OECD Studies on Water

Water Resources Governance in Brazil

OECD

OECD Studies on Water

Water Resources Governance in Brazil

OECD

BETTER POLICIES FOR BETTER LIVES

This work is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Please cite this publication as:
OECD (2015), *Water Resources Governance in Brazil*, OECD Studies on Water, OECD Publishing, Paris.
http://dx.doi.org/10.1787/9789264238121-en

ISBN 978-92-64-23811-4 (print)
ISBN 978-92-64-23812-1 (PDF)

Series: OECD Studies on Water
ISSN 2224-5073 (print)
ISSN 2224-5081 (online)

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Photo credits: Cover © Ibicuí river, Manuel Viana/RS. Zig Koch/ANA Image Bank

Corrigenda to OECD publications may be found on line at: *www.oecd.org/about/publishing/corrigenda.htm*.

© OECD 2015

You can copy, download or print OECD content for your own use, and you can include excerpts from OECD publications, databases and multimedia products in your own documents, presentations, blogs, websites and teaching materials, provided that suitable acknowledgement of OECD as source and copyright owner is given. All requests for public or commercial use and translation rights should be submitted to *rights@oecd.org*. Requests for permission to photocopy portions of this material for public or commercial use shall be addressed directly to the Copyright Clearance Center (CCC) at *info@copyright.com* or the Centre français d'exploitation du droit de copie (CFC) at *contact@cfcopies.com*.

Foreword

Brazil holds 12% of worldwide freshwater, but water scarcity due to severe weather conditions in recent years has triggered a debate about how water resources can be managed effectively in a "water-rich" country. Water availability needs to be monitored and managed locally, and robust institutions and policies are required to make the best use of available water, now and in the future.

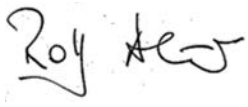
The Brazilian National Water Agency (ANA) and the OECD have been working together over the last two years to assess the strengths and weaknesses of water governance in Brazil, as well as to find ways to enhance federal and state capacity to deliver effective water policies that can contribute to national growth and development.

This policy dialogue was informed by robust data collection; international good practice, as identified in the OECD Principles of Water Governance; and in-depth consultation with a wide range of stakeholders at the federal, state, basin and local levels. It has also benefited from the experience of senior policy makers from Australia, Canada, the European Commission, Portugal and South Africa.

Five case studies showcase the diversity of situations across Brazil and the distinctive capacity of the states to manage water resources. Three states, Rondônia in the Amazon region, Paraíba in the semi-arid Northeast, and Rio de Janeiro in the Southeast, highlight the uneven performance of state water governance systems and their interaction with the federal government. The remaining two cases, the São Francisco and São Marcos basins, illustrate how water is allocated in practice.

The report *Water Resources Governance in Brazil* focuses on two critical conditions for more sustainable, inclusive and effective water policies in Brazil: better water allocation regimes to manage trade-offs across water users and uses, and a stronger multi-level governance system to better reconcile state and federal priorities and improve capacity at different levels of government. The report outlines an action plan for improving water governance and water allocation regimes in Brazil.

Crises are opportunities for change. Striking achievements have marked water governance and management in Brazil in the last decades. Ongoing developments point to the potential to strengthen resilience and raise the importance of water on the national policy agenda. All is set for an ambitious collective action that can help deliver better water policies for better lives in Brazil.



Rolf Alter,
Director, Public Governance and Territorial
Development Directorate, OECD

Acknowledgements

This report is the outcome of a one-year policy dialogue with the National Water Agency (ANA) and more than 100 stakeholders from different agencies, ministries and levels of government in Brazil. The policy dialogue was spearheaded and managed by Aziza Akhmouch, Head of the Water Governance Programme at the Regional Development Policy Division, led by Joaquim Oliveira Martins, within the Public Governance and Territorial Development Directorate, directed by Rolf Alter. It was carried out in partnership with the OECD Environment Directorate, whose contribution was co-ordinated by Xavier Leflaive, Leader, Water Team.

The report was drafted by a core OECD team comprised of Aziza Akhmouch, Xavier Leflaive and Oriana Romano, with inputs from Francisco Nunes Correia, former Minister of Environment, Spatial Planning and Regional Development of Portugal (2005-09) and President of the Department of Civil Engineering, Architecture and Geo-resources at the Instituto Superior Técnico, Lisbon; and Robert Speed, a water resources management specialist and Director of Okeanos Pty Ltd. The report also benefited from contributions by Emmanuel Branche, Senior Engineer Economist, Électricité de France (EDF) and Francisco José Lobato da Costa, local expert in integrated water management and governance. Special thanks are conveyed to Viviane Gomes and Shahnaaz Parker from the OECD Water Governance Programme for their support with desk research and institutional mappings; to Luiz de Mello, Deputy Director of the Public Governance and Territorial Development Directorate, for his valuable comments on earlier drafts as well as to Claire Charbit, OECD Regional Policy Division, for her guidance on topics related to multi-level governance and contracts, and for her contribution to the policy dialogue and related missions.

The OECD Secretariat is thankful to the ANA President, directors and officials for their availability and involvement, in particular Vicente Andreu, João Gilberto Lotufo Conejo, Paulo Varella, Gisela Forattini, Bruno Pagnoccheschi, Luiz Correa Noronha, Rodrigo Flecha Ferreira Alves, Sérgio Rodrigues Ayrimoraes Soares, Aline Machado da Matta, Ana Paula Fioreze, Paulo Augusto Cunha Libânio, Ludmila Alves Rodrigues, Alan Vaz Lopes, Alexandre Lima de Figueiredo Teixeira, Mariane Moreira Ravanello, Wagner Martins da Cunha Vilella, Patrick Thomas Thadeu and Osman Fernandes da Silva.

The OECD Secretariat is also thankful for the contributions and support of high-level policy makers during the two policy seminars (14-16 October 2014 and 10-11 March 2015): Izabella Mônica Vieira Teixeira, Minister of Environment; Francisco José Coelho Teixeira, Minister of Integration; Ney Maranhão, Secretary of Water Resources and Urban Environment; Osvaldo Garcia, Secretary of Water Infrastructure; Paulo Ferreira, Secretary of Environmental Sanitation; Ildo Wilson Grüdtner, Secretary of Electric Energy; Altino Ventura Filho, Secretary of Energy Planning and Development; Gilson Alceu Bittencourt, Secretary of Planning and Investments; Caio Tibério Dornelles da Rocha, Secretary of Agricultural Development and Cooperatives of the Ministry of

Agriculture; Ambassador José Antonio Marcondes de Carvalho, Secretary of Environment, Energy, Science and Technology of the Ministry of Foreign Affairs; Lupercio Ziroldo Antonio, President of the Brazil Network of River Basin Organizations; Professor Francisco de Assis, Federal University of Ceara; Professors Rubem Porto and Mônica Porto, University of São Paulo; and Professor Jerson Kelman, Federal University of Rio de Janeiro.

The OECD Secretariat is equally grateful to the peer reviewers who contributed on the basis of their expertise and country experience throughout the policy dialogue, and participated in the field missions to Brasilia (9-14 March 2014), Rio de Janeiro, João Pessoa, Salvador and Brasilia (18-23 May 2014) and in the Policy Seminar (14-16 October 2014). The peer review team was comprised of Sharon Bailey, Food Safety and Environmental Policy at Ontario's Ministry of Agriculture and Food, Canada; Peter Gammeltoft, former Head of Unit for Water at the European Commission, Directorate General for the Environment; Marie Brisley, Chief Director of Policy and Strategy at the Department of Water Affairs' National Office in Pretoria, South Africa; Francisco Nunes Correia, former Minister of Environment of Portugal (2005-09) and President of the Department of Civil Engineering, Architecture and Geo-resources at the Instituto Superior Técnico, Lisbon; Robert Speed, water resources management expert and Director of Okeanos Pty Ltd, Australia; and Emmanuel Branche, Senior Engineer Economist, EDF.

In addition to the valuable and dedicated work of ANA technicians throughout the process, the report has also benefited from written comments from the Ministry of Environment (Department of Water Resources and Urban Environment, Secretariat of Water Resources and Urban Environment – SRHU); the Ministry of Agriculture, Livestock and Food Supply; the Ministry of Cities; the Ministry of Planning; the Secretariat of Environment in Goiás; the State Secretariat of Environmental Development of Rondônia (SEDAM); the State Secretariat of Mining, Geodiversity and Water Resources of Amazonas (SEMGRH); the Environmental Company of the State of São Paulo (CETESB); the Minas Gerais Water Management Institute (IGAM); the National Water Resources Council; the Agency of Piracicaba, Capivari and Jundiaí River Basin (PCJ); the River Basin Committee of Jamari; the River Basin Committee of Paranaíba; the Brazilian Forum of Civil Society for River Basin Committees (FONASC-CBH); the Water and Sanitation Company of the State of Bahia (EMBASA); the National Confederation of Industry (CNI); the Federation of Industries in the state of Minas Gerais; the Association of Farmers and Irrigators of Bahia (AIBA); the Federal University of Rondônia; the Federal Institute of Education, Science and Technology of Paraiba (IFPB); the Center for Strategic Studies and Management (CGEE); and WWF-Brazil.

The report was discussed at the fourth meeting of the OECD Water Governance Initiative (24-25 November 2014). Special thanks are herein conveyed to Xavier Ursat , EdF; Benedito Braga, World Water Council; and Alain Bernard, International Network of Basin Organisations, for their participation as discussants during the peer review. The report was submitted for approval through written procedure to the OECD Regional Development Policy Committee. The report was edited by Hilary Delage and formatted by Jennifer Allain. Ulrike Chaplar and Jennifer Kilbourne prepared the manuscript for publication.

Table of contents

Acronyms and abbreviations 11

Executive summary 17

Assessment and recommendations 21

Chapter 1. **Setting the scene** 29

Key data 30
Water: A limiting factor for development in Brazil 30
Water and energy: The driving force of hydropower 31
Regional disparities 33
Climate change 35
Bibliography 35

Chapter 2. **Water governance in Brazil: A state of flux** 37

Water reform in Brazil: An unfinished business 38
Institutional mapping of water roles and responsibilities 44
Assessment of multi-level governance 58
Ways forward for strengthening water governance 81
Note 98
Bibliography 99

Chapter 3. **Advancing Brazil's National Pact for Water Management** 101

Introduction 102
The Pact: A robust policy response to water governance gaps 102
Challenges to the Pact's implementation 110
Ways forward to make the National Pact for Water Management happen 117
Notes 134
Annex 3.A1. Case study: Paraíba 135
Annex 3.A2. Case study: Rondônia 146
Annex 3.A3. Case study: Rio de Janeiro 155
Bibliography 168

Chapter 4. **Water allocation as a policy instrument in Brazil** 171

Introduction 172
Water allocation: An emerging issue in Brazil 172
Technical considerations 178
Setting priorities for water allocation 189
Supporting measures for allocation and implementation issues 193
Addressing legacy issues 205
Governing water allocation 207
Conclusions and recommendations 213
Note 221
Annex 4.A1. How climate change features in water allocation regimes 222
Annex 4.A2. Sequence of priority uses: Results of the OECD survey 225
Annex 4.A3. Duration of water entitlements in selected countries 227
Annex 4.A4. Case study: São Marcos – Mitigating past errors 228
Annex 4.A5. Case study: São Francisco – Anticipating future crises 236
Bibliography 243

Chapter 5. **Action plan for strengthening water governance in Brazil** 245

Introduction 246
Strengthening water governance 247
Making the National Pact for Water Management happen 248
Managing the water allocation reform process 249
Notes 270
Bibliography 270

Annex A. **List of stakeholders consulted during the policy dialogue** 272

Tables

Table 3.1. Management map and typologies of the Pact 104
Table 3.2. Variables of the water management target framework 105
Table 3.3. Policy recommendations by typology, a tentative framework 125
Table 3.4. Examples of water governance indicators 131
Table 3.A3.1. River basin committees in the state of Rio de Janeiro 160
Table 4.1. Water availability in the São Marcos River basin (m^3/s) 181
Table 4.A1.1. How climate change features in allocation regimes 222
Table 4.A3.1. Duration of water entitlements in selected countries/basins 227
Table 4.A5.1. Criteria for reference flows in the São Francisco basin 238
Table 5.1. Action plan for strengthening water governance in Brazil 255
Table 5.2. Action plan to make the Pact happen 262
Table 5.3. Action plan for strengthening water allocation regimes 266

Figures

Figure 1.1. Final energy consumption in Brazil 31
Figure 1.2. Sources of electricity in Brazil 32
Figure 2.1. Timeline of state water laws 41
Figure 2.2. Stakeholders' positions during the negotiations of the 1997 Water Law 43
Figure 2.3. Institutional mapping for water resources management in Brazil 45
Figure 2.4. Current composition of the National Water Resources Council 46
Figure 2.5. States with water resources councils, 1992-2012 53
Figure 2.6. Evolution of the number of state and interstate river basin committees 54
Figure 2.7. Timeline for the creation of river basin committees 55
Figure 2.8. OECD Multi-Level Governance Framework: "Mind the Gaps, Bridge the Gaps" 58
Figure 2.9. Obstacles to vertical co-ordination of water policy from the states' perspectives 63
Figure 2.10. Timeline for the development of state and interstate plans 64
Figure 2.11. Evolution of water charges and financial aid within the PCJ basins, 2006-13 68
Figure 2.12. Water charges and financial transfers in the Seine-Normandie River basin 68
Figure 2.13. Hydrographical units of the Tietê and Seine-Normandie basins, at the same scale 69
Figure 2.14. Self-assessment of selected states' capacities 72
Figure 2.15. States' perceived challenges related to planning and project development 81

Figure 2.16. Vertical co-ordination mechanisms....94
Figure 3.1. The target framework of the National Pact for Water Management....103
Figure 3.2. The interaction between Progestão and other programmes....106
Figure 3.3. Implementation steps of Progestão....107
Figure 3.4. From state decrees to implementation....108
Figure 3.5. States' perception of major bottlenecks to the implementation of the National Pact for Water Management....113
Figure 3.6. Challenges to a successful implementation of the National Pact for Water Management....114
Figure 3.7. Expected contribution of the National Pact for Water Management: A perspective from Brazilian states....117
Figure 3.A1.1. Institutional mapping for water resources management in Paraíba....137
Figure 3.A1.2. Water management timeline....139
Figure 3.A1.3. Steps of Progestão in Paraíba....143
Figure 3.A2.1. Rondônia's institutional framework timeline....148
Figure 3.A2.2. Institutional mapping for water resources management in Rondônia....149
Figure 3.A2.3. Steps of Progestão in Rondônia....152
Figure 3.A3.1. Institutional mapping for water resources management in Rio de Janeiro....158
Figure 3.A3.2. Rio de Janeiro's institutional framework timeline....159
Figure 3.A3.3. Steps of Progestão in Rio de Janeiro....165
Figure 4.1. Proportion of allocation regimes according to type of limit on abstraction....183
Figure 4.2. Number of allocation regimes with individual or both individual and collective entitlements....199
Figure 4.3. Proportion of allocation regimes with an abstraction charge....202
Figure 4.4. Proportion of allocation regimes reflection scarcity in an abstraction charge....202
Figure 4.A2.1. Sequence of priority water uses in selected countries....225
Figure 4.A4.1. Hydropower plants in São Marcos River basin....230
Figure 4.A4.2. Key milestones in Batalha's development....230
Figure 4.A5.1. São Francisco hydropower plants....237

Acronyms and abbreviations

AESA	State Executive Water Management Agency of Paraíba *Agência Executiva de Gestão das Águas do Estado da Paraíba*
AGEVAP	Association for Water Management in Paraíba do Sul River Basin *Associação Pró-Gestão das Águas da Bacia Hidrográfica do Rio Paraíba do Sul*
AIBA	Association of Farmers and Irrigators of Bahia *Associação de Agricultores e Irrigantes da Bahia*
ANA	National Water Agency *Agência Nacional de Águas*
ANEEL	National Agency for Electric Energy *Agência Nacional de Energia Elétrica*
APQ	Framework programme agreements *Accordo di programma quadro*
AWRIS	Australian Water Resources Information System
CAERD	Water and Sewerage Company of Rondônia *Companhia de Água e Esgoto de Rondônia*
CAGEPA	Water and Sewerage Company of Paraíba *Companhia de Água e Esgotos da Paraíba*
CEDAE	State Water and Sewerage Company of Rio de Janeiro *Companhia Estadual de Águas e Esgotos do Rio de Janeiro*
CEIVAP	Committee for Integration of the Paraíba do Sul River Basin *Comitê de Integração da Bacia Hidrográfica do Paraíba do Sul*
CEMADEN	National Centre for Monitoring and Alert of Natural Disasters *Centro Nacional de Monitoramento e Alertas de Desastres Naturais*
CERH	State Water Resources Council *Conselho Estadual de Recursos Hídricos*
CETENE	Northeast Strategic Technology Centre *Centro de Tecnologias Estratégicas do Nordeste*
CETESB	Environmental Company of the State of São Paulo *Companhia Ambiental do Estado de São Paulo*
CGE	Computable general equilibrium models
CGEE	Center for Strategic Studies and Management *Centro de Gestão e Estudos Estratégicos*
CIPE	Inter-ministerial Committee for Economic Planning (Italy) *Comitato Interministeriale per la Programmazione Economica*
CIS	Common Implementation Strategy
CNARH	National Registry of Water Resources Users *Cadastro Nacional de Usuários de Recursos Hídricos*

CNRH	National Water Resources Council *Conselho Nacional de Recursos Hídricos*
COA	Canada-Ontario Agreement
COAG	Council of Australian Governments
CODEBAR	Barcarena Development Company *Companhia de Desenvolvimento de Barcarena*
CODEVASF	Company for the Development of São Francisco and Parnaíba Valleys *Companhia de Desenvolvimento dos Vales do São Francisco e do Parnaíba*
COGERH	Company for Water Resources Management of Ceará *Companhia de Gestão dos Recursos Hídricos do Ceará*
CONAB	National Supply Company *Companhia Nacional de Abastecimento*
CONAFOR	National Forestry Commission *Comisión Nacional Forestal*
CONAMA	National Council of Environment *Conselho Nacional do Meio Ambiente*
CPRM	Research Company of Mineral Resources *Companhia de Pesquisa de Recursos Minerais*
CTEM	Minerals Technology Centre *Centro de Tecnologia de Minerais*
DIGAT	Directorate of Water and Territories Management *Diretoria de Gestão das Águas e do Territorio*
DILAM	Environmental Licensing Directorate *Diretoria de Licenciamento Ambiental*
DNAEE	National Department for Water and Electric Energy *Departamento Nacional de Água e Energia Elétrica*
DNOCS	National Department of Works to Combat Droughts *Departamento Nacional de Obras Contra as Secas*
DRDH	Declaration of Reserve of Water Availability *Declaração de Reserva de Disponibilidade Hídrica*
DWS	Department of Water and Sanitation (South Africa)
EDF	Électricité de France
EMBASA	Water and Sanitation Company of the State of Bahia *Empresa Baiana de Águas e Saneamento*
EMBRAPA	Brazilian Company for Agriculture and Livestock Research *Empresa Brasileira de Pesquisa Agropecuária*
EU	European Union
FERH	State Water Resources Fund *Fundo Estadual de Recursos Hídricos*
FONASC-CBH	Brazlian Forum of Civil Society for River Basin Committees *Fórum Nacional da Sociedade Civil nos Comitês de Bacias Hidrográficas*

FUNDRHI	State Water Resources Fund *Fundo Estadual de Recursos Hídricos*
FUNAI	National Indian Foundation *Fundação Nacional do Índio*
FUNASA	National Health Foundation *Fundação Nacional de Saúde*
GDP	Gross domestic product
GLWQA	Great Lakes Water Quality Agreement
GVIAP	Gross value of irrigated agricultural production
HPP	Hydro Power Plants
IBAMA	Brazilian Institute of Environment and Renewable Natural Resources *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis*
IBGE	Brazilian Institute of Geography and Statistics *Instituto Brasileiro de Geografia e Estatística*
IBRD	International Bank for Reconstruction and Development – The World Bank
ICMBio	Institute for the Conservation of Biodiversity *Instituto Chico Mendes de Conservação da Biodiversidade*
IFPB	Federal Institute of Education, Science and Technology of Paraiba *Instituto Federal de Educação, Ciência e Tecnologia da Paraíba*
IGAM	Minas Gerais Water Management Institute *Instituto Mineiro de Gestão das Aguas*
IMTA	Mexican Institute of Water Technology *Instituto Mexicano de Tecnologia del Agua*
INBO	International Network of Basin Organizations
INEA	State Environmental Institute of Rio de Janeiro *Instituto Estadual do Ambiente do Rio de Janeiro*
INMET	National Institute of Meteorology *Instituto Nacional de Meteorologia*
INPA	National Amazon Research Institute *Instituto Nacional de Pesquisas da Amazônia*
INSA	National Institute for the Semi-Arid Region *Instituto Nacional do Semiárido*
INT	National Institute of Technology *Instituto Nacional de Tecnologia*
INTERÁGUAS	Programme for Development of the Water Sector *Programa de Desenvolvimento do Setor Água*
IWRM	Integrated water resources management
JBRJ	Rio de Janeiro Botanical Garden Research Institute *Instituto de Pesquisas Jardim Botânico do Rio de Janeiro*
MMA	Ministry of the Environment *Ministério do Meio Ambiente*
MPOG	Ministry of Planning, Budgeting and Management *Ministério do Planejamento Orçamento e Gestão*

NARBO	Network of Asian River Basin Organizations
NGO	Non-governmental organisation
NRMMC	Natural Resource Management Ministerial Council *Conselho Ministerial de Gestão dos Recursos Naturais*
NWI	National Water Initiative
OECD	Organisation for Economic Co-operation and Development
ONS	National operator of the electric system *Operador Nacional do Sistema Elétrico*
OSCIP	Civil society organisation of public interest *Organização da sociedade civil de interesse público*
OUGC	Single collective management bodies *Órgãos unitário de gestão coletiva*
PCJ	Agency for Piracicaba, Capivari and Jundiaí River Basins *Agência das Bacias dos Rios Piracicaba, Capivari e Jundiaí*
PLANSAB	National Plan of Basic Sanitation *Plano Nacional de Saneamento Básico*
PNQA	National Programme for Water Quality Evaluation *Programa Nacional de Avaliação da Qualidade das Águas*
PRODES	River Basins Depollution Programme *Programa de Despoluição de Bacias Hidrográficas*
Progestão	Consolidation Program of the National Pact for Water Management *Programa de Consolidação do Pacto Nacional pela Gestão das Águas*
RBC	River basin committee
RBO	River basin organisation
SAGARPA	Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (Mexico) *Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación*
SALGA	South African Local Government Association
SDAGE	Master Plan of Development and Water Management (France) *Schéma directeur d'aménagement et de gestion des eaux*
SEA	State Secreatriat of Environment of Rio de Janeiro *Secretaria de Estado do Ambiente do Rio de Janeiro*
SEAGRI	State Secretariat of Agriculture, Livestock, Development and Land Regularisation of Rondônia *Secretaria de Estado da Agricultura, Pecuária, Desenvolvimento e Regulação Fundiária de Rondônia*
SEDAM	State Secretariat of Environmental Development of Rondônia *Secretaria Estadual de Desenvolvimento Ambiental de Rondônia*
SEGREHs	State water resources management systems *Sistemas Estaduais de Gestão dos Recursos Hídricos*
SEMARNAT	Secretariat of Environment and Natural Resources (Mexico) *Secretaría de Medio Ambiente y Recursos Naturales*
SEMGRH	Secretariat of Mining, Geodiversity and Water Resources of Amazonas *Secretaria da Mineração, Geodiversidade e Recursos Hídrico de Amazonas*

SENIR	National Secretariat for Irrigation *Secretaria Nacional de Irrigação*
SEPOG	State Secretariat of Planning, Budget and Management of Rondônia *Secretaria do Planejamento, Orçamento e Gestão de Rondônia*
SERHMACT	State Secretariat of Water Resources, Environment, and Science and Technology of Paraíba *Secretaria de Estado de Recursos Hídricos, Meio Ambiente e da Ciência e Tecnologia da Paraíba*
SIA	Spanish Integrated Water Information System *Sistema Integrado de Información del Agua*
SINGREH	National Water Resources Management System *Sistema Nacional de Gerenciamento de Recursos Hídricos*
SIPAM	Amazon Protection System *Sistema de Proteção da Amazônia*
SNIRH	Portuguese National Water Resources Information System *Sistema Nacional de Informações sobre Recursos Hídricos*
SNSA	National Secretariat for Environmental Sanitation *Secretaria Nacional de Saneamento Ambiental*
SRHU	Secretariat for Water Resources and Urban Environment *Secretaria de Recursos Hídricos e Ambiente Urbano*
TEPS	Total primary energy supply
TI	Transparency International
UEDs	Decentralised executive units *Unidades executivas descentralizadas*
UNDP	United Nations Development Programme
US EPA	United States Environmental Protection Agency
WFD	Water Framework Directive
WISE	Water Information System for Europe
WSLG	Water Service Sector Leadership Group
WUA	Water users' association

Executive summary

Setting the scene

Brazil holds 12% of the world's freshwater resources, making water a comparatively abundant resource in the country. However, water resources are unevenly distributed across the territory: while the northeastern states are mostly semi-arid, the Amazon region has an abundance of water. This uneven distribution is not unusual in large countries such as Brazil, but it poses challenges for the management of water resources now and in the future.

The report focuses on two questions that have been at the core of the policy dialogue with Brazilian stakeholders over the past 18 months: 1) how is the multi-level governance system performing in terms of co-ordinating state and federal water policies and priorities? 2) are current water allocation regimes robust enough to cope with future water risks?

Multi-level governance is particularly critical in a decentralised federation, where water resource management is under the purview of the 27 states and the Federal District, and rooted in a history of participatory democracy based on more than 200 river basin committees. As in other countries, decentralised management is an appropriate response to diversity in needs and local conditions, but it also poses co-ordination challenges that need to be taken into account when putting in place solutions to "too much", "too little" or "too polluted" water.

Water allocation has gained traction with water scarcity. Competition among different users (e.g. agriculture, industry, households) requires appropriate mechanisms for managing trade-offs, especially since hydropower is the main source of energy in Brazil (87.1% of electricity generation comes from renewables). While water permits in federal rivers are granted by the National Water Agency (ANA), permits for state rivers are issued by state agencies. As priorities can differ across federal, state and basin entities, the question is how to take the decisions across these levels mutually compatible and reinforcing.

Water governance and allocation are therefore closely linked, as more efficient water allocation regimes require both greater co-ordination at federal, state and basin levels and strengthened capacity at sub-national level. This report provides an assessment in both areas and suggests ways forward, building on existing governance structures and policy instruments.

Assessment

Brazil has made remarkable progress in water resource management since the adoption of the National Water Law in 1997 and the creation of the ANA in 2000. These achievements set the foundations for multi-level, integrated and place-based governance

of water resources, as opposed to the centralised and technocratic model of development under the military regime.

Yet, water reform has not fully reaped the expected economic, social and environmental benefits. The following governance gaps assessed against the OECD's Multi-Level Governance Framework still hinder the effective implementation of Brazil's water resources management.

- The multiple water resource plans at basin, local, state and national levels are poorly co-ordinated and barely put in practice because of limited funding, capacity, monitoring and enforcement. For instance, they do not set clear priorities or criteria that define available water resources and drive allocation decisions for hydropower development, irrigation extension and domestic use, amongst others.
- The mismatch between municipal, state and federal administrative boundaries and hydrological perimeters raises the question of the appropriate functional scale. For instance, it is difficult to enforce water quality regulations and abstraction rules where two or more water management bodies are in charge of different sections of a river.
- Silos across ministries and public agencies still hamper policy coherence among water, agriculture, energy, environmental licensing, sanitation and land use. The fact that municipalities are largely absent from river basin committees and that the National Water Resources Council is not fully playing its role are compounding factors.
- Where they exist, water charges are low and rarely grounded in affordability studies or impact assessment; they are considered public finance and therefore subject to strict spending rules and procedures, often burdensome for states. This prevents their use as a policy instrument to foster rational use of water and signal scarcity.
- The availability of good, accessible data and information on water varies across the states, preventing effective decision making in terms of who gets water, where and when.
- River basin committees are endowed with strong deliberative powers, but have limited implementation capacity. In many instances, they play essentially an advocacy role, while in most OECD countries their role is to build consensus on priorities and planning to guide decision making.

Policy recommendations

The water supply crisis in Brazil's Southeast region (especially in the states of Rio de Janeiro and São Paulo), following the driest winter period in 84 years, has shone a political spotlight on more structural challenges. Forecasts of population and economic growth, as well as climate change, suggest continued pressure on water resources in the years to come. This calls for a shift from crisis management to risk management.

The National Water Security Plan and Multi-Annual Plan expected in 2016 provide a unique opportunity to better manage water as a factor in economic growth and development. The National Pact for Water Management provides a sound vehicle for enhanced multi-level dialogue, while taking into account the diversity across states in

terms of performance, hydrology and development. The ANA, as the meeting point between top-down and bottom-up policies, has a decisive role to play to engage states towards more effective, efficient and inclusive water resources management.

The report concludes with policy recommendations as well as an action plan with concrete milestones and indicators to implement them, drawing on international experience. Recommendations include:

- raising the profile of water as a strategic priority with broader economic, social and environmental benefits for national policy
- strengthening the power, influence and effectiveness of the national and state water resources councils in guiding decisions at the highest level
- enhancing cross-sector co-ordination for greater policy coherence and consistency
- strengthening the capacity of state-level institutions in terms of staff, funding, monitoring and enforcement
- strengthening the effectiveness of basin-level institutions for results-oriented engagement of stakeholders and full-fledged implementation of river basin plans
- encouraging the adoption of pricing mechanisms, including water charges, to reflect the opportunity costs of alternative uses of water resources
- fostering the continuity and impartiality of public policy for a long-term vision towards sustainable water resources management
- fostering transparency and regular information-sharing for greater trust
- raising awareness among stakeholders about future risks and promoting greater interaction with municipalities in consultative and deliberative fora
- taking a consistent approach to define the water resource pool to maximise benefits, and facilitating reallocation when appropriate to encourage water efficiency
- setting water resources plans that guide water allocation decisions, and making the best use of the variety of economic instruments to support their implementation
- scaling-up opportunities for sharing experience across states and basins to foster learning through peer-to-peer dialogue.

Assessment and recommendations

The report focuses on two questions that have been at the core of the policy dialogue with Brazilian stakeholders over the past 18 months: 1) how is the multi-level governance system performing in terms of co-ordinating state and federal water policies and priorities? 2) are current water allocation regimes robust enough to cope with future water risks?

Multi-level governance is particularly critical in a decentralised federation, where water resource management is under the purview of the 27 states and the Federal District, and rooted in a history of participatory democracy based on more than 200 river basin committees. As in other countries, decentralised management is an appropriate response to diversity in needs and local conditions, but it also poses co-ordination challenges that need to be taken into account when putting in place solutions to "too much", "too little" or "too polluted" water.

Water allocation has gained traction with water scarcity. Competition among different users (e.g. agriculture, industry, households) requires appropriate mechanisms for managing trade-offs, especially since hydropower is the main source of energy in Brazil (87.1% of electricity generation comes from renewables). While water permits in federal rivers are granted by the National Water Agency (ANA), permits for state rivers are issued by state agencies. As priorities can differ across federal, state and basin entities, the question is how to take the decisions across these levels mutually compatible and reinforcing.

Water governance and allocation are therefore closely linked, as more efficient water allocation regimes require both greater co-ordination at federal, state and basin levels and strengthened capacity at sub-national level. This report provides an assessment in both areas and suggests ways forward, building on existing governance structures and policy instruments.

Water governance

A state of flux

Ambitious and forward-looking reforms have shaped Brazil's water resources management towards decentralisation, participation and integration. The 1997 Federal Water Law enacted basic principles and guidelines, and the creation of the ANA in 2000 provided for a highly qualified and stable institution to drive the reform process. The decentralisation to the states and river basin committees laid down a multi-level and "problemshed" approach, very much in line with the desire of a society to enhance place-based and bottom-up decision making in the aftermath of the democratic transition.

However, water reform is incomplete; there are still many governance gaps that need to be addressed. The difficult negotiations and trade-offs of the late 1990s on river basin planning, water pricing, management of multiple uses, and participation of users and civil

society have serious policy implications today. Implementation effectiveness in these areas has been uneven, and the interface between water and other policy domains has not been properly managed.

Brazil is a country of huge diversity, not just in terms of hydrographic characteristics and level of economic development but also in terms of institutions' capacity, amongst others. Such diversity across states explains why there cannot be a one-size fits all assessment and response. In addition, the country is currently going through a serious water crisis and intense questioning on what has and has not worked properly and what could be improved. Ongoing developments (e.g. National Water Security Plan and National Plan of Adaptation to Climate Change) raise formidable opportunities to strengthen resilience to fit for the future.

Three important shifts in the public debate can support better governance of water resources. First is the pivotal role of states in water resources management. Basin governance is hardly achievable without state empowerment, as much as federal integrated water management cannot be achieved without state integrated water management. Second is the fact that stakeholder engagement and widespread social mobilisation should not preclude sound technical knowledge and the exercise of public authority. Third is the acknowledgement that bottom-up approaches need to be complemented by a top-down process to guarantee the accomplishment of national goals and long-term objectives.

A fragmented setting

Water policy design and implementation in Brazil are highly fragmented due to several governance gaps and related co-ordination challenges.

- There are many water plans in place, but they tend to be poorly co-ordinated and weak in practice due to the lack of capacity, both with respect to implementation and funding. As a result, plans are often simply "paper tigers" or promises for others to fulfil. The National Water Resources Plan is too broad to set specific priorities, and fails to link to the broader development strategy and co-ordinate decision making.
- The mismatch between administrative perimeters (municipal, state, federal) and hydrological boundaries (river basin committees) leads to a "double grid" that needs to be reconciled, which is exacerbated by the double dominion and shared jurisdiction over state/federal rivers.
- Silo approaches among water-related ministries hinder policy coherence at different levels. In particular, poor co-ordination between water, land use, sanitation, environmental and economic development policies is detrimental to water policy. The fact that municipalities are largely absent from participatory structures is a compounding factor.
- The National Water Resources Council has not fully played its cross-sector co-ordination role. The level of representation of ministries is not sufficient, which undermines their influence on the decision-making process and strategic orientations. Given the technical nature of its work, the council has often been a recording chamber rather than serving as a full-fledged advisory platform to guide public action.

- Where they exist, water charges are low, as are bill collection rates. Funds accumulate with no visible use, which is discouraging for users charged and river basin committees in general. Revenues from hydropower are shared among several organisations and are generally not earmarked for the water sector. Prioritisation according to the federal, state and basin needs is rather low.
- While the ANA has a high level of capacity with competent and skilled staff and engineers, this is not always the case in deliberative bodies and public administrations across levels of government. States' capacities are often limited in terms of staff, funding, participation and political commitment and the country is entangled with many river basin committees, resulting in little implementation.
- The image of "water abundance" in Brazil generates an awareness gap that hinders the capacity of responsible authorities to cope with pressing and emerging water-related issues. Politicians and citizens are sensitive to the consequences of "bad" water management but tend to look at it from a mere sectoral point of view.
- The quality and accessibility of hydrological, economic and financial data and information varies across states in Brazil, as does the capacity to monitor water use and to enforce policies. The ANA's key role should be complemented by other stakeholders to develop water accounts at the federal level and additional tools are required to feed into a national decision support system.

Ways forward to strengthen water governance

Brazil has the ingredients for a future-proof water governance system, including tremendous potential in terms of innovation and skills, a large and rich experience, and a momentum to move forward. This report suggests the following actions to overcome multi-level governance gaps and strengthen integration and co-ordination:

- raise the profile of water in the national political agenda, as a strategic priority with broader economic, social and environmental benefits
- upgrade the power, influence and effectiveness of the National Water Resources Council and state water resources councils in guiding strategic decisions at the highest level
- strengthen and reprofile basin institutions for more effective and result-oriented stakeholder engagement
- foster greater co-ordination of the Ministry of Environment with the Ministry of Cities, the Ministry of Agriculture, the Ministry of Planning, the Ministry of National Integration and their equivalents at the state level
- strengthen the financial and technical capacity of state-level institutions in terms of staff, funding, monitoring and enforcement through empowerment mechanisms such as the National Pact for Water Management
- foster a culture of continuity in state public policy with a politically backed long-term vision, a more professionally based recruitment of water professionals, as well as mandates based on medium- and long-term consensual strategies

- encouraging the adoption of pricing mechanisms, including water charges, to reflect the opportunity costs of alternative uses of water resources
- enhance experience-sharing, communication and bench-learning at all levels to draw lessons from success stories and common challenges.

The ANA could serve as the meeting point between top-down and bottom-up trends and policies, as well as the overarching link between subsidiarity-based (states and municipalities) and solidarity-based (river basins) decentralisation. To circumvent the "double dominion" challenge whereby competences over federal and state rivers are allocated to different levels of government, the ANA could consider further delegating to the states some of its prerogatives over federal rivers, following commonly agreed guidelines and provided that capacity is in place, while retaining reserve powers to intervene. The ANA could implement this approach to the extent considered convenient, without requiring any change of the Constitution.

Water allocation

The term water allocation is used to describe the process and tools involved in sharing water resources amongst different water users. This includes establishing water resource plans that define the availability of water and the granting of water permits to individual water users. It includes allocating water resources over the long term, as well as seasonal adjustments to the amount of water available to different users, and the allocation of both surface waters and groundwater.

An emerging issue

The adoption of a systematic approach to water allocation is relatively new in Brazil, but key elements of a well-designed allocation regime are in place. They include: water resources plans at federal, interstate, state (completed in 18 of Brazil's 27 states), river basin or management unit levels (100); the National Registry of Water Resources Users (Cadastro Nacional de Usuários de Recursos Hídricos, CNARH); and the National Water Resources Information System (Sistema Nacional de Informações sobre Recursos Hídricos, SNIRH), which allows for the recording, storage and retrieval of information relevant to water resources management.

While acknowledging the diversity of contexts and arrangements across the country, several weaknesses need to be addressed so that water effectively contributes to broader policy objectives. Failure to address them could result in further conflicts over water and limit the potential for the allocation of water resources to contribute to developmental, economic and other objectives. The costs of allocation inefficiencies are already rising in several basins. For instance, the uncoordinated development of irrigation in São Marcos makes it difficult to implement optimal arrangements for water allocation, taking account of the multiple purposes for which water is used, the social and economic needs, and the balance between national and sub-national interests.

Three major weaknesses that need to be addressed

- Water resources plans do not set priorities or criteria that can drive allocation decisions. Moreover, plans generally do not factor in cyclical events, such as

droughts, and thus lack clarity in terms of priority of water use in times of crisis. Significant sectoral planning occurs largely in isolation (e.g. hydropower development, irrigation extension), frequently unconnected to the water resources planning process.

- Responsibility for many allocation decisions is placed with river basin committees or state agencies – entities whose water allocation priorities may differ from those at the national level. Potential tensions between federal and state priorities are exacerbated by challenges related to the "double dominion" over water management, and the inconsistencies in approach to allocating water from hydrologically connected water sources.
- Implementation of water allocation policy remains the exception rather than the rule.

These weaknesses hinder the capacity of water management in Brazil to strike a balance between competing obligations:

- balancing the need for security and certainty of supply (at the regional, sector and user levels) with allowing flexibility for water resource managers to respond to changing circumstances
- balancing preferred or optimal outcomes with the need to be practical and pragmatic
- balancing strategic considerations and the desire to align allocations to meet national priorities with the need to respect existing rights and local interests.

Suggestions for robust water allocation regimes in Brazil

A combination of three sets of measures can help to address these weaknesses. The sequence of action needs to reflect the urgency in specific basins or areas, thus demonstrating benefits that can be replicated and scaled up.

The first set of measures aims at ensuring that there is a clear definition of available water resources and priorities for water uses:

- Setting reference flows in a way that maximises benefits and contributes to water use efficiency; this could include identifying and allowing for the allocation of different volumes of water that would be available at different levels of reliability; or allowing for users to determine their own levels of risk.
- Water resources plans that identify priorities and drive allocation decisions. At the same time, plans should provide the flexibility to support multipurpose use of reservoirs, where appropriate.

The second set of measures can ensure that policy instruments are properly designed and implemented to serve water policy objectives through:

- Consistent standards for issuing and defining water permits based on a thorough review of existing practices. Standards should be developed with a view to identify opportunities for increasing the flexibility for water users; collective entitlements can help.

- Economic instruments that combine efficiency and flexibility. A range of options exists (essentially pricing instruments), which can facilitate reallocation of water amongst water users.

A third set of measures specifies governance arrangements required to ensure allocation efficiency:

- enforcement and monitoring as core features of a well-functioning allocation regime
- institutional arrangements that can strengthen the capacity of state actors to develop plans and set priorities, and which support better alignment of federal and state priorities and practices (including for the management of federal rivers)
- informing, building capacity and engaging with water users.

These recommendations are not prescriptive: they do not pre-empt any discussion about priorities and the nature of allocation instruments. They allow for specific adjustments that reflect the features of particular basins or catchments. Together, they would ensure a minimal level of consistency and operational efficiency, so that water allocation regimes serve policy objectives in Brazil, now and in the future, at least cost for the community.

The National Pact for Water Management

A response to multi-level governance gaps

In 2011, the ANA designed the National Pact for Water Management as a tool to enhance integration between federal and state water resources systems, to foster convergence across states' performance and to reduce regional discrepancies in water governance. The Pact has triggered a national "wake-up call" and sound political commitment to catch up in states where water had been lagging behind other priorities.

All states have joined the Pact and are clustered into homogeneous categories according to their degree of water management complexity, and the clear definition of federal and state targets. This reflects a sophisticated attempt to address place-based needs in terms of legal, planning, information and operational instruments, human resources and governance structures. A financial incentive mechanism of the Pact in place, Progestão, allocates BRL 100 million (approximately USD 40 million) over a period of five years to all the states reaching their target goals. Funds are equally distributed to all states and are not earmarked to specific spending objectives. Rewards are based on progress in achieving targets rather than on specific outputs, i.e. not so much about *what* states do but the fact that they *do* what they committed.

Benefits and challenges of the Pact

The National Pact for Water Management yields important short- and long-term benefits:

- it is a sophisticated, flexible and formalised tool, with no equivalent in OECD countries; it relies on a much needed bottom-up approach (targets, goals, variables, funding)

- the Pact promotes consistency, integration and dialogue across levels of government, with capacity building and support to decentralised water policy
- federal and state goals set in the Pact contribute to reducing asymmetries of information between federal and state institutions
- the Pact is rooted in the subsidiarity principle, which preserves the autonomy of states while engaging them towards shared responsibility to reach common goals
- the Pact can contribute to strengthening relationships across levels of government, and fostering policy continuity with medium-term commitments as its implementation cuts across political cycles
- the Pact fosters risk management to better cope with uncertainty as states diagnose their own challenges and define their own vision over the period of five years
- the process of the Pact helps to raise awareness on the impact of poor governance on water uses, financing and risks. As such, it is a powerful mechanism for capacity building.

However, a number of challenges must be considered:

- the process implies important transaction costs in terms of negotiation and implementation (consultation, verification of details, etc.), which the ANA can afford, but states may not
- the Pact foresees no sanction mechanisms in case of non-compliance (absence of "stick"), which raises the question of incentives for states to actually deliver, in particular for wealthier states that may not be motivated by the financial rewards provided
- the Pact has limited provisions for transparency and accountability of beneficiaries (states) *vis-à-vis* other stakeholders, for example the absence of reporting rules on how funds from Progestão are disbursed by state institutions
- there is a risk that the methodology to define overly sophisticated targets overshadows the importance of process itself
- little guidance is provided to ensure multi-stakeholder buy-in of the approval of the targets, beyond state governments and state water resources councils' reporting obligations
- there are challenges in evaluating the impact of governance targets on water management outcomes due to the complexity, causality and uncertainty issues
- the two-way dialogue between the federal and state levels may exclude other levels (river basin committees, municipalities)
- no provisions are in place for shared basins (across states).

Ways forward to make the Pact deliver

The Pact is a powerful instrument to put water at the centre of states' priorities and foster co-ordination. It operates in a high-level political environment with the commitment of state governors, which is critical to secure the needed buy-in. The report

suggests the following recommendations to ensure delivery of the expected medium-term outcomes:

- secure human and financial capacity at the state level for the Pact's outcomes to translate into public action (sustainable funding, professional water staff, continuity across administrations)
- strengthen the monitoring framework and assess the impact of the Pact on water governance for greater accountability (collegial design of indicators and evaluation framework)
- foster transparency and regular information-sharing on the implementation progress to build trust (dissemination campaigns, dedicated website, multi-stakeholder forum discussions, consensus on the use of funds and actions foreseen)
- foster interactions with municipalities for greater co-ordination between water and urban policies (consider "contracts" between states and municipalities; incentives for participatory fora)
- support result-oriented basin governance while engaging river basin committees throughout the implementation and clarifying their expected roles and contributions to decision making
- create opportunities for experience-sharing across states and basins to learn from each other on the results, progress and challenges related to the Pact (consider clusters by typology, use annual meetings of river basin committees and state water resources councils)
- set mechanisms to foster continuity and reap the full benefits after the five years (e.g. technical chamber overseeing the Pact in state water resources councils, multi-annual budgeting and investment plans, discussion on the next generation of the Pact).

Chapter 1.

Setting the scene

This chapter introduces basic facts and data on the main characteristics, challenges and uses of water in Brazil, linking with economic development, public health and welfare policies. It pays particular attention to the water-energy nexus and to regional disparities in terms of water availability, quality and access, as well as institutional capacity to address those challenges. The chapter also covers the impacts of climate change and the difficultly in dealing with uncertainty.

Key data

Brazil is endowed with 12% of the world's freshwater resources, and some of the world's largest water basins (the Amazon, Paraná, São Francisco River basins). The average annual water flow amounts to 180 000 m^3/s (ANA, 2014). Total water abstraction amounted to only 0.9% of total available freshwater (2 373 m^3/s) in 2010. However, water abstractions have increased by almost 30% over the past five years, reflecting both population growth and economic development (ANA, 2014).

About 50% of water abstractions are effectively consumed, i.e. not returned to the river (ANA, 2014). The balance between water supply and consumption is relatively stable in most regions of the country, except in semi-arid areas of the Northeast. In 2010, the balance between supply and consumption was considered critical or very critical for 17% of Brazil's freshwater resources (ANA, 2013).

From total water abstraction in Brazil, agriculture accounts for 54% of total water withdrawal, human water supply for 25% and industry for 17% (ANA, 2014). The shares differ across the regions, reflecting differences in climatic and socio-economic patterns across states. Losses in urban water distribution reached 36.9% in 2012 (SNIS, 2012). Median per capita domestic water consumption was 167.5 litres a day, varying from 131.2 litres a day in the Northeast to 194.8 litres a day in the Southeast (SNIS, 2012).

Domestic wastewater discharge is the main problem affecting the quality of surface waters (MMA, 2008), as only 48% of domestic sewerage is collected and 39% is treated (IBGE, 2010). Other major water quality stressors across hydrographic regions include mining, industrial effluent, diffuse inflows from urban and agricultural soil drainage, and solid waste discharge.

Water: A limiting factor for development in Brazil

Water has become a limiting factor for economic development, public health and welfare policies in Brazil. Water risks (floods, scarcity and pollution) may rise significantly as a result of the compound impacts of the interrelated factors of economic growth, land-use change, demographic change and climate change. Conservation and efficiency gains are necessary to make the best of abundant, but unevenly shared, water resources, and should be considered a priority. Efficiency here refers to both water use efficiency and allocative efficiency: the way water is allocated between water users. At the same time, a strategic approach to water resources management could play an important role in maximising economic and social welfare equitably without compromising the sustainability of ecosystems. This requires co-ordinated development and management of water, land and related resources.

Competition to access water can also hinder development. For example, lack of access to water translates into lost opportunities for development, or higher access costs (e.g. farmers and power generators). Another example is hydropower, which may be seriously affected by consumptive uses upstream; it affects the flow regime downstream and limits withdrawals upstream for other uses and environmental requirements. There is also a risk of competition among users in the semi-arid regions for the water stored in reservoirs.

Competition to access water also raises equity issues. This is an important concern as water has featured prominently in Brazil's programmes to fight poverty. Who gets the water in cases of scarcity? How are water-related risks allocated across water users? These questions need to be considered, to ensure that water management contributes to

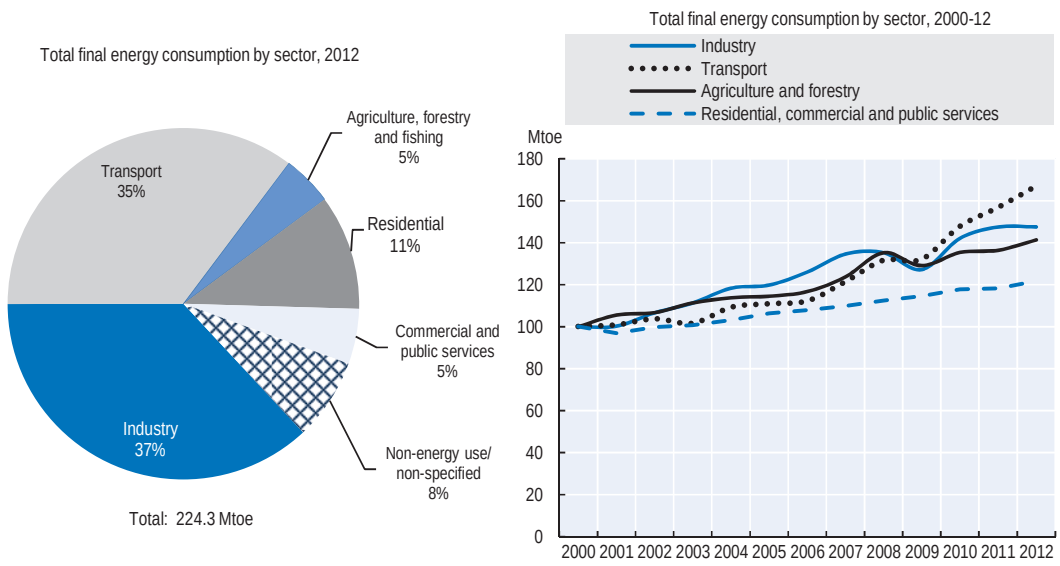
A corrigendum has been issued for this page. See http://www.oecd.org/about/publishing/Corrigendum-WaterGovernanceBrazil.pdf.

poverty alleviation and social cohesion. Article 1, Section III of the 1997 Water Law states that, in a situation of scarcity, water for human consumption and for livestock drinking is a priority.

Water and energy: The driving force of hydropower

Hydropower has been a national priority since the early 1970s when it was decided that Brazil's response to the 1973 "oil crisis" would be to substitute imports of fuels by expanding hydropower. Total primary energy supply (TEPS) has almost doubled over the past two decades, reaching 270 million tonnes of oil equivalent in 2011 (IEA, 2014). Strong economic growth, particularly the rise of a Brazilian middle class, has been the key driver behind this increase. Industry was the biggest energy consumer (37% of total consumption), followed by the transport sector with 35% of total consumption (of which more than 90% came from road transport) and the residential sector (Figure 1.1).

Figure 1.1. **Final energy consumption in Brazil**



Source: OECD (2015, forthcoming), *OECD Environmental Performance Reviews: Brazil 2015*, OECD Publishing, based on IEA (2014), *IEA World Energy Statistics and Balances* (database), http://dx.doi.org/10.1787/enestats-data-en

Brazil's energy mix has one of the highest shares of renewable energy in the world, with 41% of TEPS coming from renewable energy sources in 2014, more than five times the OECD average. In 2012, 87.1% of the country's electricity generation came from renewables (IEA, 2014). The share of renewables in the energy matrix has steadily increased since 2000, but has slightly slowed down in recent years as a result of lower consumption since 2009 of biofuel and waste energy.

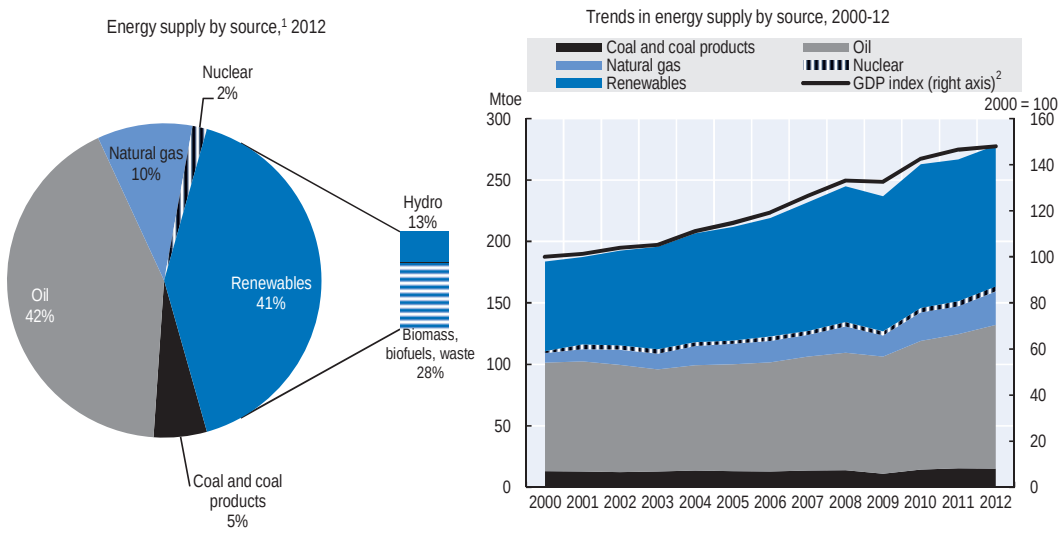
The high share of renewables has been driven by the strong reliance on hydropower for electricity generation and the widespread use of biofuels in industrial energy consumption. Hydropower accounts 92% of renewables-based electricity, while biofuels, primarily sugar cane ethanol, satisfy about 15% of transport demand (IEA, 2014). There

A corrigendum has been issued for this page. See http://www.oecd.org/about/publishing/Corrigendum-WaterGovernanceBrazil.pdf.

is still scope to expand hydropower production, but it is constrained by the social and environmental concerns of new projects.

Energy security in Brazil is closely linked to hydropower: in 2001, power had to be rationed, as a consequence of a severe crisis in hydropower generation. Moreover, when hydropower is lacking, fuel or gas oil generators are used, which are both more costly and more carbon intensive than hydropower. This, together with the enormous potential of Brazil and the quite sophisticated technology available in the country, contribute to making hydropower a favourable option for the Brazilian economy.

Figure 1.2. **Sources of electricity in Brazil**



Notes: 1. Total primary energy supply. Breakdown excludes electricity trade and heat. 2. GDP at 2005 prices and purchasing power parities.

Source: OECD (2015, forthcoming), *OECD Environmental Performance Reviews: Brazil 2015*, OECD Publishing, Paris, based on IEA (2014), *IEA World Energy Statistics and Balances* (database), http://dx.doi.org/10.1787/enestats-data-en

In Brazil, power is supplied and distributed by a national grid. Therefore, power production in one basin may be required to meet demand in another, creating competition between local and national objectives for water management, as well as social-environmental conflicts in regions like the Amazon. This may not result in optimal outcomes as hydropower may not necessarily be a priority water use in every basin or sub-basin if opportunity costs were properly reflected.

The prominent role hydropower plays in energy supply has consequences for water management. Permits for hydropower define the amount of water needed to produce energy and the amount of energy to be supplied. Accordingly, water upstream of a dam is managed so as to preserve the production capacity of the dam. This may limit diversion for other uses, such as irrigation. Recently, the ANA and the National Operator of the Electric System (Operador Nacional do Sistema, ONS) have collaborated to factor in new conditions in the operation of dams, such as ecological flows and competing water uses (water supply systems, irrigation). Further progress is needed in promoting and managing multiple uses of reservoirs in accordance with the 1997 Water Law which explicitly states that every infrastructure built in Brazil needs to look at multiple uses.

Things may change in the future, as energy sources become more diversified in Brazil. Other renewable sources of energy may be considered and scaled up (biomass, solar, wind power, etc.). Brazil also has a potential for new sources of power, such as shale gas, especially by using hydraulic fracturing techniques. There are some areas of the country like the Paraná basin that are ideal sites in terms of water availability, and others like the sub-basins within the state of Piauí, where the water demand is low. Exploiting this new form of energy may present some challenges concerning regulatory and social and environmental aspects in exploiting non-conventional gas.

Regional disparities

Regions in Brazil are affected by water issues in different ways. This holds for water scarcity and abundance, for water pollution (from industry and cities) and for access to water supply and sanitation services. The implications of water access in some regions and water quality on the provision of municipal water and sanitation also require attention. There is also a link between achieving the government's goals around access to safe water and the overall protection of source water.

The idea of a very rich country in terms of water availability masks the real problems of the semi-arid regions (in the Northeast). The distribution of freshwater is extremely uneven in Brazil: the Amazon basin holds about 70% of Brazil's freshwater resources, while populated and economically developed areas are facing problems of scarcity. Per capita water availability varies from 1 460 m^3 per person per year in the Northeast to 634 887 m^3 per person in the Amazon region (BNDES, 2009). The central and southern states need large quantities of water to irrigate water-intensive crops (rice, corn, beans, soybeans, sugar cane, fruits); the Southeast of Brazil faces competition to access water resources due to rapid industrialisation and urbanisation. The state of São Paulo, where one-fifth of Brazil's population lives and one-third of its economic activities take place, is suffering the worst drought since records began in 1930.

The current drought and scarcity issues in the Southeast, the floods in the North and the droughts in the Northeast illustrate the potential challenges that the country may face as economic development and climate change progress and land-use changes. Action is needed to ensure that lack of clean water does not impede economic growth, that droughts do not stand in the way of combating poverty and that losses and health risks due to floods are minimised.

Water quality is threatened by pollution in industrial areas of the coastal regions and by untreated discharge from cities, which are under demographic and economic pressures. In the South and Southeast, huge urban and industrial water discharge impairs water quality. The states of São Paulo, Rio de Janeiro and Minas Gerais, the heart of Brazil's industrial economy, are facing quantitative and qualitative water shortages. Only 72% of people say they are satisfied with water quality, much lower than the OECD average of 81% (OECD, 2013).

If not well managed and strictly regulated, deterioration of water quality can have a major impact on the availability of water, on the environment and on the health of people. In other regions, diffuse pollution caused by agriculture is also deteriorating water quality and causing restrictions in its availability for other uses in previous gifted zones. Greater policy coherence is also required between sanitation and water resources management, since polluted water cannot be used downstream or can only be used at a higher cost (for treatment). Thus, finding effective solutions to challenges such as droughts (in the

Northeast), increasing demand for irrigation and hydropower (in Central Brazil) and water pollution (in large urban centres) requires close co-ordination between water resources management and the provision of water supply and sanitation services.

Inequalities in access to water supply and sanitation services are also noticeable. Access rates to improved water sources in Brazil increased from 88.5% in 1990 to 97.5% in 2012. Coverage for urban water supply is almost universal (99.7%), while 15% of the rural population remains without access to an improved water source (World Bank, 2013). A large share of the 12.8 million households that remain without access is concentrated in the North and Northeast regions, where only 45% and 69% of households were connected to piped water, respectively. In the Northeast, water supply is constrained due to the semi-arid climate conditions prevailing in the region, while access in the water-abundant North is primarily attributable to the lack of infrastructure (Ministry of Cities, 2013 based on IBGE, 2010).

Progress with respect to sanitation has been somewhat slower, with access rates to improved sanitation facilities increasing from 66.8% to 81.3% between 1990 and 2012. Access rates remain significantly higher in urban areas (87%) than in rural areas (49.2%), and lag behind in urban low-income neighbourhoods (*favelas*) (World Bank, 2013). Even in the best-served regions in the Southeast of the country, about 15% of households are not connected to sewage facilities; in the North, only 30% are connected (Ministry of Cities, 2013). Only 68.8% of the total volume of collected wastewater receives some kind of treatment, which compares to 35.3% in 2000 and 19.9% in 1989. Only a third of municipalities equipped with a wastewater collection network also provide wastewater treatment (Ministry of Cities, 2013).

Access to water in Brazil is a significant issue for low-income households and precarious settlements. Large urban centres call for public water supply alternatives, while in rural areas sanitation is heavily lagging behind. It is estimated that 10% of Brazilians live in dwellings with no access to a sewage network or septic tank, while 7% live in dwellings that do not have access to piped water or wells (Ministry of Cities, 2013). The perceived quality of public services, in particular in light of Brazil's high tax burden, was one of the issues that prompted many Brazilians to take to the streets in June 2013. Important progress has, however, been achieved in recent years regarding sanitation. The National Secretariat for Environmental Sanitation, under the Ministry of Cities, recently developed a National Sanitation Plan with a set of goals by region and state for the coming 20 years. But capacities to reach them vary substantially across jurisdictions and municipalities in charge.

To address these challenges, the focus thus far has largely been based on infrastructure building. In some areas of the country, refined management tools (such as water charges, or negotiated allocation agreements) are also being employed (e.g. in Ceará; or in reservoirs in the semi-arid region and in the Cantareira System). However, to address the existing and looming crises, a revision of water governance practices in Brazil is required to improve policy and decision making and make the best use of existing infrastructure and financial resources.

A differentiated institutional framework echoes Brazil's uneven economic development and water distribution. Overall, priority has been given to the implementation of the water resources management system in most problematic regions (although for different reasons), typically the Southeast and Northeast. Current approaches extend the emphasis on capacity building and empowerment to the less economically favoured regions and those with more abundant water resources.

Climate change

Climate change affects water availability and demand, but efforts have been undertaken towards greater impact assessment. More extreme water events and changing rain patterns will require infrastructure to store water or protect against excess water. More water may also be required for cooling purposes, or to irrigate land; evaporation in water bodies and reservoirs is likely to intensify as the climate changes. Climate change increases uncertainty about water uses, and makes historical data about water availability outdated.

As climate changes, hydrology changes, and future projections on nominal flows become unreliable. The National Plan on Climate Change (MMA, 2008) requested proper assessment of the impacts of climate change on water availability and risks. Since then, the ANA has developed a method to account for the potential impacts of climate change when developing river basin master plans. A National Plan for Adaptation to Climate Change is currently being developed, under the co-ordination of the Ministry of Environment and the Ministry of Science, Technology and Innovation.

The consequences of climate changes on water availability and demand in Brazil are unclear. There are scenarios that anticipate more rainfall in some regions of Brazil, while others project the opposite. Some basins may actually receive more water, potentially alleviating scarcity and competition between water users, while other basins will be more stressed. These uncertainties have to be taken into consideration, as they affect water management. Issues resulting from climate change will not be confined to the competing use of water in economic sectors; they will also affect health because water-borne health problems may become seriously aggravated as a result of climatic changes.

Recent years have seen a shift in the disaster response paradigm of Brazil towards greater prevention. The National Plan for Risk Management and Natural Disaster Response was launched in August 2012 and a Vulnerability Atlas was released by the ANA as a diagnostic tool of the impacts of floods. Both initiatives acknowledge that if it will not be possible to avoid the impacts of extreme weather events, and that therefore adaptation, forecasting and warning are critical to reduce the damage to property and infrastructure and loss of human life.

Bibliography

ANA (2014), “Background report”, OECD/Brazil Policy Dialogue on Water Governance, Agência Nacional de Águas, Brasilia D.F.

ANA (2013), *Relatório de Conjuntura dos Recursos Hídricos 2013* (*Water Resources Conjuncture Report 2013*), National Water Agency, Brasilia D.F.

ANA (2010), *Atlas Brasil Abastecimento Urbano de Água. Panorama Nacional*, Agência Nacional de Águas, Brasilia D.F., http://atlas.ana.gov.br/Atlas/forms/Home.aspx (last accessed 5 May 2015).

BNDES (2009), cited in: Valberg A.H. (2011), "Brazil's role in environmental governance: Analysis of possibilities for increased Brazil-Norway cooperation", Report for the Norwegian Ministry of the Environment, Fridtjof Nansen Institute, Lysaker, Norway, available at: www.fni.no/doc&pdf/FNI-R0811.pdf.

IBGE (2010), *Pesquisa Nacional de Saneamento Básico 2008*, Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro, available at: www.ibge.gov.br/home/estatistica/populacao/condicaodevida/pnsb2008/PNSB_2008.pdf.

IEA (2014), *World Energy Outlook 2014*, International Energy Agency, Paris, http://dx.doi.org/10.1787/weo-2014-en.

IEA (2014), *IEA World Energy Statistics and Balances* (database), http://dx.doi.org/10.1787/enestats-data-en.

Ministry of Cities (2013), *Plano Nacional de Saneamento Básico – PLANSAB* (*National Plan for Basic Sanitation*), Ministry of Cities, Brasilia D.F.

MMA (2008), *Plano Nacional de Mudança Climática* (*National Plan on Climatic Change*), Ministry of the Environment, Brasilia D.F.

Moreira de Camargo, T. et al. (2014), "Major challenges for developing unconventional gas in Brazil: Will water resources impede the development of the country's industry?", *Resources Policy*, Vol. 41, September, pp. 60-71.

OECD (2015, forthcoming), *Environmental Performance Review: Brazil*, OECD Publishing, Paris, forthcoming.

OECD (2013), *How's Life? 2013: Measuring Well-being*, OECD Publishing, Paris, http://dx.doi.org/10.1787/how_life-2013-6-en.

SNIS (2012), *Diagnóstico dos Serviços de Água e Esgotos* (*Diagnosis of Water and Sanitation Services*), National Secretary for Basic Sanitation, Brasilia D.F.

World Bank (2013), *World Development Indicators Database*, http://data.worldbank.org/data-catalog/world-development-indicators (last accessed 4 May 2015).

Chapter 2.

Water governance in Brazil: A state of flux

This chapter analyses water governance achievements and challenges in Brazil, in the light of major reforms carried out over the past 17 years. It provides an institutional mapping of who does what *across ministries and levels of government, and assesses how interdependencies across multiple stakeholders, public authorities and policy areas are managed. The analysis emphasises multi-level governance gaps and suggests policy recommendations to bridge them, building on international experience.*

Water reform in Brazil: An unfinished business

The grounds of Brazil's water "genetic code"

Overview of historical development

Water governance is often a reflexion of a country's culture, legal regime, political system and territorial organisation. In every society, water is a complex issue, of importance to all sectors and cutting across all economic actors, combining social values and private interests, with policy formulation and decision making intrinsically linked to overarching debates. Brazil is no exception, and the process of reforming water institutions cannot be isolated from the broader institutional change that the country has gone through over the last three decades, especially in terms of the new relationship between civil society and public authorities following the country's return to democracy.

The military regime installed in 1964 was deeply discredited, which led to a generalised mistrust of public authorities and a need to build democracy "elsewhere". This discredit triggered calls from citizens for more direct participation, which has influenced public policies since then. At the time, greater emphasis on bottom-up approaches and citizens' engagement contrasted with the more important role of representative democracy as well as higher trust in public authorities that prevailed in more stabilised democracies.

In the 1980s, the technocratic model of development under the military regime gave way to a strong anti-centralist and anti-public authority attitude shared by two contradictory, if not antagonistic, opinion streams. On the one hand, the radical liberal way of thinking, which was in favour of refraining public authority to free civil society market forces from the "state inefficiency"; and on the other hand the radical promoters of participatory democracy as the only vehicle of "true" emancipation of the citizens (Abers and Keck, 2013). By the end of the 1990s, almost 40 000 participatory councils or committees had been created throughout the country as the "ethos" of Brazil at the dawn of the newly established democracy.

Merits and limitations of this system have been part of the country's "genetic code" since the early 1990s (Box 2.1). In fact, to a large extent, some of the tensions and difficulties in the negotiation of successive Brazilian water laws (Figure 2.1) are still present. This means that any appraisal of the effectiveness of water governance should factor in structural problems (rather than incidental or transitory difficulties) that need to be understood and mitigated.

Turning points in Brazil's water governance

The 1997 Federal Water Law

The new federal Constitution approved in 1988 establishes the National System for Water Resources Management and includes a chapter on environment with major repercussions on water resources management. After a 20th century of disperse legislation reflecting successive political winds (from centralised to decentralised, state to private ownership, allowing or forbidding private investment) the 1997 law (No. 9433) laid down basic principles and guidelines for water as a limited resource and as a public good with economic value, to be managed at the watershed level with a decentralised and participatory approach involving both federal and state jurisdictions.

Box 2.1. **Governance evolutions and power shifts in Brazil's water management**

Until the early 20th century

- Mainly private uses of water, with little or no regulatory public power.
- A model of water appropriation based on joint land-water property.
- Gradual intensification of uses and increase of polluting discharges.
- Construction of the first important hydraulic infrastructure, especially for energy and irrigation.
- The need for water management and increased presence of public authority starts being recognised.

1930s

- Approval of the first Water Code (Federal Decree no. 24643, 10 July 1934).
- Public authority starts playing a role.
- Free water for basic life needs is granted.
- Water abstractions require an authorisation for private uses, or a concession for public interest uses.
- Priority is always given to the supply of the population.

1940s

- Creation of the São Francisco Valley Commission (precursor of the river basin approach).
- Sectoral policies prevail with impacts on water but still without major conflicts.
- Hydropower, irrigation and navigation are the main areas with totally separate planning.

1970s

- First serious water conflicts; involvement of academics and professionals in related discussions.
- Rationale for integrated basin management to avoid the fragmentation of state policies.
- Creation the Alto Tietê Committee by the Ministry of Mining and Energy and the state of São Paulo (1976) to use hydroelectric infrastructure to improve the sanitary conditions of the highly polluted river.
- Agreement on operating rules for flood control and water supply in the metropolitan region of São Paulo.
- Creation of a Special Commission for the Integrated Study of River Basins (1978).
- Creation of ten river basin committees in federal rivers (including Paraíba do Sul, São Francisco, Doce, Mogi-Guaçu and Paranapanema), formed by representatives of the federal and state public administrations to carry out technical discussions to harmonise sectorial strategies for water use.

1980s

- Questioning of centralised and "technocratic" initiatives, growing discomfort with the military regime.
- National Department for Water and Electric Energy (Departamento Nacional de Água e Energia Elétrica, DNAEE) calls for change and maintaining a prominent role for hydroelectricity (an international seminar held in 1983 is considered a turning point).
- The DNAEE promotes debates with several states, which raises awareness at national level.
- Democratisation urgency and growing mistrust towards the military regime overshadow sector needs.

Box 2.1. **Governance evolutions and power shifts in Brazil's water management** (*cont.*)

- Basin committees suspend activities because they are seen as centralised and authoritarian.
- Growing importance is given to civil society that was not represented in those committees.
- Approval of a new Constitution (1988) and consolidation of the transition to representative democracy.
- The 1988 Constitution contains important and seminal provisions on water resources that are still in force.
- More power given to states and municipalities; the federal government becomes more constrained.
- Water reform and debate starts in São Paulo six years ahead of the federal government.
- Politicisation of the debate.
- Basin committees are reactivated with participation of water users and "organised civil society".

1990s

- Approval of São Paulo State Water Law (1991), being the first one and an example for all states.
- First version of a new Federal Water Law (1991) subject to heated debates, seminars and hearings.
- Creation of the Ministry of Environment with a Secretariat for Water Resources (1995).
- Discussion of the second version of the Water Law (1996) and approval after complex negotiations (1997).
- New law accommodates better regional diversity.
- Rationale for National Policy for Water Resources and the System for Integrated Management.
- Serious droughts (1998) call for better management and sound technical solutions.
- Topics like water allocation and coping with emergency situations require more than *ad hoc* measures.
- The importance of federal rivers for economic development also requires consistent policies.
- Ceará Governor, with World Bank technical support, suggests the creation of a National Water Agency.
- The President accepts the idea and sees it as a component of the reform of public administration.

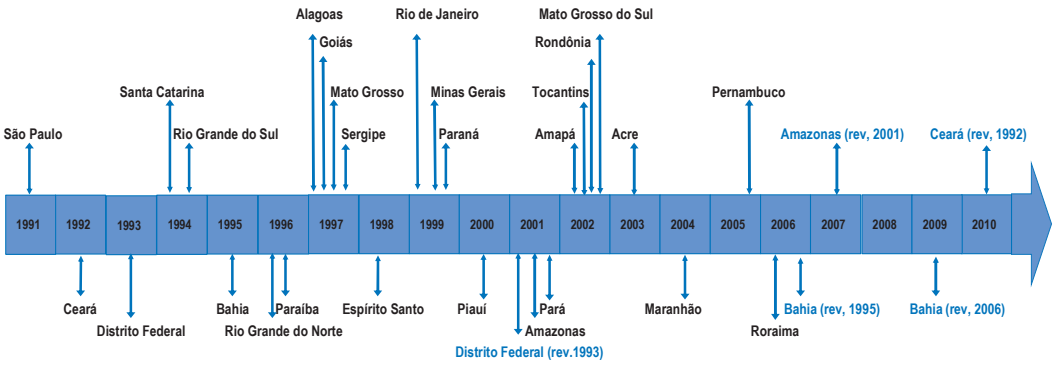
2000s

- Creation of the National Water Agency (Agência Nacional de Águas, ANA) by federal law, with the status of a regulatory agency and definition of its structure by decree.
- The ANA is a special autarchy, with administrative and financial autonomy, linked to the Ministry of Environment.
- According to this legislation, its main purpose is to implement the national water resources policy.
- This adds a second law (to the 1997 one) as the "big bang" of the water governance system in Brazil.
- Formulation of the National Water Plan, clarifying gaps and engaging stakeholders vertically and horizontally.

Sources: Synthesis based on: Lobato da Costa, F. (2003), *Estratégias de Gerenciamento de Recursos Hídricos no Brasil: Áreas de Cooperação com o Banco Mundial* (*Strategies of Water Resources Management in Brazil: Areas of Cooperation with the World Bank*), 1st edition, World Bank, Brasilia D.F.; Abers, R.N. and M.E. Keck (2013), *Practical Authority: Agency and Institutional Change in Brazilian Water Politics*, Oxford University Press, Oxford.

The 1997 Water Law was very much in line with the desire of a society that had recently returned to democracy, but that had not yet brought all of the expected benefits. At the time, the subsequent adoption of state water laws and the creation of a plethora of institutions (Figure 2.1), including river basin committees and agencies, state and national water councils, undoubtedly contributed to strengthen a much needed policy framework for the water sector. After the approval of the law, it became clear that no significant reform would be implemented if there was not an institution responsible for driving the process of reform. The idea of having river basin committees and the corresponding executive agencies throughout the country, as well as water councils in all states was ambitious. In Rio Grande do Sul, São Paulo and Ceará, where the problems were very pressing, committees and agencies had already been created prior to the law. But in most states, even some that were suffering from water shortages or serious pollution, the desired institutional reforms did not happen spontaneously.

Figure 2.1. **Timeline of state water laws**



Note: Laws indicated in blue are revisions.

The creation of the National Water Agency

When the ANA was created in 2000, democracy had been in place for one decade and the need to modernise the public administration was generally recognised. Regulatory agencies were in the spotlight and seen as a new form of administration, more independent and technically sound than traditional executive agencies because they were supposed to pursue "permanent state policies" rather than "government policies" (Bresser-Pereira, 2002 quoted by Kelman, 2009). Therefore, regulatory agencies were supposed to be less influenced by everyday politics and more rational and efficient in taking decisions. Furthermore, they had a privileged legal status in terms of attracting more qualified collaborators and paying them better.

However, when a group of distinguished water professionals suggested the creation of the ANA to the President of Brazil in 1999, it was not very clear if it should be a regulatory agency (Kelman, 2009). On the one hand, the origin of this idea stemmed from the frustrations around deadlock in implementing the 1997 law, which required an executive agency effective in executing the water resources policy. But on the other hand, the regulatory agencies were seen as an important part of the revamping of public administration and were subject to a "hitchhiking effect" (Ramalho, 2009 quoted by Kelman, 2009). Until now, the ANA has retained this somewhat ambiguous nature because it is simultaneously a regulatory and an executive agency. Despite questions that this status may raise from a conceptual point of view, the combination of high standard

and hierarchical position of a regulator at the federal level, and the capacity to keep the feet "on the ground" as a national executive agency for matters related to federal rivers (e.g. licensing water uses, collecting water charges) gives the ANA some flexibility, credibility and national presence.

The downsides of consensus-building in reforms

Negotiations and trade-offs

The political economy of reform is a challenge common to all countries, especially when developing policy and legislation. When there are different or contradictory interests at stake, striving for reaching consensus often waters down the effectiveness and the reach of the law being negotiated. According to Abers and Keck (2013), the negotiations around the 1997 and 2000 laws were subject to heated debates and intense negotiations (Figure 2.2). The price to pay for achieving approval on these two legal instruments resulted in laws that are "long on principles but short on enforceable legal instruments". Overall, only water experts were in favour of the model as a whole, and concessions were made to override the opposition in favour of the status quo. The 1997 law is still in force, has been replicated in all states, and is a valid basis for debating and improving the Brazilian system of water governance.

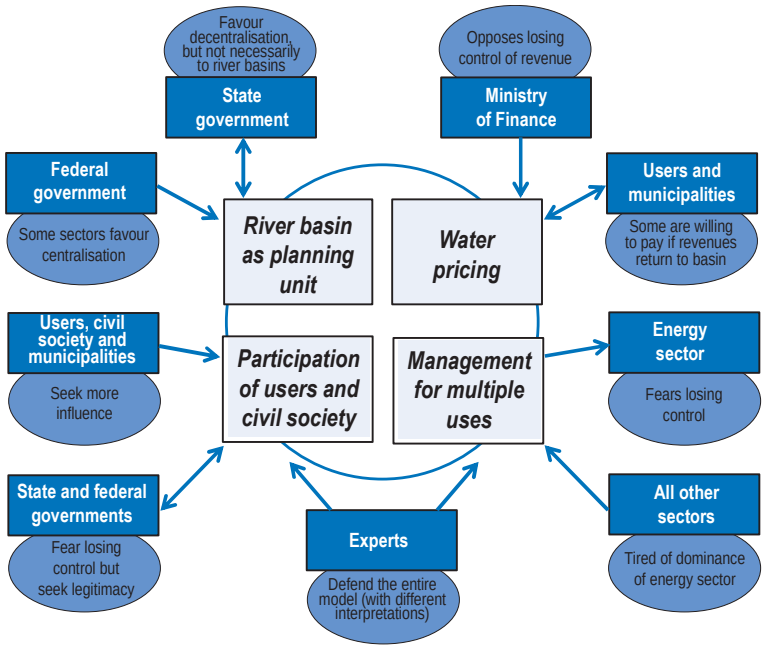
The law did not clarify all policy interfaces of water because at the time it was written, emphasis was given to water as a key factor for development. The law does not, for example, address linkages with environmental and land-use legislation, which would have required engagement with a greater number of stakeholders and could have postponed approval. Other grey areas concern the relationship and interface between the ANA and the Secretariat of State for Water Resources, which is not always clear-cut (Kelman, 2009). Some functions of the National Water Resources Council (Conselho Nacional de Recursos Hídricos, CNRH) also overlap with the ANA, especially in what concerns the role of the technical chambers. Even if these limitations inscribed in the genetic code of the water reform are still constraining water governance, they should not overshadow the forward-looking vision and the progress that was made at that time.

Policy implications of the negotiations

Many of the current water governance challenges in Brazil are rooted in the half-completed reform and resulting ambiguities. The four contentious issues identified in Figure 2.2 are still acute, with policy implications for decision makers and the Brazilian society at large. In particular, policy coherence, integration and management of interdependencies across multiple levels, plans and stakeholders raise major implementation challenges for the country.

The "River Basin as Planning Unit" is broadly accepted in theoretical terms, but lacks enforcement and implementation mainly because of the reluctance to share power across levels of government and stakeholders. States resist having a competing structure with executive powers. This is not a trivial issue because states are in many cases the "weak link" of the water institutional landscape. The creation of river basin committees therefore should be done in a way that does not conflict with the reinforcement of state organisations. Being a federal country, there is no sense in circumventing state powers and the mobilisation of the basin committees should aim at promoting direct participation and not at creating alternative executive powers.

Figure 2.2. **Stakeholders' positions during the negotiations of the 1997 Water Law**



Source: Abers, R.N. and M.E. Keck (2013), *Practical Authority: Agency and Institutional Change in Brazilian Water Politics*, Oxford University Press, Oxford.

The collection and use of water charges still requires clarification, across levels of government and with the Ministry of Finance. There is a deadlock in the process of collecting and using water charges that are considered public funds. This provides a disincentive to properly apply economic instruments at the basin level because there is no mechanism to ensure that funds collected are used in a timely and cost-effective manner for the ultimate benefit of water users within the basin area. This is an essential element of the beneficiary pays principle and the polluter pays principle. If this issue is not addressed, it is likely that water charges will become a regular "fiscal tax" subject to gradual opposition from the water users.

Participation of users and civil society is a prominent issue that has not yet entirely materialised. The "heritage" of participatory democracy as a "buffer" to direct or representative democracy in the context of a high level of mistrust of the public authorities is at the origin of current confusions or insufficient clarity of the relationship between deliberative and advisory functions of river basin committees. Participation of users and civil society is essential, but it should not supersede the capacities and powers of the democratic public authorities. This problem goes well beyond the limits of water governance and its resolution lies beyond those limits as well. Water governance, however, can provide a good example of constructive articulation of "direct democracy" with "representative democracy", and this is certainly an indicator of social and political maturity.

Management for multiple uses of water is still a pressing and partially unsolved problem. The energy sector has had for many decades a very good tradition of planning and implementation. Until the late 1980s, other sectors had neither the same level of technical expertise, nor a strategic view of their respective needs. In the face of competition, other sectors (especially irrigation and urban supply) had to voice their

concerns and secure their water with an energy sector that was already well-grounded and experienced. This tension still exists today but is much less acute, partly thanks to the co-operation between the ANA and the National Agency for Electric Energy (Agência Nacional de Energia Elétrica, ANEEL). However, there are other areas of water management with more complex and unsolved interfaces, typically "environment" and "land-use management".

There are no clear-cut solutions in such matters, and Brazil is in a process of change. It is now recognised that intense stakeholder engagement and widespread social mobilisation should not preclude sound technical knowledge and the exercise of public authority. It is also recognised that bottom-up approaches need to be complemented, if not integrated, in a top-down process that guarantees the accomplishment of national goals and long-term objectives. As a result, this intense questioning reflects the current stage and evolution of the Brazilian society and new requisites brought by economic growth and social development.

Institutional mapping of water roles and responsibilities

Water policy design and implementation is, by nature, highly fragmented and involves a plethora of stakeholders and authorities across levels of government and policy areas. From the point of abstraction of water for any sort of use, up to the extremities of the river basin (and beyond), there is a full span of administrative and political boundaries that correspond to institutions that are relevant and have a say in the management process. In this context, clearly mapping of the responsible authorities and their duties is essential, as is the effective management of their interdependences and interactions (Figure 2.3).

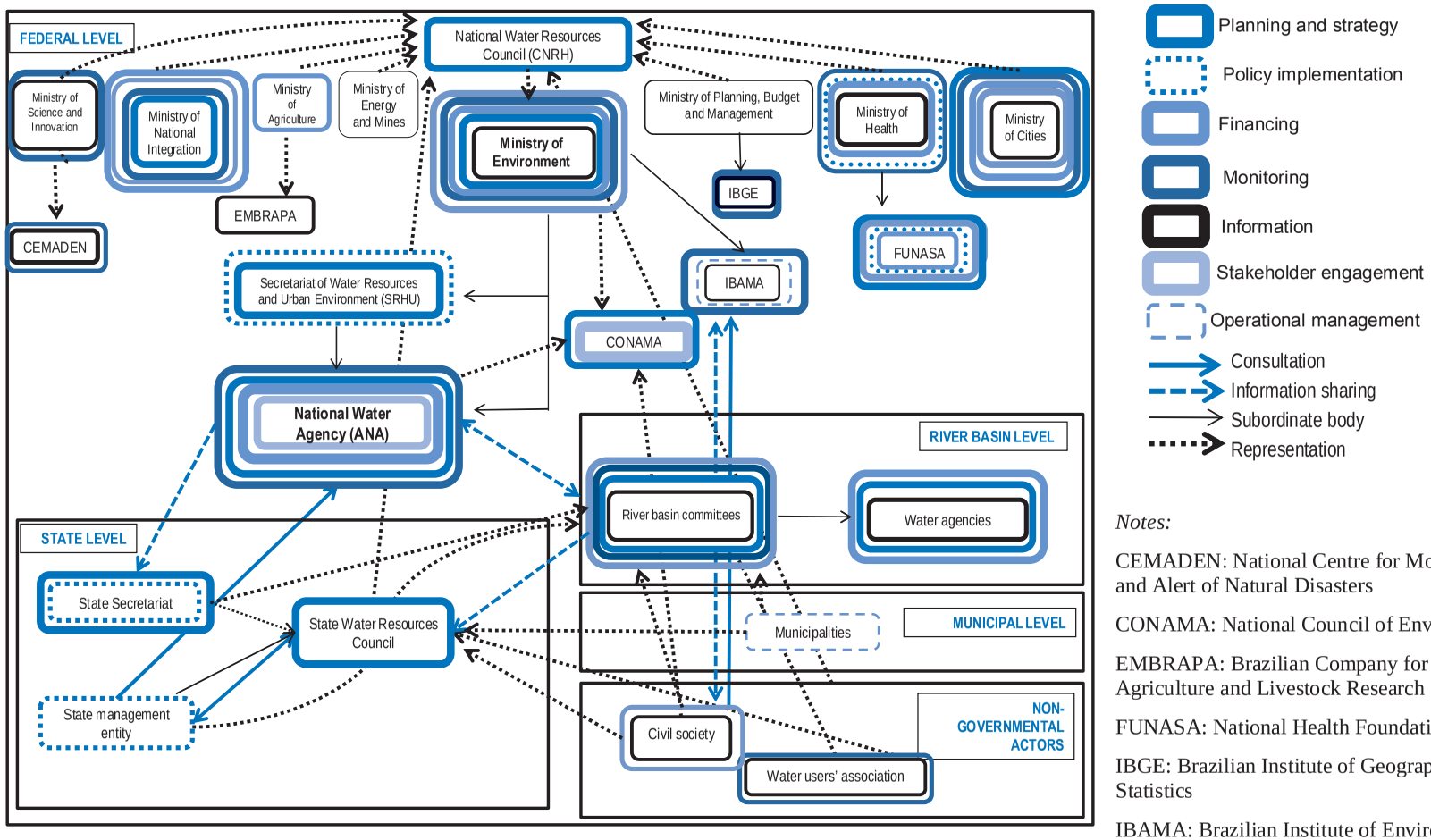
The 1997 Water Law sets the legal and institutional framework for water resources management in Brazil. According to Article 33 of the law (amended by Article 30 of Law No. 9984/2000), the National Water Resources Management System (Sistema Nacional de Gerenciamento dos Recursos Hídricos, SINGREH) is composed of the National Water Resources Council; the National Water Agency; the councils for water resources of the states and the Federal District; the river basin committees; the federal, state, Federal District and municipalities' public authorities; and water agencies with jurisdiction over water resources management.

Who does what at federal level

National Water Resources Council

The CNRH is a co-ordinating, advisory and deliberative body gathering water-related stakeholders across levels of government. It was created by the 1997 Water Law and is composed of representatives of ministries and secretaries of the federal government that play a role in water resources management, representatives of the state water resources councils, representatives of the water users and representatives of non-governmental organisations (Figure 2.3). According to Article 34 of the Water Law, the number of representatives of the executive federal power cannot exceed one-half plus one of the total members of the council, giving the majority to the representatives of the public authorities.

Figure 2.3. **Institutional mapping for water resources management in Brazil**



Notes:

CEMADEN: National Centre for Monitoring and Alert of Natural Disasters

CONAMA: National Council of Environment

EMBRAPA: Brazilian Company for Agriculture and Livestock Research

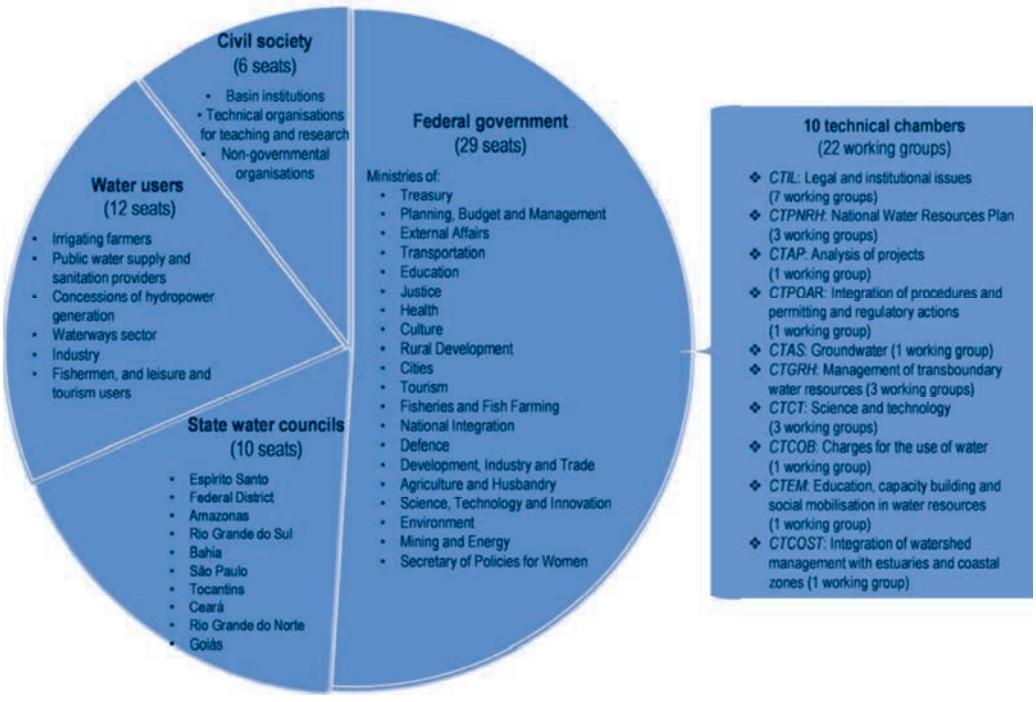
FUNASA: National Health Foundation

IBGE: Brazilian Institute of Geography and Statistics

IBAMA: Brazilian Institute of Environment and Renewable Natural Resources

The responsibilities of the CNRH are manifold in the 1997 Water Law, but to a certain extent weaker in practice. According to Article 35, the CNRH is in charge of promoting the co-ordination of water resources plans with national, regional, state and sectoral plans; arbitrating conflicts among state councils; deciding on projects with impacts that go beyond the borders of a state; deciding on matters submitted by the state councils or river basin committees; analysing proposals of water-relevant legislation; establishing complementary orientation for implementing the national water resources policy; approving the creation of river basin committees and establishing guidelines for the statutes; approving the National Water Plan and making sure its targets are met; and defining general criteria for awarding water rights and setting up water charges. The CNRH is composed of 10 technical chambers, which are backed up with 22 working groups to analyse, study and make proposals on matters within the CNRH's competence (Figure 2.4). Since 2013, the CNRH has gained a new set of responsibilities related to dam safety. Law No. 12334/2013 established that the CNRH shall oversee and define directives for the implementation of the national dam safety policy, for the application of its policy instruments and for the National Information System on dam safety. Furthermore, the CNRH shall revise the annual dam safety report, make recommendations on it and send it to the Congress.

Figure 2.4. **Current composition of the National Water Resources Council**



National Water Agency

The ANA was created as the "meeting point" of two distinct needs and, to some extent, contradictory dynamics. On one hand, it should be (and still is) the driver of the reform process to help states create their own agencies and to provide incentives and support to the creation of basin committees. In short, the ANA should help drive forward decentralisation. On the other hand, it should be (and still is) the "master mind" at the

central level with very good technical capabilities and political independence, able to provide answers to the many needs of the nation. The ANA should also help to keep some desirable and necessary degree of centralisation.

The ANA has been successful at ensuring the right mix between decentralisation and centralisation. A few important factors have contributed to this: a level of policy stability throughout different political contexts; the possibility of hiring highly skilled collaborators on a professional competitive basis; a succession of committed and forward-looking top leaders; an open attitude towards all state governments regardless of their political orientations; and, above all, a high level of technical expertise and scientific authority. The institution enjoys a very good reputation and credibility, which makes it an influential actor in the specific field of water resources management.

The problem, however, is that the importance of water issues is not fully recognised in the Brazilian political arena. Although much acknowledged and respected by those who deal with it, the ANA sometimes seems to be isolated and lack support, at least in terms of public opinion and political interest. Similarly, despite the existence of the ANA, water still receives a rather low level of attention in the national agenda compared to other "national security" issues.

Ministry of Environment

The Ministry of Environment is at the core of all the interactions with sectors and public policies that are relevant to water. The key institution is the Secretariat for Water Resources and Urban Environment (Secretaria de Recursos Hídricos e Ambiente Urbano, SRHU), to which the ANA is accountable as implementing agency. The Secretariats for Climate Change and Environmental Quality, for Biodiversity and Forests, for Sustainable Mining and Rural Development, and for Institutional Articulation and Environmental Citizenship, also have linkages with water, but in a more marginal way. Other collegiate structures with some links to water are the National Councils for Environment, for Legal Amazonia, and for the Management of Genetic Heritage, as well as the National Environmental Fund and the National Commission for the Forests. In addition to the ANA, the ministry counts four other autonomous agencies, namely the Brazilian Institute of Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis, IBAMA), the Institute for the Conservation of Biodiversity (Instituto Chico Mendes de Conservação da Biodiversidade, ICMBio), the Rio de Janeiro Botanical Garden Research Institute (Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, JBRJ) and the Barcarena Development Company (Companhia de Desenvolvimento de Barcarena, CODEBAR). Under the leadership or the supervision of the Ministry of Environment, there are a few programmes dealing with water, in most cases operationalised by the ANA (Box 2.2).

Ministry of Cities

The interface with the Ministry of Cities is crucial for the water sector, especially for water supply and sanitation in urban environments. This is obviously a very important water use in social and economic terms, and it also has a significant impact on the classification of water bodies because of the quality requirements for human consumption. The Ministry of Cities is responsible for promoting domestic water supply and sanitation for settlements with more than 50 000 inhabitants. Below this number the responsibility, including for rural areas, is given to the National Health Foundation (Fundação Nacional de Saúde, FUNASA), an institution linked to the Ministry of Health.

Box 2.2. **Water programmes of the Ministry of Environment**

- The "Fresh Water Programme" is an initiative of the federal government co-ordinated by the Secretariat for Water Resources and Urban Environment in partnership with other federal, state, municipal and civil society institutions aiming at establishing a permanent public policy for accessing water of good quality for human consumption. It promotes and regulates the implementation, recovery and management of desalinisation systems that are socially sustainable to supply primarily low-income population in dispersed settlements of the semi-arid regions. This programme participates in the joint effort co-ordinated by the Ministry of National Integration designated by "Water for All".
- The "Conservation and Management of Water Resources" with a sub-programme for the "Revitalization of River Basins" aims at reclaiming and preserving environmentally vulnerable basins through initiatives that promote the sustainable use of natural resources, the improvement of social and environmental conditions, and the amelioration of water availability in terms of quantity and quality for the various uses. The programme is currently active in the river basins of the São Francisco, the Tocantins-Araguaia, the Paraíba do Sul and the Alto Paraguai (Pantanal).
- The "Programme for Aquatic Biodiversity" led to the creation of the Department for Aquatic Biodiversity, Sea and Antarctic (DMAR) that has the mission, among other aspects, of defining public policies aiming at the conservation and sustainable use of aquatic biodiversity. The co-ordination and implementation of the Ramsar Convention for the conservation of the ecosystems of the wetlands is one of the priorities of this initiative.
- The "Interáguas Programme" has the objective of strengthening water planning and management capacities, especially in the less skilled regions of Brazil, aiming to: 1) increase the efficiency in the use of water and in the provision of water services; 2) increase the sustainable supply of water in terms of quantity and quality that is appropriate for the multiple uses; 3) improve the use of public resources in the water sector, reducing losses caused by lack of inter-sectorial co-ordination. This programme is financed by the World Bank and also involves on a regular basis the Ministry of Cities and the Ministry of National Integration. In some specific actions, when appropriate, other ministries may be involved, namely the Ministry of Mining and Energy, the Ministry of Transportation, the Ministry of Agriculture, the Ministry of Rural Development and the Ministry of Health.

Source: based on information accessible at: www.mma.gov.br/agua (last accessed 5 May 2015).

The Ministry of Cities is responsible for the preparation of the National Plan of Basic Sanitation (Plano Nacional de Saneamento Básico, PLANSAB), which was approved in 2013 for the next 20 years (2014-33). This is one of the most important sectoral plans, which is instrumental for the ANA's and other agencies' planning functions. According to the PLANSAB (2013), 93.3% of the Brazilian population is connected to a network for water supply. It is estimated that 90.4% of the population has sewage collection, but only 39.7% includes treatment and is considered adequate, although according to the IBGE (2010), only 48% of domestic sewage is collected and 39% is treated. The efficiency of sewage treatment plants varies significantly and is considered not entirely satisfactory in some cases.

The National Secretariat for Environmental Sanitation (Secretaria Nacional de Saneamento Ambiental, SNSA) conducts several important programmes, which aim at help states, municipalities, and water and sanitation companies improve service delivery. These include "Sanitation for All", which succeeded to the programme

"Pró-Saneamento" for developing and improving infrastructure for wastewater treatment; "Water and Wastewater Urban Services" for developing water and wastewater infrastructure; and "Combating Waste of Water" to promote efficient use of the resources. There is also a joint undertaking by the Ministry of Cities and the ANA to develop the Water Supply Atlas, which is a powerful mapping instrument. Though the level of wastewater treatment in Brazil remains extremely low, including in the most advanced states such as Rio de Janeiro, significant progress is underway, under the leadership of the Secretary of Sanitation in the Ministry of Cities and the Growth Accelerator Programme, to develop a long-term vision, planning and financing strategy to catch up.

At a different level, urban planning and regional policies are not well co-ordinated enough in Brazil, often leading to a predominance of scattered investments not always integrated within a regional development strategy. As the urbanisation rate is already very high and still growing, the need for compatibility with regional policies becomes more pressing, with direct consequences on the management of water resources.

Ministry of National Integration

The Ministry of National Integration is responsible for policies, programmes and infrastructure that contribute to better integration, regional development and cohesion. It is the long-standing "heir" of a Keynesian approach in Brazil's public policy, based on intense public investment for the construction of large infrastructure. But in recent years, this ministry has been combining this heritage with a "soft" approach that gives room to more bottom-up regional development strategies for addressing regional and social disparities.

The Ministry of National Integration has two important interfaces with water resources management at the national level. One is the National Secretariat of Hydraulic Infrastructure, dealing mainly with large irrigation projects; the other is the National Secretariat for Regional Development that is involved in initiatives for fighting poverty, such as the "Water for All" programme. Important entities that are simultaneously relevant for water resources management and for the social and economic development of the country are linked to this ministry such as CODEVASF (Company for the Development of São Francisco and Parnaíba Valleys) and the National Department of Works to Combat Droughts (Departamento Nacional de Obras Contra as Secas, DNOCS). The Ministry of National Integration works intensively and constructively with the ANA. The latter is very much involved in the water-related programmes undertaken by the ministry and the former participates actively in the National Water Resources Council.

Water being a key resource for development at all scales, this ministry has a central role. It is responsible for irrigation and drought mitigation infrastructure, namely construction and operation of reservoirs in the semi-arid regions. Its National Secretariat for Irrigation (Secretaria Nacional de Irrigação, SENIR) is responsible for creating a management system for irrigation, for articulating stakeholders and for supporting private irrigation. Public irrigation is also a responsibility of this ministry through the DNOCS and CODEVASF. Also, under the jurisdiction of the Secretariat of State for Regional Development, water is taken as an important factor for social and economic development in the context of regional development. Amongst the ministry's most relevant programmes related to water, three deserve particular attention.

- "Water for All" aims at achieving universal access to water for human consumption, especially in rural deprived areas, in association with the Ministries of Environment, Cities and Health.

- "Revitalization of River Basins" tries to improve the condition of some of the most important river basins in Brazil that are environmentally vulnerable, e.g. São Francisco, Paraíba do Sul, Tocantins-Araguaia and Pantanal (Alto Paraguai).
- "Proágua Semi-Arid" (implemented until 2009) aimed at increasing the availability of good quality water in the semi-arid region of Brazil, promoting a rational use of the resources, so that scarcity is not a limiting factor for development.

Ministry of Health

The Ministry of Health plays an important role in controlling the quality of water for human consumption and guaranteeing a healthy environment. This is particularly important in a country with remaining challenges for universal water supply and low levels of wastewater treatment. This ministry is responsible for the legislation establishing standards on water quality for human consumption and interacts mainly with service providers. The ministry also manages a National Programme for Surveillance of Water Quality that complements the control made by the operators and state regulators. The Ministry of Health is also involved in sanitary problems in rivers, together with environment authorities at state or national level.

The ministry participates with the ANA in important water programmes (e.g. "Water for All"). The most important and active institution related to water resources in the ministry is FUNASA, which is responsible for several important initiatives such as "Strategic Actions in Environmental Health", "Education in Environmental Health", Water Quality Control" and "Intervention in Flood Caused Disasters". The ministry spearheads the programme "Co-operation in the Support to the Management of Sanitation Public Services" to help municipalities with less than 50 000 inhabitants in the prevention and control of environmental related diseases, especially due to poor sanitation conditions.

Ministry of Agriculture

Irrigation is the largest consumer of water in Brazil and the main source of diffuse pollution, as in many countries. Securing water for irrigation with an appropriate level of reliability is always an important constraint for river basin planning. Agriculture tends to resist paying water charges or abiding by stringent standards and regulations. A culture of spontaneous and free appropriation outside any legal or administrative framework still prevails in some areas, especially in the semi-arid regions (see Chapter 4), which creates challenges in terms of water allocation and makes the interface with other categories of users more complex. Hence, the Ministry of Agriculture is an important player in the field, particularly when co-ordination is needed. Although the Ministry of Agriculture has an important role regarding irrigation, especially when it comes to financing and products pricing, its role is complemented by the SENIR of the Ministry of National Integration.

The Ministry of Agriculture runs a few programmes that are important for water resources management. "Micro-Basins and Soil Conservation in Agriculture" integrates soil, water and biodiversity to promote a sustainable agriculture, increase food production, and improve employment and living conditions in rural areas. Studies and Programmes for the Environment conducted by EMBRAPA, the Brazilian Company for Agriculture and Livestock Research, deals with diffuse pollution in aquifers and evaluates the potential risk of contamination.

Ministry of Mining and Energy

The Ministry of Mining and Energy has a well-established tradition of planning, high political visibility, economic importance and a very effective implementation capacity. For a long time, hydropower has been the most important source of energy in Brazil (45% of total energy and more than 80% of electricity). This sector has, in what concerns hydropower, a long-term plan up to 2050 and prepares a medium-term plan every ten years, which is frequently updated. It is regulated by the ANEEL, the successor of the DNAEE, which operated the largest hydrometric network that was transferred to the ANA after its creation.

Hydropower has a significant impact on water resources management because dams and their operation change the hydrologic regime of a watercourse. If this creates a significant constraint for river basin planning, it also creates many opportunities because water reservoirs can be used for multiple uses. In fact, dams change the flow regime downstream, but create a more stable and reliable source of water for all uses, especially in areas affected by large variability of precipitation, as happens in semi-arid regions characterised by water scarcity.

The fact that hydropower requires heavy investments in infrastructure creates a factor of inertia, or continuity, in water resources management at the basin scale. In fact, it is not possible to build a costly dam and a power generation system without securing minimal volume allocations. This is why the energy sector has been vocal about water permits and entitlements to ensure the stability and predictability needed for investment, especially in a context of greater private sector participation.

The hydropower sector also has importance in financial terms. It pays royalties or financial compensations based on the generated energy. These financial resources are distributed among states and municipalities in proportion to the inundated area, part of which is allocated to the ANA as a water charge on hydropower. State governments could also use this charge to improve water management, although this is seldom the case.

Operating in a rather wealthy sector, the energy players have engaged in programmes for building capacities and improving water conditions in the affected river basins. “Cultivating Good Water” involves the company Itaipu Binacional to improve water quality and quantity and the quality of life of the population in the Paraná river basin (the catchment area for the reservoir). An agreement between the ANA and Itaipu, called “Water: Knowledge for Management”, seeks to empower people in Brazil and Latin America more generally towards good water management practices. The programme “Water and Climate: Contributions for a Sustainable Development” was promoted by Petrobras as part of the company’s increasing attention to climate change and social responsibility.

Ministry of Transportation

The interface with this ministry is related to river navigation with hydroways being used to access the interior of the country. This is an important feature of many Brazilian rivers, which imposes limitations to other uses because it requires reasonable depths of water throughout the year. The construction of dams raises additional difficulties that can be overcome in many cases by costly transposition infrastructure. This way of reaching the hinterlands is important for the economic development of Brazil, also because it is increasingly recognised as energy efficient, environmentally friendly and low cost. From the 63 000 km of the estimated total length of rivers and lakes in Brazil, only 21 000 km are considered potentially navigable, 6 500 km of which are currently used for the transport of 25 million tonnes of freight, i.e. 5% of total freight transport in Brazil. It is likely that this sector will grow significantly.

Ministry of Science and Technology

Better water management requires better water technologies. The Ministry of Science and Technology manages several programmes that are relevant for improving water resources management, and there are several research centres and institutes dedicated to this topic. The Northeast Strategic Technology Centre (Centro de Tecnologias Estratégicas do Nordeste, CETENE), the National Institute for the Semi-Arid (Instituto Nacional do Semiárido, INSA), Minerals Technology Centre (Centro de Tecnologia de Minerais, CTEM), the National Amazon Research Institute (Instituto de Pesquisas da Amazônia, INPA) and the National Institute of Technology (Instituto Nacional de Tecnologia, INT) are examples of the centres that have relevant activity in the field of water. Examples of water-related programmes undertaken by these institutions include "Systems for Integrated Production in the Semi-Arid Region" and "Climatic and Environmental Monitoring" conducted by the INSA; as well as "Topics in Health, Climatology and Water Resources" and "Sustainable Management of Water Resources", promoted by the INPA. Some percentage of the royalties paid by hydropower companies is allocated to research in the field of water resources. It should be noted that the CNRH, in which this ministry is represented, has a Technical Chamber on Science and Technology (Figure 2.4) where research priorities are discussed and established.

Who does what at the sub-national level?

The 1988 Brazilian Constitution considers three levels of administration with political autonomy: federal, state and municipal governments and brought about more decentralisation and autonomy of the states and municipalities. However, the national level is still very strong and holds broad powers to pass legislation applicable nationwide, including exclusive powers on waters and energy. It also holds fiscal powers to provide resources to the lower levels through specific and targeted programmes.

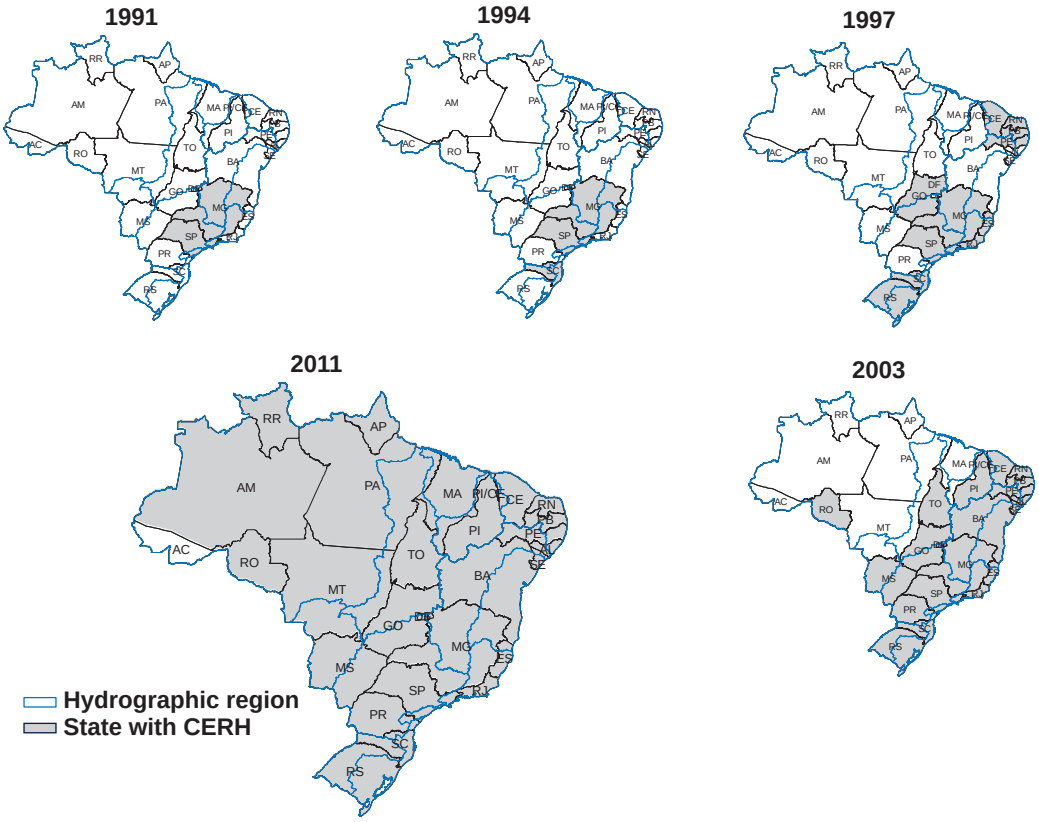
In the area of water resources management, however, there is a fourth level that has to be considered as river basin boundaries cut across state and municipal perimeters. The basin unit creates links of "causality" and "factual solidarity" as water users' behaviours in the basin propagate downstream and affect other uses. However, being essential for social and economic development and for the well-being of citizens, water is also a matter of concern of the state and municipal governments (Figure 2.3).

State water resources councils and state agencies

State water resources councils (*conselhos estaduais de recursos hídricos*, CERH) are normative and deliberative bodies with duties that are similar to those of the CNRH. Their composition is regulated by state water laws and varies from state to state. Members usually include representatives of state secretariats, municipalities, water users and civil society.

Some CERH were formed before the adoption of the 1997 law (e.g. São Paulo) especially in the Northeast , deeply affected by scarcity, and in the Southeast, where pollution problems had become very serious. The creation of state water resources councils accelerated after the 1997 Water Law (Figure 2.5) and nowadays Acre is the only state with no water council (Figure 2.5). In that state, a project is ongoing to reform the current Environment Council, which should be renamed the Council of Environment and Water Resources. The councils are at varying degrees of maturity: some states have given attention to water problems (Rio de Janeiro, São Paulo, Minas Gerais or Ceará) while others are still stabilising their composition and their role.

Figure 2.5. **States with water resources councils, 1992-2012**



Source: ANA (2014), "Background report", OECD/Brazil Policy Dialogue on Water Governance, Agência Nacional de Águas, Brasilia D.F.

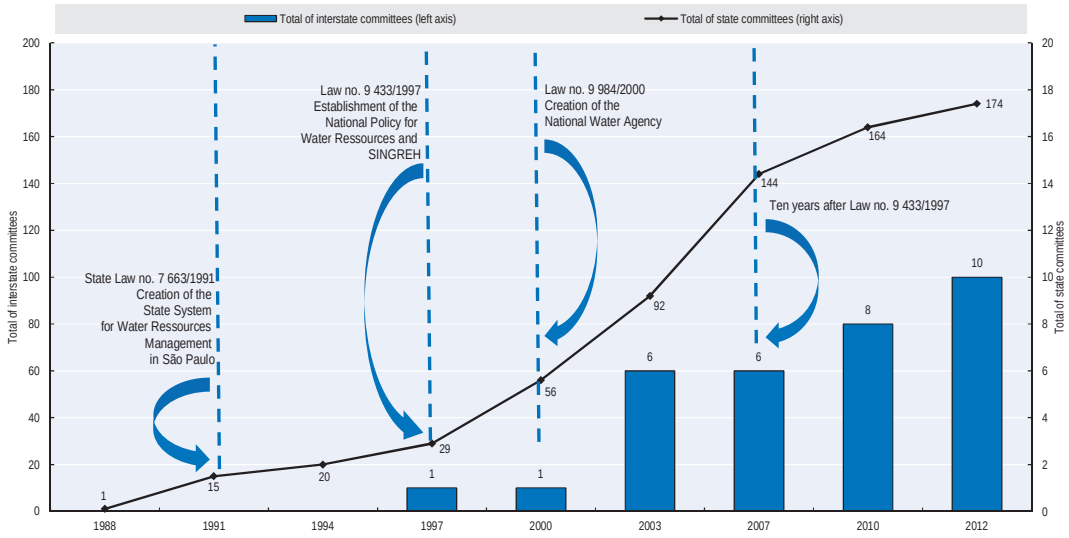
State water agencies are executive bodies managing water at the state level. They often lack qualified staff and financial resources to work properly and sometimes also carry out the tasks of river basin agencies when these do not exist. Their governance structure, accountability line and level of expertise vary from one state agency to another. In some cases they were merged with the state environment agencies (Rio de Janeiro, *inter alia*), while in others they were kept as separate entities. Rio de Janeiro is a successful case of merging water and environment management into one single agency (INEA, with separate departments) that deals simultaneously with the "blue", "green" and "brown" agenda (see Annex 3.A3). Success factors probably include deep awareness of water problems and well-trained staff to deal with them. Pollution is among the most serious issues because of the many industrial areas of the state. The case of Rio de Janeiro, however, represents an exception. In most cases, when the two agendas are merged, environmental demands tend to overcome water resources management demands.

River basin committees and river basin agencies

River basin committees and river basin agencies are explicitly considered and defined in the 1997 Water Law, which recognises them as part of the National Water Resources Management System (Sistema Nacional de Gerenciamento de Recursos Hídricos, SINGREH). Though the law does not request their creation everywhere, it has had an impact on the creation of river basin commissions at state and interstate levels

(Figures 2.6 and 2.7). In practice, the creation of river basin committees and agencies was triggered in areas with acute problems and some degree of mobilisation of the water users. The law foresees that river basin committees may cover the "totality of a river basin", the "sub-basin of a tributary of the main river or the sub-basin of a tributary of that tributary", or a "group of contiguous basins or sub-basins" (Article 37).

Figure 2.6. **Evolution of the number of state and interstate river basin committees**



Source: ANA (2014), "Background report", OECD/Brazil Policy Dialogue on Water Governance, Agência Nacional de Águas, Brasilia D.F.

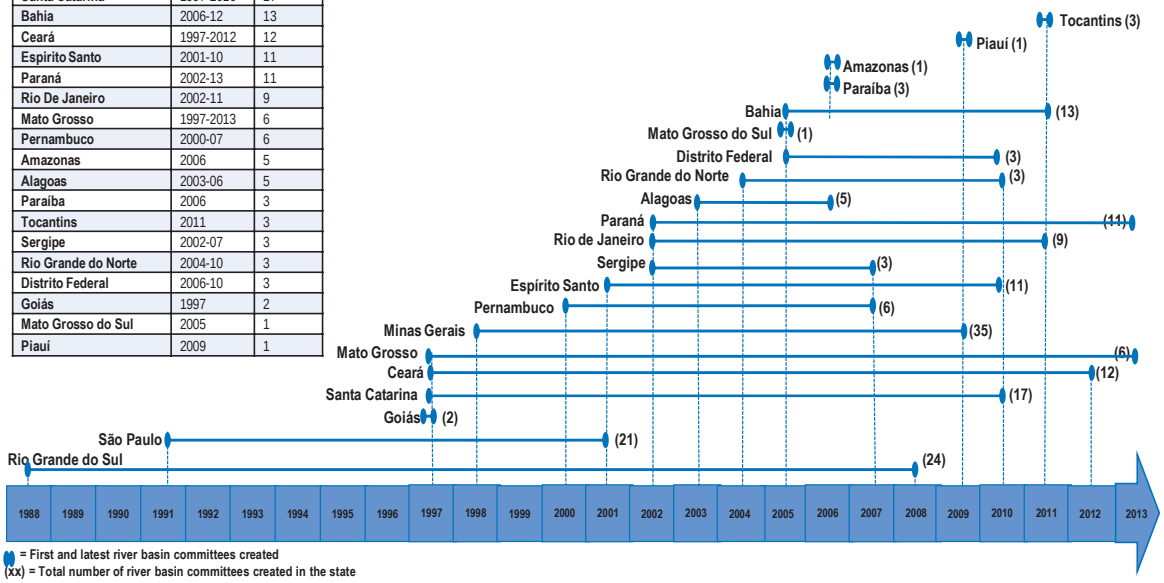
River basin committees are deliberative and consultative platforms for water resources management at the relevant hydrographic scale. At present, about 25% of the country is covered by such structures, which are located where the most serious problems occur, with emphasis on pollution problems in the Southeast and scarcity problems in the Northeast. According to the 1997 Water Law (Article 38) they should promote debate and co-ordination on relevant matters; arbitrate disputes in first administrative instance; approve river basin plans; follow up on the implementation of the plans and propose measures to accomplish the established targets; propose to the national and state councils exemption of permits for minor uses; establish mechanisms for collecting charges and propose the amounts to be collected; establish criteria and promote the sharing of costs of structures for multiple uses and of common interest. The decisions of the committees are subject to appeal to the state or national councils.

The composition of river basin committees varies across states. The CNRH Resolution No. 5 of 2000 (Article 8) establishes the rule for river basin committees located in the union domain, that the representatives of the public authorities (federal government, states and municipalities) must never be greater than 40% of the total and the representatives of civil society (users and water-related organisations) must never be less than 20%. As a quite general pattern (except in São Paulo for instance), the committees follow a "tripartite" composition, with one-third of the members from public authorities, one-third from water users and one-third from the "organised civil society". In transboundary rivers there must be a representative of the Ministry of Foreign Affairs in the public component, and when there are indigenous territories in the basin there must be a representative of the National Indian Foundation (Fundação Nacional do Índio,

FUNAI) and a representative of the indigenous communities. Some experiences, however, deviate from the standard model, as in the state of Paraná (Box 2.3), where water users and municipalities played a stronger role in water governance along with state authorities, despite the discontinuity due to political changes at the state level.

Figure 2.7. **Timeline for the creation of river basin committees**

States	Year	Nº RBCs
Minas Gerais	1998-2009	35
Rio Grande do Sul	1988-2008	24
Sao Paulo	1991-2001	21
Santa Catarina	1997-2010	17
Bahia	2006-12	13
Ceará	1997-2012	12
Espirito Santo	2001-10	11
Paraná	2002-13	11
Rio De Janeiro	2002-11	9
Mato Grosso	1997-2013	6
Pernambuco	2000-07	6
Amazonas	2006	5
Alagoas	2003-06	5
Paraíba	2006	3
Tocantins	2011	3
Sergipe	2002-07	3
Rio Grande do Norte	2004-10	3
Distrito Federal	2006-10	3
Goiás	1997	2
Mato Grosso do Sul	2005	1
Piauí	2009	1



= First and latest river basin committees created
(xx) = Total number of river basin committees created in the state
*Acre, Amapá, Maranhão, Pará, Rondônia and Roraima do not have river basin committees or are in the creation process.

Box 2.3. **Paraná 1999 reform: Joint Institutional Strategy for Committees, Basin Agencies and the State Council**

Among the states with more significant economic weight, Paraná was the last to approve its State Water Resources Law in November 1999. In the following two years, a comprehensive set of regulations were approved (based on detailed studies) with the support of a technical working group appointed by the state government. It was composed of 17 members including water users (industries, agriculture, and sanitation and energy concessions), non-governmental organisations (NGOs), universities, professional bodies, municipalities and state agencies. Seven decrees were approved for: 1) the institutional model (the State Council; basin committees, associations of users and other civil society organisations, and the state agency responsible for issuing water permits); and 2) water management instruments (the procedures for issuing permits, the creation of the State Water Resources Fund; and the charges for the right to use water).

Paraná's institutional framework presented a number of features. First, in addition to the State Water Resources Council and basin committees, the state also created "decentralised executive units" (*unidades executivas descentralizadas*, UEDs), a statute awarded either to water users' associations and/or to inter-municipal consortiums of river basins. These UEDs had executive powers and competences inherent to river basin agencies. Therefore, what differentiated Paraná as an alternative model of governance was in the first place the prominent role given to users and municipalities, who would request the creation of committees. Hence, both private and public users were partners within the management system working together in the achievement of targets established by a contract signed with public authorities.

Box 2.3. **Paraná 1999 reform: Joint Institutional Strategy for Committees, Basin Agencies and the State Council** (*cont.*)

The second difference laid in the fact that all players had equal weight in all decision-making bodies (council, committees and agencies), which contrasted with the vertical structure of other states. Paraná's system relied on a horizontal division of tasks, differentiating the composition and the responsibilities among three institutional levels, each one of them with their own identity and specific instruments.

- The first level, on the edge of the system, was formed by the agreement and convergence of public and private interests of water users (also including municipalities), based on a proposal for a river basin plan, with partial funding from water charges. This level is consubstantiated by the UEDs.
- The second level, a collegiate body with a regional identity and scope, was tasked to resolve conflicts and harmonise the specific interests of the users taking into account a wider public interest. This is done notably by the analysis and approval of the river plans. This level is consubstantiated by river basin committees.
- The third level corresponds to the highest body for decision making and appeal, in which the state government has a strong position, equal to the sum of the other members. This level is responsible for strategic planning, arbitration of disputes and political leadership of the process.

Paraná's model relies on a clear division of tasks: 1) entrepreneurs (all types of users) propose and carry out tasks of an executive nature (propose plans and collect charges); 2) civil society, participating in the river basin committees, guarantees a broad social control (plans must be approved in the committees, where users' representatives are a minority compared with the sum of civil society and state agencies representatives); and 3) the state regulates the process and arbitrates conflicts based on its position in the State Water Resources Council. These management institutions (committees and corresponding UEDs) are created only in river basins where water is of strategic importance.

Finally, two aspects deserve attention in the setting up of the system: 1) the model requires the strengthening of public authorities, especially in their environmental and regulatory functions, as a compensation of a high degree of decentralisation to the users and municipalities. This implies, *inter alia*, structuring the procedures for giving water permits and for enforcing and monitoring policies at the state level; and 2) mechanisms to encourage civil society participation in the system should be developed, in order to avoid excessive preponderance (capture) of larger users in the system.

During its initial period of implementation, this institutional model proved to be extremely promising, leading to the signature of the first management contract in Brazil, in the area of water resources, whereby the state government delegated, in December 2002, the exercise of inherent functions of the basin agencies to the Water Users Association of the Upper Iguaçu River Basin and the Alto Ribeira, created as a civil society organisation of public interest (*organização da sociedade civil de interesse público*, OSCIP), a private non-profit entity.

Source: UNEP and ANA (2007), *GEO Brasil – Recursos Hídricos* (*GeoBrasil – Water Resources*), Box 16, United Nations Environmental Program and National Water Agency, Brasilia D.F.

Representativeness and continuity within river basin committees are a challenge due to the impact of political cycles on members of the public sector (frequent changes and low institutional memory of newcomers). In that sense, representatives from users and civil society bring some stability and continuity to these structures, which is positive. Often, users' main interest in river basin committees is monitoring developments and decisions that may influence their rights or generate costs (e.g. increase in water charges, changes in allocation regimes) rather than finding solutions for the problems in the basin. This type of motivation has an impact on the functioning of the river basin committees

and is at the heart of the challenges associated with their governance. Of course, there are different levels of efficiency and constructive mobilisation in the various committees throughout the country and river basin committees' role for discussing important matters, clarifying positions and building consensus, should not be neglected, even in a context of weak implementation capability.

Where river basin agencies exist, such as in Paraíba do Sul, Piracicaba, Capivari and Jundiaí, São Francisco and Doce Rivers, they act as executive secretariats of the river basin committees. According to Article 43 of the 1997 Water Law, pre-requisites for the creation of agencies include the existence of a basin committee and some financial sustainability guaranteed by the water charges in the basin. Where river basin agencies or delegated entities do not exist, state water agencies perform their role, which has positive and negative effects. On the one hand, river basin committees become dependent on the state authority for implementing their decisions. On the other hand, such a dual role can be justified by the absence of human and financial resources to create autonomous agencies and can help to reduce transaction costs and promote a more consistent presence on the ground. The challenge, however, is that river basin committees are seen primarily as deliberative institutions as opposed to consultative bodies to discuss policies and build consensus.

Municipalities

The Constitution is not explicit about the role of the municipalities in water resources management. It foresees that the three levels (federal, state and municipal) are jointly in charge of registering and enforcing the concessions of rights to research and explore water resources in their territories. Municipalities take part in the national and state water resources councils and are explicitly mentioned in the 1997 law as part of the public executive powers of river basin committees. While exercising public authority, municipalities can be seen as water users given that they are legally responsible for urban water supply, sewage collection and wastewater treatment. Municipalities also manage solid waste, land use and spatial planning, which requires them to participate effectively in the water management system. Involving them in the implementation of infrastructure of common interest, like multi-purpose systems or regional systems, or conditioning the transfer of funds from federal and state budgets to a more active and qualified participation.

The level of participation of the municipalities in collegiate bodies varies from case to case depending on the local conditions, the importance given to water problems, the motivation of mayors and collaborators, and the specific interests at stake. Overall, this level of participation is reported to be low. As advocates of "politics of proximity", local governments are much closer to the consequences (populations and their problems) than the causes (addressed within basin governance institutions). As "doers", local authorities tend to be judged in elections for what they did locally and immediately, more than other levels of political decision; therefore their focus tends to be primarily on short-term issues, more so than at the national and river basin level. As a result, the extent to which municipalities are involved in medium- and long-term decision making on water is somewhat limited.

There is one exception to this general rule, which is participation in decisions pertaining to land-use management and territorial development, which have an impact on water resources. Protecting water sources and avoiding the occupation of floodplains are good examples of key decisions that rely on municipalities, given their role in producing

urban development plans and granting construction permits. Their participation in state councils and river basin committees is therefore important, in particular to increase awareness, share information and mitigate risks.

Assessment of multi-level governance

A framework to diagnose governance gaps in managing multi-level interactions

OECD (2011) defines multi-level governance as the explicit or implicit sharing of policy-making authority responsibility, development and implementation at different administrative and territorial levels, i.e.: 1) across different ministries and/or public agencies at central government level (upper horizontally); 2) between different layers of government at local, regional, provincial/state, national and supranational levels (vertically); and 3) across different actors at the sub-national level (lower horizontally).

The report also suggests that governments, regardless of countries' institutional features and organisation of the water sector, often face seven categories of "gaps" in water governance. The OECD Multi-level Governance Framework "Mind the Gaps, Bridge the Gaps" (Figure 2.8) provides a reading template and diagnosis tool of governance gaps between levels of government, across policy areas (ministries and public agencies), and between local and regional actors at the sub-national level that should be considered in a systemic way as they are strongly inter-related and may reinforce each other. It also suggests a set of policy responses in terms of co-ordinating water at vertical and horizontal levels.

Figure 2.8. **OECD Multi-Level Governance Framework: "Mind the Gaps, Bridge the Gaps"**

Source: OECD (2011), *Water Governance in OECD Countries: A Multi-level Approach*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264119284-en.

Assessing multi-level governance gaps in Brazil's water resources management requires an analysis of achievements and remaining challenges in terms of:

- Dealing with institutional and territorial fragmentation of water policy across multiple actors and identifying success stories and incentives for effective policy coherence across sectors (policy gap).

- Reconciling administrative and hydrological boundaries to manage water resources and supply water services at the relevant scale, taking account of the benefits and pitfalls of integration across the water chain (administrative gap).
- Addressing any funding mismatch between the responsibilities and resources available to carry them out to assess whether the current financing framework fits for the future and point out needed adjustments (funding gap).
- Securing hard (infrastructure) and soft (expertise) capacity at central and sub-national level. This implies identifying and addressing potential gaps in knowledge, human capital, technology and other capabilities to design and implement sustainable, efficient and effective water policies (capacity gap).
- Fostering accountability mechanisms to engage stakeholders and protect consumers through inclusive and transparent decision making. This implies analysing enforcement, monitoring and evaluation mechanisms in place in the water sector and their effectiveness (accountability gap).
- Aligning objectives, diverging interests and priorities to foster synergies and complementarities at the right scale and overcome discontinuity and vested interests (objective gap).
- Developing physical, socio-economic, financial and institutional water information systems in support of decision makers, with specific attention to their coherence, consistency, reliability and public disclosure as well as to their costs and benefits (information gap).

Water governance gaps in Brazil

A diversity of situations and contexts

Brazil is a diverse country in terms of institutional capacity, performance, hydrographic characteristics and level of economic development, amongst others. Hence, there cannot be a one-size-fits-all response and assessment across Brazilian states. Taking a problemshed approach in practice requires, on the contrary, place-based responses to territorial challenges. Rio de Janeiro, Paraíba and Rondônia are interesting examples of the distinctive features of Brazilian states.

- Rio de Janeiro is advanced and sophisticated in technical terms, with qualified staff, although it is facing some problems. Legislation is in place and consolidated; institutions are functioning; integration of water and environment has been successful; river basin plans have been approved or are being finalised; permits and licenses are being issued consistently and water charges are being collected. Challenges are related to the instability caused by the political cycles, the lack of consistent and comprehensive information systems, and burdensome tendering for spending revenues from water charges.
- Paraíba was a pioneering state in approving a water law, preparing a state water resource plan and creating river basin committees. This process, however, has not developed and deepened enough. The state plan is outdated; the state agency lost qualified staff and struggles to promote water reforms; the legislation for collecting water charges was approved but has not been implemented yet due to the drought and administrative burdens; river basin committees have lost connections with the State Water Resources Council; some segments of civil society are mobilised but water users are not fully active. The institutional

framework is therefore in place, but implementation lags behind despite awareness of the importance of water and the need to go beyond infrastructure logics.

- **Rondônia** is a state of water abundance with limited water problems, although recent floods had devastating impacts on the population and economy and triggered some urgency to act. Past attempts to implement the State Water Resources Management System failed, leaving behind harsh recriminations. Only recently was the State Water Resources Council reformulated and started moving the water agenda forward. River basin committees are not fully operational and there are currently no river basin agencies. Some segments of civil society have been very mobilised but not fully taken into account in the decision-making process. Water permits exist but are rooted on low technical criteria, and water charges are not even considered at this stage.

Administrative gap

In the water sector, the administrative boundaries of municipalities, regions and states rarely correspond to hydrological frontiers. This results in a mismatch at sub-national level that often obstructs water policies and complicates the relationships between elected representatives, local authorities, water agencies, resource managers and end users. Management failures, such as a lack of co-operation, participation and transparency, are often rooted in this mismatch. For example, it is difficult to enforce water quality regulations and water abstraction rules where two or more water management bodies are in charge of different sections of one river. The administrative gap may also raise the question of the "appropriate" scale for management, engagement and investment, which can be achieved through better co-ordination of water policy.

In Brazil, this duplication at sub-national levels (triplication if municipalities are also considered) adds complexity to the water resources management system and is exacerbated by the double dominion and jurisdiction over state and federal rivers. The mismatch between administrative borders and river basin (or aquifer) borders leads to a "double grid" that needs to be reconciled, leading to the multi-level approach (OECD, 2011). In fact, whatever happens in the basin has impacts downstream, making the river basin a natural "integrator" of different water uses. On the other hand, federal, state and municipal levels are the appropriate "integrators" of social and economic policies and development strategies.

River basin committees should act as co-ordination mechanisms to bridge the "administrative gap" and fit water policies to places; in practice, however, they face challenges. River basin committees have deliberative functions that give them significant powers with limited means of implementation, contrary to public authorities. The divide between public authorities and civil society in the committees is increasing with respect to priorities for water decision making. Water plans lay out what needs to be done, but they are not always implemented, which discourages water users and restricts the role of river basin committees to that of advocacy.

Weak implementation can discourage water users, especially when river basin committees mainly complain and denounce problems rather than provide a forum to help executive powers find solutions. Communication with the national and state water resources councils is sometimes insufficient. All river basin committees have a seat on the state council, and are often represented indirectly, but there is no formal mechanism to guarantee that information is shared and that those who participate in the state water resources council really

speak on behalf of other committees. Good practices suggest that public authorities have a major role to play to prevent this "consultation capture" (Box 2.4).

Box 2.4. **Guidelines for Effective Basin Institutions**

Several institutions have developed guidance for effective and efficient river basin organisations. The Global Water Partnership Toolbox for IWRM (Integrated Water Resources Management) draws some lessons from a variety of successful experiences in setting-up effective basin institutions and highlights key success factors:

- an ability to establish trusted technical competencies
- a focus on serious recurrent problems such as flooding or drought or supply shortages, and the provision of solutions acceptable to all stakeholders
- broad stakeholder involvement, fostering grassroots participation at a basin-wide level (e.g. through water forums)
- an ability to generate some form of sustaining revenue
- the capacity to collect fees, and attract grants and/or loans
- clear jurisdictional boundaries and appropriate powers.

Pegram et al. (2013) developed ten golden rules to foster effective basin planning in basin institutions:

- Rule 1: Develop a comprehensive understanding of the entire system.
- Rule 2: Plan and act, even without full knowledge.
- Rule 3: Prioritise issues for current attention, and adopt a phased and iterative approach to the achievement of long-term goals.
- Rule 4: Enable adaptation to changing circumstances.
- Rule 5: Accept that basin planning is an inherently iterative and chaotic process.
- Rule 6: Develop relevant and consistent thematic plans.
- Rule 7: Address issues at the appropriate scale by nesting local plans under the basin plan.
- Rule 8: Engage stakeholders with a view to strengthening institutional relationships.
- Rule 9: Focus on implementation of the basin plan throughout.
- Rule 10: Select the planning approach and methods to suit the basin needs

The Global Water Partnership and the International Network of Basin Organisations produced a handbook for IWRM in basins which, among other aspects, lays out the role of basin institutions with three main functions: 1) monitoring, investigating, co-ordinating and regulating; 2) planning and financing; and 3) developing and managing. More importantly, they advise that river basin organisations should take a "big picture" perspective and be the leading voice on basin-wide issues while keeping constituencies and decision makers in all sectors and at all levels, in both public and private sectors, fully informed and involved.

Sources: GWP IWRM Toolbox website, www.gwp.org/en/ToolBox (last accessed in September 2014); Pegram, G. et al. (2013), *River Basin Planning: Principles, Procedures and Approaches for Strategic Basin Planning*, UNESCO, Paris, available at: www.adb.org/sites/default/files/publication/30248/river-basin-planning.pdf; GWP and INBO (2009), *A Handbook for Integrated Water Resources Management in Basins*, Global Water Partnership and the International Network of Basin Organizations, Elanders, Sweden, available at: www.inbo-news.org/IMG/pdf/GWP-INBOHandbookForIWRMinBasins.pdf.

Policy gap

The policy gap refers to the fragmentation of water-related tasks across ministries and public agencies at the national level, and across local and regional authorities at the sub-national level. These silo approaches result in incoherence between sub-national policy needs and national policy initiatives, and suboptimal outcomes across water-related policy domains. In the absence of effective co-ordination mechanisms, the opportunity for "whole-of-government" approaches is minimised.

The generalised sense of water abundance in Brazil does not help to fully engage all ministries and levels of government in the shift from crisis management to risk management. It also obscures the real problems of water pollution, demand, availability and conflicts, especially to satisfy water demand in the large metropolitan areas and fast-growing irrigation areas. The scale and nature of water problems in Brazil require heavy investment in both long-term infrastructure (hydropower, navigation, irrigation, drinking water supply, sewage treatment) and soft infrastructure (co-ordinated institutions, policies and awareness), which could support a greater culture of compliance and enforcement. It is also important that water quantity and quality remain together for reasons of coherence, consistency and cost-effectiveness and to reduce transaction costs.

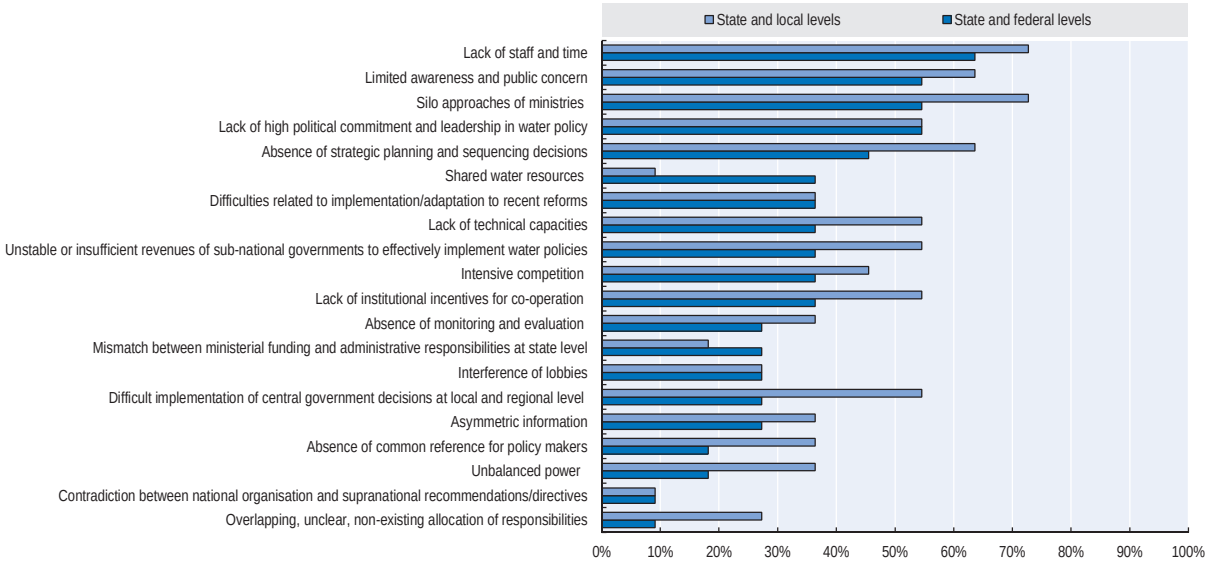
The interface between water resources at the basin scale and land-use management is fragmented. First, there is a lack of land-use planning and management tools at the level of local authorities. Second, there is a mismatch in how water and territorial development are managed across multiple scales. The absence of regional integrated land-use plans that should guide municipal plans and factor in water resources concerns is a challenge. To a certain extent, the resistance of municipal and state governments towards river basin committees also stems from the reluctance in accepting other instances of power in their territories, which are seen as opposing a paradigm of "progress" associated with urban expansion and development of economic activities regardless of their environmental impacts. Moreover, governments and river basin committees have different timing (governments may see river basin committees as instances that will slow down decision making) and different priorities (river basin committees may focus on issues which are less important for the governments and not always related to what is being discussed). According to a survey carried out across Brazilian states, the perceived degree of fragmentation is overall higher between states and municipalities than between federal and state levels. The most frequent bottlenecks to vertical co-ordination listed include the lack of staff and time, the limited awareness and public concern over water issues, silo approaches of ministries, the lack of leadership and political commitment, as well as the absence of strategic planning (Figure 2.9).

Another challenge is that the National Water Resources Management System does not establish sufficient linkages between water resources management and sanitation, which affects both water quality and quantity since polluted water cannot be used downstream or can only be used at a higher cost (for treatment). Thus, solutions to droughts (in the Northeast) and water pollution (in large urban centres) require effective co-ordination of water resources, water supply and sanitation, among other sectors.

The complex relationship of water with other areas of public policy requires a good understanding of scientific and technical terms, and awareness at a high political level. While water experts seek an integrated approach, decision makers (with more political weight) tend to be focused on crisis management rather than risk management. Recent years have seen the proliferation of state and interstate plans (Figure 2.10), which are often developed in disjunction with other sectoral plans where water demand and

availability should feature. While planning can be a powerful co-ordinating vehicle across ministries and levels of government, its potential has not been fully exploited in Brazil. The ongoing development of a multi-annual plan under the leadership of the Ministry of Planning provides a unique opportunity to bridge inconsistencies and minimise contradictory policies.

Figure 2.9. **Obstacles to vertical co-ordination of water policy from the states' perspectives**



Note: The bars represent the percentage of states that indicated a given obstacle in co-ordination between state and local levels (light blue) and between state and federal levels (dark blue).

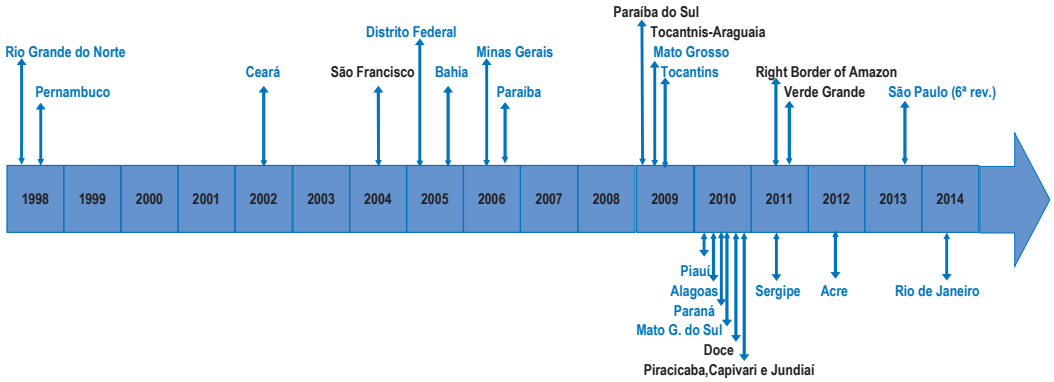
Source: OECD (2014a), based on responses to the OECD questionnaire; out of 14 states surveyed, the following 11 provided answers: Ceará, Maranhão, Paraíba, Paraná, Pernambuco, Rondônia, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, Santa Catarina, São Paulo.

Coping with current and future challenges means that water issues need to be brought into the high-level political and decision-making arena. In practice, the National Water Resources Council should be devoted to enhancing cross-sector co-ordination. But it has not fully played its role for three main reasons:

- First, the level of representation of the various ministries is not as high as desirable. Lengthy discussions on rather technical matters discourage the participation of high-level officials who tend to delegate to lower rank representatives. According to the 1997 law, the Minister of Environment should preside over the National Council, but this is seldom the case, which has a cascade effect on the level of representation of other stakeholders and the capacity to take decisions.
- Second, the CNRH is not totally dedicated to and focused on strategic issues. If the council had a higher political level and a more strategic agenda, the system could be more effective and transaction costs would be lower. The 10 technical chambers and 22 working groups, all of a very specialised nature, can overlap with or replicate those of some public agencies (e.g. ANA). A national council focusing on overarching priorities for the country could be more appealing to other ministries and representatives of users and NGOs.

- Third, state councils and basin committees are not fully represented and often poorly informed about the activities of the CNRH. Not all river basin committees and state councils can have a seat (Figure 2.4) because the balance between categories of stakeholders needs to preserve a majority for the federal power. Sharing the outcomes between national, state and basin levels is a challenge. The deliberative profile of the council tends to translate into a "recording chamber" function, whereby decisions taken in committees are validated instead of being discussed thoroughly.

Figure 2.10. **Timeline for the development of state and interstate plans**



Notes: State plans are indicated in blue and interstate plans in black. Amapá, Amazonas, Espírito Santo, Goiás, Maranhão, Pará, Rio Grande do Sul, Rondônia, Roraima and Santa Catarina do not have state water resources plans, but Amazonas, Espírito Santo, Goiás, Pará, Rondônia and Roraima are covered by interstate plans. Only Amapá and Maranhão are not covered by any type of plan. Amazonas, Goiás, Pará and Santa Catarina are under preparation.

There is a range of instruments in place in Brazil to co-ordinate water with other public policies at different levels:

- At the highest level, the Ministry of Environment, notably through the Secretariat for Water Resources and Urban Environment, is the main organisation responsible for promoting policies and co-ordinating with other ministries.
- A number of agreements have been signed with the Ministry of Agriculture and the Ministry of National Integration to foster policy consistency and complementarity. Inter-ministerial working groups have also been set up (e.g. by the Ministry of Cities to co-ordinate urban policies and related domains such as water).
- The CNRH also holds co-ordinating functions, which thus far have not been performed in an optimal way and could be strengthened to allow for effective cross-sector co-ordination and high-level guidance to ultimate decision makers.
- Under the co-ordination of the National Water Resources Council, the National Water Resources Plan is also an important tool for cross-sector co-ordination with other policy areas involved in its preparation (energy, mining, national integration, agriculture, sanitation).
- A range of federal programmes also provide opportunities for integrating policies and initiatives that are relevant for water.

- The National Water Security Plan under preparation by the ANA with the Ministry of Environment and the Ministry of National Integration (expected to be concluded at the end of 2016), will help to articulate policies and measures among the various ministries, and to select the waterworks and activities necessary in order to improve the overall water security in the country.

Funding gap

The funding gap refers to the difference between sub-national revenues and the expenditures sub-national authorities require to meet their responsibilities in the water sector. Sub-national authorities often depend on higher levels of government for funding water policies, while central government depends on the sub-national authorities to deliver them and meet both national and sub-national priorities. This interdependence is all the more crucial when government funding has been slashed in times of economic and financial crisis.

Financing needs are important in Brazil at all levels. Additional infrastructure is required to store water, to protect the country against extreme events, and to supply safe water and reliable sanitation services to city dwellers and rural inhabitants. Stable revenues are also required to operate and maintain the stock of assets. In addition, finance is required to sustain water-related institutions and to build capacity in water management at federal, state, basin and municipal levels. This funding gap illustrates the lack of an overall prioritisation process when allocating scarce financial resources against the federal, state and basin priorities. The ongoing National Water Security Plan addresses the deficit by prioritising infrastructure works for risk management.

A ball-point projection on financing needs for water and wastewater services suggests that expenditures could rise from 0.2% to 1.9% of Brazilian GDP between now and 2030 (OECD, 2006). According to the PLANSAB, the necessary amount of financial resources until 2033 for water and wastewater services may represent 5.2% of Brazilian GDP. Without consideration of funding and stable long-term commitments, water policy cannot be successfully implemented. Making the most of available finance and attracting additional funding requires agreements between ministries in charge of federal funding and states, but also ensuring that the funds are spent in ways that provide maximum value for money. Otherwise, inappropriate spending will not only harm implementation, but also curtail the attainment of growth and welfare targets.

Where they exist, water charges are low, and so is bill collection. Revenue collection and allocation for priority investment are sub-national level responsibilities, with a critical role for river basin committees. A wide range of situations can be witnessed across Brazilian states. While some states have the legal framework in place to collect water charges, in many others the legal framework is either pending or not enforced because of political, climatic and administrative reasons. Often, water charges are not grounded on affordability studies or impact assessment. Under these circumstances, a low value became a requisite for implementation. The willingness to charge remains rather low even when the ability to pay has not been assessed thoroughly. This situation prevents water charges from being used as a policy instrument as they are too low to drive behavioural change or to provide a significant source of finance for water policy. A way forward could be to raise awareness on the cost of inaction in the short, medium and long term, as in the case of São Paulo droughts. Greater awareness could also help define the acceptable level of tariffs for water resources management compared with other expenditures, key economic data (disposable income, etc.) and the investment needs for sustainable water management. International experience also provides lessons (Box 2.6).

Box 2.5. **EU conditionalities to align investment in water infrastructures with water policy compliance**

Making federal funding of water infrastructure investments contingent on compliance with key legislative requirements can foster compliance with national policies. With the funding programme concerning the period 2014-20, the European Union supports the implementation of policies and legislation by providing financial incentives to member countries, applying *ex ante* conditionalities that member countries must fulfil in order to qualify for the provision of such financial support. This ensures that investments are coherent and consistent with EU legislation and policies. In fact, if *ex ante* conditionalities are not met, the European Commission can suspend any payments in their support.

Water-related investment under funds intended for water-related programmes and projects to support regional development are subject to an *ex ante* conditionality and a number of criteria related specifically to whether member countries satisfy the most essential requirements of EU water legislation. Requirements applicable to all water-related programmes include the existence of:

- compliant river basin management plans
- compliant water pricing policies
- a relevant monitoring network
- compliant environmental objectives and use of exemptions
- a summary of the programmes of measures that will deliver the objectives set.

Similarly, funds intended to support rural development are subject to an *ex ante* conditionality for payment of support for investments in irrigation systems, concerning the putting in place of:

- a water pricing policy recovering environmental and resource costs
- the existence of a river basin management plan for the basin concerned
- the use of water metering
- a minimum requirement for water savings.

To be fair and effective, conditionalities should be attached to outcomes that are under the control of the parties, and cannot be affected by third-party failure. For instance, farmers should probably be able to receive funding to increase production or to meet environmental requirements, provided they comply with obligations incumbent on themselves, independently of whether their local public sector bodies comply with their obligations.

Conditionalities could be used to improve water planning in Brazil. For example, it would be advisable that public finance for water infrastructure was made available only where a river basin plan exists and complies with a number of specified key requirements, such as all-encompassing compliant allocations, effective enforcement, data sharing and undertakings by states to invest and finance in a timely manner. The system of conditionalities should ensure that funds are not blocked and capacity is needed to comply with the mandatory requirements.

Source: Peter Gammeltoft, former Head of Unit for Water at European Commission, Directorate General for the Environment.

Furthermore, in Brazil revenues from water charges are considered public finance and have to be spent according to very strict laws and procedures, which the delegated agencies at the river basin level do not systematically master. Funds accumulate with no visible use, which is discouraging for users charged and committees in general. In some

cases, those funds were given to municipalities as a second-best option given that municipalities were better prepared to spend them. This was the case in São Paulo for instance, which ranks amongst the most successful states in charging for water, and where 70% of the water revenues were given to the municipalities for *ad hoc* measures rather than for the implementation of a coherent river basin plan. This type of issue was overcome in Ceará because all water charges were formulated as "tariffs" paid to a public company (Company for Water Resources Management of Ceará, COGERH) that operates all water resources systems (Box 2.7). This approach can inspire other solutions nationwide, without requiring legal reforms.

Hydropower contributes to water resources management financing with a flat fee as financial compensation for the use of water for hydropower generation, distributed according to flooded areas (Law No. 9984/2000). However, revenues are shared among several organisations, including federal entities, state governments and municipalities affected by reservoirs, and those funds are generally not earmarked for the water sector. So far, municipal and state governments have not shown particular willingness to use these revenues to improve or consolidate the water management system. A key way forward is to set the incentives to focus this source of revenues on the main water priorities, which entails strong links with planning.

Difficulties related to public tendering hinder the spending of funds collected through water charges. Even in the case of Rio de Janeiro, this is a critical issue. Water charges collected cannot be easily used because of a rather cumbersome and lengthy bureaucracy in the tendering procedures of public agencies. Users, who pay charges as a contribution to improve basin conditions, do not always see the benefits of such charges in improving overall water outcomes in the basin, which may generate a disincentive to pay water charges in the future or accept increases. The approach adopted by Ceará, in which water is charged by a company, not as a natural public resource but rather as a service provided to the user based on infrastructure management, may be a way of circumventing the deadlock, although very much tailored for Ceará conditions and a little artificial under different circumstances (Box 2.7).

Capacity gap

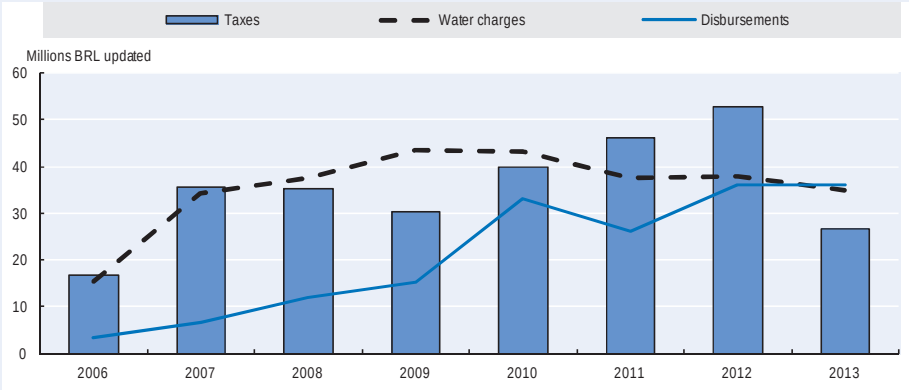
A capacity gap is generated by insufficient scientific and technical expertise and infrastructure for designing and implementing water policies. If there is a difference between the capacity needed to shoulder water responsibilities and the local authority's organisational, technical, procedural, networking and infrastructure capacity, consequences for the implementation of national water policies are unavoidable. The local authority may not have the funding to operate and maintain services effectively. This may lead to the deterioration and potential failure of water services and infrastructure, which in turn threatens the quality of water resources.

Box 2.6. **Raising water charges: Insights from the Seine-Normandie, Piracicaba, Capivari and Jundiai basins**

The comparison between the implementation processes of water charges in the basins of the Rio Piracicaba, Capivari and Jundiaí (PCJ), from 2006 to 2013 and in the Seine-Normandie basin in France from 1968 and 1975 helps to better understand the difficulty in increasing water charges values in Brazil.

Water charges in the PCJ basin were implemented in 2006 and extended to the entire basin (state domain rivers) in 2007. The values of the total charges in the basin during the first seven years of its implementation remained around BRL 40 million per year.

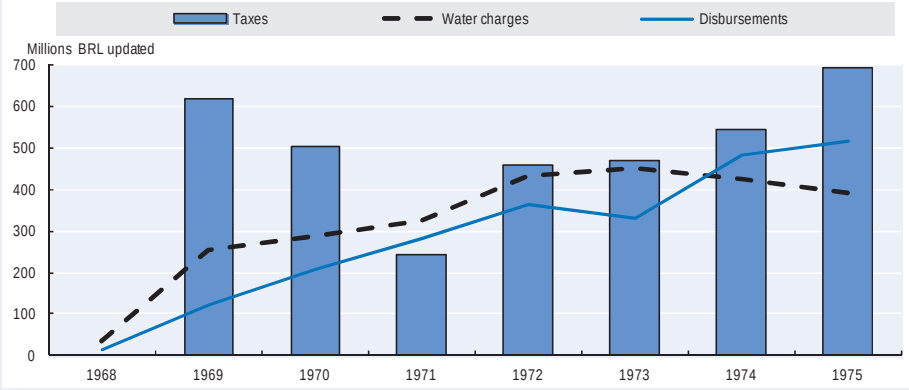
Figure 2.11. **Evolution of water charges and financial aid within the PCJ basins, 2006-13**



Source: Laigneau, P. (2014), "Tristes águas francesas: Olhar a história das agências e comitês de bacia na França desde os trópicos", Universidade Federal do Rio Grande do Sul, Porto Alegre, http://hdl.handle.net/10183/114439.

Within the Seine-Normandie river basin, a temporary water tax, called "charge for studies", was implemented in 1968 with annual amount of 10.5 million francs at the time (BRL 36 million). This collection allowed a three-year programme to be set up with priority projects to be financed by the Seine-Normandie basin agency, including sewerage treatment plants and a dam on the Seine River, for a total cost of 900 million francs (BRL 3 billion). In addition to the funds already available, 40% of this value had to be funded by the "definitive" water charge, which was then set up at BRL 350 million per year, with a gradual increase during the first three years.

Figure 2.12. **Water charges and financial transfers in the Seine-Normandie River basin**



Source: Laigneau, P. (2014), "Tristes águas francesas: Olhar a história das agências e comitês de bacia na França desde os trópicos", Universidade Federal do Rio Grande do Sul, Porto Alegre, http://hdl.handle.net/10183/114439.

Box 2.6. **Raising water charges: Insights from the Seine-Normandie, Piracicaba, Capivari and Jundiai basins** (*cont.*)

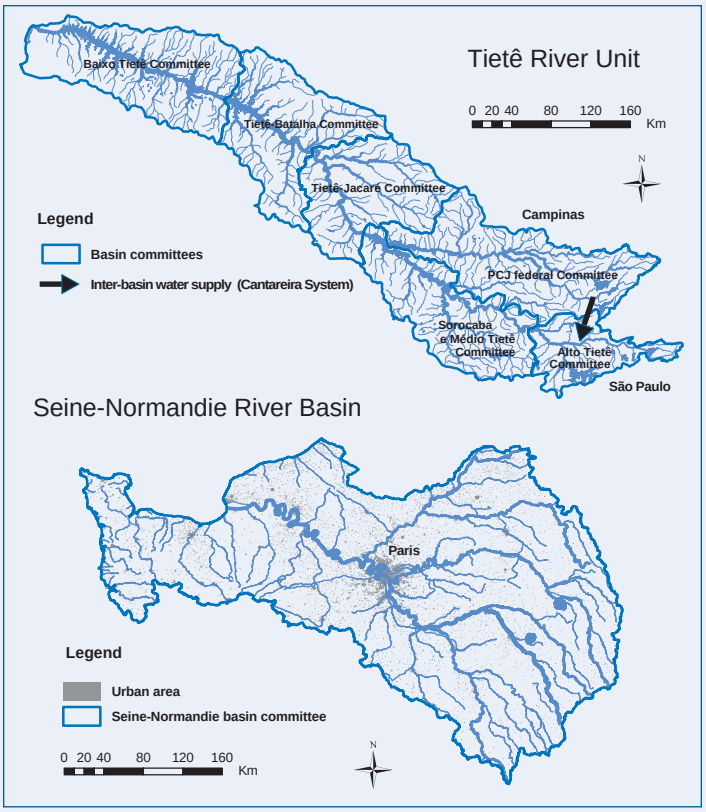
The level of charges in the PCJ in 2013 was ten times lower than the charges applied in 1975 in Seine-Normandie. The PCJ committees decided each year that water taxes would be equal to the amount of annual charges collected, while the Seine-Normandie Committee, already in 1969, ruled for much higher financial aid, equal to half the priority programme, providing that the disbursements would be progressive over the following years.

The fact that the Seine-Normandie Committee immediately assigned financial aid to large priority projects convinced its members that the water charging system was an efficient one, thus contributing to its acceptance by water users and opening up the possibility to increase the values for the agency's second intervention programme (1972-75). Such a collective dynamic was only possible because the city of Paris, the main beneficiary of financial aid from the water agency and the main source of recovery, was located in the basin and its representatives were influential members of the committee.

Figure 2.13 suggests that a committee on the scale of the River Tietê unit, in addition to the interstate Committee PCJ and existing state committees, would allow water management issues to be discussed at a relevant hydrological scale, bringing together representatives from the Metropolitan Region of São Paulo and representatives of the PCJ basin where the Cantareira System is implemented. The map also shows that a basin agency at the Tietê River scale would be comparable to the Seine-Normandie agency, including in the possibility of raising larger amounts by charging water uses.

This example shows that the geographical scales of governance structures for existing river basins in Brazil, among other factors, have an impact on efficiency. While France faces the challenge of bringing the six major committees closer to local actors, Brazil faces the opposite challenge of building governance structures at the regional scale from existing and consolidated committees at the local level.

Figure 2.13. **Hydrographical units of the Tietê and Seine-Normandie basins, at the same scale**



Source: Based on inputs from Alain Bernard (INBO); Laigneau, P. (2014), "Tristes águas francesas: Olhar a história das agências e comitês de bacia na França desde os trópicos", Universidade Federal do Rio Grande do Sul, Porto Alegre, http://hdl.handle.net/10183/114439.

Box 2.7. **The water resources management model of Ceará**

The experience of the state of Ceará is characterised by the search for a specific model adapted to the Brazilian semi-arid region. Progress achieved, with the support of World Bank loans, can be largely characterised as follows:

- Management of water stored in dams, given scarcity problems derived from multi-annual seasonality of precipitation and high evaporation that occur in semi-arid regions.
- Allocation of water to multiple uses, based on socially negotiated decisions in users' collegiate structures (principally users' associations of the reservoirs), based on established relationships between water height and stored volume that provide reliable projections of water availability in the short and medium terms.
- Transport of raw water over long distances, over the limits of watersheds, reaching the major demand sites, especially the Metropolitan Region of Fortaleza, where the largest demands for industrial and domestic consumption are concentrated.
- Collection of charges for the services of non-treated water storage, transport and distribution provided to the industrial users and to the concessionaires of domestic supply (those charges are formally different from the charges associated with the abstraction of non-treated water).
- Adoption of mechanisms of negotiation among water users, allowing for changes in water allocation in order to increase the efficiency of water use (sectors with higher added value may pay for subsidising the reduction or suspension of activities of users with less added value – particularly irrigation with high demand).
- Promotion of local associations of small users in order to facilitate the negotiation processes for water allocation.
- A single state agency, the COGERH, created as a mixed economic enterprise acting in all the state territory and beyond the limits of the river basins, interconnecting reservoirs and systems for water transfer, being responsible for the operation and maintenance of the entire system.
- A Secretariat for Water Resources that keeps all the competences of the state, notably those concerning the granting of permits and the systematic inspection of compliance.
- An agency for the construction of water-related public works (SOHIDRA), and another one for the collection of hydro-meteorological data (FUNCEME).
- A total collection of BRL 57 million in 2012, with a large part used to cover the operational costs of the raw water storage and transport systems.

Ceará water management is oriented towards the process of conciliation of conflicts among the multiple uses of water in a Brazilian semi-arid region, both for rural uses (family-based agriculture and large irrigation schemes), and metropolitan use in Fortaleza (urban and industrial consumption). Therefore it addresses both the bulk and retail dimensions of water supply, from a regional point of view and based on large infrastructures held by the state, and formulates new projects to satisfy expanding needs, according to the profiles of water users and uses.

Box 2.7. **The water resources management model of Ceará** (*cont.*)

An additional merit of the system is the consistency of available data for supporting the processes of negotiation, which are crucial to reallocating water among users and generating higher added value. The real operation and maintenance costs of dams, canals, conduits and other equipment are fully covered by the charges that are collected for the non-treated water supplied, always rigorously metered. Hence, Ceará's water resources management system relies on governance, governability, financial consistency, in addition to a regional development strategy.

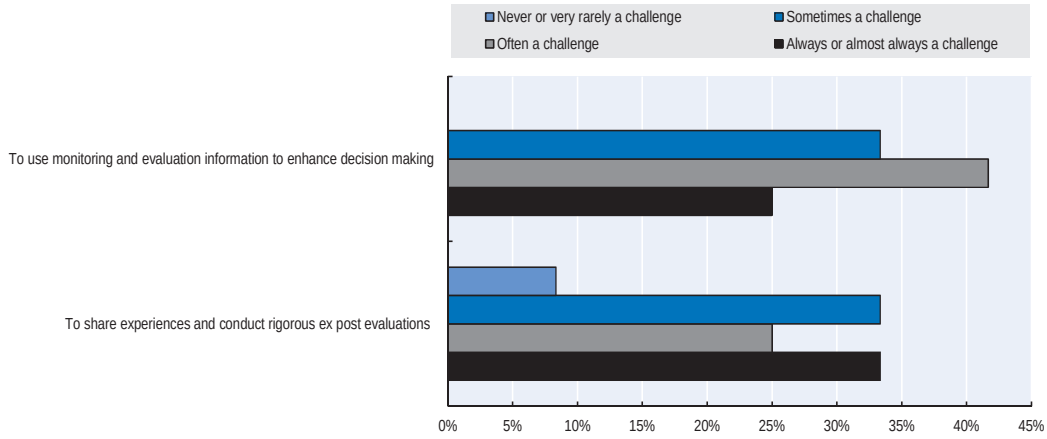
Sources: Adapted from Lobato da Costa, F. (2014), *Plano Nacional de Adaptação às Alterações Climáticas Identificação dos Principais Problemas e Desafios para o SINGREH* (*National Plan for Adaptation to Climate Change – Identification of the Main Problems and Changes for SINGREH*), Francisco Lobato & Consultores Associados, Ltda., Curitiba, Paraná; UNEP and ANA (2007), *GEO Brasil – Recursos Hídricos* (*GEO Brazil – Water Resources*), United Nations Environmental Program and National Water Agency, Brasilia D.F.

Many countries willing to decentralise their water policy face a fundamental sequencing question: at what point is the sub-national level ready or sufficiently mature to assume responsibilities associated with devolved or decentralised tasks in water policy making? Will learning by doing be sufficient, or is it essential to build capacity before it is possible to properly deliver on assigned competences? There is no right or wrong answer to these questions. Capacity needs vary with the pre-existing levels of administrative infrastructure. Established sub-national governments with well-developed institutions may need little capacity building when faced with new responsibilities. But where sub-national governments or related institutions must be created or have historically had a limited role, the difficulties will be greater. In addition, the capacity gap is not restricted to the sub-national level of governance. It also applies to the national level and public administration at large in terms of managing multi-level relations, allocating responsibilities and funds, and ensuring co-ordinated, coherent policy approaches.

Decentralisation of water management in Brazil is an "unfinished business". Responsibilities were transferred *de jure* but failed to be implemented *de facto*. There are two threads of decentralisation that need to be encouraged. On the one hand, decentralisation to the states, as unavoidable members of a federal nation, or "subsidiarity-based decentralisation"; on the other hand, decentralisation to river basin committees or "solidarity-based decentralisation", based as much as possible on specific interests of users rather than lobbying or activism. While both are necessary, the first one is the current top priority for the ANA. However, state empowerment is hardly achievable without strong basin governance; as much as federal integrated water management cannot be achieved without state integrated water management. A multi-scalar perspective is crucial for convergence of water resources management systems.

The ANA has a high level of capacity with competent and skilled staff and engineers, which is not necessarily the case in other public administrations and levels of government. Ever since it was created, the ANA has been managed by top experts: of the 110 people initially hired, 78% hold a MSc or a PhD. More broadly, significant progress has been achieved in terms of technically and scientifically trained professionals. But representatives of state and basin institutions often misunderstand basic issues and their respective role related to water management, the importance of co-ordination and the needed linkages between plans and budgets. Monitoring, evaluation and experience sharing are the top capacity bottlenecks at state level with one-third of the states surveyed considering them as always or often a challenge (Figure 2.14).

Figure 2.14. **Self-assessment of selected states' capacities**



Source: OECD (2014a), based on responses from the OECD questionnaire; out of the 14 states surveyed, the following 12 provided answers: Ceará, Distrito Federal, Maranhão, Paraíba, Paraná, Pernambuco, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, Rondônia, Santa Catarina, São Paulo.

Box 2.8. **Education levels and professional competencies in public services in Brazil**

Education plays a key role in the development of Brazil, having a population of around 200 million inhabitants, of which 60% are under 30 years of age. However, educational attainment levels and professional capacities in public service remain low. Despite the recent increase in the number of students in Brazil, very few people between the ages of 25 and 64 have completed higher education. In 2008, only 11% of people in this age group had received tertiary education, as compared with 24% in Chile and the OECD average of 28%. The quality of public secondary schools tends to be lower than that of private schools, resulting in easier access to high-quality public tertiary education for graduates from private secondary schools. There are also strong geographic disparities, with students in the Northeast region – where adult illiteracy is still close to 20% – scoring particularly low on the tests.

There is also room for progress for what concerns research and development. At a time of consistent growth in Brazil's output in basic sciences, which reached a 2.02% share of international published articles in 2007, Brazil's share of the world's registered patents was only 0.06%. One reason for Brazil's poor record in converting scientific knowledge into practical results is the country's low level of investment in R&D. While Brazil dedicates only 0.98% of its gross domestic product (GDP) to research and development investments, the People's Republic of China invests 1.22%, and Brazilian corporations, which should be most responsible for creating patents, are investing little in their own research.

Professional education and competencies in public administration and services at all levels also need to be improved if citizens' expectations of good service and value for money are to be met. For instance, the management of managers and senior managers in the federal government of Brazil receives less attention compared to the situation in most OECD member countries. Human resources management practices in the federal government tend to focus more on controlling compliance with basic rules and standards with little room for strategic management based on competencies and performance.

Box 2.8. **Education levels and professional competencies in public services in Brazil** (*cont.*)

At the local level, the lack of capacity of administrations hinders the quality and performance of public services in various areas. For example, in urban transportation services, plans for new metropolitan underground trains or extensions of existing lines have been delayed due to planning difficulties in Porto Alegre, Curitiba, Brasília and São Paulo. In some instances, a lack of precision of the call for tender, or changes in the municipal governments, has been the source of delay. Improving local administrative capacity may therefore warrant particular attention to get more infrastructure projects off the ground. Another example is the health sector where, beyond the number and skill level of health professionals, there are regional disparities in the availability of human resources, with the South and Southeast regions being twice as well served as the rest of the country. The capacity of municipalities to deliver health services also varies, which means that the quality and type of services offered vary.

Education has played a key role for social progress in Brazil in the past, and will continue to be paramount in the future. One of the principal challenges going forward will be to improve the quality of education. Competencies of school-aged children have increased over the years as enrolment rates have improved, but compared to international benchmarks, Brazilian students still learn significantly less. The OECD PISA programme assesses 15-year-olds' competencies across 70 countries, and allows direct comparisons. Despite a 92% enrolment rate in education up to age 14, Brazilian youths still underperform their peers from other countries significantly in terms of competencies. This suggests that the bottleneck is no longer access but quality.

In the long term, Brazilian economic growth will require more trained human resources in different fields than those that the present system is able to deliver. There should be pressure for reform, both in terms of social cohesion and economic development. Greater admittance into the Brazilian higher education system will require addressing equity issues without compromising quality.

For what concerns professional competencies, the Brazilian government has already begun to develop competency management in the public service and its approach shows promise. Further developing competency management should be a priority for improving human resources management in the Brazilian public service as it can serve as an integrating mechanism and a lever of change for other areas of HRM. Competencies can help to build skills and change behaviours, achieve a better fit between recruitment and the needs of government organisations, and contribute to inculcating a culture of management and performance. To achieve these outcomes, competency management and performance management will have to be developed in a co-ordinated manner and changes will be needed in recruitment and workforce planning.

Sources: OECD (2014b), *Investing in Youth: Brazil*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264208988-en; OECD (2013a), *OECD Economic Surveys: Brazil 2013*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-bra-2013-en.

Brazilian states have different capacity needs and priorities. In the Amazon, for example, the problem is understaffing and underfunding. In Ceará, the National Pact for Water Managementalso presents an opportunity to strengthen managerial and budgeting capacity. Other states face challenges related to the capacity of certain stakeholders (e.g. indigenous people) to effectively participate in water management discussions within the river basin committee. In all cases, capacity is critical to deliver water policies (Box 2.9). Amongst others, robust skills at basin and state levels lack to ensure proper enforcement and compliance of the law; to strengthen inspection powers and capacity; and to improve the water information systems.

Box 2.9. **Capacity needs for effective basin governance**

Planning and project development

- To design plans that are tailored, result-oriented, realistic, forward-looking and coherent with national objectives.
- To co-ordinate across sectors to achieve an integrated place-based approach.
- To co-ordinate levels of government to ensure complementarities and achieve economies of scale across boundaries.
- To involve stakeholders in planning for inclusive plans reflecting local concerns.
- To build technical and managerial capacities in sub-national institutions.

Finance and budgeting

- To link multi-annual strategic plans to annual budgets.
- To decentralise fundraising and allocation prerogatives for priority investment.
- To mobilise private sector financing, without compromising long-term financial sustainability of public investment projects.
- To increase user fees and charges.
- To devise and implement economic instruments.
- To learn how to deal with requirements and restrictions of public expenditure, including public procurement.

Implementation

- To engage in transparent practices.
- To design and use monitoring indicator systems with realistic performance-promoting targets.

Evaluation

- To share experiences and conduct rigorous *ex post* evaluations.
- To use monitoring and evaluation information to enhance decision making.

Source: OECD (2013b), *Making Water Reform Happen in Mexico*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264187894-en

Objective gap

The objective gap occurs when diverging or contradictory objectives across levels of government, ministries and public agencies compromise long-term targets for integrated water policy. Water policies are often long-term endeavours that involve planning, *ex ante* evaluation, consultation, several stages of implementation, and *ex post* evaluation. Short-term considerations and vested interests can result in action that is potentially counterproductive. Frequently, when priorities are not clearly formulated at the highest political level, conflicting interests in water uses, quality, energy efficiency and pricing policy prevent consensus on aligned targets. All relevant stakeholders must be engaged

for the long haul, beyond political changes and electoral calendars. The objective gap can be somewhat mitigated through strengthening the planning procedures in water-related sectors (as is currently the case for energy) and improving co-ordination of planning between sectors. This may require providing more financial and material support to sectors at both the federal and state level for states to catch up in terms of data, methodologies and analysis and to be considered on an equal footing with more organised sectors such as energy.

The timeframe for decisions is of crucial importance in strategic planning. The prospects of success are greater when the timeframe for one policy aligns with activities in another policy. In theory, time scales are relatively easy to co-ordinate. For instance, regulatory and budget cycles can be synchronised over time (e.g. multi-annual budgeting) so that decisions that require coherence can be taken independently of political calendars and agendas, which vary from one ministry to another. But strategic planning is more difficult to design if policies, legislation and institutions on water are questioned from one government to another. This requires effort to manage the expectations of those who have a vested interest in previous policies and build flexibility towards policy coherence at the central and local levels.

Public policy discontinuity is a serious challenge for effective water governance in Brazil, due to instability caused by political changes in state governments. This observation goes far beyond the water sector. Water policies take time to implement and institutions take time to mature. In many cases the political cycle of elections is too short to achieve significant results. The habit of bringing new leaders to the institutions and starting new policies when the government changes can result in wasted time and effort. At the same time, it is normal for new governments to feel legitimised by the elections to introduce changes; often they do not perceive how this can challenge the continuity of policies and the accumulation of experience and skills in the administration, and result in a negative impact on their predecessors' efforts.

Any incentive that brings stability to the public administration and to public policies, especially those that are medium- and long-term targeted, is positive. Some contributions to policy continuity could be building consensus around water policies, discussing them openly in the society, mobilising and giving visibility to the professionals and prestigious experts regardless of their political orientations, and anchoring policies in federal or international requirements or recommendations.

Accountability gap

The accountability gap refers to a lack of transparency and inclusiveness in water policy making. Often, the shortening of the decision-making process introduces risks of capture and corruption, in particular when local governments do not have the capacity to monitor investment and civil society is not totally engaged.

The lack of awareness from citizens on water risks and costs in Brazil is a sign of an accountability gap. At some point this could be interpreted as the "trap of hiding in the backstage" that often affects water as a public policy. Politicians and citizens are sensitive to the consequences of "bad" water management, but tend to look at it from a mere sectoral point of view in terms of consequences. For instance, a lack of water to produce food is a "food problem"; a lack of water to produce energy is an "energy problem"; a lack of water for the economic needs is an "economy problem"; a lack of water to supply households is an "urban problem"; insufficient water quality to guarantee healthy conditions for the population is a "health problem". While the water community may be

clear about these linkages and how to solve them, for most people and decision makers it takes a much greater effort to understand what is somehow hidden "behind the stage".

Another fact challenging accountability is the limited enforcement power of water institutions. The problems of state water resources councils and river basin committees are particularly difficult to solve because of the great diversity of situations, from the physical and climatic conditions to the social and institutional characteristics. There is, however, a risk of over-estimating the importance of "local solutions" to all "problems". A "problemshed" approach is very wise under many circumstances, but specific incentives also need to be set at the federal level for outcome-oriented governance at basin and state level. This is very much the spirit of the National Pact for Water Managementsigned in 2011 between the ANA and state governments to converge towards integrated water resources management (see Chapter 3).

Information gap

An information gap occurs when there is an asymmetry or lack of information across ministries, between levels of government and across local actors involved in water policy. In many instances water policy reforms are difficult to put into practice because little data and information are available, particularly on the economic, financial and institutional implications. This is exacerbated by the lack of capacity, resources and expertise to collect, analyse and interpret water data in many countries. Even when the information is available, it must be shared at all levels of government to capitalise on individual knowledge centres, thereby creating a stronger whole. An asymmetry of information may occur when national and sub-national authorities do not actively share their knowledge of what is happening on the ground. Win-lose situations can also result from specific use of information that is not in the possession of the other party. A streamlining of required data for water management and the sharing of responsibilities for collecting and disseminating that data is presented in Box 2.10.

In practice, sub-national governments tend to have more information than national governments about local needs and preferences, and also about the implementation and costs of local policies. Unless they generate and publish this information on a timely basis and communicate it to the central level, an information gap can be created. Nevertheless, the sub-national level's views are only "partial" – limited to a specific area or territory. Thus, the central government plays an indispensable role in managing the information so as to support a broader vision of public policy objectives. Information can also be used to identify capacity needs. Once again, this indicates a relationship of mutual dependence. The relevant information does not lie exclusively with one level of government, and actors depend on each other's knowledge to disseminate information to and from relevant levels of government.

Effective water management requires a robust set of data to feed into a national decision support system. But the quality of hydrological data varies across states in Brazil. The ANA cannot develop alone water accounts at the federal level. It must rely on the knowledge of water use at the state level. A more detailed water balance has been developed in critical areas. Additional tools are required, under critical conditions. Knowledge relies on estimates and water users' registries, at either the federal or the state level. A National Register of Users of Water Resources (Cadastro Nacional de Usuários de Recursos Hídricos, CNARH) was set up in 2003, and data collection is in progress (incentivised by the National Pact for Water Management) and integration with state systems is ongoing, although challenging. The robustness of the CNARH is considered adequate, especially where water charges have been implemented (São Francisco, Paraíba do Sul, PCJ and Doce River basins) but does not cover the entire country.

Box 2.10. **Data for water management and shared responsibilities**

1. Monitoring for water management

Monitoring provides a fundamental contribution for a consistent water management.

From this perspective, the monitoring of **water availability** is necessary, involving:

- data on rainfall
- data on flow and quality of water
- seasonal variations
- historical data and prospective scenarios
- hydrogeological data and relationship between groundwater and surface water
- identification of strategic points for monitoring, with possible new design of the current network, considering regional characteristics and future trends of territorial development in each region.

It is also necessary to monitor the **water demand**, involving:

- the registration of all users, including not only those that have a permit, but the small users when their total water use is significant
- the effective uses of water compared with the volumes that were granted, since some users require more than what they need in order to guarantee a future increase in consumption
- the identification of production technologies and consumption seasonalities, to foster water efficiency
- the analysis of scenarios of water demand in order to adopt measures that prevent water shortages.

2. Three concrete steps

- Integration of information from different sources, with an emphasis on the strengthening of the National Water Resources Information System (Sistema Nacional de Informações sobre Recursos Hídricos, SNIRH) and the National Register of Users of Water Resources (CNARH).
- Funding of monitoring activities, with more co-operation between the environmental and the water resources inspections – e.g. between the IBAMA and the ANA to promote joint inspection activities.
- Strengthening of local actors, especially state agencies for water resources management (via the Water Pact) and the municipalities.

3. Short-, medium- and long-term steps forward

- The recent take off of the National Programme for Water Quality Evaluation (Programa Nacional de Avaliação da Qualidade das Águas, PNQA), under which new monitoring points are being selected and equipped to measure several water quality parameters.

Box 2.10. **Data for water management and shared responsibilities** (*cont.*)

- The recent consultancy contract signed by the ANA aiming at upgrading and advancing in the calculation of consumptive water uses in all states and municipalities, better methodologies and more consistent data (to be done in 20 months).

4. Identification of "who can do what"

Considering the need for integrating different sources of information on water availability and demand, the following actors should play a role:

- institutions responsible for water resources management (the ANA and the corresponding state agencies), with a closer relationship and collaboration made possible by the Water Pact and the creation of situation rooms
- the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE), given that it produces data and census that provide information for proper water balances, like urban and rural population of all municipalities, and data on the various economic sectors, including irrigation areas with special relevance for water use
- the municipalities, because they are very close to relevant realities and specific contexts.

In view of these sources of information, it is up to those responsible for water resources management to overlap and cross data for the several relevant territorial units and to integrate the information over the river basins.

5. Indicators

In relation to the leading indicators, it is necessary to check the consistency of data coming from the register of water permits with effective use of water. Therefore, it is always necessary to compare water balances based on the amounts of granted abstraction with data monitored on the ground reflecting the effective use of water.

Source: Summary prepared by Francisco Lobato of the debate held during the policy seminar organised by the ANA and OECD in Brasilia, 14-16 October 2014.

The capacity to monitor water use and to enforce water policies also varies greatly from one state to another. Compliance is a major challenge and very much influenced by cultural factors. The large number of small water users and the lack of a culture of compliance contribute to the problem, as does the limited use, high cost and maintenance issues associated with water meters.

Monitoring and enforcement is often the responsibility of several bodies depending on the institutional structure of the state and water functions considered. While some states have a basic institutional structure with only one governmental body in charge of monitoring and evaluating water policy, others rely on more complex institutional frameworks, with a great number of institutions responsible for monitoring and evaluating water policy. Some states also count on specific bodies (similar to the ANA) for monitoring water quality and quantity. Also, water management in Brazil sometimes relies on monitoring to be conducted by the neighbouring countries, when they share water bodies.

Planning

There is an abundance of plans, often weak in practice as information provided through planning is not properly enforced. Water resource plans should be an essential tool to identify gaps, to implement strategies, to build consensus among stakeholders, to guide concrete action and to measure progress in achieving targets.

In Brazil, plans are developed at different scales: national, state and basin. Under the principle of subsidiarity, the Brazilian legislation indicates the division of tasks between the national plan, the state plans and the river basin plans: the former should focus on strategic issues and larger scales, the state plans should also address strategic issues in their regional contexts, while river basin plans, with a more local approach, should focus on executive and operational tasks (Box 2.11). However, the National Water Resources Plan is too broad to set specific priorities and fails to link to the broader development strategy. River and state basin plans are often "paper tigers", which are not implemented due to lack of buy-in from the stakeholders and decision makers within whose remit measures may have to be taken and funds allocated. Plans are then often a "wishful thinking type of exercise", whereby promises taken are for others to fulfil.

In Brazil, sectoral plans, when they exist, often lack consistency and co-ordination. This is especially the case with agriculture, land use, spatial planning, infrastructure and biodiversity planning. Plans do not translate into budget or priorities for water entitlements. Another challenge is that there are no established procedures for cyclical planning in most ministries and bodies, which often results in emergency-driven situations.

Economic and ecological zoning are key. In practice, co-ordination between water and coastal management is also challenging. Rainwater is not taken care of appropriately and water conservation is also an issue. Solid waste deserves special attention as well. If not properly disposed of, waste may have adverse impacts on the quality of water resources. Allegedly, pollution from solid waste contributes significantly to the scarcity issues in some metropolitan areas like São Paulo and Rio de Janeiro. Poor water quality in Rio de Janeiro is largely due to pollution from solid waste linked to a bad habit of waste disposal in rivers. Some cost-effective measure to reduce pollution may well lie in changes in the waste disposal, even though pollution from other sources should not be neglected.

Furthermore, plans should define clearly a few requisites for water use, as required by law. Resolution CNRH 145/2012 establishes guidelines for the elaboration of river basin plans and Resolution CNRH 16/2001 establishes general criteria for the water use permits. But this does not happen in practice. If that were the case, some of the plan requisites could be immediately translated into regulatory guidelines. Thus, plans could shift from a "programme" approach, which always requires someone else to implement, to a "target" approach. For example, plans could define water quality targets, limits in water consumption and pollution loads, and standards for water use efficiency. Those targets can be easily incorporated into water permit systems, and if they were not met, sanctions could be imposed. The survey conducted across Brazilian states shows that more than 60% of states consider that it is always or almost always a challenge to design plans that are tailored, result oriented and coherent with national objectives; to co-ordinate across sectors to achieve an integrated place-based approach; and to link multi-annual strategic plans to annual budgets (Figure 2.15).

Box 2.11. **Sharing tasks among the National Water Resources Plan, state plans and river basin plans**

According to the 1997 law, the water resources plans are management instruments "to support and guide the implementation of the National Water Resources Policy" (Article 6). They are long-term plans with the following minimum content (Article 7):

- diagnosis of the current situation of water resources
- analysis of alternatives for population growth, the development of productive activities and changes in patterns of land use
- the balance between availability and future demands of water resources in quantity and quality, identifying potential conflicts
- targets of use rationalisation, increasing the quantity and improving the quality of available water resources
- measures, programmes and projects to be implemented to meet established targets
- priorities for the granting of rights of use of water resources
- guidelines and criteria for charging for the use of water resources
- proposals for creating areas subject to use restrictions in order to protect water resources.

Article 8 foresees that water resources plans shall be prepared by river basin, by state and for the whole country.

National and state plans, due to their larger scale, should consider a longer term perspective, with a planning horizon compatible with the period of implementation of its components, programmes and projects. Given that some of the actions and interventions, notably of an institutional nature, will have a permanent and continuous period of execution, these plans should be understood as a process, always subject to updates, corrections and adjustments, so that they can incorporate new variables, contexts and constraints that affect the water resources of the country and the states. In addition, being one of the instruments of the water resources policy, the fundamentals, concepts and guidelines to be followed should be consistent with those that guided the formulation of the Water Resources Management Systems – both at the national and state levels – especially in terms of decentralisation and participation.

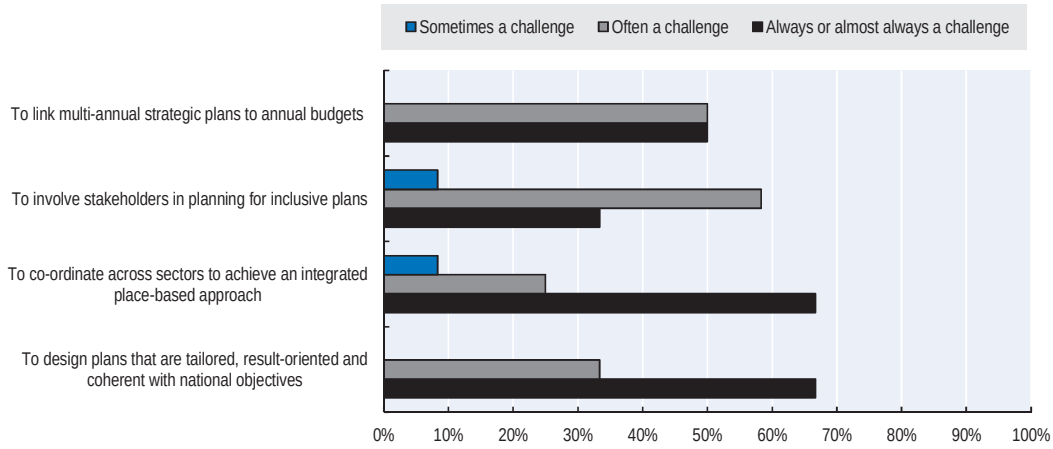
As one of the important concepts to be considered, the following question then arises: what is the division of tasks between the national plan, the state plans and the river basin plans? Should the national plan or the state plan be understood as a sum of the river basin plans? Conceptually, the answer is no.

In fact, if the national plan or the state plan is seen as a summation of river basin plans, the result will be a tendency of the local actors to expect the federal government or the state government to resolve their problems through financial transfers. From this perspective, on the top of the tendency for "accommodation" and transfer of responsibilities, and resistances in the implementation of charges for water use, there will be a conceptual inconsistency leading to the substitution of an effective decentralisation by a deconcentration of tasks.

Note: Adapted from inputs provided by Francisco Jose Lobato Da Costa.

Prerequisites are needed for effective planning. They should rely on both proactive actions (e.g. public organisations like the ANA taking steps to develop permits) and reactive levels (developing a set of rules for those requesting permits). Executive powers are also key to effective planning implementation, which raises three main questions related to planning as a multi-level, multipurpose and multi-stakeholder governance instrument: planning for **what** (e.g. collection of charges, co-ordination, implementation), planning with **whom** (which institutions need to be engaged) and planning at **which scale** (local, basin, state, federal).

Figure 2.15. **States' perceived challenges related to planning and project development**



Source: OECD (2014a), based on responses to the OECD questionnaire; out of 14 states surveyed, the following 12 provided answers: Ceará, Distrito Federal, Maranhão, Paraíba, Paraná, Pernambuco, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, Rondônia, Santa Catarina, São Paulo.

Lessons can be drawn from the electricity sector, which is by far the most advanced in planning, and faces challenges in terms of interaction with other sectors lagging behind in terms of planning. It is also critical that planning factors in both short-term considerations and long-term projected impacts (e.g. climate change; Box 2.12). A strong ANA at the federal level and strong agencies at the state level are needed to balance pressures from existing public or private sector stakeholders. It is important to ensure that water management does not become a mechanism to share the resource between incumbent sectors to the detriment of the protection of current or future "newcomers" who do not yet have a voice and to the detriment of the "general interest" with no "sector voice", such as water resources, the environment or biodiversity. The point on incumbency is also relevant in the context of river basin committees – if governance is left essentially to them, there is significant risk that the incumbents will carve out the resource between them – which argues for a strong and independent public administration and for maintaining the right of deliberation for the elected authorities.

Ways forward for strengthening water governance

Seventeen years after the publication of the Water Law and 14 years after the creation of the ANA, water resources management in Brazil is at a crossroad. Undoubtedly, a very ambitious and forward-looking vision was put forward, but it is necessary to recognise that its implementation is slow and not completely assimilated by society and political leaders. It is equally important to understand that those 17 years coincided with a period of change and consolidation of public powers. In fact, the water reform occurred at the crossroad of two distinct, at times even contradictory, trends. On the other hand, the need to strengthen and modernise public authorities emerging from the democratic reform; and on the other hand, a civil society eager of direct participation and frequently with feelings of mistrust towards public authorities. Both are still present in Brazilian society and although the ANA is clearly a product of the "first trend", it has to accept and deal with a sector of public policy very much influenced by the "second trend".

Box 2.12. **The Lake Simcoe Protection Plan in Canada**

Lake Simcoe is a local watershed in Canada which is under significant pressure from urban growth, extensive agricultural activities, and a strong recreation and tourism sector.

In 2008, the Ontario government passed the Lake Simcoe Protection Act which enabled the development of a legislative-based watershed protection plan, established a process for updating and amending the plan on a regular basis, and established two permanent committees to guide the ongoing efforts to protect the watershed and the lake.

The Lake Simcoe Science Committee is comprised of scientific experts in watershed issues and aims to:

- Review the environmental conditions of the Lake Simcoe watershed and provide advice to the minister with respect to the ecological health of the watershed, significant threats, potential strategies to deal with the threats and identify the scientific research that needs to be pursued to support the implementation of the Lake Simcoe Protection Plan.
- Provide advice on the design and implementation of monitoring programmes to monitor whether the Lake Simcoe Protection Plan is meeting its objectives.

The Lake Simcoe Co-ordinating Committee is comprised of representatives from municipalities, Aboriginal communities, the Lake Simcoe Conservation Authority, the province, agricultural and industrial sectors, interest groups and the public. The committee was established to:

- provide a forum to co-ordinate implementation of the Lake Simcoe Protection Plan
- provide advice to the minister on any issues or problems related to the implementation, the types of measures that could be taken to deal with threats to the lakes
- assist with monitoring progress on the implementation of the Lake Simcoe Protection Plan
- make recommendations on any proposed amendments to the Lake Simcoe Protection Plan and assist the minister with a review of the Lake Simcoe Protection Plan.

Through an extensive process of stakeholder engagement, the Lake Simcoe Protection Plan was developed and released in 2009. The process allowed diverse stakeholders to provide input on potential actions, including designated policies within the plan that have legal weight to protect sensitive parts of that watershed. The final plan was approved by the Ontario Cabinet. The province takes a lead role in co-ordinating implementation of the plan.

Among others, the Lake Simcoe Protection Plan aims to:

- protect, improve or restore the elements that contribute to the ecological health of the Lake Simcoe watershed, including water quality, hydrology, key natural heritage features and their functions, and key hydrologic features and their functions
- improve the Lake Simcoe watershed's capacity to adapt to climate change
- provide for ongoing scientific research and monitoring related to the ecological health of the Lake Simcoe watershed
- promote environmentally sustainable land and water uses, activities and development practices.

The plan should build on the protections for the Lake Simcoe watershed that are provided by provincial plans that apply in all or part of the Lake Simcoe watershed, including the Oak Ridges Moraine Conservation Plan and the Greenbelt Plan, and provincial legislation, including the Clean Water Act 2006, the Conservation Authorities Act, the Ontario Water Resources Act and the Planning Act; and identify the environmental conditions of the Lake Simcoe watershed, indicators and targets for restoring ecological health, significant existing and potential threats, policies to achieve the objectives of the plan, areas of scientific research that should be pursued and a financing strategy.

Box 2.12. **The Lake Simcoe Protection Plan in Canada** (*cont.*)

The plan includes a range of legally binding policies, monitoring policies and strategic action policies related to:

- co-ordination of environmental and resource management programmes, land-use planning programmes and land development programmes of the various ministries of the government of Ontario, municipalities, conservation authorities and other local boards
- protection of key natural heritage features that contribute to its ecological health
- planning, development, infrastructure and site alteration, and the management of stormwater and wastewater
- prescribed instruments, such as the issuance of permits, to ensure the activities do not adversely affect the ecological health of the Lake Simcoe watershed
- stewardship programmes, pilot programmes, best management practices, outreach and education programmes, research and monitoring programmes, including performance monitoring programmes to assess the effectiveness of the plan.

The legislation requires regular reporting on progress and reviews of the plan must be carried out at least every ten years.

Note: Contribution of Sharon Bailey, peer reviewer, Food Safety and Environmental Policy at Ontario's Ministry of Agriculture and Food.

The National Water Resources Management System is still very heterogeneous, lacks consolidation and faces very distinct levels of implementation. Complex structures with overlaps in some areas and voids in others create transaction costs that penalise seriously the implementation of any governance model, and are seen by many users as a waste of resources, discrediting the system. Decisions without enforcement undermine the credibility of the institutions, efficiency and effectiveness of water governance. Brazil needs to be cautious about transaction costs and the creation of basin committees and agencies should be preceded by an evaluation to guarantee that the benefits, not only in monetary terms but including societal dimensions, can justify the costs. Water generates social militancy because it is directly connected to social needs, poverty abatement and economic development. This social mobilisation around water may be positive if it generates feasible and technically robust solutions. Otherwise it merely spreads illusions that end up in frustration.

Action is required, to create more value and welfare with the available resource; to address needs where they are pressing: and to avoid lock-in into suboptimal situations. International experience shows how business-as-usual creates rights and expectations and how postponing reform can be costly, in economic, social, environmental and political terms. Priorities for action need to reflect a sense of urgency and seize opportunities for change, which may unfold from a particular crisis or high-level agenda.

In any case, the focus should always be on solving the real problems. No governance model is an end in itself. Therefore, it is good or bad not for theoretical or conceptual reasons. It is good if it solves effectively and adequately the key water issues, while complying with global principles, such as efficiency, accountability, fairness, legitimacy and full compliance with the law. After all these years of experience, it might be useful to

ponder the possibility of redrawing the lines between three important and equally dignified functions in Brazil's water governance: consultative, deliberative and executive.

Policy recommendations

In light of the many improvements that have characterised Brazil's water governance in the last two decades and taking into account the need for place-based solutions, suggestions can be made to strengthen the articulation across policy areas, between levels of government, and with end users and society at large. Brazil has a tremendous potential, creative energy, skilled people, quite a large and rich experience, and a good critical mass to move forward. These are ingredients for a future to be invented.

Raising the profile of water as a strategic priority with broader economic benefits for the national political agenda

A deeper political recognition of the importance of water policies is important at the highest level. There is that partially mistaken idea that Brazil is gifted with an abundance of water. This "abundance trap" contributes to overlooking the importance of a long-term strategy and opens the room for many *ad hoc* and short-term decisions. Inevitably, water crises and conflicts among users may bring some leverage to this recognition, and the current development of the National Water Security Plan also provides a window of opportunity to link water to broader strategic priorities of the country. At present, water resources management is somewhat "hidden behind the scene". Society and political decision makers are always very sensitive to the negative consequences of insufficient management, but not always sensitive to the causes that explain those undesirable consequences. This tends to happen with all public policies of a horizontal nature. A range of options can be considered to link water to a broader strategic agenda at country level (see Chapter 5), and greater awareness of political decision is also key to unveiling the causes of the problems that are not frequently perceived.

A national strategic framework that includes water in the government's objectives around energy (particularly hydropower), agriculture and industry (heavy water users) is needed to adjust institutional frameworks, where necessary. Clarifying goals and targets for these sectors and linking them to overall water demand (quality and quantity) is critical. A prioritisation of the greatest challenges (which may vary from one basin to another) and their direct implications for water allocation and quality is also desirable. The typologies behind the National Pact for Water Management (Chapter 3) and the ongoing preparation of the National Water Security Plan can contribute greatly: the latter in particular is an opportunity to demonstrate how water security contributes to growth. The renewed ambition of the Ministry of Planning to promote structural reforms, instead of *ad hoc* reactions to water crises, provides another opportunity to highlight the importance of water for development and planning.

Greater political visibility of water policies is not easy to achieve. A proactive role in trying to solve or overcome all water-related crises is the most immediate action to be taken, especially given the hotspots between Rio de Janeiro and São Paulo. Widespread environmental education is also important and should address not only the component of social mobilisation but also the need for well-conceived technical solutions and the importance of good expertise and sound technology. This could help promote a culture of responsibility and exigency across the system and at all levels together with a sense of technical and economic feasibility, as opposed to a culture of demagogic simplicity and formulation of wishes regardless of the means for achieving them.

Strengthening the power, influence and effectiveness of the national and state water resources councils in guiding strategic decisions at the highest level

The CNRH holds the potential to be an important vehicle to higher political visibility of water in the broader national agenda. It would be advisable to think of a "political upgrade" of the council. The frequent participation of the Minister of Environment, its persuasion of other ministers to participate personally in the most important sessions, and some regular (yearly) participation of the President of the Republic would have the merit of bringing the council to a higher level of visibility and effectiveness as an advisory body to be attentively heard and followed. For discussions to be effective, the CNRH could discharge its "deliberative" power to the government itself to concentrate on building consensus with other sectors of society and channelling opinions of the various sectors and civil society to enrich water decision making.

It is also important to stabilise representation in the CNRH to make it less dependent on political changes. A larger representation of state councils and river basin committees, as well as other measures to improve communication with sub-national levels, are important. But striking a balance between the comprehensive representation of states, river basin committees and stakeholders and the need for sizeable groups for meetings to be effective is instrumental. If the deliberative powers of the council were confined to a limited number of key points (like giving a positive opinion on the national plan or on key legislation) and if this institution was assumed to be essentially a high-level consultative body, it could be more efficient. In fact, what is important is not to discuss if a given decision is or is not deliberative. What is important is that decisions are implemented in practice. It is better to have effective influence on decisions that are really implemented rather than make supposedly deliberative decisions that remain unapplied. The key issue is how to make the CNRH more influential, and how to ensure a better and more effective representation of all stakeholders in it. These recommendations also apply to state water resources councils.

Strengthening the effectiveness of basin institutions for result-oriented stakeholder engagement

Brazil's water governance is entangled with many deliberative bodies and little capacity for implementing decisions. In some cases, the social activism of the river basin committees is close to NGO-types of endeavours. There is an assumption that the collegiate structures, with a majority of users and organised civil society, are more legitimate than the public institutions, which is questionable in a consolidated democratic society.

Taking a step backwards, reprofiling the roles of basin institutions could allow two steps ahead in the future, paying back in effectiveness and implementation capacity. In that sense, it could be attractive and probably wise in future situations to reverse the process and create committees only when executive powers in a river basin are clarified and effective. This may require specific legislation and an investment in improving the capacities of relevant institutions first, before formalising such institutions as, according to the specific circumstances, a basin agency linked to the state water agency; or the state water agency itself. Shortly, emphasis should be put on the side of the executive capacity of the system.

Indeed, there is some paradox in giving deliberative powers to the river basin committees and keeping all executive powers in the state agencies. The committees approve river basin plans, but frequently do not have means for implementing them and the state agencies cannot either, because plans are not diligent enough, realistic nor feasible. This situation is at the origin of frustration and abandonment. A more pragmatic approach should seek to foster result-oriented stakeholder engagement, and define "forms" of institutions according to their intended "functions".

Although this is a sensitive question, and possibly against the prevailing winds, it would make sense reinforce the consultative role of the councils and committees (from basin to national level), and concentrate deliberative powers and executive powers in the state (and federal) agencies. This would match decision making to capacity and accountability lines, and result in less unimplemented decisions. This way forward does not imply deflating the role of the national and state water resources councils or overlooking the role of basin commissions. In a democracy, roles and jurisdictions should be assigned in a very clear way, and holding deliberative powers is not the only way of having effective influence on the decisions.

In consolidated democracies, elected governments (and parliament) are seen as the most important representative bodies that are supposed to consult extensively with other forms of direct representation of relevant specific interests, but that are also irrevocably the ultimate body responsible for the strategic and political decisions. Regardless of what the committees and the councils decide, states have formal, factual and legitimate powers that cannot be ignored or superseded. In fact, it is not possible to devise a system that ignores or goes against those powers. The empowerment of river basin councils and agencies is certainly useful to better water management, but it is very questionable that the ultimate source of those powers are not elected bodies, both at the state level and at the federal level.

The flip side of a change in this direction should be the strict obligation of the state (and federal) agencies to consult with the "advisory" councils and the committees, and give thorough explanations when they do not follow their advice, in order to guarantee transparency and accountability. The Brazilian basin governance model was inspired by the French experience. But in the case of France, councils build a consensus on the priorities (e.g. use of the water charges that they generate) but the executive powers stay firmly on the side of the deconcentrated bodies of the central power, and elected officials. Furthermore, France is a unitary country while in Brazil's federalism, states have political and administrative autonomy. International experience in basin governance provides examples where consultation is taken seriously but the final deliberative and executive powers remain on the side of public authorities (Box 2.13).

Box 2.13. **A range of situations for river basin governance in Europe**

In the **European Union**, the Water Framework Directive gives high importance to the participation of stakeholders and society in general, but this is done at a consultative level. This type of consultation and open debate is particularly relevant at the beginning of the preparation of the river basin plans, when an extensive public consultation process is mandatory to identify the so-called "significant questions". The resulting plan must respond to those significant questions largely identified by the water users and civil society. Meanwhile, the government of each member country has to designate the "competent authority" that is responsible for water management at the basin level. Representatives of water users and civil society in state councils and basin committees should be selected to guarantee genuine and recognised representativeness and should keep close links with the sector that they represent in order to share information and convey consensual positions of the sector on the most relevant matters.

In **Spain**, "*confederaciónes hidráulicas*", which are part of the Ministry of Environment of the central government, manage the river basins that are shared by more than one autonomous region. In each basin there is a river basin council in which the governments of the autonomous regions participate. The river basin councils are consultative bodies and river basin plans prepared by the "*confederaciónes hidráulicas*" are discussed and previously approved by these councils, and finally adopted by the Council of Ministers following consultation of the National Water Council. All executive powers stay in the hands of the "*confederaciónes hidráulicas*", which means in the hands of the Ministry of Environment.

In **Portugal**, the 2005 Water Law created hydrographical region administrations that are regional public institutes with full executive powers dependent from the Ministry of the Environment and in close articulation with the national agency responsible for water. There are corresponding hydrographical region councils of a consultative nature that help to identify key issues and need to be consulted at various predefined situations. The river basin plans require prior approval of the councils and then they are approved by the Council of Ministers; central authorities are also responsible for all matters related to the conventions regulating transboundary basins, although some measures can be delegated to the hydrographical region administrations.

In the **Netherlands**, water boards are an autonomous level of the organisation of the state in political terms. To give them democratic legitimacy, there are general elections for water boards, and there are even some political parties specialising in this level of public authority. However, in administrative and financial terms, they are submitted to the rules and to the inspection of the provinces and the central government and heavily controlled by them. They are a level of government in the Dutch Constitution and enjoy specific taxation powers and a governance framework (functional democracies).

In **Germany**, a federal republic like Brazil, the *Länder* are basically responsible for water management and have to build consensus about shared river basins, namely in the process of preparing river basin plans. In some cases, like in the Rurh River basin, there are users' associations with delegated powers promoting a consistent basin approach. There is no dominion of the *Länder*, and the *Bundenstag* and the federal government produce legislation that all *Länder* have to obey. The federal government is also responsible for international conventions on transboundary rivers (such as the Rhine, the Danube, the Odra or the Elbe).

Governance should not jeopardise governability. In other words, an ample participation of water users and organised civil society is extremely important to enrich decision making and to guarantee that the real problems faced by society are correctly addressed. However, when it comes to implementation, a range of instruments is needed to guarantee the achievement of the expected results. Authority to enforce decisions is necessary at that point, and there is no collective forum that can exercise that authority alone. It requires democratic legitimate powers and the state agencies are supposed to be invested of those powers. It is necessary to improve their capabilities, their accountability, their acceptance by society, but it is not possible to minimise their role or to put them aside. The European Union provides a good example of combining ample stakeholder engagement with a clear enforcement role of public authorities. The implementation of

the Water Framework Directive is based on the Common Implementation Strategy that is formulated and approved at three levels working in close co-ordination (Box 2.14).

Box 2.14. **Key role of stakeholders in the Common Implementation Strategy (CIS) for the EU Water Framework Directive**

The Common Implementation Strategy (CIS), established by EU Environment Ministers and the European Commission, supports member countries' implementation of the requirements of the EU's Water Framework Directive (WFD), aiming at attaining "good status" of all surface and groundwater in the EU.

The CIS ensures the full involvement of stakeholders such as water users, public authorities, the scientific community, international organisations and non-governmental organisations (civil society) in the preparation and adoption of policy documents and guidance in support of member countries' implementation of the Directive. The CIS ensures that stakeholders are not only consulted but play an active role in informing the implementation process and in preparing decisions, activities and outputs from the process, working at three distinct levels:

- Working groups, to ensure the technical preparation of documents, decisions, workshops and other activities, before being submitted for discussion and agreement in the Strategic Co-ordination Group (see below). Participation is open to all member countries and stakeholders volunteering to do so.
- A Strategic Co-ordination Group (SCG), to ensure the strategic co-ordination of the implementation process, discuss in detail and agree on technical documents for the three-year work programmes presented by the working groups. It is composed by representatives of all member countries and stakeholders.
- A Water Directors' Group, overall strategy of the CIS, including approval of the CIS Work Programme, after prior discussion in the SCG and formal approval of the CIS' decisions. It consists of the Water Director of each member country and the European Commission. If any residual issues are still outstanding, this group decides on how to resolve them. In most cases issues are agreed by consensus in the working groups and the SCG.

The CIS has organised many workshops, conferences and dialogues, adopted a large number of guidance and policy documents on technical, legal and economic issues and ensured co-ordination with other policy areas relating to the implementation of the Directive (e.g. on use of economic instruments, application of exemptions, use of water bodies for hydropower and navigation, measures in the agricultural sector, consideration of climate change in water management, protection of drinking water resources, etc.).

Note: Contribution of Peter Gammeltoft, peer reviewer, former Head of Unit for Water at European Commission, Directorate General for the Environment.

Appropriate representativeness of collegial platforms is key to build legitimacy and buy-in. The procedures for selecting the members of the collegiate structures should be analysed carefully and consensual. Stakeholders' interests make a difference for meaningful and constructive contributions. It would be important to establish criteria for guaranteeing an effective representation of all sectors in such fora. There should be a code of conduct that obliges them to discuss all matters with the sector that they represent, obtaining their points of view and conveying them to the council or committee at stake.

Box 2.15. **OECD Key Principles for Stakeholder Engagement in water governance**

The OECD has developed a set of key principles to provide orientations for governments at all levels to set up the framework conditions for result-oriented stakeholder engagement (OECD, 2015).

1. **Inclusiveness and equity: Map who does what, core motivations and interactions across all those having a stake in the outcome or likely to be affected.** Attention should be paid to newcomers, out of the water box players, and traditionally marginalised groups to ensure that all stakeholders involved are identified and included throughout the decision-making cycle. Careful consideration is also needed regarding the risks of potential consultation capture from over-represented categories, to the detriment of unheard voices. Equity between present and future generations in a perspective of sustainability should be promoted.

2. **Clarity, transparency and accountability: Define the ultimate line of decision making, the objectives of stakeholder engagement and the expected use of inputs.** Clarifying the goals and reasons for engagement is key for informed stakeholders to provide quality contributions in line with expectations. The purpose should be made explicit as well as the authority responsible for the decision and its willingness to take stakeholders' ideas on board in doing so to enhance confidence in the value of the process. Transparency and accountability in how the engagement process is designed and implemented (e.g. stakeholder mapping methods, use of stakeholders' inputs) is crucial to improve credibility and legitimacy, and build trust among the stakeholders involved.

3. **Capacity and information: Allocate proper financial and human resources and disclose needed information for result-oriented stakeholder engagement.** Improving the overall contribution to substantive discussions and decision making requires access to information, technical expertise and funding in the right format and sufficiently on time (planning) to realistically and effectively participate. Supporting information through a consistent and appropriate communication channel is key as is ensuring the financial affordability of the engagement process to ensure the effective engagement of all those who have a stake. The interpretation and application of these resources and information require competences and capability development at all levels to enable sustainable stakeholder engagement (e.g. skills, social learning).

4. **Efficiency and effectiveness: Assess regularly the process and outcomes of stakeholder engagement to learn, adjust and improve accordingly.** Such evaluation and monitoring can resort to fact-based and perception-based tools and indicators, and be carried out by targets, promoters and/or third parties. Public disclosure of results to increase accountability and provide insight on success in reaching the intended objectives and learning from experience to improve practice in the future. Evaluation should not be limited to *ex ante* and *ex post* assessment but remain an on-going process throughout the decision-making cycle. Stakeholder engagement can yield benefits in terms of resilience, sustainability, cohesion, acceptability, capacity and efficiency. But it can also delay decision making and generate different types of (monetary and non-monetary) material, process, reputational and social costs. Assessing the costs and benefits of engagement processes can help ensure that all interests, including those that are under-represented, are respected regarding the distribution of impacts, compensation and benefits. Mitigation measures are needed to reduce costs, and set the right incentives while managing the dual short-term/long-term temporality.

Box 2.15. **OECD Key Principles for Stakeholder Engagement in water governance** (*cont.*)

5. **Institutionalisation, structuring and integration: Embed participatory processes in clear legal and policy frameworks, organisational structures/principles and responsible authorities.** There is no water governance without governance at large. Similarly, there can be no effective stakeholder engagement without proper incentives for bottom-up and inclusive policy making. A clear set of rules, platforms and vehicles for doing so is critical to move from reactive to proactive and systematic stakeholder engagement in the water sector. But institutionalisation per se is not the panacea. It should provide for the flexibility needed to adjust to place-based needs and changing circumstances while fostering a change in the "mind-set", daily practices and culture of decision making. Provisions for stakeholder engagement should be aligned coherently and holistically across the water chain and policy domains related to water.

6. **Adaptiveness: Customise the type and level of engagement to the needs and keep the process flexible to changing circumstances.** Stakeholder engagement tools and mechanisms work differently across places, times, objectives and stages of decision making. They should be tailored to each (geographic, socio-economic, cultural) context, type of stakeholder concerned, policy goal targeted and place-based needs to accommodate varying levels of interest and resources from stakeholders and consider other options as needs arise. Water governance systems are complex and in flux, hence engagement processes need to remain flexible to manage risks and resilient to adapt to the changing environment.

Source: OECD (2015), *Stakeholder Engagement for Inclusive Water Governance*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264231122-en.

Enhancing cross-sector co-ordination for greater policy coherence and consistency

Cross-sector integration is a concern from national to sub-basin levels. The governmental drive on this matter is important to guarantee that water is taken into consideration in all sectoral plans and bring the discussion of those sectoral plans into the national and state water resources councils. Also, the bilateral interactions of the ANA with other sectoral agencies are fundamental.

The frontier between policies for water and the environment is not yet consolidated. Some states have merged water and environment agencies, with pros and cons. The importance of the aquatic environment for biodiversity and ecosystem services is unquestionable, and there is no doubt that water is an important component of the environment and needs to be dealt with as such. Water permits cannot be dissociated from environmental licensing and it is necessary to integrate the dimensions of quality and quantity. Furthermore, conservation and enhancement of water ecosystems is the only guarantee of having water for all necessary uses in the long term. The merging of water and environment administrations should not discard these important dimensions of water management, especially in water-scarce regions. The ANA and the corresponding agencies at the state level should be thoroughly consulted with respect to decisions taken in the environment area and the state and national water resources councils should take steps to promote better sectoral integration at all levels.

The integration of water with development policies is also of paramount importance. This concern should be present at the highest levels of federal and state governments and placed high on the agenda of state and national water resources councils.

Another frontier that is not consolidated is between water and land use. The relationship between these two areas of public policy is not easy to address because the basin scale where water problems are equated is usually larger than the scale of land-use management in Brazil. Municipalities play a key role in this interface and that is an additional reason to strengthen their presence in the state water resources councils and the river basin committees. It would be important to have regional land-use plans that incorporated water concerns and a good capacity for implementing them. If those regional tools are not available or their implementation is weak, only some *ad hoc* protection measures and a pedagogic action with the municipalities may help overcome existing and potential problems. Territorial planning legislation in Brazil could be revised in order to incorporate water requisites.

The ANA should take advantage of its relationship with the states to advocate, promote and, as much as possible, enforce the co-ordination of water policies with relevant sectoral policies. The National Pact for Water Managementand other programmes are opportunities to promote trade-offs with sectors such as energy, agriculture, regional integration and sanitation, all important priorities in the economic and development policy.

- At the national level, further communication on the implementation of those programmes and related results could raise greater awareness. For example, a regular item on the agenda of the CNRH to report back on achievements, difficulties and required public actions could help explore cross-sector synergies. A high-level event with the range of concerned ministers and the President, halfway through the implementation of the National Pact for Water Management, could contribute to increasing its visibility towards decision makers and its potential as a "role model" for other sectors.
- Further horizontal integration across water-related ministries such as the Ministry of Cities, the Ministry of Agriculture and the Ministry of National Integration is needed, especially given the financial resources they allocate to implement water-relevant policies and infrastructure. One way to achieve this is to promote binding "water tests" or "water assessments" before significant decisions are taken in areas with implications on water (e.g. infrastructure, spatial planning, sanitation, etc.) as it is currently the case for hydropower.[1] It may be a very constructive measure, and a good opportunity for engaging state sectoral agencies in those assessments.
- The National Pact for Water Management and other programmes can also be an opportunity of strengthening links between water and other policy areas at state level. Some states merged the agencies dealing with blue, green and brown agendas to foster synergies and coherence (e.g. Rio de Janeiro), while others have kept them separate (Paraíba). Multi-stakeholder workshops and discussion fora offer multiple opportunities to address the "nexus" issue, to identify contradictory incentives or policies, and to build consensus on solutions.
- It is important to factor in emerging issues (climate change, regional disparities, water allocation, etc.) in states' vision on water to raise further awareness on the need to develop strategies to fit for the future, in states where hotspots and tipping points have been identified.

Box 2.16. **Water collaboration in South Africa through the Water Sector Leadership Group**

The Water Sector Leadership Group (WSLG) enables water sector partners to provide policy and strategic input whilst aligning their approaches to each other, in compliance with national objectives and sector goals. Created by the Department of Water and Sanitation (DWS) in 2003, the WLSG is not a formal decision-making forum, but a platform aiming at sharing information, fostering a common vision, influencing policy and building consensus.

The WSLG is chaired by the Director General (DG) of the DWS, the Director General of the Department of Co-operative Governance or the CEO of the South African Local Government Association (SALGA). Members include high-level representatives from relevant government departments such as Cooperative Governance and Traditional Affairs, Environmental Affairs, Agriculture, Energy, Human Settlements, Mineral Resources, Trade and Industry as well as the Planning Commission, the Presidency and National Treasury. Other members include water institutions such as catchment management agencies, water boards and water users' associations. From the non-governmental sector, organised business, mining, organised agriculture and civil society are represented.

All the partners retain their policy-making autonomy, and there are no obligations to adhere to the resolutions of the WSLG. The WSLG's mandate has remained informal, although its existence was formalised in the 2003 Strategic Framework for Water Services.

The WSLG meets twice a year for two days. The first day focuses on topical issues (i.e. climate change, the National Water Resource Strategy, etc.), while the second day allows working groups (on skills and capacity, institutional development, policy, financing, etc.) to report back on progress. Similar structures to the working groups have been established at provincial level. The WSLG played a critical role in informing and making recommendations for the second edition of the National Water Resource Strategy (2013).

Note: Contribution of Marie Brisley, peer reviewer, Chief Director, Policy and Strategy Department, Water and Sanitation, South Africa.

- Cross-sectoral co-ordination and integration could be explicitly addressed in all programmes aiming at improving the capacities of the state councils and state agencies. From an awareness point of view, it is necessary to "push" the states "outside the box" instead of focusing only on water matters. From a practical point of view, representatives from other sectors should be engaged not only at the technical level but also at political level throughout the implementation of the programmes.

Strengthening the capacity and financial sustainability of state-level institutions

Strengthening water governance in Brazil requires full engagement of the 26 states and the Federal District. Overall, the state level of the executive power is the weakest link in terms of water governance. There are exceptions, some states are outstanding, but it is not infrequent to find at the state level apathy, lack of awareness and a rather low concern about water in public policy. The National Pact for WaterManagement goes in the direction of strengthening states as the intermediary level, which is an excellent initiative to achieve this goal in the medium term (Chapter 3).

Especially at the state level, decisions should be enforced, and plans elaborated with the participation of users and civil society should be implemented by public authorities. Greater empowerment and qualification of state water agencies can help achieve this purpose, and those agencies should be fully accountable for the implementation of all decisions. This emphasis on states should not exclude the role of the river basin committees and agencies but drive a learning curve whereby states, as they become stronger, will likely contribute to strengthening river basin institutions as well.

Box 2.17. **Policy co-ordination under the EU Water Framework Directive: The case of the Rhine River**

While aiming at maintaining good status of EU waters, the EU's Water Framework Directive (WFD) ensures the continued availability of the full range of ecosystem services and facilitates simultaneous and multiple uses of water bodies. A good example of the results provided by this approach is the Rhine River, one of the major European rivers, in a densely populated area and with high indices of industrial and agricultural activity. Previously known as the "sewer of Europe", it is an example of fruitful efforts in applying an integrated approach over many years which allowed the river to win in 2013 the 1st European River Prize for the quality of its water management.

The river simultaneously hosts hydropower generation, inland waterway transport, nature protection areas, leisure activities, delivers water for the production of drinking water and for agricultural and industrial use while allowing migratory fish to access the upper reaches of the river basin where they reproduce.

On the other hand, in other areas of the EU where such approaches have not been applied, billions of euros are being paid (e.g. by drinking water consumers for the potabilisation of waters affected by diffuse pollution from agriculture). Similarly, in other areas where water allocation has gone beyond the limits of sustainability, water authorities are now finding it almost impossible to reverse the situation due to the social and economic dependency created through over-allocation.

Note: Contribution of Peter Gammeltoft, peer reviewer, former head of Unit for Water at European Commission, Directorate General for the Environment.

Box 2.18. **Options for co-ordinating policies across ministries and public agencies**

In **Canada**, the government's Consultation and Accommodation Interdepartmental Team is tasked to improve co-ordination amongst federal departments regarding Aboriginal affairs. The team has been a valuable sounding board for government departments as they encounter new challenges related to the legal duty to consult. This team, generally consisting of regulatory and land-holding departments and agencies, is composed of representatives from the national headquarters of a number of departments including the Canadian Nuclear Safety Commission, Environment Canada, Public Works and Government Services Canada, Transport Canada and the National Energy Board. The team meets regularly to discuss emerging policy and operational issues, share consultation and accommodation experiences, distribute other information relevant to Aboriginal consultation, and better co-ordinate Crown efforts of Aboriginal consultation and accommodation.

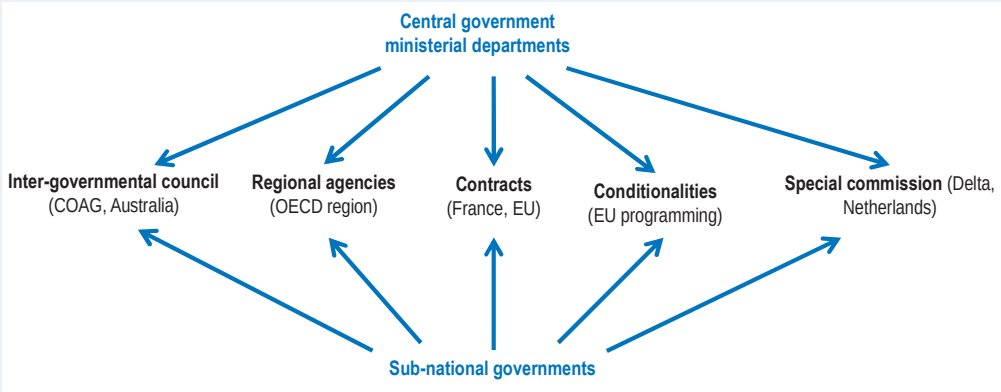
In **France**, the Inter-ministerial Committee for Sustainable Development was created by decree in 2003. Presided by the Prime Minister, it gathers annually and is composed of the ministers responsible for interior affairs, social affairs, employment, foreign affairs, European affairs, defence, youth, education, research, economy, finances, industry, transport, housing, tourism, health, agriculture, culture, state reform, territorial development, cities and local communities, sports and overseas territories. A representative of the President also takes part in the activities of the inter-ministerial committee. Its role is to define and monitor the implementation of governmental orientations to foster sustainable development, including regarding greenhouse gases and the prevention of major natural risks. It also ensures alignment the national strategy and action plans for sustainable development with the country's commitment in that field at European and international levels. The committee prepares an annual evaluation report on the implementation of the strategy and actions plans.

Box 2.18. **Options for co-ordinating policies across ministries and public agencies** (*cont.*)

In **Australia**, the Council of Australian Governments (COAG) is the peak intergovernmental forum. The members of COAG are the Prime Minister, state and territory premiers and chief ministers and the President of the Australian Local Government Association (ALGA). The Prime Minister chairs COAG. The role of COAG is to promote policy reforms that are of national significance, or which need co-ordinated action by all Australian governments. COAG is supported by inter-jurisdictional, ministerial-level councils that facilitate consultation and co-operation between the Commonwealth and the states and territories in specific policy areas such as health, education, indigenous rights and the economy. Together, these councils constitute the COAG Council System. COAG councils pursue and monitor priority issues of national significance and take joint action to resolve issues that arise between governments. Councils also develop policy reforms for consideration by COAG, and oversee the implementation of policy reforms agreed by COAG. COAG has been the co-ordinating and driving force behind the water reforms undertaken across Australian jurisdictions for more than 20 years.

In **Mexico**, progress in addressing institutional fragmentation of water policy at the federal level is noticeable. Some of these efforts were undertaken through the National Water Commission (CONAGUA)'s Technical Council. The council is an inter-ministerial body in charge of approving and evaluating the commission's programmes, projects, budget and operations, as well as co-ordinating water policies and defining common strategies across multiple ministries and agencies (SEMARNAT; SEDESOL; Secretary of Agriculture, Livestock, Rural Development, Fisheries and Food [SAGARPA.]; Treasury; Energy; CONAFOR; and IMTA).

Figure 2.16. **Vertical co-ordination mechanisms**



Sources: Aboriginal Affairs and Northern Development Canada official website, www.aadnc-aandc.gc.ca (last consulted in September 2014); French National Assembly official website, www.assemblee-nationale.fr (last consulted in September 2014); Council of Australian Governments' official website, www.coag.gov.au (last consulted in September 2014); OECD (2013b), *Making Water Reform Happen in Mexico*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264187894-en.

In practice, action is need on two fronts for stronger state authorities in water resources management at technical and financial levels:

- On the one hand, it is very important to improve the technical capacity of state agencies. Their ability to collect and use data and to perform all the necessary technical and administrative duties is essential for the interface with the users and with the other sectors of administration. To build capacities in the state agencies requires persistency and continuity. These institutions are very much affected by frequent changes in the top management associated with the political cycles.

Recruitment should be based on professional capacity, and public policy continuity is crucial. Attracting and keeping qualified collaborators and building capacity insistently, consistently and persistently at the state level is absolutely necessary to make any aspiration for real improvement in water management viable.

- On the other hand, there can be no effective water governance without sustainable funding. It is important to implement further and more extensively the payment of water charges as a policy instrument, where relevant and needed. Not only do economic instruments generate resources in the quite impoverished state administrations, but they can also trigger greater engagement of water users (interest-pay-say principle) and foster rational use of water resources. Water charges certainly bring new dynamics to river basin committees. They also have important legal consequences because basin agencies can only be created after water charges are implemented. The willingness to pay of the various sectors and affordability of water bills should be analysed thoroughly and taken into consideration.

There is a range of options for incremental approaches to the use of economic instruments, but often users' willingness to pay goes with awareness on water risks in the short and medium term. Sectors such as industry, tourism and agriculture (livestock and sugar cane) should be sensitised about the impact of water scarcity on their respective activities and the cost of inaction. The implementation of the polluter-pays and beneficiary-pays principles is essential to ensure that those who generate future liabilities or benefit from resources also bear the related costs. For instance, it is estimated that in Paraíba BRL 2 million could be collected through water charges once the state system is fully operational, according to the volumes established by water permits. This represents ten times the current budget of the state water agency, of which only 7.5% can be spent on overhead costs for governance functions.

Thorough, reliable and updated information should be produced and shared to guide decision making in water charges. Affordability studies and economic analyses should be carried out to assess users' capacity to pay based on tangible data and projections, and different methodologies. It should also be noted that not all river basin committees may have the potential to collect water charges. In states where the legal framework is in place but water charges have not been implemented yet (e.g. Paraíba), it is important that the required political step forward is taken to make it happen.

The current deadlock in spending the funds collected with the water charges needs to be overcome. Unnecessary complexities in the tendering procedures (going beyond the water sector) should be solved, but may require a more systemic and co-ordinated framework of action. Solutions need to be sought outside the water box, either at federal or state level. Alternatively, solutions like those adopted in Ceará should be considered (a company that charges for service, not for the resource).

Fostering continuity and impartiality of public policy for long-term vision

Strengthening water governance requires an effective, accountable and respected public administration at all levels. Qualified, impartial and accountable state agencies that interact constructively with collegiate fora are the components of a truly democratic model of water governance. Democracy should not be putting away or shadowing legitimate public powers to give room to the ruling of participative structures, but rather

have participative structures help improve the performance of public powers and fine-tune the purposes of its action.

A politically backed long-term vision is needed to provide continuity of public policy, given the high costs of investments. Discontinuities across political cycles have an impact on the turnover of high-rank officials in state agencies and committees and cause serious harm to states' performance. A more professionally based recruitment of water professionals and mandates based on medium- and long-term consensual strategies may help stabilise the activity of state agencies. Ideally, state agencies and basin agencies should replicate as much as possible the high standards of the ANA.

Building broad consensus around plans and other policy documents is very important to implement water policies that go beyond the term of office of the political leaders. A new version of the national plan, emphasising its strategic nature, based on a vision for the next one or two decades and addressing explicitly the very distinct conditions of the various regions of the country, could be a very useful tool for building consensus on strategic water issues. The ANA has been an exception in building progressively on the previous achievements rather than putting them apart. Therefore, it can be a strong co-ordinating vehicle across ministries and levels of government to incentivise multi-annual perspectives across the political timetable and make different priorities converge for the sake of the general interest. In doing this, the technical capabilities of the ANA and its profile of an independent and neutral agency should be preserved as an important asset of the country, which guarantees an effective role in the Brazilian water scene.

Foster experience-sharing at all levels to draw lessons from success stories and common challenges

An ample debate in each state should be sought and special attention should be given to those members of the councils and river basin committees that are more motivated to advance the water agenda. It could be useful to organise national meetings of state councils and river basin committees to share experience, raise national awareness and reveal "natural" leaders and opinion makers in each state.

Public awareness is also an important driver of political decisions. Improvements cannot be achieved unless there is a shift in public opinion. Therefore, public authorities should consider the possibility of devoting some resources to make water a public concern. Crises, especially floods and droughts, play a role in increasing the awareness of the population and decision makers. However, the importance given to these topics fades away quickly when the crises are over. Thus, it is important to sustain the momentum, which requires support from proactive stakeholders.

Better communication is needed between basin, municipal, state and federal institutions as well as between river basin councils and between state water resources councils, especially around specific topics of common interest. Inter-municipal co-operation around water-relevant issues, including land-use and flood management, should be encouraged. This would be a good opportunity for sharing experiences and voluntarily harmonising agendas as much as appropriate. Promoting the exchange of experiences can allow for different states to compare their evolution in implementing water governance structures. National or regional meetings of those institutions could foster self and mutual learning.

An important role for the National Water Agency in a decentralised context

The meeting point between top-down and bottom-up trends and policies

Since its creation in 2000, the ANA has always played a key role in promoting and consolidating water reform in Brazil. Its highly qualified collaborators and leaders have largely potentiated this role. This high profile is based on a very rigorous process of recruitment and a very constructive and independent attitude towards all states. The ANA has been, and should keep being, the meeting point of two tendencies. On the one hand, a "centralisation" tendency in the sense that it is part of its role to build a "national platform" of data and knowledge, a role which no other organisation can perform that way. On the other hand, the ANA is also responsible for leading a "decentralisation" tendency through capacity building of institutions at the sub-national level. This role is justified by the fact that a central node cannot be strong if the periphery is weak, especially in a country with the size and complexity of Brazil. Both tendencies should be encouraged, as both are part of the consolidation of the whole system.

Consider states as the link between subsidiarity-based and solidarity-based decentralisation

Decentralisation in Brazil's water governance has two threads that should be pursued. First, the "subsidiarity-driven decentralisation" towards the states for them to be "integrators" of water issues in broader social and economic policies considered at state level; and second, the "solidarity-driven decentralisation" towards river basin councils and agencies. The members of these basin structures reflect necessarily a local (or regional) view centred on water and can provide state and federal authorities with information and proposals that are well-rooted in the ground. Without discarding or neglecting the river basin institutions, which also need to be qualified and made more effective, the priority can be given to bringing states into the water scene by raising the topic on their political agendas, qualifying their agencies and encouraging them to participate in national projects like those related to the collection of reliable data. The National Pact for Water Management is a good and timely tool for achieving this goal (Chapter 3).

Consider options to overcome challenges of the "double dominion"

The system of double dominion deriving from the Constitution raises problems of consistency in the criteria for granting permits for water abstraction or licenses for effluent discharge. Those inconsistencies result from the fact that the ANA is responsible for those criteria in the main channel of a river of the federal domain, but the states are responsible for the criteria in the tributaries of that same river if those tributaries are in the state dominion. Changing these prerogatives would require constitutional change, political negotiations and trade-offs. Therefore, the best option to go ahead is to accept this double role and perform it as effectively and consistently as possible, and to consider low-cost options and alternatives based on specific problems to solve. A possible way of circumventing this problem is for the ANA to delegate to states some of its prerogatives on water allocation following commonly agreed guidelines and when capacity is in place, while retaining reserve powers to intervene if something is not in conformity with those guidelines (Chapter 4). This approach can be implemented by the ANA to the extent considered convenient, overcoming the constitutional limitations imposed by the double dominion without requiring any change to the Constitution.

Consider more targeted support to help states transition

The ANA's main role remains one of bringing technical soundness, reliable data and constructive viable solutions to water problems in Brazil at all levels. In some states that are transitioning towards institution-building (Chapter 3), customised and targeted support from the ANA is desirable. The ANA has a long and well-established tradition of supporting capacity building at the state level. The Common Implementation Strategy in place for implementing the Water Framework Directive in the EU provides a good example of learning experiences triggered at central level (Box 2.18).

Box 2.19. **The capacity support of the EU Common Implementation Strategy**

The Common Implementation Strategy (as described in Box 2.14) helps to build technical capacity in member countries and thus to create conditions for better implementation of a very demanding Directive. It does so by providing a platform for information sharing and learning across member countries.

The CIS Guidance and policy documents and the EU-level intersectoral co-ordination activities help provide member countries with legal certainty about their implementation and facilitate the integration of water management requirements into other policy areas at the level of the EU member countries.

These CIS activities have been complemented by bilateral dialogues between the European Commission and each member country to identify areas where they need to concentrate resources to make more progress following a detailed assessment of their implementation of the Directive.

Note: Contribution of Peter Gammeltoft, peer reviewer, former Head of Unit for Water at European Commission, Directorate General for the Environment.

The ANA is a national agency and has direct access to all actors at all levels. This is a privileged position to help stakeholders improve their contributions to the National Water Resources Management System. It is important that this improvement takes place not only in the state and other federal institutions but also at the municipal level. Municipalities have been in many cases reluctant to take part in basin and state structures, although they play a crucial role in sanitation, land-use management, solid waste management and environmental licensing. Promoting a more conscious and responsible participation of municipal and non-governmental sectors is important and the ANA can help these sectors in accessing accurate information and enhancing well-informed opinions on water issues.

Note

1. According to Law No. 9984/2000, in order to authorise the exploitation of hydropower potential in a water body of federal jurisdiction, the Brazilian Electricity Regulatory Agency (ANEEL) must obtain from the ANA, a prior "declaration of reserve of the water availability" (OECD, 2012). In addition, environmental impact assessment is also commonly used for decision making on water-related projects.

Bibliography

Abers, R.N. and M.E. Keck (2013), *Practical Authority: Agency and Institutional Change in Brazilian Water Politics*, Oxford University Press, Oxford.

Aboriginal Affairs and Northern Development Canada official website (n.d.), www.aadnc-aandc.gc.ca (last accessed in September 2014).

ANA (2014), "Background report", OECD/Brazil Policy Dialogue on Water Governance, Agência Nacional de Águas, Brasilia D.F.

ANA (2011), *O Comitê de Bacia Hidrográfica: O que é e o que faz* (*The River Basin Committee: What It Is and What It Does*), Cadernos de Capacitação em Recursos Hídricos, Vol. 1, Agência Nacional de Águas, Brasilia D.F.

Bresser-Pereira, L.C. (2002), *Reforma do Estado para a Cidadania: A Reforma Gerencial Brasileira na Perspectiva Internacional* (*State Reform for the Citizenship: Brazilian Managerial Reform from the International Perspective*),. Escola Nacional de Administração Pública, Brasiília D.F.

Council of Australian Governments' official website (n.d.), www.coag.gov.au (last accessed in September 2014).

French National Assembly official website (n.d.), www.assemblee-nationale.fr (last accessed in September 2014).

GWP and INBO (2009), *A Handbook for Integrated Water Resources Management in Basins*, Global Water Partnership and the International Network of Basin Organizations, Elanders, Sweden, available at: www.inbo-news.org/IMG/pdf/GWP-INBOHandbookForIWRMinBasins.pdf.

GWP IWRM Toolbox (2012), www.gwp.org/en/ToolBox (last accessed 9 September 2014).

IBGE (2010), *Pesquisa Nacional de Saneamento Básico 2008*, Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro, available at: www.ibge.gov.br/home/estatistica/populacao/condicaodevida/pnsb2008/PNSB_2008.pdf.

Kelman, J. (2009), *Desafios do Regulador* (*Challenges of the Regulator*), Centro de Estudos Económicos do Setor Energético e Synergia Editores, Rio de Janeiro.

Laigneau, P. (2014), "Tristes águas francesas: Olhar a história das agências e comitês de bacia na França desde os trópicos", Universidade Federal do Rio Grande do Sul, Porto Alegre, http://hdl.handle.net/10183/114439 (last accessed 3 March 2015).

Lobato da Costa, F. (2014), *Plano Nacional de Adaptação às Alterações Climáticas – Identificação dos Principais Problemas e Desafios para o SINGREH* (*National Plan for Adaptation to Climate Change – Identification of the Main problems and Changes for SINGREH*), Francisco Lobato & Consultores Associados, Ltda. Curitiba, Paraná, Brazil.

Lobato da Costa, F. (2003), *Estratégias de Gerenciamento de Recursos Hídricos no Brasil: Áreas de Cooperação com o Banco Mundial* (*Strategies of Water Resources Management in Brazil: Areas of Cooperation with the World Bank*), 1st edition, Série Águas Brasil 1, World Bank, Brasilia D.F.

Ministry of Cities (2013), *Plano Nacional de Saneamento Básico – PLANSAB* (*National Plan for Basic Sanitation*). Ministry of Cities, Brasilia D.F.

MMA (2011), *Atualização do Plano Nacional de Recursos Hídricos* (*Update of the National Water Resources Plan*), Ministry of the Environment, Secretaria de Recursos Hídricos e do Ambiente Urbano, Brasilia D.F.

OECD (2015), *Stakeholder Engagement for Inclusive Water Governance*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264231122-en.

OECD (2014a), OECD questionnaire for the OECD/ANA Policy Dialogue on Water Governance, February.

OECD (2014b), *Investing in Youth: Brazil*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264208988-en.

OECD (2014c), *Water Governance in the Netherlands: Fit for the Future?*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264102637-en.

OECD (2013a), *OECD Economic Surveys: Brazil 2013*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eco_surveys-bra-2013-en.

OECD (2013b), *Making Water Reform Happen in Mexico*. OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264187894-en.

OECD (2011), *Water Governance in OECD Countries: A Multi-Level Approach*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264119284-en.

OECD (2006), *Infrastructure to 2030:Telecom, Land Transport, Water and Electricity*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264023994-en.

Pegram, G. et al. (2013), *River Basin Planning: Principles, Procedures and Approaches for Strategic Basin Planning*, UNESCO, Paris, available at: www.adb.org/sites/default/files/publication/30248/river-basin-planning.pdf.

Ramalho, P.I.S. (2009), "Regulação e agências reguladoras: Reforma regulatória da década de 1990 e análise de impacto regulatório" ("Regulation and regulatory agencies: Regulatory reform of the 1990s decade and analysis of the regulatory impact"), in: *Regulação e Agências Reguladoras – Governança e Análise de Impacto Regulatório* (*Regulation and Regulatory Agencies – Governance and Analysis of the Regulatory Impact*), Agência Nacional de Vigilânia Sanitária e Casa Civil da Presidência da República, Brasilia D.F.

UNEP and ANA (2007), *GEO Brasil – Recursos Hídricos* (*GEO Brazil – Water Resources*), United Nations Environmental Program and National Water Agency, Brasilia D.F.

Chapter 3.

Advancing Brazil's National Pact for Water Management

This chapter focuses on the National Pact for Water Management as a multi-level governance contract aiming to strengthen states' capacity to manage water resources in an integrated manner. Building on an international review of experiences in contracts across levels of government, the chapter highlights the key features and advantages of the National Pact for Water Management, as well as possible bottlenecks to its implementation, and concludes with recommendations to reap the full benefits of this governance instrument in support to the National Water Resources Management System.

Introduction

Brazil is an interesting case of complexity and diversity in terms of water resources management and governance. It has different levels of development, maturity and capacity of the public powers, perception of water problems, resource availability and profiles of water use. The federal nature of the Brazilian political structure lends itself to the diversity and complexity of decision making in the sector. Furthermore, the democratisation process the country has undergone over the last decades has accentuated this immense patchwork of distinct and legitimate political entities.

Diversity and complexity have policy implications for agencies like the National Water Agency (Agência Nacional de Águas, ANA) when navigating between two conflicting systems: centralisation and decentralisation. The ANA plays an important national role in water management given its central position amongst the vast network of stakeholders in Brazil's "mega-river-basin", and its technical capacity and financial resources that surpass those of most states. However, being committed to the country's decentralised model, and fully aware of the importance of this process for integrated water resources management, the ANA has gradually developed a sense of dragging the states to a higher level of capacity and engagement. In 2011, the National Pact for Water Management was designed as a tool for the ANA to enhance capacity among state institutions for water resources management.

The Pact was instituted to help strengthen water resources management at the state level, including the state water resources councils and state water executive agencies. It was also put in place to provide flexibility and adaptability to address the diverse situations and levels of ability that range from state to state. Adherence to the Pact is voluntary in an effort to secure commitment by the states with respect to implementation.

The Pact: A robust policy response to water governance gaps

A flexible multi-level governance contract

As a voluntary-based co-operation agreement, the Pact is a powerful instrument to better integrate water management between federal and state levels. The rationale for the Pact is that water resources management in Brazil can only improve if there is better integration of the National Water Resources Management System (*Sistema Nacional de Gestão dos Recursos Hídricos*, SINGREH) with the state water resources management systems (*sistemas estaduais de gestão dos recursos hídricos*, SEGREHs).

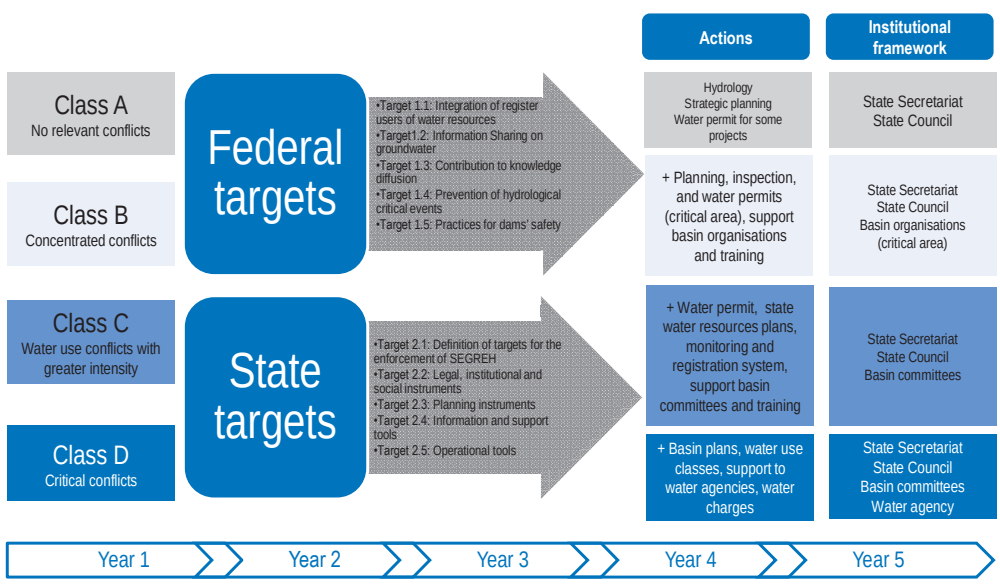
The 1997 Water Law leaves the establishment of its system for water resources management at the discretion of each state. This is certainly an attitude of respect towards that level of political decision, but it probably is also due to the fact that the mentors of the law wanted to put the emphasis on river basin organisations rather than on the states. It happens, however, that the states have formal, factual and legitimate powers that cannot be ignored or superseded.

Since the signing of the "Brasilia Letter in favour of the National Pact for Water Management" in December 2011 by state officials and ANA directors, significant buy-in has been achieved from the states at high political level (governors) and concrete actions have been put in place over a period of five years. The Pact is intended as a political and administrative tool (rather than a planning or normative one) to support the implementation of the Brazilian model of water management: integrated, decentralised and participative.

The Pact also aims to foster convergence and reduce regional discrepancies across states, whilst working towards a "coherent diversity" of state water management systems. Its overarching goals consist in: 1) establishing commitments among federative units to overcome common challenges and lack of harmonisation; 2) encouraging multiple and sustainable use of water resources, especially in shared river basins; 3) promoting an effective articulation between water resources management and regulation processes at national and state levels; and 4) empowering states towards greater capacity and awareness in dealing with water risks. The programme guidelines are well conceived and robust: strengthening the state water resources management systems, commitments to specific targets associated with a vision of the future (prognosis); institutional development based on the aspirations of the states; and control of targets defined in the contract.

All states have embarked on the programme, which speaks to the flexibility of the Pact and the general perception that it is indeed adaptable to states at very different stages of development. Implementation contracts have been signed between the ANA, state governments and state water resources councils in 24 states. The contract commits states to achieve medium-term and final federative targets (defined by the ANA, common to all states, and to be completed each year) as well as state targets (defined by the states, with the ANA's technical support). The targets are approved by state water resources councils, and certified by the ANA (medium term and final) and the ANA and state water resources councils (state). They relate to the enforcement and development of the institutional part of the SINGREH and the implementation of instruments for supporting water resources management in terms of planning, information, operation and decision making (Figure 3.1).

Figure 3.1. **The target framework of the National Pact for Water Management**



Source: OECD elaboration based on ANA (2014), "Background report", OECD/Brazil Policy Dialogue on Water Governance, Agência Nacional de Águas, Brasilia D.F.

The "management maps," defined to support the implementation of the Pact, recognise asymmetries in water management needs across the country and provide for place-based diagnoses and solutions (Table 3.1). Acknowledging regional differences between the states, this methodology clusters the states into four "categories" according to their respective degree of complexity in water management: low (Class A), medium (Class B), high (Class C) and very high (Class D).[1] The degree of complexity is determined by the scope, intensity, number and dispersion of conflicts in the water regions analysed. For each management typology, the methodology establishes the corresponding institutional model: low, medium, high or very high.[2] This characterisation is simple, clear and provides a good basis to reach a consensus and guide discussions in a very pragmatic and factual way.

Table 3.1. **Management map and typologies of the Pact**

Typology	Complexity	Institutional framework	Number of states[1]	States
Class A	Low	Basic	4	Acre, Amazonas, Roraima, Amapá
Class B	Medium	Intermediate	13	Alagoas, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Pará, Piauí, Sergipe, Santa Catarina, Rio Grande do Norte, Rio Grande do Sul, Rondônia, Tocantins
Class C	High	Developed	5	Bahia, Espírito Santo, Paraíba, Paraná, Pernambuco
Class D	Very high	Advanced	4	Ceará, Minas Gerais, Rio de Janeiro, São Paulo

Note: 1. The typology has not been defined yet for the Federal District.

Source: OECD elaboration based on ANA (2014), "Background report", OECD/Brazil Policy Dialogue on Water Governance, Agência Nacional de Águas, Brasilia D.F.

In line with international best practice and recommendations, the main assumption behind the Pact's rationale is that the type of governance should match the magnitude of the problem. Therefore, the higher the degree of complexity in water resources management, the higher the need for institutional governance structures. Overestimating the institutional framework would represent a potential waste of efforts and resources; and underestimating it may hinder the capacity to manage trade-offs across water users, and to prevent or solve conflicts that may arise. Thus, as basic structures are inadequate to manage critical situations, due to the lack of skills and resources, complex realities are likely to involve high transaction costs.

The approach requires states to reflect on where they are and what they want to achieve, linking the complexity of the solutions to the complexity of the problems, now and in a foreseeable future. This is consistent with the idea that governance models are tools to solve problems and not ends per se. As a result, states adopt varying degrees of institutional complexity for addressing identified issues, which match their unique circumstances.

The map and typology reflect states' self-assessment of risks and vision of the future, and result in a priority action plan based on a "package approach" to implement the SINGREH. Each management typology has a corresponding set of very sophisticated and specific legal, planning, information and operational instruments going from 17 (class A) to 32 instruments (class D, Table 3.2). It is up to each state to choose the management typology and to define and approve a target framework based on the ANA's predefined indicators.

Table 3.2. **Variables of the water management target framework**

Level \ Group	Legal, institutional and social articulation	Planning	Information and support decision	Operational
Basic	– Institutional model – State water organisation – Legal framework – State Water Resources Council – Training sector	– Hydrographic Division – Water balance	– Cartographic base – Hydro-meteorological monitoring – Monitoring water quality	– Water permit – Inspection
Intermediate	– Process management – Basin committees and basin organisations – Water agencies – Social communication and broadcasting	– Strategic planning – State Water Resources Plan – Basin plans	– Registers users and infrastructure	– Financial sustainability management system – State Water Resources Fund
Advanced	– Interaction with water users and cross-sectors	– Water use classes – Special management studies – Models and decision support systems	– Information system – Research, development and innovation	– Water charges – Hydro works – Programme inductors – Management and control of critical events

Source: OECD elaboration based on ANA (2014), "Background report", OECD/Brazil Policy Dialogue on Water Governance, Agência Nacional de Águas, Brasilia D.F.

The targets will enable the desired institutional framework to be set, through a series of "actions, human resources and structures of governance". Examples of actions include tools and processes such as the improvement of the monitoring network of rivers, database on water availability or issuance of permits, drafting of basin studies and plans, training or deployment of charging for the use of water resources. It is positive that there are precise and largely quantifiable targets to serve as milestones in the process, and which are differentiated according to the degree of institutional development of each state. The Pact has no equivalent in OECD countries in terms of comprehensiveness and sophistication. The implementation process is clearly defined, including specific mid-term and final targets, as well as delineation of responsibilities and accountability across institutions.

A coherence-building instrument with potential multipliers' effects

The Pact is one of many programmes already in place at federal and state levels (Box 3.1) and requires a systemic approach in its implementation to fully yield its benefits. The Pact aims to foster consensus building on the ways forward and concrete actions to better implement the SINGREH, while preserving the distinctive features of SEGREHs. A range of programmes is in place to support the achievement of specific targets and needs to be aligned with the Pact's ambition. Other initiatives by the ANA contribute to co-ordinating a range of water programmes (INTERÁGUAS), reducing the levels of pollution watersheds (PRODES) and regenerating them (Water Producer Program), and increasing the knowledge about the quality of surface water resources in Brazil (PNQA) (Figure 3.2). These preceding and parallel efforts are coherent with the aims of the Pact, which has potential to represent the "joining link" or overarching framework for fostering coherence and ensuring synergetic effects across cumulative programmes into a vision over five years.

Box 3.1. **Selected programmes by the ANA in support of water management**

The Programme for Development of the Water Sector (Programa de Desenvolvimento do Setor Água, INTERÁGUAS) creates incentives for water users to articulate and plan their actions in a rational and integrated way, in order to contribute to the strengthening of planning and governance, especially in the less-developed states.

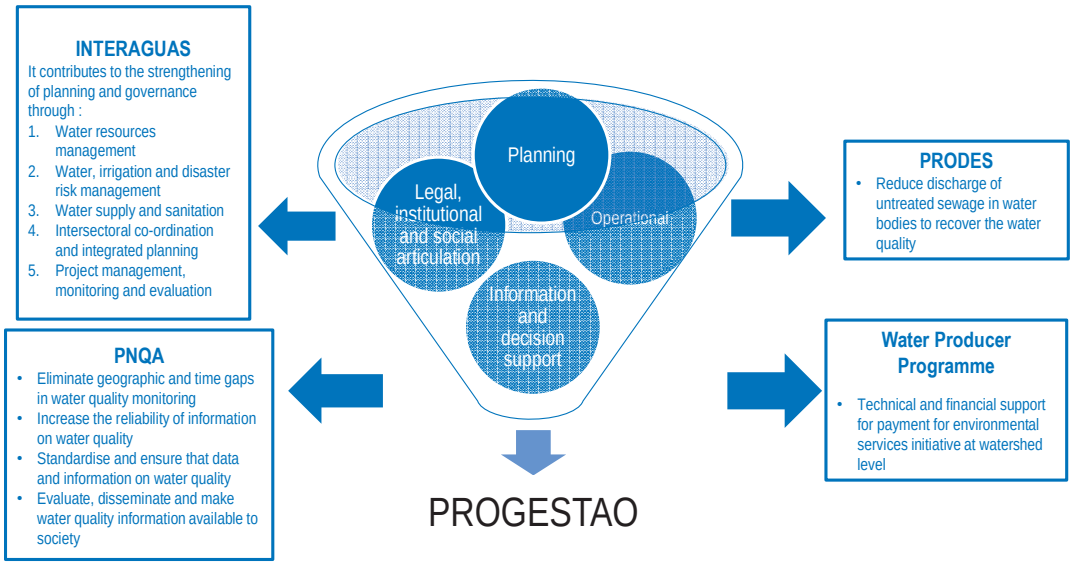
The River Basins Depolltuion Programme (Programa de Despoluição de Bacias Hidrográficas, PRODES) created in 2001 is known as the "Programme for Purchase of Treated Sewage" as it stimulates public service providers of sanitation to invest in deployment, expansion and operation of sewage treatment plants by means of a contract. Rather than allocating public funding for engineering works or procurement of equipment, it is based on a pay for results approach (i.e. attainment of efficiency goals and removal of organic loads, measured in terms of kilograms of biochemical oxygen demand per day, and operational performance of wastewater treatment plants).

The Water Producer Programme was designed in 2001 to ensure environmental regeneration of watersheds through payment for environmental services in rural environment, which is reflected in the quantity and the quality of the water that reaches the cities. With different institutional arrangements, the programme already counts 20 projects in progress throughout Brazil.

The National Programme for Water Quality Evaluation (*Programa Nacional de Avaliação da Qualidade da Água*, PNQA) was developed in 2010 to guide public policies for the recovery of environmental quality in water bodies such as inland rivers and reservoirs. The creation of a national network of water quality monitoring is in progress to be operated by the states with the co-ordination of the ANA. The programme provides training, quality improvement of laboratories, evaluation and periodic dissemination of the results obtained with the monitoring and standardisation of parameters and procedures.

Source: ANA (n.d.), www2.ana.gov.br/Paginas/EN/programs.aspx (last accessed 15 May 2015).

Figure 3.2. **The interaction between Progestão and other programmes**

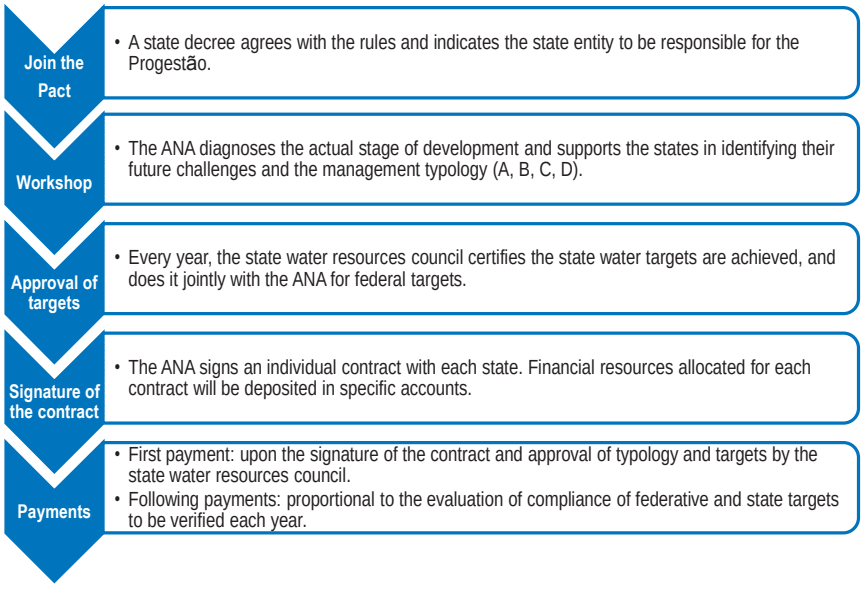


Source: based on ANA (n.d.), www2.ana.gov.br/Paginas/EN/programs.aspx (last accessed 15 May 2015).

A result-based financing mechanism

The Consolidation Programme of the Pact is Progestão, a financial implementation mechanism making BRL 100 million (approximately USD 40 million) available over a period of five years, for the states reaching their goals. Disbursements are based on a "paying for results" principle. The first instalment (BRL 750 000) is released after the definition and approval of the target water management framework by the state water resources council and the signing of the contract by the state entity. Equal funds are distributed to all states regardless of the complexity or typology of the water system; they are not earmarked to specific objectives. Payments occur annually proportionally to the achievement of targets during the previous year (Figure 3.3), i.e. funding is contingent on the successful implementation of what states have committed to undertaking. In other words, it is not so much what states do, but the fact that they have done what they committed to doing.

Figure 3.3. **Implementation steps of Progestão**



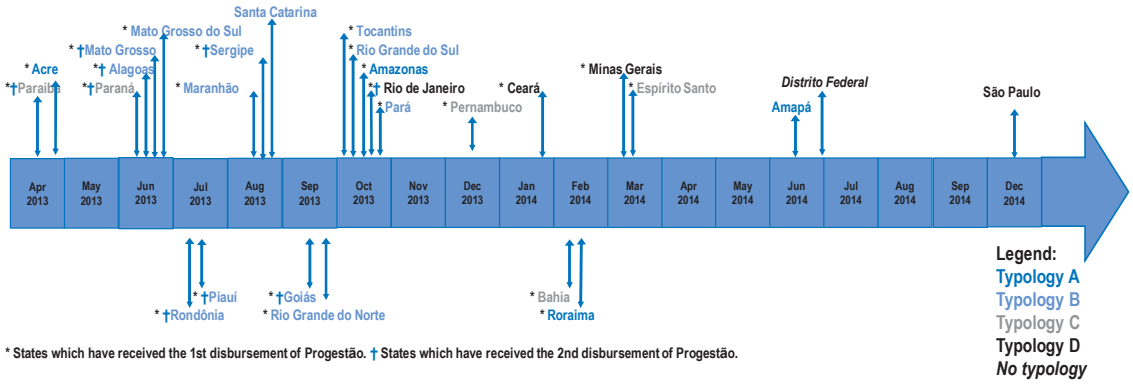
Stage of progress and early achievements of the Pact

The Pact has triggered a national "wake-up call" for states to pay greater attention to water management and to set up institutional structures to address the specific needs of the state. As such, the Pact represents a sound political commitment to catch up and place water issues at the forefront of policies, in particular in areas where it had been lagging behind other priorities. This is a valuable means to create a sense of responsibility, to raise greater awareness and to engage as many states as possible, regardless of their level of economic development and challenges.

The Pact provided a new vehicle for further dialogue across levels of government. It is the outcome of a negotiation process between the ANA, state governments and state water resources councils, which itself (regardless of targets, goals and financing) provides windows of opportunity to facilitate multi-level interactions (with river basin committees, state institutions). The organisation of 27 workshops, the signing of 24 contracts and the

23 first payments have all provided opportunities to strengthen vertical integration and consensus building on overarching priorities and related measures (Figure 3.4).

Figure 3.4. **From state decrees to implementation**



The Pact seeks to foster stronger intermediation and empowerment of the state level. The ANA provides the states with technical support, instruments and resources to shed light on their own weaknesses and needs. States recognise the ANA's role as a trustworthy and acknowledgeable partner. The Pact relies on a self-assessment approach based on each state's vision of the future, which does not threaten the subsidiarity principle nor the autonomy and prerogatives of states enshrined in the Constitution. Thus, what could have been perceived as a "soft-recentralisation" initiative is actually rather considered as an opportunity to use the central role of the ANA to establish a more robust relationship with federated entities, and to raise awareness and capacity among states on the perception of water issues and capacity to deal with them.

The Pact stimulated a "copycat" process among states to join the Pact and place emphasis on local water challenges. For some states, mostly the poor states, there was a financial incentive to take action (payments are equal and regardless of the complexity of the typology), and for others, rich and big states, the reputational effect played a more crucial role. By joining the Pact, states increase the political commitment and the visibility given to the water sector, and also benefit from concrete outcomes, such as their integration in national databases (e.g. users' registry). The rationale for providing equal funds to all states is that those which are lagging behind will need relatively more resources than others for advancing the implementation of the SINGREH. While for stronger states, those funds provide opportunities to address some marginal gaps and to achieve increased efficiency. Giving all states equal amounts also helps to avoid lengthy and complex discussions and complaints on unfair allocations of funds and political recriminations.

The Pact in the light of international experience

Inter-governmental contracts are a common mechanism for strengthening co-ordination and policy coherence. They help set convergent goals, build consensus, strengthen capacity, make commitments clear and transparent, provide common reference frames, share information, and trigger actions and decisions that better articulate priorities across levels of government (OECD, 2007). As such, these negotiated agreements are

crucial to manage interdependencies and commit political leaders beyond electoral mandates to "depoliticise" the strategies while ensuring some continuity of public action.

The other advantage of contracts is to leave scope for adapting policies to territorial characteristics. Contracts are often used as empowerment tools to delegate functions, to control and co-fund projects, and to manage complex issues. A number of examples exist in policy fields such as rural and urban development, innovation and technology, education, and environmental goods and services.

Box 3.2. **Benefits and challenges of the National Pact for Water Management in Brazil**

Short- and long-term benefits

- Very sophisticated, flexible and formalised bottom-up approach (targets, goals, variables, funding).
- Promotion of consistency of water policy making and implementation at vertical level.
- Accompaniment of decentralisation through capacity-building at state level.
- Reduction of asymmetries of information between levels of governments.
- Preservation of the autonomy of states and the subsidiarity principle.
- Mitigation of fragmentation of roles and responsibilities through greater vertical co-ordination.
- Empowerment of decision makers towards shared responsibility.
- Stabilisation of relationships with medium-term commitments (five years) cutting across political cycles.
- Reduction of uncertainty through risk management (instead of crisis management).
- Awareness-raising on the impact of poor governance on water uses, financing and risks.

Potential and actual pitfalls

- Transaction costs in terms of negotiation and implementation (consultation, verification of details, etc.).
- No sanction mechanisms in case of non-compliance (absence of a "stick").
- Limited provisions for transparency and accountability of beneficiaries (states) *vis-à-vis* other stakeholders.
- Risk that the search for the "perfect variables" intends to overshadow the importance of process.
- Little guidance to ensure the inclusiveness of the approval of targets beyond states and their councils' obligations.
- Difficult evaluation of the impact of governance targets on water management performance.
- Little experience sharing across states throughout the implementation (bench-learning).
- Risk of exclusion of other levels (river basin committees, municipalities) in the two-way state-federal dialogue.
- No provisions for shared basins (across states).
- Limited information on how the funds are spent for the achievements of targets.

Contracts are mostly characterised by both transactional and relational elements. Through "transactional" contracting, the respective duties of both parties and co-ordination problems can be stated *ex ante* (before the signature of the agreement). These types of contracts implement (often financial) "incentive schemes" and are supervised by external third parties (such as the judiciary). "Relational" contracting implies *ex post* commitment and problem-solving by co-operating parties after the signing of the contract and design of the "governance mechanism". In such cases, the supervision of the agreement enforcement tends to be bilateral as the parties are involved in a win-win co-operative game. When contracts are characterised by both elements, commitments concerning existing clauses have to be achieved (transactional characteristics) but in contexts where mutual obligations remain "open-ended" and have to be revealed in the implementation phase (relational characteristics) (OECD, 2007).

International experience can provide valuable lessons for the Pact's implementation, although cases vary in terms of ambition, scale and scope. The closest experience to Brazil is the Canada Water Act agreements signed between federal and state/provinces since 1970 to strengthen multi-level governance on the conservation, development and use of the country's water resources. Their ultimate goal is to facilitate the co-ordination and implementation of water policies and programmes, maintain continuing consultation between levels of government on water resource matters, and to advise on: 1) priorities for research, planning, conservation, development and utilisation relating thereto; 2) formulation of water policies and programmes (Box 3.3).

Another example is the Administrative Agreement on Water Affairs signed in 2011 in the Netherlands between the Ministry of Infrastructure and Environment, regional water authorities, drinking water companies, provinces and municipalities, to foster efficiency gains across the water chain up to EUR 750 million per year until 2020 through improved collaboration and reallocation of roles and responsibilities.

The experience of the Australian National Water Initiative is also relevant for the Pact. This principal water policy agreement of the Council of Australian Governments (COAG) was signed in 2004 between the federal government, New South Wales, Victoria, Queensland, South Australia, the Australian Capital Territory and the Northern Territory to increase water use efficiency, provide greater certainty for investment and the environment, and underpin the capacity of Australia's water management regimes to deal with change responsively and fairly. Its main strength relied on the definition of key performance indicators to track implementation and progress results (Box 3.3).

The Italian co-operative experience behind the framework programme agreements for regional policy (including water) is also worth considering given the policy emphasis on helping lagging regions catch up, which is at the core of the Pact's spirit.

Challenges to the Pact's implementation

The Pact is very comprehensive, and recognised as such by all states, but despite its great value, a few challenges deserve attention (Figure 3.6). Addressing these changes will allow states to take advantage of the full benefits of the Pact in the medium and long term, and to achieve the expected outcomes across levels of governments. For instance, more than 50% of states surveyed during the policy dialogue consider that the lack of citizens' concern about water and the absence of strategic planning hinder proper implementation of the Pact (Figure 3.5).

Box 3.3. **Examples of multi-level governance contracts in the water sector**

Canada Water Act agreements

In Canada, a federal state that has largely decentralised its water policy, the 1970 Water Act sets the enabling framework for multi-level water governance.

- It provides for federal-provincial arrangements to develop and implement a water resources management plan.
- It enables the minister, either directly or in co-operation with any provincial government, institution or person, to conduct research, collect data and establish inventories associated with water resources.
- It facilitates federal-provincial agreements where water quality has become an urgent national concern.
- It permits the joint establishment and use of federal or provincial incorporated agencies to plan and implement approved water-quality management programmes.
- It provides for inspection and enforcement of licensed operation.
- It allows the creation of advisory committees and public information programmes, at the initiative of the sole minister or in co-operation with any government, person or institution.

With the approval of the Governor in Council, the minister enters into an arrangement with one or more provincial governments. Participating governments into the agreement contribute to funding and information sharing. For activities such as the water quantity survey agreements with each province, cost sharing is in accordance with each party's need for the data. For study and planning agreements, the cost is equally shared between the federal government and the provincial government.

A long-standing example of this type of federal-provincial agreement is the Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health (COA). The COA helps Canada deliver on commitments made under the Canada-US Great Lakes Water Quality Agreement (GLWQA). It establishes a domestic action plan to guide co-operation and co-ordination of federal and provincial efforts to protect the lakes.

The first COA was signed in 1971 in advance of the first GLWQA in 1972 and has been updated approximately every five years since then. The COA and GLWQA have co-evolved and the focus of both agreements has expanded and adapted to address new issues – from reducing point sources of nutrients to include reducing persistent toxic substances, restoration of degraded "areas of concern", habitat protection, invasive species and climate change. Extensive public engagement is undertaken before a COA is renewed.

The COA identifies specific results and commitments to action for each issue being addressed. The agreement also facilitates partnerships with municipalities, First Nations, conservation authorities, industries, environmental groups and others to help in the delivery of Great Lakes restoration and protection. The COA has achieved measurable progress, including a 90% reduction in releases of PCBs since 1993, 89% reduction in releases of dioxins and furans, and 90% reduction in releases of mercury since 1988. Progress has also been made in cleaning up all 17 Canadian Great Lakes areas of concern, including completing all restoration actions in 5 areas.

In 2012, the province released Ontario's Great Lakes Strategy to outline longer term goals, provide a mechanism to focus resources across 11 provincial ministries, and enhance collaboration and engagement with other governments and the broader Great Lakes community. The strategy complements the COA and defines a more comprehensive Ontario vision as one of "Healthy Great Lakes for a stronger Ontario – Great Lakes that are drinkable, swimmable and fishable". To achieve this vision, six long-term goals have been established:

Box 3.3. **Examples of multi-level governance contracts in the water sector** (*cont.*)

- engaging and empowering communities – to create opportunities for individuals and communities to be involved in protecting the lakes
- protecting water for human and ecological health
- improving wetlands, beaches and coastal areas
- Protecting habitats and species
- enhancing understanding and adaptation – to advance science and understanding stressors such as climate change
- ensuring environmentally sustainable economic opportunities and innovation.

Key results have been identified for each goal which will be monitored and reported on every three years. The strategy will be reviewed in six years and updated to respond to emerging issues and new science and to establish new milestones. The province has also proposed a Great Lakes Protection Act to further strengthen and formalise mechanisms for collaboration, co-ordination and implementation.

Administrative Agreement of Water Affairs in the Netherlands

The Administrative Agreement on Water Affairs (2011) was signed between the central government and spearheads of the main actors of multi-level governance, committing their respective constituencies. These include the Ministry of Infrastructure and the Environment; the National Water Authority; the Association of (12) Provinces (IPO); the Association of (408) Municipalities (VNG); the Association of (23) Regional Water Authorities (UvW); and the Association of (10) Drinking Water Companies (Vewin).

The agreement promoted important developments in the allocation of roles and responsibilities, as well as further cross-sectoral planning integration between central and provincial authorities (water, environment and spatial planning). Savings of EUR 750 million annually by 2020 are expected across the water chain through reducing the control and supervision functions, learning and knowledge-sharing, clear agreements about the division of tasks and reallocation of roles and responsibilities when organisations are able to perform the same tasks better and/or cheaper (e.g. transfer of muskrat and coypus control from the provinces to the regional water authorities; new cost-sharing arrangements for primary flood defence systems).

Progress towards efficiency is annually monitored and published in the publicly available report *Water in Beeld* prepared by the Directorate-General for Spatial Development and Water Affairs (Ministry of Infrastructure and the Environment) in collaboration with all parties to the contract.

Framework Programme Agreements in Italy

The Accordi di Programma Quadro (APQs) are frequently used as multi-level governance instruments for regional development policies in Italy, including natural resources and infrastructure areas. They involve several ministries depending on the nature and area of intervention provided (i.e. the Ministry of Infrastructure and Transport, the Ministry of Economy and Finance, the Ministry of Environment). Funding resources are allocated by the Inter-ministerial Committee for Economic Planning (CIPE) on the basis of three indices: 1) size and population index; 2) index expressing the structural problems (inverse of the GDP, unemployment rate, infrastructure deficit); and 3) index expressing the negative factors affecting the region (e.g. islands, small size territories). Beneficiaries are mostly southern regions.

Each project is accompanied by spending forecast models. The preparatory and investigation phases require collaboration between technical staffs and central authorities. APQs include an implementation section and a programming section, which lists interventions in accordance with the general objectives. APQs also indicate actors responsible for the phases of monitoring and evaluation.

Box 3.3. **Examples of multi-level governance contracts in the water sector** (*cont.*)

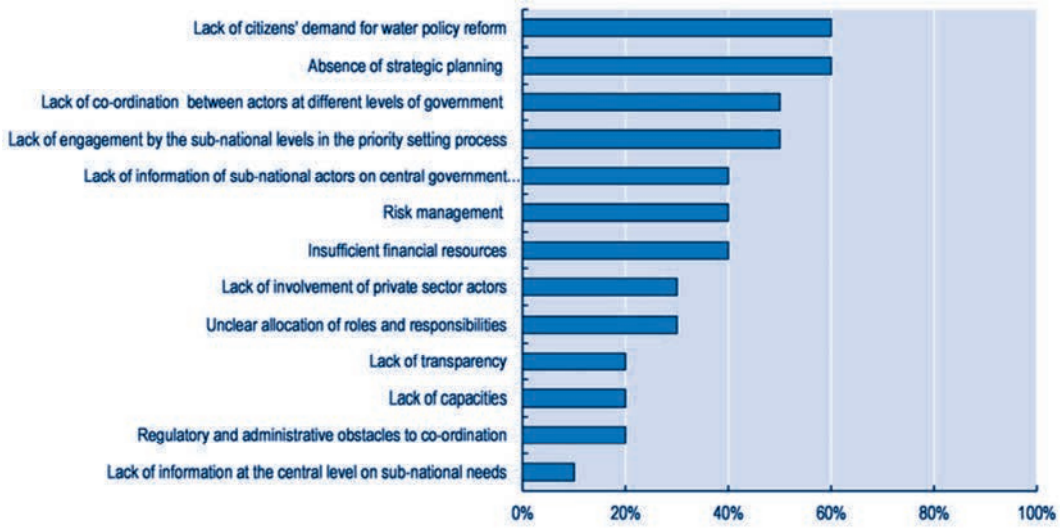
A successful example in the water sector is the APQ signed in 1999 between Apulia, Basilicata and the Ministry of Infrastructure and Transportation to address water shortage in Apulia. It committed the two regions to commonly plan the use of water and agree on investment strategies by 2015. Thanks to the agreement, the quality and the effectiveness of water provision improved in both regions.

Sources: Environment Canada (2015), www.ec.gc.ca (last accessed 10 May 2015); OECD (2014a), *Water Governance in the Netherlands: Fit for the Future?*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264102637-en; Venanzi, D. and C. Gamper (2012), "Public investment across levels of government: The case of Basilicata, Italy", OECD, Paris, available at: www.oecd.org/gov/regional-policy/basilicata_edited.pdf; OECD (2007), *Linking Regions and Central Governments: Contracts for Regional Development*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264008755-en; and inputs from Sharon Bailey, peer reviewer, Food Safety and Environmental Policy at Ontario's Ministry of Agriculture and Food.

The need to consideri the broad context of water policies

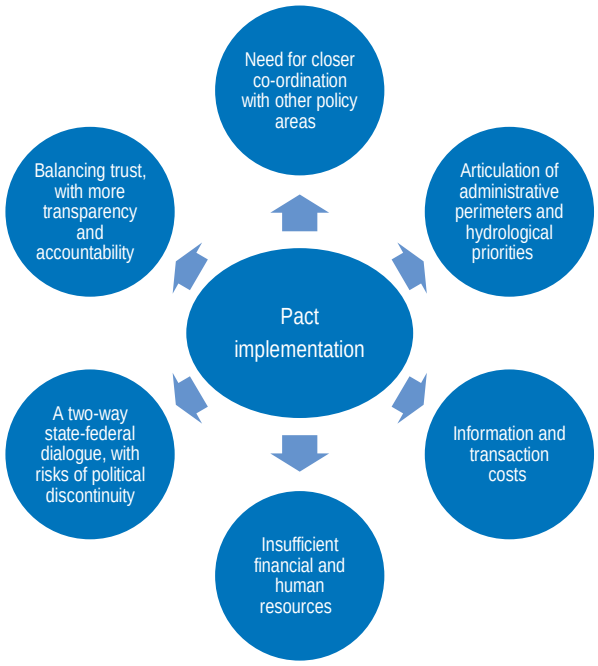
The Pact deals specifically with "water" management, but its effectiveness may be reduced if states do not create a favourable global environment for the implementation of the specific water policies. The ANA has been very successful in engaging state political leaders to commit to action, but these efforts can be hindered if decisions taken in other policy areas neutralise achievements to be made in terms of water management. For example, if urban dwellers and property developers generate long-term liabilities for which they do not bear the risks or costs; if farmers receive subsidies for the production of ethanol that do not foster rational use of water resources; if larger public investment priorities in terms of infrastructure do not feature water needs properly; if wastewater is discharged into rivers without treatment, generating high pollution risks; or if the national system does not fully connect sanitation and water management.

Figure 3.5. **States' perception of major bottlenecks to the implementation of the National Pact for Water Management**



Source: OECD (2014b), responses to the OECD questionnaire; out of 14 states that responded to the survey, the following 10 considered the above-listed bottlenecks as a "major challenge": Ceará, Distrito Federal, Paraíba, Parana, Pernambuco, Rio de Janeiro, Rio Grande do Sul, Rondônia, Santa Catarina, and São Paulo.

Figure 3.6. **Challenges to a successful implementation of the National Pact for Water Management**



Such contradictory policies occur in all governments and administrations due to "silo" approaches. The ANA may have a role to play in persuading authorities in participating states to create a favourable environment that supports the Pact. It is important that water-related authorities for energy, cities, regional integration and agriculture at the state level be aware of the Pact and in tune with it. To date, the Pact has been spearheaded, incentivised and managed by the ANA (a water player) in close collaboration and dialogue with the state agency and the state secretary responsible for water (also water players). Other policy areas should engage in the process to achieve good governance targets and mutually beneficial results and synergies.

A range of mechanisms can help to overcome the silo tradition of Brazilian sectors in public policy (both at federal and state levels) and foster a culture of horizontal co-ordination (Chapter 2). The Pact is an opportunity to put water at the centre of the political debate at the state level and to draw the attention of all relevant sectors, triggering mobilisation around a development strategy and better co-ordination among fragmented decision making, especially if accompanied by a communication strategy.

A two-way state-federal dialogue, with risks of political discontinuity

The Pact operates in a high-level political environment, which is critical to secure the buy-in of state authorities, but also leaves it open to risks. The commitment of state governors for a defined period is a strong asset to keep political will and leadership up, to guarantee that the states are motivated at the highest level, and to ensure that Progestão is not seen simply as another way to get funds from the federal government. The five-year time frame is also a means to bridge the political discontinuity; as a "contract", the plan is expected to be implemented regardless of the outcomes of elections, which take place every four years. However, ensuring that the Pact's implementation becomes neither a

mere "technical" co-operation between the ANA and state authorities nor a tick-the-box exercise, new governors should remain on board.

Institutions are vulnerable to political capture and shifting priorities caused by the electoral cycle. The fact that the Pact goes beyond the term of office of the state governor is an asset, but it does not ensure that the acquired results are factored into the broader strategic policy agenda in case of leadership change. Incentives need to be put in place at the technical and administrative levels, and carefully balanced in a way that does not collide with the legitimacy and the political autonomy of newly elected governors. Continuous trust-building should also be sought with newcomers throughout the implementation of the Pact. In addition, while the technical staff of the ANA can guarantee continuity at the national level, it is not always the case at the state level where there is a high turnover of water staff at the end of the political mandate. The lack of robust commitment over a consistent time frame may be an obstacle in ensuring some sustainability within and beyond the five-year period.

Lack of articulation of administrative perimeters and hydrological priorities

The Pact seeks to raise awareness, empower and commit state authorities whose perimeters do not follow hydrological boundaries. This "administrative gap" (Chapter 2) has implications for other tiers of government (river basin committees, municipalities). Currently, there is too much emphasis on the "observer" rather than "active players" in the current implementation of the Pact. The mismatch between the administrative boundaries (where decisions are taken) and the hydrological boundaries (where actions might be taken) can increase transaction costs and deter effective water management, which requires an integrated approach, especially for planning.

There is a risk that river basin committees will not fully embark in the process if sufficient provisions are not put in place for greater inclusiveness throughout the implementation of the Pact. Therefore, there is a need to ensure they are involved in the process, despite the current focus of Progestão, which is to strengthen state agencies.

As case studies in Paraíba, Rondônia and Rio de Janeiro show (see the annexes to this chapter), implementation has sometimes faced weaknesses in terms of reporting back on progress results, dispersion of funds and priority actions beyond fora provided by state water resources councils (where all river basin committees are not always represented, and municipalities are quasi-absent). Therefore, setting clearer guidelines for inclusiveness across the different scales can provide a good opportunity for having organised civil society fully part of the process.

The Pact itself does not foresee explicit mechanisms for interstate co-operation in case of shared basins, which are governed separately. Interstate co-operation is an issue of paramount interest as riparian states need to improve water quantity and quantity management together in order to have a concrete impact on interstate river management. The Pact should contribute to incentivise interstate co-ordination towards harmonised administrative actions and proper allocation of competence between federal agencies. Federative co-operation mechanisms foreseen by Law 140/2011 include technical co-operation agreements, public consortia, partnerships, national or state commissions, public and private funds, among others.

Challenges to balancing trust, with more transparency and accountability

The Pact is above all a pact of trust, based on progress in achieving targets rather than on specific outputs. There are currently no requirements in place that require funding recipients (state water agencies) to report (to other stakeholders, the ANA included) how the money is spent. Monitoring of expenditure is done by the state council for state targets, and jointly with the ANA for federal targets. This process can generate conflicts of interest while overestimating progress for the state to get the next disbursement of funds. Therefore, there is a need to mobilise a broader range of stakeholders, including from civil society, throughout the implementation process, to verify the accuracy of reported achievements.

The Pact helps build confidence between the federal and state levels of governance and reinforce a sense of partnership with the ANA, which in turn creates greater responsibilities in terms of accountability. The responsibility to set national targets that need to be satisfied by all states falls on the federal government (and the national congress). For transparency, verification mechanisms should be put in place to guarantee the flux of *in itinere* information, the openness of the processes, and potentially inspection powers of independent bodies.

Information and transaction costs

Paradoxically, while the Pact is partly aiming at bridging information gaps, it also generates important transaction costs. Implementation involves a huge amount of data collection and exchange (spreadsheets monitoring target progress, email exchanges, workshops summary, contracts signed, approval reports). While the ANA has a dedicated team fully committed to provide assistance to the states, this is not always the case, especially in those states where water is not a high priority.

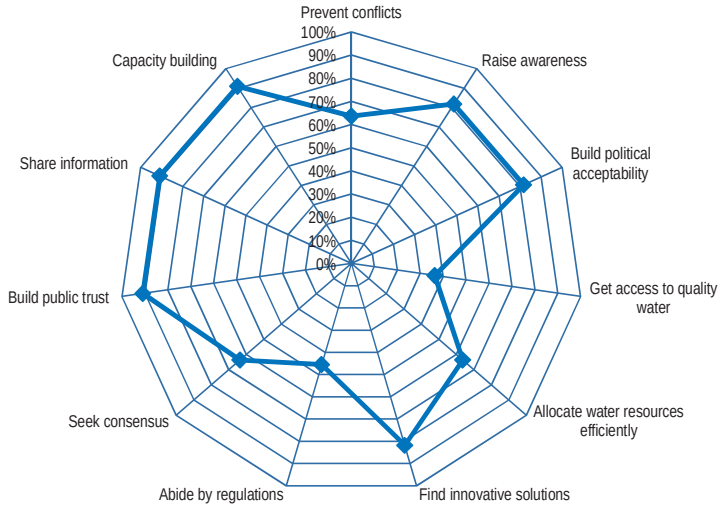
Obstacles to meet requirements in terms of providing data and information at the state level can represent a significant hurdle to the Pact's success and therefore need to be carefully assessed. Unsatisfactory information exchange with other organisations, e.g. river basin committees, can jeopardise effective implementation, while the lack of public information on implementation progress can weaken the accountability of authorities requested to deliver the targets. The lack of technical (i.e. data, reports) and less technical information (i.e. flyers, press release) is also a concern in many states.

Insufficient financial and human resources

State water agencies are often fragile in terms of skilled collaborators, and human resources are often insufficient in quantity and quality at state level, which can jeopardise the Pact's implementation. Most states surveyed by the OECD expect the Pact to contribute primarily to greater capacity building, information sharing, political acceptability, as well as trust (Figure 3.7).

This gap in terms of technical expertise threatens implementation and the sustainability of the results obtained beyond the five years of the programme. Even if the states embark on this process with the sincere intention of improving water governance, there is a tangible risk that state authorities will be attracted by other priorities or simply incapable of maintaining sufficient resources (human and financial) to sustain the process.

Figure 3.7. **Expected contribution of the National Pact for Water Management: A perspective from Brazilian states**



Source: OECD (2014b), responses to the OECD questionnaire. Of the 14 states surveyed, the following 11 considered the above indicators as "great contributions" of the National Pact for Water Management: Ceará, Distrito Federal, Paraíba, Parana, Pernambuco, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, Rondônia, Santa Catarina and São Paulo.

This is a problem that goes beyond the water sector, and can be resolved if enough political priority and attention are given to water in the state administration, and sufficient resources are allocated accordingly. There could be a role for Progestão to play in sustaining "interest" in water governance at the state level after all funds are transferred. In addition, there may be a need for better synergies with other programmes by the ANA to address funding gaps (and improve resources management) that prevent the set-up of an adequate institutional and operative framework.

Ways forward to make the National Pact for Water Management happen

The Pact and Progestão are a clear breakthrough in fostering interactions between the ANA and water resources management institutions at the state level. They combine flexibility and rigour in a well-conceived and balanced way. They leave enough room for states to decide what they want to do and where they want to go, and they foster vertical information-sharing, especially on federal goals as a requisite for the disbursement of the funds. The fact that all states receive the same amount of financial resources from the ANA, regardless of the ambition of the agreed steps and their financial situation, may be difficult to conceive in theory as different states have different needs, but makes sense in practice.

Policy recommendations

In light of previous considerations, recommendations can be put forward for the Pact to achieve its full potential in strengthening federal and state water governance. These recommendations can be achieved through a menu of options to be agreed upon between parties (see Chapter 5).

Secure human and financial capacity for the Pact's outcomes to translate into public action

The Pact is not an end per se, and requires strong and lasting capacity in delivering goals for its implementation to concretely improve water resources management at the sub-national level. The Pact has the potential of playing a key role to improve capacity to deal with a complex and diverse institutional and territorial setting. This is critical to support decision making at the state, basin and municipal levels.

Capacity building (human resources) and financial flows (funding) will be important elements to carry the programme forward and sustain results after the five-year implementation period. The ANA has a culture of excellence and a long-term vision that needs to be exported to the states.

- It would be advisable that state water agencies have requisites to recruit water staff based on professional capacities with incentives for well-trained staff to stay in the state institutions (e.g. competitive salaries). In particular, state agencies created in compliance with the Pact should be staffed adequately as a first and fundamental step to improve water resources management.
- The need for technical and professional staff in the states that have less robust and qualified institutions can be partly addressed through public tenders, which are a good step forward towards stronger capacity.
- Customised capacity-building programmes should be further encouraged for water professionals at the state, basin and local level dissociated from political leadership. The introduction of water charges, which requires economic analyses and data, could be accompanied by educational campaigns, training courses on specific topics and tools.

The royalties that some states get as compensation for hydropower systems built on states' territories should be used to finance part of the state water resources management system.[3] The ANA could consider incentives such as a money-match mechanism, whereby the next generation of Progestão would feature conditionalities that go in this direction.

The Pact should not be restricted to a mechanism for state empowerment in "water" management, but it should also be considered as an instrument for "institution building" at large through learning by doing. At first sight, and given the long-standing Brazilian "problemshed approach", one could legitimately question the creation of institutions and structured assemblies in states with abundant resources like Rondônia. However, there are at least two reasons for justifying the current move in this direction in those regions:

- Droughts and floods are critical risks that can have impacts on the economy of those states (with related consequences at national level given the strong presence of hydropower in most of them), social cohesion and environmental sustainability. These shocks require adaptive pathways to move from crisis to risk management, as well as resilient institutions to increase preparedness in the future.
- Water is often the "eye opener" to broader governance gaps and can certainly be a sector-specific vehicle to build broader capacity in the public administration, power-sharing via participatory approaches in decentralised assemblies, and intermediation between states and citizens in the context of a low degree of trust.

Strengthen the monitoring framework and assess impact for greater accountability

Result-based initiatives, such as the Pact, raise the question of how to monitor results and evaluate achievements. Contracts need impact evaluation to adjust the policy and improve decision making (through learning by doing), and bilateral commitments must be as verifiable as possible. Impact assessment can help select policy strategies, resource allocation and account for results.

Measuring progress on water governance, however, is not an easy task. The concept of water governance is complex; it has a degree of uncertainty due to factors that policy makers have little control over; and causality between policies and results is difficult to establish.

Since contracts allow for agreeing on roles and commitments of partners at different levels, evaluation of policy outcomes and performance of parties should be foreseen within a given framework. However beyond the what and the how, it is necessary to carefully look at who will be carrying out the monitoring and evaluation. This is important for the credibility of the process and a range of options can be foreseen (which may vary from state to state, according to the needs).

- When certifying the approval of Pact's goals and targets, state water resources councils should scale up success stories of basins or areas where significant impact on water governance can be measured and list challenges that are likely not going to be solved within the Pact's timeline.
- This more "dynamic" monitoring would help go beyond the "validation" approach conditioning Progestão disbursement to address policy issues. In other words, the Pact is not simply a technical or technocratic process, it may also be a political process through which the sectors of society that are more open to water reforms advocate that state officials push them forward.
- It is important to engage river basin committees in the monitoring and evaluation process. State councils play a key role in establishing the targets and monitoring the evolution of the implementation of Progestão. This makes "allies" of the ANA in advancing water management institutions nationwide. In doing so, states need the full support of stakeholders and authorities operating within their administrative boundaries.
- A system of homogenous, comparable and replicable indicators could be designed to monitor the evolution of each contracting state after the fifth year of implementation, and commit them to pursue efforts after this period. Indicator systems are useful for solving asymmetries of information and contribute to a common learning process.
- A tentative impact assessment framework could help draw lessons from the Pact's progress results and design a longer term strategy. Consensus on such indicators, following a bottom-up approach is also much needed to secure buy-in for the next steps.

Foster transparency and regular information sharing for greater accountability and trust

Fostering information sharing and stakeholder engagement throughout the implementation cycle would allow for more transparency and inclusiveness. Broad dissemination to showcase and scale up concrete results obtained through the Pact could raise further awareness.

- A dedicated website, accessible to all, could report on progress in achieving the targets and goals of the Pact, and provide avenues for multi-stakeholder forum discussions. Systematic reporting of the outcomes of state water resources council discussions to the general public would also help to strengthen the transparency of the decision-making process, thereby increasing its legitimacy and buy-in.
- Incentives for newcomers and unheard voices (including from outside the water sector) to contribute to the Pact's implementation through regular public consultations could help to overcome the risk of consultation capture from over-represented categories and provide a reality check on the major water risks and costs.

For the moment, there is neither earmarking nor conditionalities from the ANA on how Progestão funds are spent, but voluntary action can be taken to dispel suspicions and show good will for transparency.

- Regular and voluntary updates and information sharing from state water agencies on how funds are spent (or intended to be spent) would be an important step to keep everybody on board (especially river basin committees) and strengthen transparency in the process.
- An *ad hoc* technical chamber could be created in state water resources councils for this purpose. There should be a distinction between the technical monitoring of the transactional part of the contract related to infrastructure building and the monitoring of the relational part of the contract concerning capacity building, which also has to be evaluated regularly.

Transparency is also an important lever to increase the willingness to pay from water users. As the implementation of the Pact is taking place, state authorities have further opportunities to disclose greater information to stakeholders in order to raise awareness on water costs and risks, and trigger behavioural change towards more sustainable practices. Understanding who pays for what and how the ultimate sources of revenues are allocated across priorities is not an easy task at present. While it is clear that sanitation companies are usually in a position to contribute to water financing, such as in Rio de Janeiro, farmers pay less (as in many countries). Greater transparency on water charges and related decision making could allow small users to group together (e.g. as users for raw water) in order to better voice their concerns. It is, however, important to note that remarkable progress has been made to shed greater light on the use of water charges across basins, which is often reported back to state water resources councils.

The flip side of the call for greater decentralisation, especially in pilot cases, is the absolute guarantee of transparency. Progestão funds can be a challenge for those states with limited funding dedicated to water, and where it will take time to build a robust local expertise and effective decentralised system. Meanwhile, priorities have to be clearly established in using the funds, especially in the absence of monitoring and earmarking. A

clear indication of actions foreseen with Progestão funds can increase the trust in public authorities.

Use the Pact as a window of opportunity for greater interactions with municipalities

The Pact has potential to foster interactions between levels of governments and stakeholders beyond formal and tick-the-box approaches on targets' certification. Workshops held to discuss progress in achieving the Pact's objectives should provide opportunities for further interactions on ways forward between public, private and non-profit actors at state level. It would be advisable to use these events as a one-stop shop for broader dialogue and awareness raising. To that effect, representatives from the state councils should not only take part in the presentation of the reports for certification purposes, but also interact with the state agencies throughout the year to follow-up on the implementation of river basin plans. This would strengthen communication and information exchange on the progress of the Pact and foster a more systemic vision that could feed a robust state water policy.

A greater interaction with municipalities, and better co-ordination between water and urban policies, are needed to ensure an integrated water approach at the relevant scale. Municipalities are largely absent from deliberative and consultative bodies (especially in large cities), while their responsibilities in environmental licensing, solid waste management, spatial planning and sanitation have huge impacts on water management. During the 2012 elections in Rio de Janeiro, for example, only 1 out of 12 mayoral candidates was aware of the dynamics of federal and state water plans.

- The reluctance of municipalities partly stems from their limited awareness of water risks and trends and the impact on their activity. A clear indication of the cost of inaction could certainly contribute to greater interest at municipal level. Also, the fact that sanitation does not have a "national agency" that can dialogue with its peers may be a challenge.
- Raising municipalities' awareness through educational programmes is important but not sufficient. The commitment and engagement of political leaders (mayors) is critical to the success of the Pact in empowering states to the benefit of all stakeholders.
- Governor-mayor roundtables across states of a same typology could trigger political will and leadership. Similarly, fora on the environment gathering state and city hall officials could foster dialogue at the technical level.
- But for municipalities to fully engage, clarity on the goals and expected use of their inputs in guiding state decision making is needed to avoid "consultation fatigue" and the general feeling of wasting time in useless meetings.
- A similar type of "contract" between states and municipalities could be featured in the next generation of Progestão to build trust between state and local authorities and to set-up needed incentives towards integrated management within the state water resources system.

Support result-oriented and inclusive stakeholder engagement for stronger basin-level accountability

The Pact provides opportunities to push for action-oriented engagement towards the achievement of specific targets. The two-way dialogue between the federal and state level throughout the implementation should also provide room for river basin committees to contribute effectively. Achieving the Pact's objective is a shared responsibility. The Pact should be an "eye opener" on state and basins' governance gaps. Making it happen implies identifying some "champions" who can convince their peers to embark fully on the collective undertaking.

It is important to clarify the roles and contributions of river basin committees to decision making and implementation. A trade-off is needed between deliberative and consultative functions, and a distinction is equally important between governance and governability. Understanding who is responsible for what, and who is accountable for implementing decisions, is critical to the credibility of these institutions and to convince "unheard voices" or "missing stakeholders" to join. Another important trade-off is between proactive (visionary, forward-looking, strategic setting) and reactive (solving existing problems) duties.

Decentralisation can only result in democratisation when mechanisms for decision making are accountable and legitimate. At present, water-related decision making shows gaps in terms of stakeholder engagement. The biggest users with vested interest in critical areas such as water allocation (e.g. energy, agriculture) tend to overshadow unheard voices, leading to a consultation capture.

Create opportunities for experience sharing across states and basins to learn from each other

The Pact relies very much on a bilateral process between the ANA and each of the signatory states. This is the case from the signing of the contract to the monitoring of targets and disbursement of funding. The Pact has the potential to develop a strategy for sharing success stories and similar challenges across states of a same typology, and beyond. This is still more important in states that consider themselves far away from the centres of decision when compared to the north-eastern centre of gravity of Brazil.

Greater information sharing and dialogue across states on the Pact's results, progress and challenges should be incentivised to learn from success stories and draw lessons from failure or slow progress. The mobilisation of stakeholders involved in the Pact throughout the country creates a natural forum for this collective learning process. Sharing experience throughout the implementation stage can be a powerful means to foster peer-to-peer dialogue within each typology (A, B, C, D) of states facing similar challenges, complexity and structure. There are different (non-exclusive) options for doing it.

- A number of existing fora could feature regular updates and discussions on the progress of the implementation of the Pact. This is the case of the annual meeting of state water agencies or the annual gathering of river basin committees. These platforms are instrumental in fostering convergence between federal and state water resources management. Smaller group discussions (clustered around the management typologies and target framework for instance) could be held back to back to such meetings to dig deeper on specific challenges.

- At the political level, it is equally important that state governments have opportunities to share views, ideas and ways forward throughout the Pact's implementation. The outcomes of such meetings could be made public and reported back to the broader range of stakeholders to keep the momentum up and pave the way for state-to-state support and co-operation in achieving some targets or defining some priorities. Such platforms of dialogue can be particularly relevant in shared basins to ensure riparian states go in the same direction for positive spill-overs on interstate river management.
- The Pact between the ANA and states also has potential for inspiring other forms of "contracts" across levels of government (e.g. with river basin committees, municipalities). Exchanges between peers throughout the Pact's implementation could provide lessons and incentives to replicate the experience at other levels. In France for example, "river contracts" are signed between municipalities, river basin organisations and public authorities for planning purposes and to restore water uses and functions through dialogues between partners. The state of São Paulo started in 2009, as part of the Istanbul Water Consensus, a pioneering experience in promoting a Water Management Pact with 598 municipalities to rehabilitate and conserve water quality in the state's rivers.

Experience sharing certainly entails logistical and financial costs in the short term, but expected benefits from the peer-to-peer dialogue are worth it. The ANA should further promote this form of interstate co-operation, which may also be of interest to other federal ministries and agencies with prerogatives over water-related issues. Two concrete steps can be taken:

- establish dialogue platforms between state, basin and municipal levels, for regular updates on the implementation progress, to discuss the allocation of Progestão funds with relevant stakeholders
- set-up a dialogue platform between states in shared basins for the same purpose, and encourage reporting mechanisms.

Currently, the ANA is promoting experience sharing through meetings and workshops within each of the signatory states. River basin committees and management bodies already have opportunities to meet their peers in their respective national networks and fora. A similar platform gathering all state councils at the national level could also contribute to enhance capacity building of state authorities.

Set mechanisms to foster continuity and reap the full benefits after the first five years of the Pact

Electoral cycles frequently imply radical change in the top management of state administration, regardless of the level of competence and commitment. However, there should be mechanisms in place to ensure that electoral cycles do not affect the Pact's results; the achievement of established goals and commitments undertaken through the Pact should go beyond the term of office of the governor who signed it. Efforts should be made to ensure that newly elected governors continue to support implementation of the Pact, striking a balance between old commitments and new orientations, which stem from the legitimacy and the political autonomy of new governors.

- A technical chamber overseeing Pact implementation could be created within each state water resources council. This would help enhance the credibility and the neutrality of the state bodies. The chamber should oversee implementation but

also the use of funds and resources. This would support continuity of the results obtained with the Pact beyond five years, contribute to stabilising water policies at the state level, and provide room for updating, when relevant, the long-term vision.

- Incentives such as multi-annual budgeting and investment plans can enhance longer term water planning and financing. Several goals and targets in the Pact require further funding than Progestão. The commitment behind these targets provides a solid guarantee that concrete actions will be taken and could be used as *ex ante* or *ex post* conditionalities for the ANA and federal agencies/ministries to grant funding over a period that matches the Pact's timeframe.

The Pact allows for the revision of targets, expectations and solutions at any time to adjust to changing circumstances; however, this is not sufficient to solve the magnitude of the challenge at the state level. The flexibility of the Pact is a powerful means to keep some room for manoeuvre in case of new arising needs.

However, it is advisable to think of what may happen after the five-year time frame to ensure that achievements are maintained and benefits fully reaped. It is important to engage in discussions on next steps before the contract ends, and to carry out an inclusive and bottom-up consultation on the way forward based on lessons learnt. This type of undertaking may help to maintain progress on current targets, motivate and keep all stakeholders engaged, and foster long-term vision and continuity.

The related condition is to set standardised and transparent procedures for hiring quality and competent water professionals in state administrations, and put in place sufficient incentives for them to stay (salaries, training, working conditions, etc.). This could undoubtedly help foster a "continuity" mind-set, fuelled by a strategic vision, leadership, high expertise and knowledge at the technical level.

Synthesis of recommendations

Each state adhering to the Pact shows different challenges and capacities in terms of human and financial resources, management instruments and institutional framework. The adoption of water management instruments must be adapted to match the ANA's methodology, which groups states into different classes (Table 3.3). This implies a method that accounts for differences in the level of complexity of water governance among states, which can be monitored by a set of dedicated indicators.

Learning from international experience on monitoring and enforcement

EU Water Framework Directive

Water governance in Brazil is similar yet different to the EU system. In Brazil, an instrument like the Pact is based on voluntary participation, political negotiation and the recognition by the states that it is necessary to make steps forward to face water problems, coupled with some financial incentives. The EU also has a large diversity in terms of hydrological, climatic and environmental conditions; pressures on water resources; economic development; and technical and financial capacities. Nevertheless, all countries are required to implement the Water Framework Directive (WFD) and to define and implement measures that will allow them to satisfy the requirements for water quality laid down in the Directive, which is binding and strictly enforced through reward and sanction mechanisms (from the European Court of Justice) following the logic of the "stick" and the "carrot".

Table 3.3. **Policy recommendations by typology, a tentative framework**

	A	B	C	D
Strengthen vertical co-ordination	Between state and federal authorities → More tailored support and guidance by the ANA (i.e. to create new institutions)		Between state authorities → Greater dialogue between state water resources councils and agencies on on-going activities and programmes and implementation actions required from river basin plans	Within the state, especially with municipalities in large centres → Multipartite contracts to share capacity and funding for convergent objectives (e.g. sewage collection and treatment)
Foster stakeholder engagement	To build trust → Promotion of the "institution-building" process capacity development of civil society	To build trust and take account of unheard voices → Promotion of common objectives to be achieved, by balancing voices from big and small users with different interests in water	To raise awareness and share progress on the Pact's results → Workshops between public, private and non-profit actors at state level	To build consensus and foster greater accountability → Promote a transparent dialogue on allocation of water charges and Progestão funds
Information sharing and bench learning	Within the state → Promotion of platforms for dialogue	Across states of the same typology → Promotion of interstate co-operation by the ANA	Within the state and with similar states → Dissemination campaign to showcase and scale up concrete results of the Pact	Systematic information sharing on the Pact's progress, financing and challenges at state level → Website bringing together the information from workshops, state water resources council meetings, etc.
Transparency and accountability	A clear statement and consensus-building concerning the use of funds to enhance trust → Making information publicly available	Clear prioritisation on how to use the funds → Set up a clear objectives grid and use financial assessment methods	Voluntary actions to show good will for transparency in the use of funds → Regular and voluntary updates and information sharing	Stakeholder engagement in the discussions related to how to efficiently use funds → Promotion of the Pact as a "public commitment" tool, without incurring in political capture from strong stakeholders
Continuity and synergies	Building of a robust local expertise for the expected increasing complexity of the management and institutional system → Setting up standardised and transparent procedures for hiring water professionals	Fostering synergies with other funding and capacity programmes →Investigation of on-going programmes and available funds to create synergies between hard and soft capacities	Exploring follow-up to the Pact to secure continuity and capacity → Inclusive and bottom-up consultation on the ways forward based on lessons learnt from implementation	Supporting continuity of state public policy for sustainable water management → Creating incentives to motivate all stakeholders to remain on board → Territorial approach to manage water (integrated planning with industrialisation, etc.)

Both Brazil and the EU follow the subsidiarity principle and are therefore responsible for choosing their institutions based on their specificities. This approach, which has significantly shaped the Pact, is the same for the WFD, whereby EU member countries decide how they organise themselves to achieve the required targets. However, the main difference with the Pact is that the European Commission closely monitors the results, and if they are not satisfactory, heavy sanctions may be imposed on member countries (Box 3.4).

Box 3.4. **Compliance and performance assessment methodology of the EU Water Framework Directive**

The EU's Water Framework Directive (WFD) sets a legal framework for the establishment of plans and programmes for attaining "good status" of all surface and groundwater in the EU within a timetable defined in the Directive. The Directive is based on attaining good ecological status for all aquatic ecosystems by 2015. It contributes to ensuring a provision of a sufficient supply of good quality surface water and groundwater as needed for sustainable, balanced and equitable water use. In doing so it allows for multiple uses of all or most water bodies, e.g. for drinking water supply, nature protection purposes, energy production, industrial use, fluvial navigation, agricultural use, etc.

To that effect, it includes a number of requisites to be reached in a consistent time frame up to 2015:

- 2003: identification of river basin districts and authorities
- 2004: characterisation of river basin: pressures, impacts and economic analysis
- 2006: establishment of monitoring network and public consultation (river basin management plans must be submitted to public consultation for at least six months so to encourage participation by all stakeholders in the implementation)
- 2009: river basin management plan including programme of measures (the plan shall be revised in 2015, and then every six years thereafter)
- 2010: introduction of pricing policies to provide adequate incentives for users to use water resources efficiently and that the various economic sectors contribute to recovery of the costs of water services, including those relating to the environment and resources
- 2012: make operational programmes of measures
- 2015: meet environmental objectives (protect, enhance and restore the status of all bodies of groundwater; prevent the pollution and deterioration of groundwater; ensure a balance between groundwater abstraction and replenishment; and preserve protected areas).

The WFD classification scheme for surface water ecological status includes five categories: high, good, moderate, poor and bad. "High status" means very low human pressure; "good status" means a "slight" deviation from this condition; "moderate status" means "moderate" deviation; and so on. Its ultimate objective is to achieve "good status" for all EU waters (inland surface, transitional and coastal waters, as well as groundwater) by 2015. Member countries are required to designate a competent authority for the application of the rules provided for in this framework Directive within each river basin district.

For the purpose of compliance checking, measuring progress in the implementation and for communicating the results, the European Commission developed the first implementation report about the WFD in 2007 at a point in time before the main deliverable – river basin management plans by the end of 2009 – in first cycle of implementation would be available. The assessment methodology consisted of several steps:

- Screening assessment is based on a checklist of key issues, such as the designation of river basin districts, the identification of competent authorities, the national administrative set and co-ordination, international co-ordination (where relevant) and the data submission.
- In-depth assessment in order to determine whether there were cases of "non-compliance", the Commission carried out an in-depth assessment in cases where the screening assessments indicated more serious shortcomings.

Box 3.4. **Compliance and performance assessment methodology of the EU Water Framework Directive** (*cont.*)

- Performance indicators were based on a simple scoring system in which a number of points were attributed for each question. Questions were grouped for the above-mentioned key issues (e.g. designation of river basin district; competent authorities, administrative set-up and co-ordination; international co-operation, data submission). The assessment was therefore designed as a "distance to target" assessment, taking into account the deliverables delivered, their timeliness and their quality. Progress was measured on a one-dimensional scale between 0 and 100 to identify those member countries which presented a better report and could therefore be used as an example for others, as well as the "distance to target" for those member countries scoring lower.

Within the reporting and compliance approach, the Water Information System for Europe (WISE) is an important tool to provide up-to-date information to the EU institutions, feedback to the member countries and transparency of the implementation process to the European citizens. This partnership between the European Commission (DG Environment, Joint Research Centre and Eurostat) and the European Environment Agency, known as "the Group of Four" (Go4), was launched for public use in 2007, providing a web-portal entry to water-related information ranging from inland waters to marine, grouped into the following sections:

- EU water policies (directives, implementation reports and supporting activities)
- data and themes (reported datasets, interactive maps, statistics, indicators)
- modelling
- projects and research (inventory for links to recently completed and ongoing water projects and research).

Since 2007 member countries have adopted river basin management plans required by the end of 2009. A further assessment of implementation of the Directive took place in 2012 based on these plans as adopted and published by member countries and data reported in the WISE IT-information system. By its very nature, this assessment was a compliance assessment and therefore different from the assessment carried out in 2007: it was no longer an assessment of readiness to comply with the main delivery deadline of the Directive, but rather an assessment of the quality of countries' compliance with the Directive, including the extent to which they were projecting to be able to comply with a water quality objective for 2015. This was measured in terms of member countries' compliance with more than 20 individual requirements of the Directive (e.g. spanning governance, legal issues, designations, monitoring, technical and economic assessments, application of assessment methodologies, correct legal transposition, application of measures, integration with flood risk management and climate adaptation).

This assessment has given a very accurate picture of progress in applying the requirements and the extent to which the main water quality target of the Directive for 2015 will be met. The results of this assessment were published in the "European overview", as well as an annex for each member country. Further improvements in the reporting regime are under preparation for the next river basin management plans due at the end of 2015, particularly with a view to improve the ability to establish links between application measures and their ability to ensure delivery on the main water quality targets of the Directive.

Sources: Directive 2000/60/EC of the European Parliament and the of the Council of 23 October 2000; Commission of the European Communities (2007), "Towards sustainable water management in the European Union: First stage in the implementation of the Water Framework Directive 2000/60/EC", COM (2007) 128 final, Brussels; European Commission (2012a), "Report from the Commission to the European Parliament and the Council on the implementation of the Water Framework Directive (2000/60/EC) river basin management plans", COM (2012) 670 final, Brussels; European Commission (2012b), "European overview", Commission staff working document, SWD (2012) 379 final, Brussels; and inputs provided by Peter Gammeltoft, peer reviewer, former Head of Unit for Water at European Commission, Directorate General for the Environment.

Hence, the Pact and the EU WFD both set targets to be achieved, and let parties or member countries decide on how they organise themselves to achieve them. While the former is a law, which is by definition binding, the latter is a voluntary agreement that does not foresee any explicit or implicit sanctions or reward beyond the terms of the contract. The WFD established a number of objectives and requires member countries to produce several documents as part of the evaluation framework. These include an analysis of the characteristics of each river basin district; a review of the impact of human activity on water; an economic analysis of water use; a register of areas requiring special protection; a survey of water bodies used for human consumption and production. Producing such evidence-based documents is instrumental to monitor progress in the WFD implementation and could provide some inspiration to the Pact's reporting and monitoring framework (Box 3.4).

Australia's National Water Initiative

Australia's National Water Initiative (NWI) is an intergovernmental agreement whereby commitments to reach targets related to the efficient and sustainable management of water are made across levels of government, and closely monitored. This agreement has been fostering concrete, consistent and, where appropriate, co-operative actions (close to those foreseen in the Pact) such as: preparing water plans, dealing with overallocated or stressed water systems, introducing registers of water rights and standards for water accounting, improving pricing for water storage and delivery.

The monitoring of results under the NWI can provide inspiration to the ANA's Pact implementation assessment. The National Water Commission advises the Council of Australian Governments (COAG) on progress through biennial assessments, published in reports publicly released in 2007, 2009 and 2011. The last one included the development of 28 performance indicators by the Natural Resource Management Ministerial Council (NRMMC) to review the extent to which the NWI had built strong and effective water governance; improved the efficiency and productivity of Australian water use; improved the sustainability of water management; and impacted regional, rural and urban communities. The last report was released in 2014, and future assessments will take place on a triennial basis (Box 3.5).

A tentative scoreboard with indicators to track implementation

While monitoring the performance and assessing results are straightforward for a number of water-related dimensions (i.e. quality, quantity, provision of service, etc.), they are more challenging for water governance. Nevertheless there are several examples of water governance assessment, which rely on indicators on specific dimensions (Table 3.4).

Box 3.5. **Performance indicators of Australia's National Water Initiative**

A system of 28 performance indicators was developed in 2011 by the Natural Resource Management Ministerial Council of Australia to assess *ex post* the impact of the National Water Initiative (NWI). Such indicators aim to assess the NWI impact against its ten initial objectives (e.g. strong and effective water governance; improved efficiency and productivity of water use; improved sustainability of water management, benefits to regional, rural and urban communities; etc.).

1. Clear and nationally compatible characteristics for secure water access entitlements
   - 1.1. The number of decisions by governments that revoke or change the security of statutory water access entitlements and the reasons for these decisions
2. Transparent, statutory-based water planning
   - 2.1 The proportion of surface water systems and proportion of diversions [of inflow and storage volume]
   - 2.2 The proportion of groundwater systems and proportion of groundwater extraction [of aquifer recharge and storage volume]
3. Statutory provision for environmental and other public benefit outcomes, and improved environmental management practices
   - 3.1 Proportion of water use for consumptive and non-consumptive purposes
   - 3.2 Extent to which actions have been implemented to achieve environmental and other public benefit outcomes defined in water planning frameworks
   - 3.3 Improved resource condition outcomes
   - 3.4 Number and proportion of water systems for which:
     - high conservation value aquatic ecosystems have been identified
     - water plans or other instruments addressing high conservation value components have been completed
     - actions consistent with the plan have been undertaken
   - 3.5 Environmental compliance by urban water service providers
4. Complete the return of all currently overallocated or overused systems to environmentally sustainable levels of extraction
   - 4.1 The number and proportion of water systems for which a water plan has been completed that:
     - have not been assessed for overallocation
     - have been assessed for overallocation and are determined not to be overallocated
     - are assessed as being overallocated (and the level of overallocation) with a pathway in place to address the overallocation

   4.2 The number and proportion of water systems for which a water plan has been completed that:
     - have not been assessed for overuse
     - have been assessed for overuse and are determined not to be overused

Box 3.5. **Performance indicators of Australia's National Water Initiative** (*cont.*)

- ❖ are assessed as being overused (and the level of overuse) with a pathway in place to address the overuse
- ❖ are assessed as being overused (and the level of overuse) with no pathway in place to address the overuse

5. Progressive removal of barriers to trade in water and meeting other requirements to facilitate the broadening and deepening of the water market, with an open trading market in place
   - 5.1 Per cent (by volume and number) of entitlements/allocations traded permanently/temporarily or leased
   - 5.2 Water trade approval times
   - 5.3 Number and proportion of applications rejected by state and territory approval authorities, by reason for rejection
   - 5.4 Cost of doing a trade of a water entitlement, including permanent and temporary trade
6. Clarity around the assignment of risk arising from future changes in the availability of water for the consumptive pool
   - 6.1 Application of risk management framework in jurisdictions and regular public reporting to aid risk management
7. Water accounting which is manageable to meet the information needs of different water systems in respect to planning, monitoring, trading, environmental management and on-farm management
   - 7.1 Percentage of total water and proportion of water systems accounted for, audited and reconciled in accordance with the agreed accounting system standards
8. Policy settings which facilitate water use efficiency and innovation in urban and rural areas
   - 8.1 Rate of use of more efficient irrigation systems
   - 8.2 Gross value of irrigated agricultural production (GVIAP) per megalitre of water, by state or territory
   - 8.3 Water application rates for irrigated agriculture
   - 8.4 Household water use per annum
   - 8.5 Percentage of water supplied to users, by source
   - 8.6 Percentage of water losses in distribution systems
   - 8.7 Consistency of pricing arrangements – lower bound
   - 8.8 Consistency of pricing arrangements – upper bound: rate of return being generated on asset base for rural providers/rate of return being generated on asset base for urban providers
   - 8.9 Operating costs per megalitre of water delivered
9. Addressing future adjustment issues that may impact on water users and communities

Box 3.5. **Performance indicators of Australia's National Water Initiative** (*cont.*)

- 9.1 Future adjustment issues that may impact on water users and communities

10. Recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource

- 10.1 Proportion and spatial areas of water plans:
  - with no assessment of connectivity between surface water and groundwater systems
  - that are assessed and have no connectivity between surface water and groundwater systems
  - that identify interconnected surface water and groundwater systems but do not have integrated management
  - that have integrated management for interconnected surface water and groundwater systems.

Source: National Water Commission (n.d.), "Appendix A: NRMMC performance indicator report 2011", *The National Water Initiative: Securing Australia's Water Future: 2011 Assessment*, available at: www.nwc.gov.au/__data/assets/pdf_file/0017/8252/2011-BiennialAssessment-AppendixA.pdf.

Table 3.4. **Examples of water governance indicators**

Indicators	Variables
Water Management Transparency Index Transparency International Spain (2013) *The index assesses the extent to which a water agency makes relevant information available on the website*	– Information about the river basin authority – Relationships with the public and stakeholders – Transparency in the planning process – Transparency on water use and management – Economic and financial transparency – Transparency in contracts and tenders

UNEP, Integrated Approaches to Water Resources Management for Rio+20 (UNEP, 2012)
The report is to be used as the basis for informed decision making by the United Nations Commission on Sustainable Development and national governments. It includes lessons learnt and recommendations, as well as focus areas for action
	– Policy, strategic planning and legal framework
	  – Enabling environment for the development, management and use of water resources (national, federal instruments, agreements)
	– Governance and institutional frameworks
	  – Governance systems for the development, management and use of water resources (institutional framework, stakeholder participation, capacity building)
	– Management instruments
	  – Management instruments for the development, management and use of water resources (programmes, monitoring and information, knowledge sharing, financing of water resource management)
	– Infrastructure development and financing
	  – Infrastructure for the development, management and use of water resources (investment plans and programmes, mobilising financing for water resources infrastructure)
	– Sources of financing
	– Outcomes and impacts: improved water resource management
	– Priority challenges
	– Indicator water resources governance:
	  – Progress towards planning and implementing integrated water resources management – national scale and sub-national scale

Table 3.4. **Examples of water governance indicators** (*cont.*)

Indicators	Variables
Asia Water Governance Index (Araral and Yu, 2010) *Using 20 governance indicators representing "best practices" in water governance, the index compares water governance in Asia, in terms of water laws, policies and administration*	– Legal dimension: – Legal distinction of different water sources – Format of surface water rights – Legal accountability of water sector officials – Centralisation/decentralisation tendency within water law – Legal scope for private and user participation – Legal framework for integrated treatment of water sources – Policy dimension: – Project selection criteria – Finance available for water investments – Pricing policy – Linkage between water law and water policy – Linkages with other policies – Attention to poverty and water – Private sector participation – User participation – Administrative dimension : – Existence of independent water pricing policy – Organisational basis – Functional capacity and balance – Accountability and regulatory mechanisms – Validity of water data for planning – Science and technology application
Performance Indicators for African Basin Organizations (INBO, 2010) *Self-evaluation of organisations on their operation and achievement of their missions*	– 20 indicators on the governance and operation of organisations in charge of the implementation of integrated water management in transboundary basins – 15 indicators on the river basin, describing its condition, pressures and responses
Towards the development of IWRM implementation indicators in South Africa(Braid S. et al.,Water Research Commission, 2010) *Indicators for assessing how IWRM will impact on the lives of women and the poor*	– Transparency: – Information freely accessible (reports and documents available in local libraries, Internet and/or easily obtainable from the Directorate for Water Affairs, institutions, organisations or consultants) – Information accessible (reports and documents available in applicable languages, non-technical, etc.) – Voice: – Opportunities for the public to express their views (existence of civil society organisations [WUA, CF, farmers unions, etc.], meetings being held and attended) – Accessibility of opportunities (specific efforts made such as transport to/from meetings, location of meetings, timing of meetings, etc.) – Opportunities for women to express their views (meaningful opportunities and contributions by women at civil society organisations [WUA, CF, farmers unions, etc.], meetings – Opportunities for the poor to express their views (meaningful opportunities and contributions by poor at civil society organisations [WUA, CF, farmers unions, etc.), meetings – Authority: – Equal distribution of knowledge, insights and confidence amongst all stakeholders (stakeholders adequately capacitated to express their views and opinions) – Equal distribution of knowledge, insights and confidence amongst women (women stakeholders adequately capacitated to express their views and opinions) – Equal distribution of knowledge, insights and confidence amongst the poor (poor adequately capacitated to express their views and opinions) – Accountability: – Promotion and awareness of rules and regulations (rules and regulations promoted, interpreted and highlighted) – Enforcement of rules and regulations (active and visible enforcement of rules and regulations) – Agency: – Power to influence decision (examples of where stakeholders have managed to get a decision changed) – Commitment: – On-going engagement (opportunity after formal public participation process to provide input, comment, raise concerns and awareness raising)

Table 3.4. **Examples of water governance indicators** (*cont.*)

Indicators	Variables
Cap-Net, UNDP, Indicators: Implementing integrated water resources management at river basin level, (2008) *Cap-Net assists river basin organisations (RBOs) in their development as effective managers of water. A minimum Indicator Set for Water Resources Management is developed*	– Monitoring: – Proportion of water allocation permit holders complying with permit conditions – Proportion of water pollution permit holders complying with permit conditions – Number of water resource monitoring stations producing reliable data – Total water storage capacity – Per cent of groundwater monitoring stations with declining water levels – Basin planning: – Water management activities driven by basin plan – Stakeholder priorities reflected in the basin plan – Economic and financial management: – Charges and fees for water allocation favour the poor and efficient water use – Pollution charges give incentive to reduce pollution – Information management: – Database is established in formats compatible with other river basin organisations – Water management information is available to managers and other stakeholders as required – Stakeholder participation: – Number of meetings of government agencies with water interests to consult and collaborate on water management – Formal stakeholder structures established with clear roles and responsibilities in water resources management – Basin stakeholders (male and female) represented in decision-making bodies at all levels
System of indicators for assessing the performance of river basin organisations (Hooper, 2006) [Key Performance Indicators of River Basin Organizations." technical note US Army Corps of Engineers] *115 Indicators assessing the performance of river basin organisationsgrouped in 10 categories.*	– Co-ordinated decision making – Responsive decision making – Goals, goal shift and goal completion – Financial sustainability – Organisational design – Role of law – Training and capacity building – Information and research – Accountability and monitoring – Governments and citizens
RBO performance benchmarking (NARBO, 2005) *Uses a balanced scorecard to assess the organisation, including self-assessment of performance moderated by peer reviewers. The benchmarking system includes 14 performance indicators that reflect common processes in core business areas considered essential for effective basin management within the IWRM framework*	Five critical performance areas: – Mission – Stakeholders – Learning and growth – Internal business processes – Financing

Sources: OECD (2014c), "OECD Water Governance Indicators", scoping note presented at the OECD Water Governance Initiative, 3rd meeting, Madrid, 28-29 April; and OECD (2015), "Inventory of Water Governance Indicators and Measurement frameworks", OECD, Paris, http://www.oecd.org/gov/regional-policy/Inventory_Indicators.pdf.

Measuring water governance is critical when accounting for the achievement of the targets within the Pact. Indicators help to identify needs, support capacity building, determine whether or not additional funds are needed, and assess whether the contract should be renewed and rewards or sanctions should be set. If well defined, indicators can be useful in informing future actions. The implementation of a performance indicator system is an iterative process and requires competency and reasonable administrative costs (OECD 2009). A number of features also ought to be considered:

- Participatory design: To keep the spirit of co-operative approach, the ANA should identify simple metrics in agreement with the states that can track the successful implementation of the Pact. This will allow consensus building across states and make the exercise a transparent one rather than a top-down inspection.
- Streamlining procedures: The provision of data should be clear and simple. It would be to favour the electronic submission of information, to provide guidelines and to maximise information sharing within and between levels of government to reduce redundant requests for information.
- Capacity support: Resources should be set aside to provide technical support and learning opportunities for stakeholders to produce the information requested throughout the process.
- Linking indicators and actors' realm of influence: Understanding which target produces which types of outputs and outcomes is important. Greater accountability can be established where more is known about the causal relationships between inputs, activities, outputs and outcomes.

Notes

1. Class A: Occasional and scattered uses/absence of conflicts; class B: conflicts for water use in some areas (critical areas); class C: water use conflicts with greater intensity and scope; class D: conflicts of greater complexity.
2. Certain conditions of success establish the minimum requirement for defeating the challenges in each class. In terms of the institutional structures, classes A and B require setting up a secretariat and state water council, with the establishment of river basin committees in some critical areas, while class C requires a specific state water organisation with basin committees (or basin organisations) in most critical areas and class D (in addition to all these) must implement a water charge and may create an executive agency at the state level.
3. At present, some states indeed face issues related to the use of water for producing energy from sugar cane and soy production for ethanol, hydropower to expand electricity generation, etc., but do not use royalties to finance related actions.

Annex 3.A1. Case study: Paraíba

Key facts and features

Box 3.A1.1. **Key data for the state of Paraíba**

- Paraíba is a small state located in the Northeast region of Brazil. There are 223 municipalities. The capital is João Pessoa. It seats in the hydrographic region of Eastern Northeast Atlantic. The state counts 11 watersheds, including 5 in the federal domain.
- Population: 3.9 million inhabitants (2013), of which 75.37% in urban areas and 24.63% in scattered rural communities located mainly, but not only, in the semi-arid areas.
- Paraíba is the north-eastern state with the highest variability of rainfall. Cabaceiras (the driest municipality in the country) has an average annual rainfall about 300 mm, while Joao Pessoa exceeds 1 700 mm.
- The main economic activities are agriculture (sugar cane, pineapple, cassava, maize, beans), industry (food, textile, sugar and alcohol), livestock and tourism (the state was named best domestic destination of the year in 2013).
- The Water and Sewerage Company of Paraíba (Companhia de Água e Esgotos da Paraíba, CAGEPA) provides water supply service in 79% of municipalities (181 cities), 73% of which have sewage collection, but only 20% wastewater treatment (IBGE, 2011; ANA, 2010).

Paraíba suffers from severe droughts and intense conflicts over water use with important social and economic consequences. This state, which is mostly located in the semi-arid area of north-eastern Brazil also called "Polygon of Droughts" (one of the hottest semi-arid regions in the world) ranks among the poorest states of the country in terms of gross domestic product (GDP). Since the 1970s, the frequency of droughts has dramatically increased from a drought event every four or six years to a drought event every two years. This trend culminated in 2012 when the Governor declared a state of emergency for drought in 170 municipalities (76% of the total number of cities in the state). In addition to vulnerable natural and climate conditions, the state suffers from severe pressures from the main uses of water (irrigation and urban supply), deficits in both sewage collection and treatment, the lack of an integrated water resources management, and the lengthy process of implementing effective operational and institutional water instruments.

Legal and institutional framework

Rationale

Water has long been a priority in the state's policy making. Paraíba's first state Water Law was adopted in 1996, one year before the National Water Law. The state Law No. 6.308/1996 provided the framework to tackle the adverse effects of pollution, drought and silting. The law established the Integrated System for Water Resources Planning and Management aiming to formulate, update and implement the State Water Resources Plan. It considered the watershed as the basic physical-territorial planning unit for proper management of water resources. The law also promoted a participatory and integrated approach conceiving water as a right (whose use should be guaranteed), an economic

good (whose use should be billed) and a limited resource (whose use should take into account the development and preservation of the environment).

Main players and instruments

Paraíba has developed a sound institutional structure for managing water at state level although it is not fully consolidated yet. The state system is composed of the State Water Resources Council (Conselhos Estaduais de Recursos Hídricos, CERH), as a deliberative body; the State Secretariat of Water Resources, Environment, and Science and Technology (Secretaria de Estado de Recursos Hídricos, Meio Ambiente e da Ciência e Tecnologia, SERHMACT), as a co-ordination body; the State Executive Water Management Agency (Agência Executiva de Gestão das Águas do Estado da Paraíba, AESA), as a management body; and river basin committees, as deliberative and participatory bodies (Figure 3.A1.1).

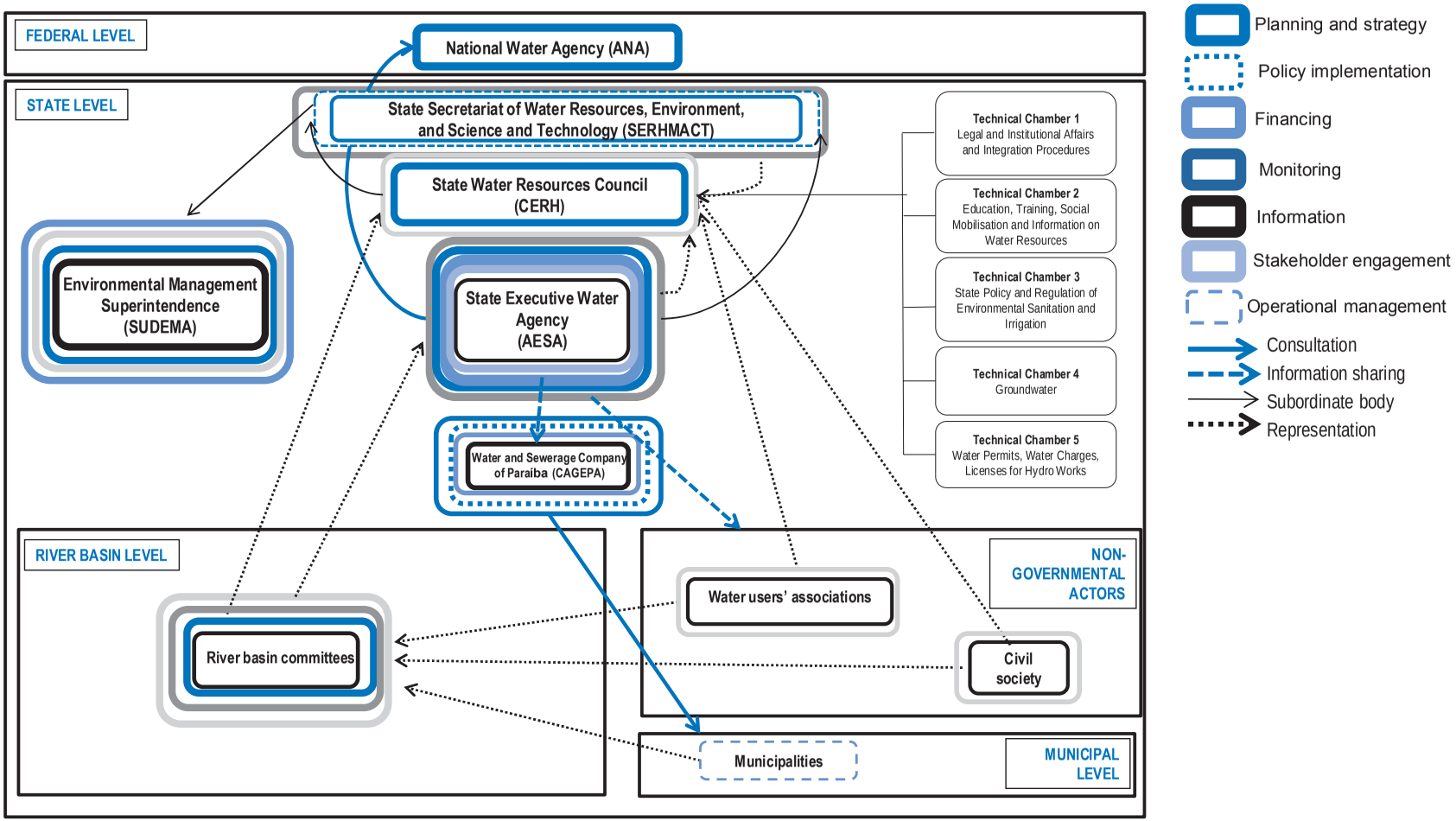
The institutional framework is still in its expansion and consolidation phase, but important steps forward have been made towards integrated water management. Since its creation in 2005, the AESA has embarked on several operations involving hard (infrastructure) and soft measures. Since 2007, the CERH has created five technical chambers to deal specifically with water-related issues. It also approved the interstate river basin committee of Piancó-Piranhas-Açu in 2009 to deal mainly with water scarcity between the states of Paraíba and Rio Grande do Norte.

The AESA's role is paramount in the state water landscape. The AESA is the interlocutor of the ANA and other state authorities for the management of groundwater and surface water, but also for water originating from watersheds located in other states which are transferred to the state of Paraíba, as well as waters under federal dominion occurring in the territory. The AESA developed several institutional, planning, information and operational instruments (Box 3.A1.2) and promoted significant stakeholder engagement in water policy design and implementation. The AESA has been improving its relationship with internal and external actors, in order to reduce conflicts and manage them in a more rational and democratic way.

The CERH is supported by five technical chambers, which meet regularly. It co-ordinates the implementation of the State Policy on Water Resources and promotes the integration among state, federal and municipal agencies and civil society. Eighteen resolutions have been approved since 2003, and four ordinary meetings have been held annually. Technical chambers have specific roles in terms of: 1) legal and institutional affairs and integration procedures; 2) water permits, water charges, licenses for hydro works; 3) groundwater; 4) state policy and regulation of environmental sanitation and irrigation; and 5) education, training, social mobilisation and information on water resources.

The state of Paraíba promoted a constructive dialogue with its neighbour state Rio Grande do Norte, to manage important conflicts over water allocation through joint solutions. This was a good example of the ANA's mediation. The Interstate River Basin, 60% of which covers Paraíba and 40% Rio Grande do Norte, is the only federal committee located entirely in the semi-arid Northeast region. This is an important watershed for the states of Rio Grande do Norte and Paraíba, since it hosts the Armando Ribeiro Gonçalves Dam and the system of reservoirs Curema-Mãe d'Água, both considered strategic for the socio-economic development of the two states. The River Basin Committee of Piranhas-Açu was created in 1997 and replaced by the Piancó-Piranhas-Açu River Basin Committee in 2006, before being eventually approved in 2009. The Interstate Committee Piancó-Piranhas-Açu has its own executive secretariat.

Figure 3.A1.1. **Institutional mapping for water resources management in Paraíba**



Box 3.A1.2. **AESA water management instruments**

Legal, institutional and co-ordination instruments

- Implementation of river basin committees.
- Establishment of water users' associations.
- Educational campaigns on water use.

Planning instruments

- State Water Resources Plan.
- Project design integration of the São Francisco River with the Paraíba and Piranhas River basins (in preparation).
- Plan of flood control and multiple use reservoirs (in preparation).
- Mapping of alluvial aquifers of Paraíba state for purposes of rural supply (human and animal) and agricultural production (completed).

Information system

- Implementation of the information system of water resources.
- Quantitative monitoring of 122 dams.
- Monitoring of climate and weather.
- Water uses registry and infrastructure.

Operational instruments

- Water charges (not yet implemented).
- License deployment for hydropower infrastructure.
- Fiscal instruments for water use.
- Operation and maintenance of reservoirs.
- Charges for bulk water use (raw water) (approved).
- Manual for fiscal tools.

Source: Governo da Paraíba (Government of Paraíba) (n.d.) www.aesa.pb.gov.br/gestao (last accessed 20 May 2015).

The state has a specific fund to provide financial support for the implementation of the State Policy on Water Resources. The State Water Resources Fund (Fundo Estadual de Recursos Hídricos, FERH) was created in 2010 by a state decree and has been managed by the AESA since then. In addition to decentralising water management, it aims to foster the economic feasibility of the implementation of management instruments, the development of actions, programmes and projects of the State Water Resources Plan and river basin plans, as well as the implementation of government programmes to mitigate conflicting uses of water resources. It also finances studies, research, recovery actions, remediation, preservation and inspection of water resources.

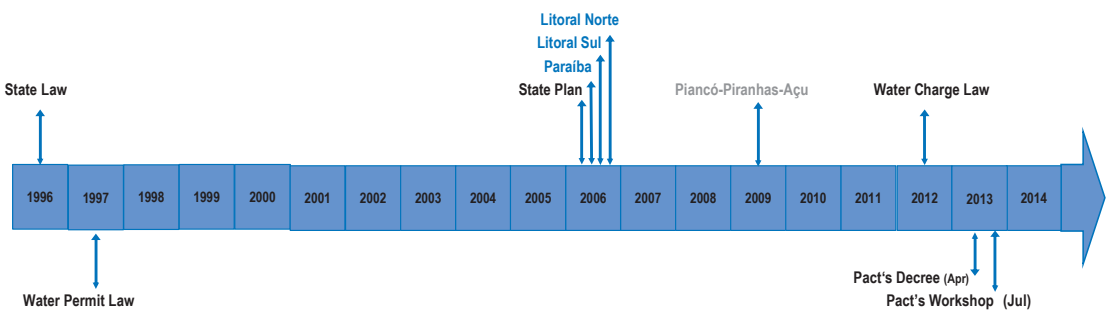
The AESA has been instrumental in boosting progress on decentralisation of state water management, but much remains to be done. The state agency is an advocate of strengthened river basin committees and provides significant support to that effect, such as in the South Coast River Basin Committee, where nine municipalities are represented, including the capital João Pessoa. However, decentralisation has not fully materialised. Most river basin committees are not yet outcome-oriented, nor fully autonomous because of the lack of financial and human resources. River basin committees aim to support a participatory water management, but participation on its own cannot foster decentralisation in the absence of fully implemented river basin plans and water charges.

Multi-level governance gaps

Policy gap

Water instruments and institutions started to become operative one decade after the adoption of the state water law. The State Water Resources Council started to operate in 2003. The State Water Plan was drafted in 2006 and approved in 2012, and is expected to be revised soon with support of the Ministry of the Environment/Secretariat for Water Resources and Urban Environment. Three river basin committees have already been created and cover all river basins in the state. The North Coast Committee, with three contiguous river basins, and the South Coast Committee, with two contiguous river basins. Only one out of five river basin committees under federal domain has been set up (Figure 3.A1.2). These gaps have contributed to conflicts and contradictory goals in the jurisdiction about river basin management, in the absence of dedicated structures and clear allocation of roles and responsibilities. Water charges were approved in 2009, revised in 2011 and regulated by decree in 2012. Thus far, however, they have not been concretely implemented.

Figure 3.A1.2. **Water management timeline**



Note: Interstate river basin committees are shown in grey and river basin committees are shown in blue.

Some institutional devices are missing, and the AESA also acts as the executive secretariat of the river basin committees. The AESA has three decentralised offices (Pato, Souza and Campina Grande) that were created by law in 2007. Many river basin committees cannot afford to create their own water agencies, but at the same time they feel the pressure of being too dependent on the AESA. River basin committees cannot be fully autonomous in taking decisions, as their implementation relies on human and financial resources to be provided by government and the AESA. But the financial implications to enable each river basin committee to set up specific agencies are

significant; sustainable funding has to be secured and well-trained and competent staff recruited, which also has a cost. Not all river basin committees have the potential to collect a sufficient amount of charges. That is why the AESA will probably be the executive secretariat for all state river basin committees, except for the Piancó-Piranhas-Açu that is an interstate basin.

Capacity gap

Paraíba's river basin committees face important water risks and conflicts, but citizens have a rather limited awareness of such risks in what is a predominantly water-scarce state. Water quantity is the primary concern, with tensions between water uses for irrigation and urban supply. Reservoirs are the main water source of the region and the large amount of water allocated to the metropolitan region of João Pessoa creates tension with irrigation use, especially under drought conditions. There are neither sophisticated techniques for irrigation in place nor economic instruments to incentivise rational use of water by farmers. Despite severe water scarcity, this basin has been considered as an alternative to supplement the water supply of the capital João Pessoa, generating conflicts between urban and rural users. In addition, water quality is an issue for Paraíba, especially in the North Coast River Basin. The environmental degradation caused by extractive activities like shrimp farming is worsened by the lack of effective monitoring. There is also a high rate of sediment deposition in major rivers and brickworks in the margins of rivers.

River basin committees have limited capacities to cope with water challenges. Even if they have a voice in arbitrating disputes for water permit decisions, they are not mature and robust enough to take part in such a process. They also face significant challenges to produce reliable, quality and up-to-date data on water availability to guide decision making.

The financial sustainability of the sector is also at stake because of the absence of water charges. Despite the existence of legal frameworks to raise revenues from water users, the political momentum has not yet occurred and recent droughts have created an uncertain climate, which has delayed the feasibility of collecting such revenues. In addition, interactions with the CERH are limited (not all river basin committees fully participate in it), which contribute to a lack of awareness at the watershed level on the magnitude of challenges ahead and policy instruments needed to tackle them. Lastly, the small number of experts and trained staff as water professionals is insufficient to meet demand.

Administrative gap

River basin committees are better prepared to exercise their real role as "parliament of water", but updated plans are needed as well as tools for taking more concrete actions in the basin. There are 11 basins in the state (5 federal basins and 6 state basins). Most river basin plans are outdated and under revision. The Rio Paraíba and Gramame river basins plans were approved by state committees in 2001 (within the Proágua programme), the Mamanguape River Basin had the assessment done and terms of reference prepared for the design of the plan, but has been waiting for funds, while the Piancó-Piranhas-Açu River Basin Plan is in its final phase of development.

In 2003, Resolution No. 140 from the National Water Resources Council addressed a set of parameters for standardising the minimum content of river basin plans. In the case of an interstate river basin committee with strategic importance, the ANA plays a stronger role in the process for developing these plans. Greater integration between state and river

basin plans is needed. At present, state plans provide a strategic view of state and national water management but have limited provisions or consideration for the basin level.

Accountability gap

Unbalanced voices are represented in the committees, where the bigger users are very active while municipalities are quasi-absent. One of the 6 river basin committees of Paraíba has 85 municipalities and 60 members. The committee has retained its members over the last three years, but it still lacks resources for logistical activities, and heavily relies on *ad hoc* and voluntary contributions from members. This lack of capacity has contributed to a lower level of participation. Another example is the North Coast River Basin Committee, which is composed of 26 members, where the strongest voice is that of the sugar cane mills representatives, while municipalities barely take part in the meetings. The South Coast River Basin Committee is composed of 25 members, 16 of which have knowledge in environmental or water resources management. There as well, the participation of municipalities is extremely weak.

Overall, municipalities have shown limited willingness to take part in water consultations and bodies. But they have bilateral relations with the AESA, especially in terms of licensing, with no less than 540 requests for well-drilling submitted between October and December 2014. Municipalities' poor engagement is an issue given their strong influence on the quality of water (drainage, sewage collection and treatment) and the need for integration between water and other sectors, such as solid waste management, which is a great source of water pollution. Solutions such as the creation of waste disposal areas or environmental protection areas (to address soil occupation impacts) are being contemplated, as well as specific legislations.

Support to cities that are not properly equipped in terms of staff and secretariat to take part in water discussions is also needed. The CAGEPA (Water and Sewerage Company of Paraíba) and the National Health Foundation (Fundação Nacional de Saúde, FUNASA) have been greatly supportive of the AESA and other state actors' efforts in better reaching out to local authorities in state water management.

Funding and information gaps

The lack of sustainable sources of revenues has consequences in terms of poor investment in infrastructure and inefficiencies in water resources management. The water budget is composed of the state fund, which includes income from granting permits and the collection of environmental fines established in the basins (e.g. mining companies polluting the rivers). Because of the water scarcity challenge in the area, water charges foreseen by the law have not been applied yet. Some river basin committees, such as the North Coast and South Coast committees, approved the amount of water charges back in 2008, but only recently has this option been put back on the table. The implementation is essentially challenged by climate conditions, which hinder the political and social acceptability of fees at a time of scarcity. Moreover, even if the legal framework for water charges is in place, there is no supporting management system to enable the effective collection of charges. The state is facing important information gaps in terms of licensing, water permits, a comprehensive and up-to-date water users' registry, up-to-date classification of water bodies, IT system, etc.

The model applied in Ceará (Chapter 2) is a strong reference for Paraíba when it comes to the implementation and monitoring of water charges. A very promising step is

that both states have been exchanging on the Ceará model through several meetings and working groups. Dedicated field trips have also been organised for Paraíba authorities to gain better insights on the framework conditions and implementation results of the Ceará model in order to figure out the potential for replicability in the state. These efforts do have to be pursued and the Pact's implementation can offer ample room for peer-to-peer dialogue.

Objective gap

The predominant tendency to build heavy infrastructure for water supply generates path dependency leading to overlooking demand management strategies and possible synergies between sectoral policies.

Different levels of government, from the state to municipalities, agree on the need for investment in water supply and sanitation infrastructure to ensure universal coverage and better connection across municipalities. Recently 20 dams have been recovered while another 22 dams under ongoing maintenance and recovery. The AESA is currently monitoring 124 dams in Paraíba.

The major challenge is the inter-basin transfer project for São Francisco, which requires important efforts in terms of maintenance of the dams and transportation of water. Public consultations for the pillars of the project management have been established with farmers. However, in addition to issues of access, water quality is affected by waste management. Hence a better integration of water and waste policies to properly manage solid waste, sewerage and drainage would be beneficial for water quality.

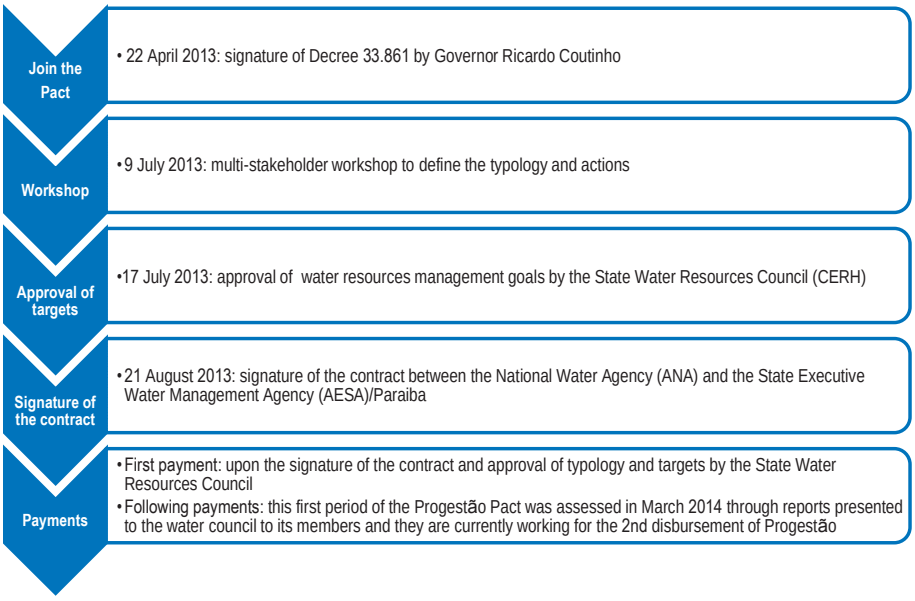
Stage of progress and early achievements of the National Pact for Water Management

Paraíba was the first state to sign the Pact and expectations are very high. The Pact represented a chance for the state government to gather additional funds for improving the water resources management system and infrastructure for water supply.

According to the questionnaire, state authorities expect that the Pact will contribute to strengthening capacity building; sharing information; raising awareness (on water availability, risks, quality, cost, etc.); building political acceptability, trust and confidence; allocating water resources efficiently across users; seeking consensus (across policy areas, between water users); preventing conflicts (among water users, across sectors, etc.); finding innovative solutions; and getting access to quality water.

The state of Paraíba featured itself in typology "C" of the Pact, as its institutional framework is highly developed and water challenges are complex. The goals of Paraíba were defined during the workshop held in July 2013 with the participation of representatives of the ANA and the AESA, the entity responsible for co-ordinating the implementation of the National Pact for Water Management in the state, and a broader range of stakeholders from river basin committees and civil society. The federative goals to be achieved in the period 2013-17 include the integration of records databases, sharing information on groundwater, the contribution to knowledge diffusion, the prevention of critical hydrological events and activities for dam safety.

Figure 3.A1.3. **Steps of Progestão in Paraíba**



Note: Schema based on Contrato N. 050, ANA/2013 Progestão and Decreto Paraíba 33861, 22/04/2013.

A system of weights has been assigned to state targets and variables on which to base the level of achievement of targets for certification purposes and disbursement of funds. This first step of Progestão was assessed in March 2014 through reports presented by the AESA to the State Water Resources Council, containing what was proposed and fulfilled for the first period. The council approved the report, which was forwarded to the ANA and opened the second phase of the Progestão, consisting of achieving targets for the next year against the second disbursement. The implementation of the first phase of the Progestão has been characterised by very good relations between the AESA, the CERH and river basin committees. Stakeholders agree that the milestones of the Pact have been discussed in an open, transparent and integrated manner, which contributed to strengthen the trust between them, the ANA and the state.

The council validated the achievement of the goals for the first year on the basis of documents certifying the allocation of funds, which was a way for the AESA to show transparency and accountability in the use of public funds despite that the fact that this was not a binding requirement from the Pact's implementation framework. The signature of the Pact occurred when river basin committees were meeting and renewing their members, which contributed to the inclusiveness of the process and broad consensus on the targets to be achieved afterwards. Also, the AESA is expecting continuity of the commitment following the latest elections as the Pact was primarily conceived as a commitment of states, governments and committees.

Progestão promotes interaction within the state and with neighbouring states, but there is potential for more involvement of river basin committees throughout implementation. River basin committees point out a certain lack of communication regarding the Pact, but the AESA is working on improving collaboration and catching up on this front. On the other hand, Progestão has facilitated the interaction between Paraíba and other states in terms of information needs on the process and the operative actions of the Pact so that they can learn from each other but also move forward in the same

direction with a view to reducing transaction costs for the ANA. In that context, Paraíba stood as a role model for many states to join the Pact and ended up benefiting tremendously from partnerships.

The strategy followed by the state of Paraíba is that of "marginal gain", so to achieve goals based on activities already foreseen. The financial resources represent a rather limited support compared to what is actually needed, but Progestão is for Paraíba a very strong incentive to focus on important priorities, such as financial self-sustainability and capacity building (e.g. promoting public tenders for hiring staff).

Paraíba is facing gaps concerning climate information, the state of dams, reservoirs and registry for users. The harmonisation of the online information system thus represents a priority for which the state was able to use the funds from Progestão to hire specialised IT experts to meet the federative goal on synchronisation with the national information system. The Pact will also be a helpful vehicle to update river basin plans by enhancing participatory processes as these have been mostly developed by government departments of water resources thus far. With assistance from the Progestão, the executive agency is hiring consultants to write the terms of reference of the state water plan, to make it implementable and correspond to the current level of water resources available. Authorisations to make public tenders to hire technical staff have also been requested. The council approved the concrete implementation of water charges within the period foreseen by the Pact. Hence, the Pact will certainly strengthen the management tools of river basin committees and their relation with the state agency in the short and medium term.

Policy recommendations for the implementation of the National Pact for Water Management in Paraíba

Policy recommendations for the implementation of the Pact and Progestão presented in Chapter 3 are fully applicable to Paraíba. Nevertheless, a few specificities stem from the characteristics of the state and its degree of institutional maturity and deserve a few additional comments.

Those who "pay" are still more entitled to have a "say", and this is one additional reason why water charges contribute to the maturity of the water governance systems. According to the volumes established by water permits, it is estimated that between BRL 2 million and BRL 8 million could be collected through water charges once the state system is fully operational in Paraíba. This represents between 10 and 40 times the current AESA budget, of which only 7.5% can be spent on overhead costs for governance functions. The legal framework in place provides all the needed incentives to put water charges in practice; a political step forward has to be taken to make it happen. Affordability studies and economic analyses are also needed to assess users' capacity to pay based on tangible data and projections, and methodologies. It should also be noted that not all river basin committees have the potential to collect water charges, and the AESA will probably act as executive secretariat for all basins in that regards, except the Piranhas-Açu.

Regular and voluntary updates and information from the AESA on how funds allocated to Paraíba are actually spent (or meant to be spent) would be an important step to keep everybody on board (especially river basin committees) and strengthen transparency in the process. As in other states, the funds could be monitored by an *ad hoc* technical chamber within the State Council, which work closely with the

five water-related technical chambers already in place, based on the monitoring of the State Water Resources Fund.

All initiatives that provide opportunities for further policy dialogues on bottlenecks and ways forward between public, private and non-profit actors at state level should be encouraged. Paraíba's municipalities are largely absent from deliberative and consultative fora that exist and it is necessary to devise tangible ways of attracting the municipalities to the institutions in which their presence is crucial.

It is also necessary to identify future needs and complementary resources based on a transparent assessment of the Pact's implementation within the state of Paraíba, e.g. in terms of technical and professional staff through public tenders hiring, which are a good step forward towards stronger capacity.

Annex 3.A2.
Case study: Rondônia

Key data and features

Box 3.A2.1. **Key data of Rondônia state**

- Rondônia is located in the Amazon region. The state counts 52 municipalities and covers an area of around 240 000 km^2. The capital is Porto Velho.
- Population: 1.8 million inhabitants (2013), of which 73.22% lives in urban areas.
- Rondônia has a humid tropical climate with high rainfall concentrated in the rainy season and high average temperatures throughout the year. About 70% of the surface of Rondônia was originally covered by the Amazon rainforest and the remaining 30% by Savannahs. The state accounts for about 0.7% of the total Brazilian economy, but it is a front of expansion of agriculture and livestock. The industrial sector of Rondônia contributes to about 30.6% of the GDP; the second leading contributing component is the agriculture industry, which accounts for 15.3% of GDP. Rondônia's GDP grew four times more than the national average between 2003 and 2007. Water supply is provided by the Water and Sewerage Company of Rondônia (Companhia de Água e Esgoto de Rondônia, CAERD) to 81% of municipalities. Only 10% of these have sewage collection and 4% of them have wastewater treatment (IBGE, 2011; ANA, 2010).

The abundance of water resources is paradoxically both a strength and a weakness for Rondônia. On the one hand, it supported economic growth, making Rondônia the state with the lowest incidence of poverty and the fourth state with the best income distribution throughout Brazil. On the other hand, this situation of "too much water" has also lowered the level of attention towards a proper management, not to say a lack of concern or neglecting attitude of public authorities and citizens. The exploitation of water resources for agriculture, fish farming, hydroelectricity and industrial activities has generated deforestation and soil erosion. The lack of incentives for rational use has also generated a lot of waste and consequences on water quality. Anthropogenic activities and climate change increased the risk of floods and droughts. In 2010, Rondônia suffered from the driest event ever recorded in Amazon, and only four years later the state recorded the largest flood in 106 years, which crippled the local economy and displaced thousands of families, especially in Porto Velho, the capital.

Prominence of hydropower

The water agenda is shadowed by energy interests, which are a national priority and stake. Water has been integrated in the State Secretariat of Environmental Development (Secretaria Estadual de Desenvolvimento Ambiental, SEDAM) since 1993. Only in 2009 was a proper Water Resources Division created with the SEDAM, with specific responsibilities.

The prevailing energy interests and the lack of planning and comprehensive operative instruments in the water sector (i.e. limited permits, absence of water charges, weak information systems) are considered by many authorities and stakeholders as the primary

cause for the increasing number of catastrophic events in recent years. This legal and institutional vacuum has somewhat generated emergency-driven responses to disasters in the absence of a proper risk management approach.

While hydroelectric plants provide energy supply for millions of Brazilians nationwide, they generate territorially localised conflicts over water allocation, affecting fluvial cycles and biodiversity in the Amazon. The severe floods that affected the state of Rondônia in 2014 are attributed by many people to the hydroelectric plants of Santo Antônio and Jirau on the Madeira River. The former, which will be completed in 2015, will be the sixth-largest installed capacity in Brazil and the third in terms of energy supply. These two plants figure among the most important works of the federal government in recent years.

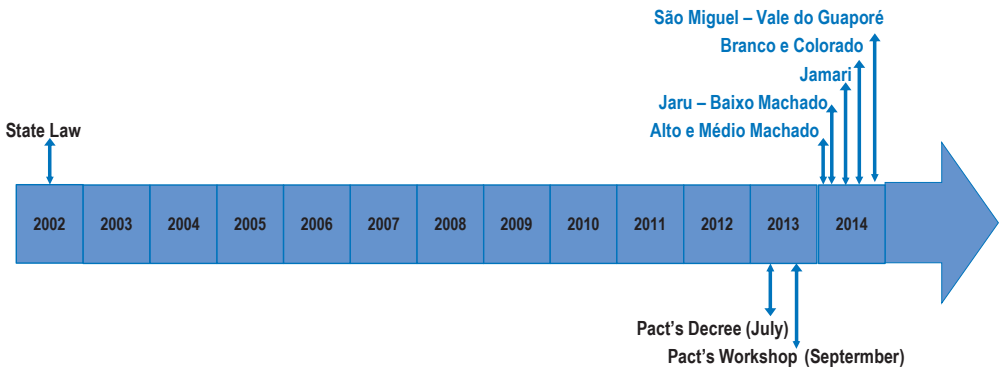
In March 2014, a new environmental impact assessment of the new hydroelectric facilities was ordered by the Court of Justice, based on the suspicion that these have caused extensive flooding in the area and following a number of complaints from environmental NGOs. These also pointed out the lack of preparedness of public authorities in the state, which were unable to face coherently the crisis despite short notice that water levels would go up. According to the Amazon Protection System (Sistema e Proteção da Amazônia SIPAM), "the high levels of Madeira river are due to the large amount of rain in the rivers that feed the watershed". They calculate that the recurrence of this event is about 180 years (Gumbel formula) and claim that this is not a recurring event.[1]

A legal and institutional framework under gestation

The institutional framework for water resources management in the state is centralised and under development. The state of Rondônia was created in 1981, which makes it relatively new in the Brazilian landscape. The Water Resource Law was approved in 2002. The same year, the State Water Resources Council was created and was active between 2003-05. It was again summoned regularly by the state agency only in 2011, with new counsellors being designated in 2012, when water risks (droughts and floods) exacerbated and raised awareness and willingness to act. Since then, 8 resolutions have been approved and 15 minutes of regular meetings have been published, showing political will to catch up. The advantage of a framework under gestation is that the institution building is a "learning by doing" process; however, it takes time and can be costly.

As in other states, responsibilities for water management are carried out by several authorities (Figure 3.A2.2). The SEDAM is the main body responsible for the state water resources policy, and there is no specific management body as in most other states. The Water and Sewage Company (Companhia de Água e Esgoto de Rondônia, CAERD) is also an important player. Other institutions include the State Secretariat of Planning, Budget and Management (Secretaria do Planejamento, Orçamento e Gestão, SEPOG) and the State Secretariat of Agriculture, Livestock, Development and Land Regularization (Secretaria de Estado da Agricultura, Pecuária, Desenvolvimento e Regulação Fundiária, SEAGRI). The SEDAM does not directly participate in water infrastructure construction, but it is responsible for issuing licenses for water use and environmental permits for water infrastructure. Specific institutional bodies such as state water agencies have not been created yet.

Figure 3.A2.1. **Rondônia's institutional framework timeline**



Note: River basin committees are shown in blue.

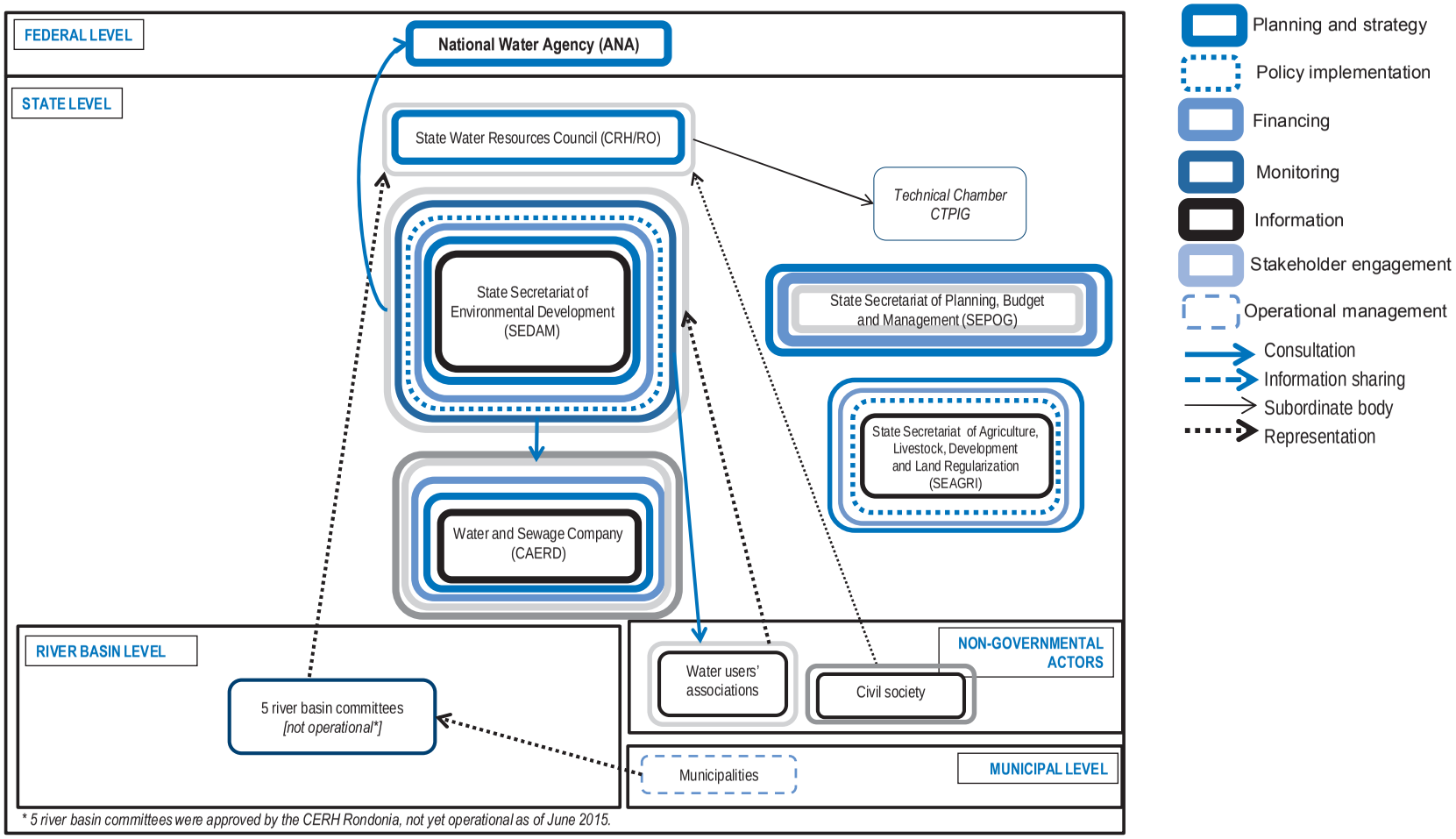
Rondônia is heading towards the decentralisation of its water management system through the creation of river basin committees. These are expected to deal with conflicts over water use and pollution, to raise awareness and to stimulate a participatory model. The state is divided into 7 basins and 42 sub-basins. The Ordinary Meeting of the State Water Resources Council of Rondônia held on 20 February 2014 approved the creation of five river basin committees, but as of March 2015 only the designation of their governing boards and their representatives in the State Water Resources Council had taken place. The creation of committees is harder where conflicts over water use are particularly intense, as in the case of hydropower plants with impacts on indigenous lands, or for agricultural use and fish farming. Three river basin committees located along the BR 364 road,[2] which runs between the Rondônia state capital, Porto Velho, and Cuiabá (state capital of Mato Grosso), currently face water shortages for human consumption. Water is supplied to several municipalities by wells, but the availability is not constant.

Progress in water governance

Progress has been made at state and basin level in terms of planning and institutional structure. A State Water Resources Plan has been announced since 2011, and is now being developed. It is expected to bring an adequate understanding of water availability from surface and groundwater, as well as water demand to better deal with water balance and entitlements.

The SEDAM approved a strategic plan, which is now being discussed with the members of the State Water Resources Council. Rondônia is considered in the Interstate Plan prepared by the ANA for the right bank of the Amazon. Even if the creation of two river basin committees is pending and others under development, some of them, such as Rio Branco and Jamari, have already made good advancement in terms of developing and discussing river basin plans. This is mainly due to the socio-environmental impacts on water resources in these basins, which triggered some sense of urgency to get organised.

Figure 3.A2.2. **Institutional mapping for water resources management in Rondônia**



Co-operation between institutions and with stakeholders is also important aspect of water policy in Rondônia. A number of technical co-operation agreements between public institutions and others involving NGOs have recently been developed. For example, the co-operation agreement with the ANA under the National Programme for Water Quality Evaluation (Programa Nacional de Avaliação da Qualidade da Água, PNQA) aims to implement and maintain a national network of water quality monitoring. Another agreement between the SEDAM and the Brazilian army aims to map hydrographic basins and sub-basins and to conduct advanced studies on water resources. In 2013, an agreement with the ANA enabled the installation of ten hydro-meteorological stations in the state. The Amazon Protection System (Sistema de Proteção da Amazônia, SIPAM), in charge of maintenance of meteorological networks, and the Research Company of Mineral Resources (Companhia de Pesquisa de Recursos Minerais, CPRM) work together to foster training of technicians and support other activities of the SEDAM. This collaborative process helps to develop clear and timely information to address civil defence protection and forecast critical hydrological events occurring in the state of Rondônia. The Progestão and the partnership with the Ministry of Environment can enhance further co-ordination between state and basin actors. These programmes also help to enhance participatory management and decision making at lower levels of government.

Remaining water governance gaps

The lack of quality, accessible and updated information is a major bottleneck to move from crisis to risk management. The SEDAM does not have a specific registry for water infrastructure assets. Since 2006, information on state water resources has been organised within the National Registry of Water Resources Users (Cadastro Nacional de Usuários de Recursos Hídricos, CNARH), but it includes only users for whom the SEDAM issued water permits, which are estimated to represent only 20% of total water users.

Water charges are not implemented in the state, although foreseen in the legal framework (contrary to the water charge on hydropower). Over the past ten years, the state has had practically no budget for water management. In 2002, a state fund was established, but it never became operative as sources of revenues (other than from licensing) had not been identified. Nevertheless, there have been attempts to operationalise this state fund based on the compensation for hydropower production in the rivers Jirau, Santo Antonio and Samuel.

The rationale for water charges is affected by the possibility for basins to apply their own rules in identifying "insignificant uses" of water, determining whether water charges are applicable or not. It is also affected by the lack of political will to charge for water beyond what is currently paid for licensing (e.g. by water supply companies), as regulated by law. This lack of funding is certainly an obstacle for the state's capacity to develop an adaptive water policy that can face future shocks.

There is an important capacity gap within the state public administration and civil society, but improvements are ongoing in this field. The SEDAM has 5 regional offices with 15 staff in all to cover the entire state environmental portfolio, with a limited number staff dedicated to water management. Attracting and maintaining professionals (e.g. specialists in hydrology) within the state administration is a challenge because of the low level of salary. The high turnover is also due to the insecurity of contracts for water consultants, experts, technicians mobilised for preparing the registry, entitlements, and other *ad hoc* projects in the absence of a more medium-term or strategic vision. This has

an impact on the SEDAM's capacity to deliver on the water front. So far, the state has been extensively relying on the technical and logistical support of the ANA, as in the case of the launch of the CNARH in 2006, the statement on reserve of water supply in entitlements and for the creation of river basin committees.

A number of trainings are targeting water users, public institutions and NGOs through courses, meetings and symposia held by the SEDAM and the ANA, but they cannot bridge, on their own, a gap that has more structural origins. The lack of technical capacity and weaknesses in monitoring and assessment are amongst the most challenging obstacles for improving the decision-making process in the state.

Another challenge is the question of scale, as watersheds in the Amazon region tend to cover very large areas with very sparse population. For example, the watershed of Valley Guapore faces challenges because of disparities regarding administrative access. This is why it was divided into two sub-basins for the regions of "Valley Guapore" and "Zona da Mata", which have different characteristics from a natural and anthropic point of view, requiring different rules and incentives. Moreover, the low number of registered water users creates challenges in the management of water between urban/metropolitan and rural areas.

The conservation of the riparian forests is a very serious problem in Rondônia because for years landowners have been destroying the forests of the riverbanks, triggering the process of silting and facilitating animal access to the rivers. It would be important to have at the national or state level some compensation to landowners for the conservation and restoration of riparian forests. All measures established so far are considered theoretical and not implemented.

Stakeholder engagement within the State Water Resources Council is a challenge. The complexity to understand water issues and the geographical distance of core decision making (the river basins covering a very large territorial area) are important bottlenecks. Citizens are generally unaware of the basics and challenges of the state water policy and do not organise to voice their concerns. This low degree of motivation to participate in water-related discussions (especially in the absence of institutionalised mechanisms to facilitate them) also applies to business, farmers and entrepreneurs. Minutes reporting on the outcomes of the State Water Council's meetings are available online but trigger little interest. They are mainly used as a learning tool for technicians rather than an awareness tool for stakeholders.

There is a certain degree of mistrust between citizens, civil society and their political leaders, which hinders collaborative efforts and participatory dynamics. This accountability gap has been further exacerbated by recent droughts and floods in the state. To a certain extent the creation of river basin committees, in this peculiar context, is also motivated by the willingness to create "intermediation" bodies between government and end users for political and advocacy reasons in addition to water-specific concerns and needs.

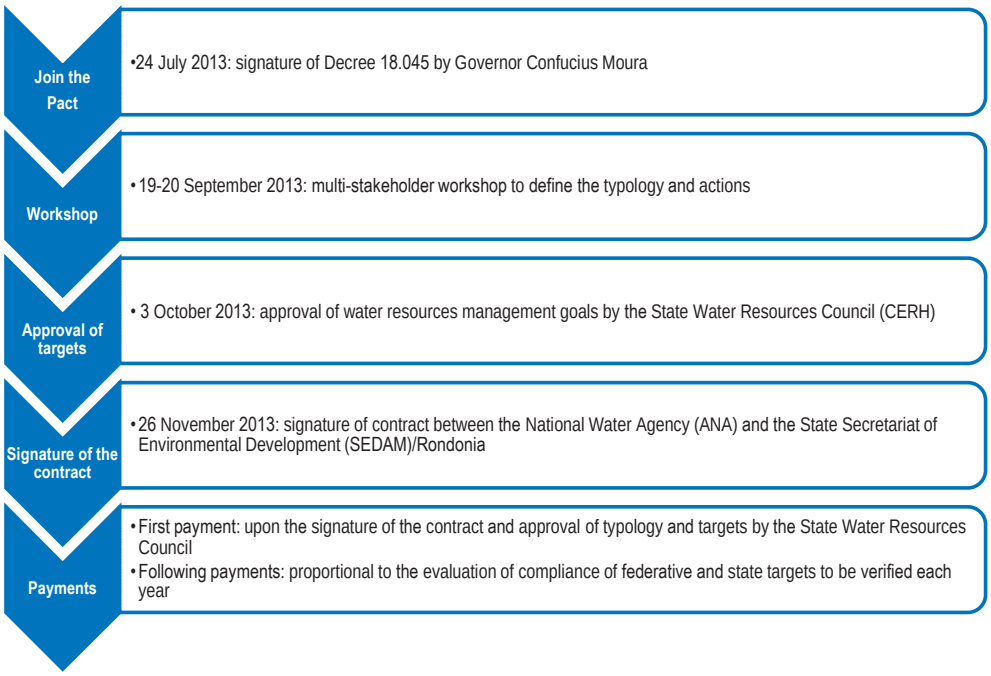
State of progress of the National Pact for Water Management

The Pact is in its early stages of implementation and no real impact assessment can be made for now. Rondônia was the eighth state to join and the SEDAM is the entity responsible for co-ordinating related activities. The Pact's core objectives for the state are to promote sustainable and multiple uses of water resources, the effective co-ordination

between processes for water management and regulation of water uses, and the strengthening of integrated, decentralised and participatory governance in the sector.

The first workshop was held on 19-20 September 2013 with ANA officials, representatives from the SEDAM, river basin committees and the State Water Council, to share views on the future vision for water and needed actions. Rondônia featured itself in the management typology "B", as the state has medium complexity and an intermediate institutional framework. Priorities for using the funds were agreed upon, i.e. essentially for capacity-building programmes and maintenance (Figure 3.A2.3).

Figure 3.A2.3. **Steps of Progestão in Rondônia**



Note: Schema based on Contrato N. 083, ANA/2013 Progestão and Decreto Rondônia 18045, 24/07/2013.

State representatives view the Pact as an instrument to devise a place-based water policy that can cope with future shocks, but also as a means to build capacity and strengthen accountability at large, beyond the water sector. The greatest incentive for Rondônia to join is the funding allocated to achieving targets via Progestão in a state that has almost no resources earmarked for the water sector. Legitimate concerns can be raised about the absorption capacity of state authorities and the decision-making process behind funding allocation to ensure their timely and effective use. An expected contribution of the Pact is the structuring and functioning of river basin committees. Discussions fora related to the Pact's implementation can also raise awareness and support research on water resource management at the state level to build the evidence needed to guide decision making and identify innovative solutions. The Pact is also considered a vehicle to review and update the State Water Law and regulations of the uses of surface and groundwater resources, as well as to share information across stakeholders and policy makers. In particular, the federative goal requesting updates on registration of users with the National Water Resources Council can be valuable incentive to obtain more precise figures and take informed decisions. It is also expected that the establishment of a duly formalised training programme on water resources management,

to be carried out continuously, will strengthen the capacity of state officials and professionals. This is a much needed step to trigger policy levers and consensus on sensitive issues such as the issuing of water charges.

It is important to note that all states, including Rondônia, have benefited from the flexibility inherent to the Pact in terms of adjustment of goals and targets, at any time. Because of internal problems, the federative target concerning the information sharing on groundwater (Goal 1.2) was cancelled by the ANA. For certification purposes, its weight will be distributed proportionally to other targets, according to contract provisions. The SEDAM confirmed the will to integrate data of water resources in the National Registry of Water Resources Users (Goal 1.1) which has been used by the SEDAM since 2006. The SEDAM will also contribute to the dissemination of knowledge (Goal 1.3) by providing information on water permits issued from 2010-13. It will take action on the prevention of critical events (Goal 1.4) by collecting data and monitoring actions planned for safety of dams (Goal 1.5), consisting in updating hydrological maps.

Policy recommendations for the implementation of the National Pact for Water Management in Rondônia

In the case of Rondônia, the Pact is not considered only as a mechanism for state empowerment in "water" management, as it can also foster "institution building" given the two contradictory tensions:

- On the one hand, developments in Rondônia have great impacts given the prominence in the region of hydropower, which complementarily supplies energy to the country. Hence, to better anticipate and manage pressing and emerging water risks in this specific region, partnerships between state and federal authorities need to be strengthened to build resilient institutions.
- On the other hand, the "institution-building" process is at an early stage and accompanied by pressures for more bottom-up, inclusive policies and place-based engagement from civil society, especially in a context where citizens' trust in the state government is low.

These trends can be reconciled by an incremental approach to decentralisation, which is based on a learning by doing process whereby the ANA has a significant role to (continue to) play. It may be advisable to use the Pact as an opportunity to think of continuous and direct support of the ANA to the state water policy.

A "contract" where almost everything is to be built cannot be limited to "capacity building". Customised guidance is needed to properly develop river basin committees with clear roles and responsibilities (going beyond NGO-type of activities, as is currently the case) that could become success stories for other states in the region (and same typology of the Pact). Problems of representation are very important everywhere, but especially in Rondônia. Municipalities are not very involved, although they were mostly in favour of the creation of the committees and are the biggest users with vested interest in critical areas such as water allocation (e.g. energy, agriculture). Also, Rondônia is not represented in the National Water Resources Council. Civil society involved in existing river basin committees frequently lacks specific knowledge on water and a clear understanding of the roles and responsibilities of these institutions (thus carrying out mostly awareness activities as any environmental NGO could do).

A set of mechanisms, principles and framework conditions are needed for stakeholder engagement to be inclusive and contribute effectively to decision making. As shown in Chapter 2, tools have to be tailored to needs for fit-for-target engagement. It would be advisable to think of direct links between Rondônia and other river basin committees to develop lasting exchanges about roles, responsibilities, levers of action, resources and concrete results of river basin committees in the country. This is also a means for the ANA to facilitate state-to-state and basin-to-basin capacity support, and identify some "role models" or "champions" that can help restore trust in public institutions by showing pragmatic actions and results.

Greater information-sharing and dialogue across Amazon states on the Pact's results, progress and challenges should be encouraged. Rondônia is a remote area, compared to the north-eastern centre of Brazil; therefore, it is all the more important to ensure that it can benefit from experience-sharing from neighbouring states such as Acre and Mato Grosso on a regular basis and beyond *ad hoc* trainings.

Progestão funds can be a challenge for a state that has had no specific budget dedicated to water so far. It will take time to build a robust local expertise and effective decentralised system. Meanwhile, priorities have to be clearly established in using the funds. A clear statement and consensus about foreseen actions when disbursing funds in Rondônia would increase the trust in public authorities.

There is certainly room for synergies between hard and soft capacity programmes on water in Rondônia. The implementation of the federal programme "Água para Todos" in Rondônia (approved in 2012) is mostly involving state and municipal authorities as the ultimate recipients of the BRL 15 million provisioned to finance projects, especially in flood-prone areas (Madeira River). Further information sharing on the expected benefits of this "hard" infrastructure programme with basin committees is needed to discuss potential synergies and complementarities with "soft" measures.

Notes

1. For more information, see: http://maisro.com.br/sipam-garante-que-nova-enchente-recorde-do-madeira-so-daqui-a-180-anos.

2. BR-364 is a road across the rainforest that was cut for a long period in 2014, especially during the flood of the Madeira River cutting off the access to the neighbouring state of Acre by land and causing shortages in food and fuel supplies. This situation was to some extent repeated in 2015. Outbreaks of diseases like leptospirosis and cholera also claimed lives.

Annex 3.A3.
Case study: Rio de Janeiro

Key features and trends

Box 3.A3.1. **Key data on the state of Rio de Janeiro**

- Located in the Southeast Region.
- Highest population density of the country with 16 million inhabitants (2011), i.e. 8.4% of the total population.
- 92 municipalities, including the capital city Rio de Janeiro.
- Humid tropical climate with abundant rainfall (1 000-1 500 mm annually), very hot in the summer and dry in the winter with moderate temperatures.
- It is the second largest economy, which mostly relies on services and industry; little share for the agricultural sector; near 10.5% of GDP, after São Paulo, reaching 33% and before Minas Gerais, close to 10%.
- Sixty-six per cent of municipalities are supplied water services by the State Water and Sewerage Company of Rio de Janeiro (Companhia Estadual de Águas e Esgotos do Rio de Janeiro, CEDAE). The others are served by municipal services or private companies. Ninety-two per cent of municipalities have sewage collection, but only 59% have wastewater treatment (IBGE, 2011; ANA, 2010).
- The state is situated in the hydrographic region of Southeast Atlantic, and includes a river basin under the federal domain (Paraíba do Sul) and 9 hydrographic regions organised in river basin committees.

The State Water Resources Management System of Rio de Janeiro is among the most advanced in the country. Institutions and management structures are in place, strong capacities are available in the administration, and policy instruments such as water permits and water charges are used even if they are not fully exploited. State authorities have demonstrated strong commitment to the sector.

But critical issues have recently gained traction in terms of water quality, water scarcity and conflicts over water uses. Major issues faced by the state administration include: 1) the need for dealing with very large amounts of information to improve the decision-making process; 2) the large dependency of state water supply from other states, namely São Paulo and Minas Gerais, through shared rivers, raising acute problems in periods of drought; and 3) urban water issues, especially floods and droughts.

The problem of water quality in Rio de Janeiro is primarily related to the lack of wastewater treatment. According to the Ministry of Cities, 30% of the population in the city of Rio de Janeiro is not connected to a formal sanitation system, and even in areas with formal connections, only half of sewage is actually treated before it is rejected in waterways and the ocean. Large urban problems arise from a high number of areas with irregular and inadequate soil occupation and a large concentration of residents without appropriate sanitation infrastructures.

Municipalities are responsible for service provision, but the state plays an important role in large urban agglomerations to exploit economies of scale and cross-subsidise poor municipalities. Service providers need to report back to the state regulatory agency on indicators and investments. Rio's regulatory agency oversees a few sanitation companies but does not regulate the CEDAE, which covers most of the state. Even if the latter is working to improve water supply efficiency through repair and maintenance work, updating equipment and adding new water intakes, it is lagging behind in terms of wastewater treatment.

There is hope that the sanitation plan to 2030 developed by the Secretary of State for Sanitation within the Growth Accelerator Programme can tackle the issue seriously. This programme foresees a total of BRL 1.59 trillion (USD 965 billion) in investments, including "Water and Electricity for All". The "Water for All" part should receive BRL 30.6 billion for improving water supply in urban areas, construction and expansion of pipelines and treatment plants and irrigation. The "Electricity for All" programme will receive BRL 5.5 billion to bring electricity to 495 000 homes.

The state is also facing water quantity issues, both in terms of too much and too little water. While Rio experienced severe water scarcity in 2014, major floods occurred in the same region back in 2011 and 2012 when over 15 000 people were displaced (in Rio de Janeiro and São Paulo), business was destroyed and plantations were devastated. These extreme events have governance implications for the state because several levels of government and stakeholders have a say in water-related decision making (federal managers, state managers, users, municipalities and public and private users). Also, water-related disasters require adaptive mechanisms to move from crisis to risk management and to increase resilience and preparedness of institutions. According to the Institute for Graduate Studies and Research in Engineering (COPPE, 2014), water sources supplying Rio de Janeiro will be depleted by 2030. The study found that the Paraíba do Sul River, which supplies water to 12 million people, is now at 70% usage capacity, but it will reach 100% use by 2030. It is also estimated that in 15 years, the metropolitan region of Rio de Janeiro will account for 95% of the state's water consumption given the unbalanced distribution of the population and economic activity.

Rio de Janeiro also faces acute conflicts over water allocation, which has recently gained particular traction from political leaders and civil society. The most demanding sectors are tourism and the oil industry, which both also alter occupation of land and generate conflicts over the uses of water. Water allocation regimes are bureaucratic and conservative. They lack flexibility and robustness (Chapter 4), especially in cases of shortage, which has direct consequences on the agenda for water quality, prevention and mitigation of floods, and water financing.

Institutional mapping

State authorities

Significant progress has been achieved in the state water policy in since the 1999 law. Many of the achievements are due to the successful consolidation of the State Environmental Institute (Instituto Estadual do Ambiente, INEA), the previous water management body, and the Directorate of Water and Territories Management (Diretoria de Gestão das Águas e do Territorio, DIGAT) into one single agency, the INEA, which has been combining the blue, green and brown agendas of the states since 2009. The State Secreatriat of Environment of Rio de Janeiro (Secretaria Estadual de Meio Ambiente do

Rio de Janeiro, SEA) is the first hierarchical level body of state government (Figure 3.A3.1). Its mission is to formulate and co-ordinate the state policy of protection and conservation of the environment and management of water resources.

The INEA is very unique at the national level. It promoted in an innovative way both horizontal and vertical co-ordination. A specific directorate for water interacts closely with the environment component of the INEA. Altogether the agency has approximately 1 400 collaborators with 200 specialising on water-related activities. This shows a clear critical mass in terms of staff to tackle the high density of problems. The INEA has nine regional offices; one in each of the hydrographic districts. It encourages cross-sector integration between forest management, water management, coastal and land management, as well as pollution control.

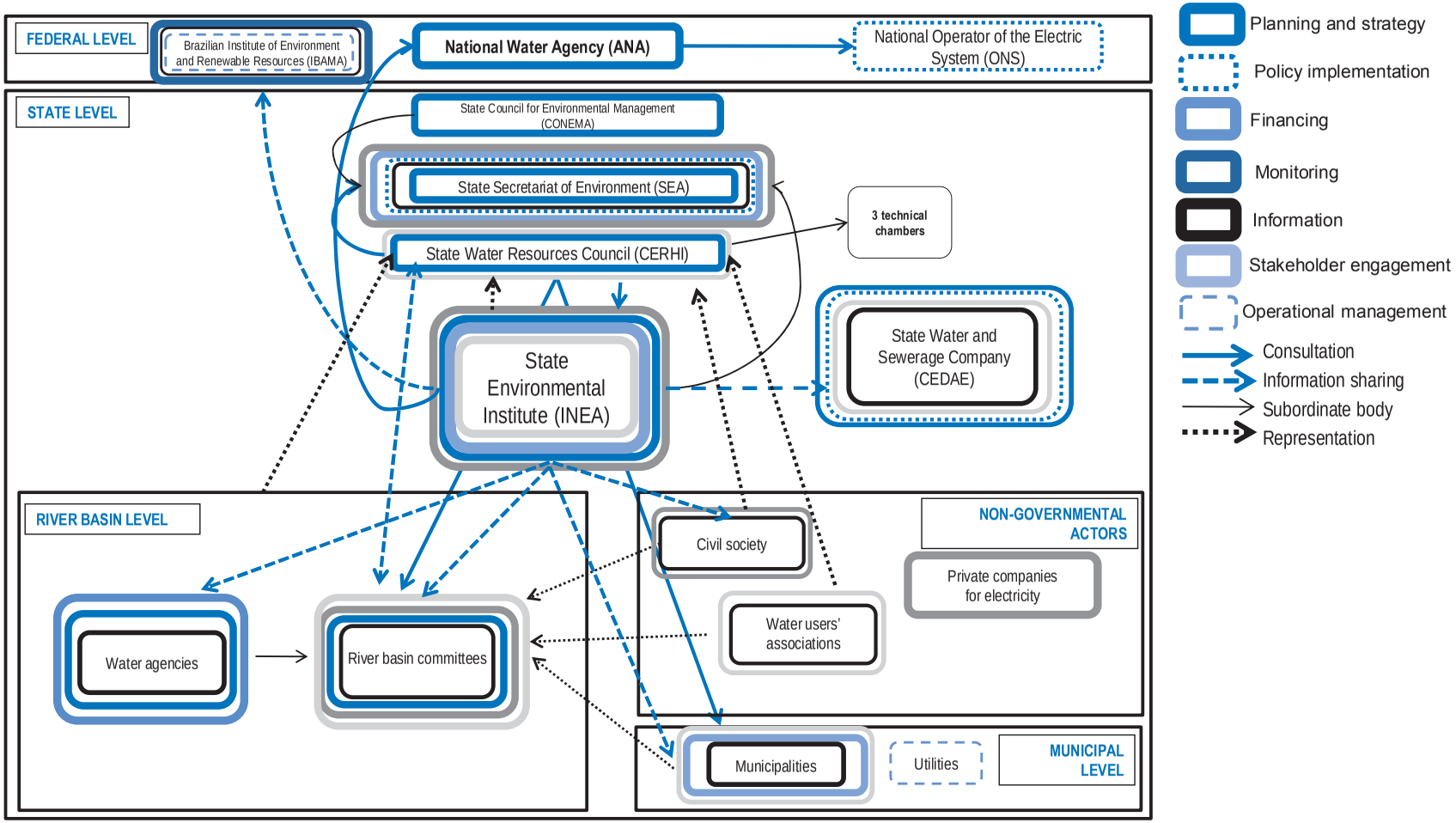
Following the merger of agencies, the water sector rather than being shadowed by other priorities, benefited from significant improvements. For example, environmental licensing and water entitlement were merged under the same directorate. The INEA strengthened relationships with other bodies at state and national level, and built a very close and active partnership with the ANA. The agency is self-sufficient from a financial point of view as it collects revenues from water charges (up to BRL 35 million a year, of which 10% is used to cover overhead and governance functions in the sector). The INEA has six directors responsible for implementing the water resources management system (i.e. water entitlement, environmental recovery, flood management) together with collegiate bodies for water management.

The State Water Resources Council was created by the 1999 law as a collegiate body with regulatory, consultative and deliberative assignments. Its functions were revised twice by decree in 2007 and 2013. The State Water Resources Council establishes guidelines for the creation, organisation and operation of river basin committees and water agencies. It exercises arbitration at administrative level, establishes general criteria on water charges and their collection, decides on water resources projects within the state, in addition to analysing the proposed amendment of the state policy on water legislation. Since 2000, the State Water Resources Council has met 95 times and 132 resolutions have been approved. It is composed of 30 members (and an equal number of alternates) from government (essentially the INEA and SEA), water users, river basin committees (3 seats) and civil society. The latter has a greater share in terms of seats than in other states.

The council has three technical chambers to support its tasks and responsibilities. They cover: 1) water management instruments; 2) institutions and legal frameworks; and 3) groundwater. The technical chambers' duties mostly consist in preparing decisions to be taken rather than carrying out technical work. The council often creates thematic working groups on specific issues as currently is the case on: 1) payments for environmental services and 2) geographic information system.

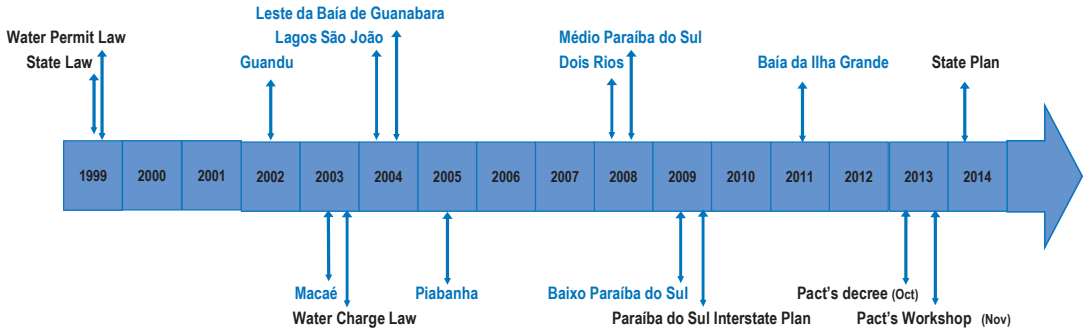
The last ten years have seen the creation of several committees at watershed level (Table 3.A3.1). Each of the nine hydrographic regions has one river basin committee, as foreseen by the national and state water laws. They have deliberative and advisory functions. Deliberative functions, approved by the State Water Resource Council, include: mediation of conflicts over water use in the first instance; approval and monitoring of river basin plans; proposal of methodology and criteria for water charges; investments in the river basin; proposal of priorities and minor uses in the water permits rules. To date, eight out of the state's nine river basin committees are supported by water agencies.

Figure 3.A3.1. **Institutional mapping for water resources management in Rio de Janeiro**



River basin authorities

Figure 3.A3.2. **Rio de Janeiro's institutional framework timeline**



Note: River basin committees are shown in blue.

Since 2010 the water agency from the Association for Water Management in Paraíba do Sul River Basin (Águas da Bacia Hidrográfica do Rio Paraíba do Sul, AGEVAP) has performed the function of basin agency for four river basin committees (Rio Paraíba do Sul, Médio Paraíba do Sul, Piabanha, Dois Rios e Baixo Paraíba do Sul), thus facilitating their integration. River basin committees have a wide range of responsibilities, but a weak operative and financial capacity to meet all the objectives.

The forum of basin committees is a co-ordination tool that brings the committees together for discussion and promotion of joint resolutions and joint investment. It has strengthened the political representation of basin committees in the State Water Council and helped to build a very positive interface between river basin committees and the INEA.

An important interstate river basin

The Interstate River Basin – Paraíba do Sul is the most important source of water for the state of Rio de Janeiro and the economy of the state, and a pioneer in terms of institutional organisation. It generated a laboratory for the consolidation of methods and processes for water resource management in the country. This basin was pioneer in the introduction of water charges and was also the first to enter into a management agreement with the ANA. This is also the place where the integration of water users in the national information system has been promoted as an example for other states. The performance of river basin committees, consortiums and other similar organisations denotes the high level of effort and interest with respect to its water resources.

Policy instruments

A state fund for water

Rio de Janeiro has a specific fund devoted to water resources management. The State Water Resources Fund (Fundo Estadual de Recursos Hídricos, FUNDRHI) (over BRL 9 million in 2014) helps to implement policy instruments, and develop actions, programmes and projects foreseen in the state and river basin plans. The INEA is

Table 3.A3.1. **River basin committees in the state of Rio de Janeiro**

Name	Surface	Population	Municipalities	Achievements/ongoing projects	Gaps/issues
Rio Guandu	3 800	990 000	15	– One of the richest committees – River basin plan – Working group before the committee was formed – Very strategic basin for the state because it provides all the water supply to the metropolitan area – Appointed a juridical person for operationalising projects – Stimulation of research for more academic support to the decision-making process – Projects and programmes towards 2016	Gap in communication on water charges devoted to sanitation purposes
São João	3 800	520 000	12	– River basin plan – Sanitation rates above 70% – Private company set up business – Involvement of civil society – Technical monitoring chambers that track status of water	Political discontinuity at local level (high turnover of mayors)
Rio Macaé	2 000	240 000	4	– River basin plan approved – Hired 30 community-based leaders across hydrographic regions trained on all aspects of the plan meetings – Introduced the project to the population for a widespread buy-in – Provision of information in the bulletin – Educational activities and projects	Possible conflicts Difficulties to understand the difference between federal and state water management and interactions between public and government organisations
Rio Piabanha	3 400	540 000	10	– Civil society organisations very involved – Sewage treatment stations, bio systems, biological filters – Cheap method promoting a more intelligent use of resources – Study on different indexes for quality water assessment with the ANA to propose a new index that will assess quality – Co-ordination with civil defence and state authorities to minimise flood risks – Two-year action plan allowing to have workshops with different players – Very active role for water management in the region	
Leste da Baia de Guanabara	4 800	11 200 000	17	– Discussion and networking – Partnerships for managing local actions – Experiences to protect water in conservation areas – Participatory work approach with 68 organisations with the protection of waters – Partnership with universities helping to focus on bio indicators of pollution of the lagoon system	Still does not have an agency operationalising its work
Rio Dois Rios	4 800	340 000	11		Still in the process of being developed, there is not yet any programme in place
Médio Paraíba do Sul	6 600	1 020 000	19	– Strategic planning – Monitoring for preventing disasters – Research projects in environmental education – Agreement with the WWF for co-operation on vulnerability of river basins and to help collect evidence for them through workshops	Deforestation Occupation of urban use in the area
Baixo Paraíba do Sul	11 300	810 000	22	N/A	N/A
Baía da Ilha Grande	1 750	210 000	3	N/A	N/A

Source: Based on data from CBH (n.d.), "Rio de Janeiro", www.cbh.gov.br/DataGrid/GridRio.aspx (last accessed 5 May 2015).

Box 3.A3.2. **Paraíba do Sul: Governance achievements and current conflict**

The Paraíba do Sul River cuts across São Paulo, Rio de Janeiro and Minas Gerais and developed in several steps.

- 1992-99: The "France-Brazil Co-operation" to the river basin performed extensive work for the upgrading, acquisition and systematisation related to water resources of the basin.
- 1996: The Committee for Integration of the Paraíba do Sul River Basin (Comitê de Integração da Bacia Hidrográfica do Paraíba do Sul, CEIVAP) was the first step of a new paradigm of public administration in the country towards decentralisation and participation.
- Implementation of the Water Quality and Pollution Control Project (World Bank-federal government support) in partnership with the states of Rio de Janeiro and São Paulo. This project involved studies to prepare investment programmes for the environmental restoration of the basin with IBRD funding. The CEIVAP functions and structure were also adjusted in that context.
- 2002: The ANA promotes agreements to foster co-ordination for water permits and water charges between São Paulo, Minas Gerais and Rio de Janeiro. The CEIVAP and CNRH approve the creation of the AGEVAP as a delegated basin agency.
- 2003: The CEIVAP's first decisions on the approval of water charges in 2003.
- 2004: Full implementation of water users' charges. First collection of revenues, which went up significantly.

Since December 2013, the basin has been affected by a political conflict between the states of Rio de Janeiro and São Paulo, as a result of the severe drought that affected the Cantareira System in São Paulo, the largest water reservoir in the state, supplying 9 million people in the metropolitan region. The opposition of Rio de Janeiro in building a 15-kilometre tunnel for transferring water from the Rio Paraíba do Sul to the Cantareira System generated a so-called "water war" between the two neighbouring states. For the state of Rio de Janeiro, the dependence on water from the Paraíba do Sul is significant since it occupies about two-thirds of its territory and supplies more than 10 million people. Hence, water abstraction would cause damage to residential and business supply in the state. Being an interstate basin, the solution lies with the federal government. A first meeting of the national council established a technical team to discuss water quality and quantity monitoring, harmonise methodologies across the three states and agree on future projections in terms of water demand and supply in the three states.

Sources: Lobato da Costa, F. (2003), *Estratégias de Gerenciamento de Recursos Hídricos no Brasil: Áreas de Cooperação com o Banco Mundial* (*Strategies of Water Resources Management in Brazil: Areas of Cooperation with the World Bank*), 1st edition, World Bank, Brasilia D.F.; UNESCO and ANA (2005), *Evaluation of National Programs of the National Water Resources Plan – PNRH*, www.ceivap.org.br (last accessed 11 May 2015).

responsible for co-ordinating the FUNDRHI, which is organised into sub-accounts that allow autonomous management of each hydrographic region. According to the 2008 state law that established charges for water uses, these are applied by river basins for each category of water use and centralised into the fund, 90% of which is then reallocated to river basins and 10% to the INEA. Regulations request that at least 70% of the funds be applied in the collection and treatment of municipal wastewater, until the target of 80% of sewage collection and treatment is reached in each hydrographic region.

Water permits and charges

The state of Rio de Janeiro was a pioneer in implementing water permits and water charges. Permits (established in the 1999 law) are issued by the Environmental Licensing Directorate of the INEA (Diretoria de Licenciamento Ambiental, DILAM). Over 30% of water users within the state already have water permits. The use of charges has been regulated since 2003, but their collection increased particularly after 2010 when the sanitation company (CEDAE) started to pay for water use. Some argue that water charges have not been defined in a democratic way, as little consultation was carried out within state deliberative bodies to build consensus on the criteria and amounts. It is estimated that these charges generate a BRL 35 million annual budget for the nine river basin committees, but there are important disparities in terms of revenue collection between the different basins of the state.

Other sources of funding

In 2010, a state Law (No. 5639/2010) introduced equalisation mechanisms to offset the deep inequality between committees and ensure the sustainability of a minimal structure for the delegated entity or water agency of each river basin committee. The compensation for water use to hydropower generation is particularly earmarked to those delegated entities or water agencies with low levels of water charges collection.

Another important financial source of the sector comes from transfers from the federal government. Several management contracts are signed between the ANA, SEA and INEA on the one hand, and river basin water agencies on the other hand. These aim to support water agencies' investments according to a plan approved by their respective river basin committees. This earmarked funding contributes to strengthen the collegiate bodies by structuring executive departments, and providing technical support to selected river basin projects.

Planning

The state has a multi-year plan that organises the actions of governments in programmes and provides support to river basin committees in developing their own plans. Although the INEA has been working intensely with the committee and the State Water Resources Council for the planning of water resources for all river basins, only one river basin plan has been approved thus far.

Plans are drafted and assembled by river basin committees. Some are innovative while others are lagging behind, traditional and conservative. Baía da Ilha Grande is completing the terms of reference for a consultant to co-ordinate the preparation of the plan, with a specific concern for co-ordinating water and coastal management. The first river basin plan of Baía da Ilha Grande is about to be requested by the INEA. Lagos São João and Baía de Guanabara have river basin plans, which will soon be revised and updated. Médio Paraíba, Piabanha, Rio Dois Rios, Baixo Paraíba do Sul and Itabapoana developed their own plans during the review of the Paraíba do Sul River Basin Plan, which started in 2012. The Macaé Water Resources Plan, developed in close partnership with the INEA, the basin committee and the local society was approved in December 2013. The Guandu River Basin Plan is the only one that was approved back in 2006.

Information systems

Several water-related information systems have been developed in the state. On paper, Rio de Janeiro has a sound water information system mapping water users and infrastructure registries, which is synchronised with the national information system (which allow for the proper implementation of water charges and permits), hydro-meteorological monitoring and water quality monitoring. Research, development and innovation are also boosted in the state. However, most of the available information deals essentially with water users and uses, and weaknesses exist in terms of water availability, water quality, and socio-economic and financial parameters.

The state participates in the National Programme for Water Quality Evaluation (Programa Nacional de Avaliação da Qualidade da Água, PNQA) through which the ANA provides assistance to states in monitoring water quality in a planned and strategic way. The state also contributes to the Rural Environmental Registry, which allows public record of rural properties and is one of the key instruments for the implementation of the Forest Code and the promotion of environmental conservation initiatives.

Although the information systems can also be improved and expanded, the fact is that the situation in Rio de Janeiro is certainly very advanced in comparison with most states in the country. Major problems for the INEA are how to effectively mobilise large amounts of information in order to make it useful in the decision-making process and how to share it effectively with other stakeholders and civil society.

Governance challenges

Water governance in Rio de Janeiro has attained a quite sophisticated level of development. Nevertheless, there are still important steps forward to be made for full-fledged implementation. A few issues deserve particular attention, such as the integration of federal, state and local water policies (particularly for what regards urban planning); the difficult articulation for decision making between state agencies and river basin committees (for example, some projects implemented are not presented to river basin committees) and between state authorities and municipalities (especially large ones); the lack of planning or the prevalence of too traditional plans (very few plans are robust and comprehensive enough to trigger changes in practice).

Regarding investments and future steps, most plans consist of a "wish list" with no indication on the allocation of responsibilities, timeline and funding for implementation. River basin committees have been a civil society driver and mobiliser, but struggle to engage major stakeholders because of the absence of clarity on what their roles should be, namely deliberative or consultative. The difficult navigation between representative and participatory democracy is an issue, especially when it comes to implementing decisions taken by others and defining the accountability line. Tensions can also arise because stakeholders actually attending the meetings are not always speaking on behalf of their constituencies (but rather voice their own concerns) nor reporting back on the decisions taken.

The existing information system is fragmented, under-utilised and needs to be expanded and consolidated. Technical information to control the uses of water (due to exponential increase in the number of registered users and permits) is needed in order to enhance transparency and effectively guide decision making on water allocation and water financing. The entitlement, framing and classification system neither includes information on flow levels nor on factoring in meteorological information. Data on water

charges are reported on the INEA website but not fully available to the general public, which does not shed light on who pays for what.

State authorities have dedicated technical teams for managing water, but capacity in the public administration is still insufficient to address all the identified challenges. The INEA's technical staff positions were filled through two tender procedures conducted in 2008 and 2013, which had a positive impact on the agency's capacity to support technical, administrative and operational tasks. However, although the INEA clearly has the required critical mass, the problems in the state are manifold and pressing. Therefore resources are always short to deal with all issues and it is certainly difficult and challenging to maintain trained and qualified staff due to low salaries in the administration. This results in discontinuity in public action and ineffectiveness. Incentives are limited to professional training, especially provided by the ANA. Only a small portion of revenues from water charges is used to strengthen knowledge and expertise of river basin committees and civil society.

The double dominion affects water permits within state boundaries. Rio's primary source for water, Paraíba do Sul, is shared with Mina Gerais and São Paulo. Water allocation criteria vary from one state to another. The state of São Paulo can self-authorise the crossing of a tributary of the Paraíba do Sul River, which can generate strong controversies. This is a major issue for Rio de Janeiro, which is located downstream. Inconsistent approaches to setting reference flows and managing water permits can create conflicts, as the absence of defined flow requirements for federal rivers. Allocation decisions can be taken at a state or basin level (and based on state or local priorities) on matters of national significance and in conflict with national priorities (see Chapter 4). Also, water charges represent less than 15% of investment needs at state level. The value of charges has stagnated since 2003, stalling in institutional limbo. River basin committees approve annual and multi-annual investment programmes based on resources from water charges and financial compensation of the electricity sector. Charges collected cannot be easily used because of rather complex and lengthy bureaucracy in the tendering procedures of the water agencies. This is a serious problem because the users pay charges as a contribution to improve basin conditions and, if nothing is done with the collected funds, the level of frustration and discouragement increases. Bureaucratic hurdles generate problems for properly using funds collected from water charges. Water is a public good and therefore subject to public spending requirements. This problem is a nationwide concern that is not restricted to the case of Rio. The bulk of revenues are, in general, channelled to the national government, while only a small share goes to states and municipalities.

The weak participation of municipalities in existing deliberative and consultative platforms is a concern. Municipalities do not have water under their domain; they also face capacity issues to engage properly; and they often do not see the value of discussion fora that are not followed by concrete action and implementation. Mayors and their technical departments show little concern and motivation, especially in the largest cities. These problems are encountered nationwide, and likely require the identification of tangible incentives to attract municipalities to the collegiate structures.

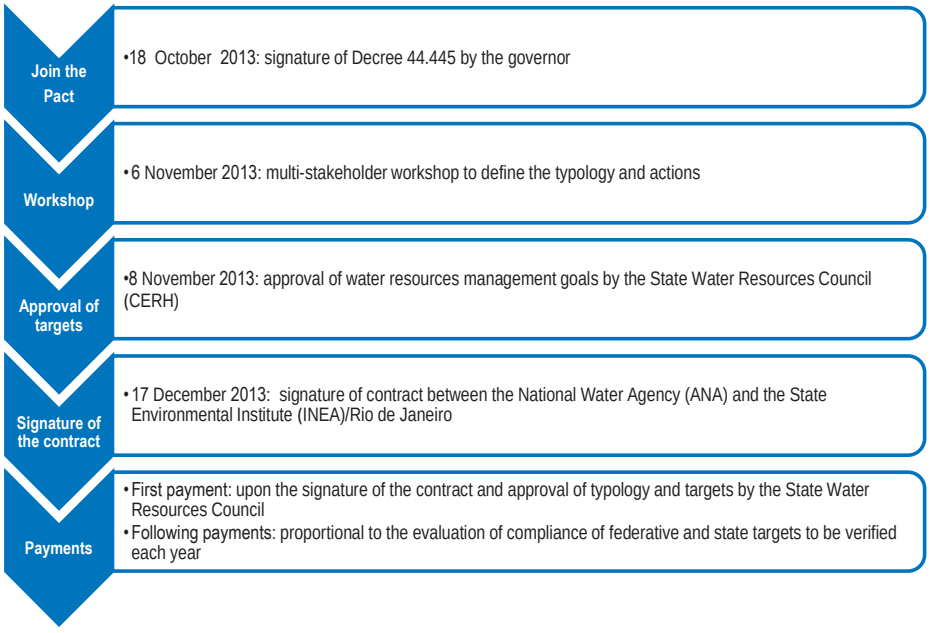
There are plans in place to help anticipate the effects of extreme hydrological events, better articulate actions between actors, implement procedures to monitor critical risks, and execute actions, but thus far, they have not proven effective in moving from crisis to risk management. In practice, most river basin plans serve as consensus-building tools rather than evidence-based documents that can set clear objectives and means of action based on data and

future trends. In some (limited cases) they include both a reactive dimension (criteria for regulation, licensing and administrative management) and a proactive component (flood prevention, etc.). The Rio de Janeiro State Plan was approved in 2014.

The National Pact for Water Management and its implementation

Rio de Janeiro joined the Pact in October 2013. The contract is implemented and monitored by the INEA, and the State Water Resources Council certifies progress as in other cases through its technical chambers and plenary meetings. Targets were defined in November 2013 under typology D, corresponding to the prognosis of a very high complexity scenario for water management in the state. Such a decision implies monitoring all 32 management variables for certification of the targets to strengthen the state water management system for the period 2013-16.

Figure 3.A3.3. **Steps of Progestão in Rio de Janeiro**



Note: Schema based on Contrato N. 092, ANA/2013 Progestão and Decreto Rio de Janeiro 44.445, 18/10/2013.

The allocation of funds through Progestão was not the primary incentive for the state to join the initiative, which was mainly triggered by the willingness to show political commitment to converge towards greater integration of federal and state water systems. This is important in a state like Rio de Janeiro because it depends significantly on water resources outside the state boundaries. While the state legal and institutional framework is robust, it also heavily relies on political will. In that sense, the Pact is a powerful means to commit beyond electoral cycles and to enhance commitment and accountability.

In addition, the regulatory functions of the ANA can generate incentives for the state to perform closer to the federal standards. This is particularly true for what relates to technical information and transparency. The Pact greatly contributes to process management and information consolidation, while fostering a systemic assessment of water management at the state level, in a participative way. The marginal funding from Progestão can help to provide credibility and trust to the management system. According

to the OECD questionnaire, state authorities expect the Pact to contribute to raising awareness, building political acceptability, sharing information, capacity building and finding innovative solutions, more than actually preventing conflicts.

Critical priorities have been established within the Pact's implementation process. The Pact is likely to help the approval of the state water plan and the finalisation of pending river basin plans. Water permits and charges could also be further used. In order to receive the second payment from Progestão, the state has to meet all 5 federal goals and at least 14 of all 32 targets defined. It is already known that 7 out of 32 will be not achievable in the short term and addressing them will be the main challenge for the future. Similarly, the federal goal on sharing information on groundwater was cancelled by the ANA because of internal problems. For certification purposes, the weight will be proportionally distributed to other targets, according to contract provisions. A few state variables are also likely to be difficult in the short term. Most progress is expected in the area of water information systems, namely in making it accessible to stakeholders and using it effectively in decision making. The first step was the creation in 2013 of a project module on qualitative and quantitative measuring. Progestão also encouraged the INEA to build a multiannual programme of training and communication.

Policy recommendations for the implementation of the National Pact for Water Management in Rio de Janeiro

As the Pact is entering its fourth year of implementation, the INEA and other state authorities should disclose greater information to stakeholders in order to raise awareness on water costs and risks, and trigger behavioural change towards more sustainable policies. The payment of water charges, among other benefits, triggers an increased demand for transparency. Understanding who pays for what and how ultimate sources of revenues are allocated across priorities becomes a requirement from stakeholders.

While it is clear that sanitation companies are contributing to water financing, farmers pay less (as in many countries). Greater transparency on water charges (and related decision making) could allow small users to group together (e.g. as users for raw water) in order to better voice their concerns. It is, however, important to note that remarkable progress has been made to shed greater light on the use of water charges across basins in Rio de Janeiro, which is reported back to the State Water Resources Council. It would be advisable to follow this path for financial transactions inherent to the Pact.

As the third disbursement of Progestão is approaching, the INEA has a unique opportunity to engage stakeholders on how these funds will be used. The Pact is a powerful transparency exercise on public commitment; a great incentive for authorities to identify and prioritise issues; and an opportunity for non-governmental authorities to push commitments. The flip side of the coin is that accountability throughout the process is critical to ensure that funding targets concrete actions to improve water governance in the basin and state. The INEA and tate water resources councils have an important role in ensuring the regular flow of information related to progress and decisions taken, especially as funding provided via Progestão is not earmarked by the ANA, but monitored and audited by state entities. It should then be used cost-effectively, with the needed balance between technical, logistical and institutional actions to reach intended goals.

It is also important to build on Progestão targets and requirements to consolidate a more robust and integrated information system. There is a transparency law at the federal level which should provide the framework for more systematic information sharing on the Pact's progress,

financing and challenges at state level (e.g. website bringing together the information from workshops, State Water Resources Council meetings, etc.). This could also contribute to greater visibility of the initiative. An underlying objective of Progestão is to disseminate information to all the states that signed the contract, and the ANA has a role to play in making this information available to the public. For example, the use of resources collected via water charges in each basin could feature in the national water information system and be accessible to academics, citizens, basin committees, state agencies, the State Water Resources Council, municipalities and other interested stakeholders, including from neighbouring states.

The question of political discontinuity is common to all states, including Rio de Janeiro. One advantage of the Pact is that it commits states to take action over five years; planning for the next stages, should begin before the five-year cycle is over, especially in a quite mature state as Rio de Janeiro. This will help to motivate INEA staff members involved in the current programming period and to keep stakeholders engaged in defining a longer term vision for managing water that should also include a territorial approach (integrated planning with industrialisation, etc.) to identify future challenges and ways to collectively address them.

Although Rio de Janeiro is an important city, it can still be difficult to effectively engage with decision makers at the municipal level there. For example, during the 2012 elections, only 1 out of 12 mayoral candidates was aware about the dynamics of federal and state water plans, and requirements to develop municipal water plans. New incentives to attract local representatives to the river basin committees and to the State Water Resources Council are necessary. These incentives have to be sought in the specific context of each state. A range of options can be considered for river basin committees and the State Water Resources Council to better engage with municipalities. For example, multipartite contracts could be signed between the ANA, the Ministry of Cities, the state and the municipality of Rio de Janeiro (including all cities within the metropolitan area) to share capacity and funding towards meeting objectives on sewage collection and treatment, against commitments (and related monitoring) in the relevant governance structures where decisions can be taken. This could probably boost information sharing (e.g. municipal water plans) and foster the willingness to contribute at political (mayor) and technical levels.

Another option is to consider a greater role for the private actors in discussion fora when important infrastructure or strategic decisions (e.g. related to land use, spatial planning or environmental licensing) are under consideration. *Ad hoc* invitations to inform on objectives, costs and expected benefits could help ensure such infrastructure fit in the state's strategy for the sector and do not contradict water policy goals.

The two-way dialogue between the federal government and Rio de Janeiro state level throughout the implementation process should also provide room for better involvement of water-related structures beyond the INEA. River basin committees are quite active in this state and should contribute effectively to the monitoring and implementation of the Pact. This implies that the workshops should not be restricted to the procedural assessment or technical monitoring of the targets but reaffirm the ultimate rationale behind the Pact: there is no effective and integrated federal water management without effective and integrated state water management, which goes beyond state administration structures and relies on effective and integrated basin management. In Rio de Janeiro, as elsewhere, making the Pact happen implies identifying "champions" that really believe in potential benefits of better water governance and that can convince their peers to embark fully on the collective undertaking. Rio de Janeiro clearly has those "champions."

Bibliography

ANA (2015a), *Boletim Progestão Nº 1*, Agência Nacional de Águas, Brasilia D.F.

ANA (2015b), *Boletim Progestão Nº 2*, Agência Nacional de Águas, Brasilia D.F.

ANA (2014), "Background report", OECD/Brazil Policy Dialogue on Water Governance, Agência Nacional de Águas, Brasilia D.F.

ANA (2013a), *Contrato N. 050/ANA/2013 - Progestão*, Agência Nacional de Águas, Brasilia D.F.

ANA (2013b), *Contrato N. 083/ANA/2013 - Progestão*, Agência Nacional de Águas, Brasilia D.F.

ANA (2010), *Atlas Brasil Abastecimento Urbano de Água. Panorama Nacional*, Agência Nacional de Águas, Brasilia D.F., http://atlas.ana.gov.br/Atlas/forms/Home.aspx (last accessed 5 May 2015).

ANA (n.d.), "Programs and Projects," www2.ana.gov.br/Paginas/EN/programs.aspx (last accessed 15 May 2015).

ANA, INEA and CERH (2013), *Contrato N. 092/ANA/2013 - Progestão*, Agência Nacional de Águas, Brasilia D.F. available at: www.inea.rj.gov.br/cs/groups/public/documents/document/zwew/mdy1/~edisp/inea0065526.pdf.

Araral, E. and D. Yu (2010), *Asia Water Governance Index*, Lee Kuan Yew School of Public Policy, Singapore, available at: http://lkyspp.nus.edu.sg/iwp/wp-content/uploads/sites/3/2013/04/AWGI-brochure-IWP-LKYSPP9-10.pdf.

Braid, S. et al. (2010), *Towards the Development of IWRM Implementation Indicators in South Africa*, Water Research Commission, South Africa.

Cap-Net, UNDP (2008), "Indicators: Implementing integrated water resources management at river basin level", Cap-Net.org, available at: www.cap-net.org/documents/2008/09/indicators-implementing-integrated-water-resources-management-at-river-basin-level.pdf.

CBH (n.d.), "Rio de Janeiro", www.cbh.gov.br/DataGrid/GridRio.aspx (last accessed 5 May 2015).

Commission of the European Communities (2007), "Towards sustainable water management in the European Union: First stage in the implementation of the Water Framework Directive 2000/60/EC", COM (2007) 128 final, Brussels.

COPPE (2014), *Plano Estadual de Recursos Hídricos*, Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering.

Cunha Libanio P.A. (2014), "The use of goal-oriented strategies in the building of water governance in Brazil", *Water International*, Vol. 39, No. 4, http://dx.doi.org/10.1080/02508060.2014.910433.

Environment Canada (2015), www.ec.gc.ca (last accessed 10 May 2015).

European Commission (2012a), "Report from the Commission to the European Parliament and the Council on the implementation of the Water Framework Directive (2000/60/EC) river basin management plans", COM (2012) 670 final, Brussels.

European Commission (2012b), "European overview", Commission staff working document, SWD (2012) 379 final, Brussels.

Governo da Paraíba (Government of Paraíba) (2013), *Decreto No. 33.861 de 22 Abril de 2013* (*Decree No. 33.861 of 22 April 2013*), available at: www.aesa.pb.gov.br/legislacao/decretos/estadual/DECRETO_N%2033861_13_Pacto-Aguas.pdf.

Governo da Paraíba (Government of Paraíba) (n.d.), www.aesa.pb.gov.br/gestao (last accessed 20 May 2015).

Hooper, B. (2006), "Key performance indicators of river basin organizations", US Army Corps of Engineers, Southern Illinois University, available at: www.iwr.usace.army.mil/Portals/70/docs/iwrreports/2006-VSP-01.pdf.

IBGE (2011), *Atlas de Saneamento 2011*, Instituto Brasileiro de Geografia e Estatística, www.ibge.gov.br/home/estatistica/populacao/atlas_saneamento/default_zip.shtm (last accessed 15 May 2015).

Lobato da Costa, F. (2003), *Estratégias de Gerenciamento de Recursos Hídricos no Brasil: Áreas de Cooperação com o Banco Mundial* (*Strategies of Water Resources Management in Brazil: Areas of Cooperation with the World Bank*), 1st edition, World Bank, Brasilia D.F.

NARBO (2005), *RBO Performance Benchmarking*, Network of Asian River Basin Organizations.

National Water Commission (n.d.), "Appendix A: NRMMC performance indicator report 2011", *The National Water Initiative: Securing Australia's Water Future: 2011 Assessment*, available at: www.nwc.gov.au/__data/assets/pdf_file/0017/8252/2011-BiennialAssessment-AppendixA.pdf.

OECD (2015), "Inventory of Water Governance Indicators and Measurement Frameworks", OECD, Paris, available at: www.oecd.org/gov/regional-policy/Inventory_Indicators.pdf.

OECD (2014a), *Water Governance in the Netherlands: Fit for the Future?*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264102637-en.

OECD (2014b), OECD questionnaire for the OECD/ANA Policy Dialogue on Water Governance, February 2014.

OECD (2014c), "OECD Water Governance Indicators", scoping note presented at the OECD Water Governance Initiative, 3rd meeting, Madrid, 28-29 April.

OECD (2012), *Water Governance in Latin America and the Caribbean A Multi-level Approach*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264174542-en.

OECD (2009), *Governing Regional Development Policy: The Use of Performance Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264056299-en.

OECD (2007), *Linking Regions and Central Governments: Contracts for Regional Development*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264008755-en.

Rio de Janeiro State (2013), "Decreto No. 44.445 de 18 de Outubro de 2013" ('Decree No. 44.445 of 18 October 2013"), *Diário Oficial do Estado do Rio de Janeiro* (*Official Gazette of the State of Rio de Janeiro*), Rio de Janeiro, 21 October 2013, available at: http://arquivos.ana.gov.br/imprensa/noticias/20131021_Decreto%20Ades%C3%A3o%20RJ.pdf.

RIOB/OIEau (2013), *Élaboration d'indicateurs de performance de la GIRE pour la gestion des bassins transfrontaliers africains* (projet KPI – "Key Performance Indicators") (2007-2010), Indicateurs de performance relatifs à la gouvernance dans les bassins.

Rodonia State (2013), *Decreto No. 18045* (*Decree No. 18045*), available at: www.sedam.ro.gov.br/arquivos/progestao/1%20-%20Decreto%20Progestao.pdf.

Transparency International (2013), *Water Management Transparency Index*, Spain.

UNDP (2013), *User's Guide on Assessing Water Governance*, Oslo Governance Centre, Oslo, available at: www.undp.org/content/undp/en/home/librarypage/democratic-governance/oslo_governance_centre/user-s-guide-on-assessing-water-governance.html.

UNEP (2012), The UN-Water Status Report on the Application of Integrated Approaches to Water Resources Management, UN-Water Report, available at: www.unwater.org/fileadmin/user_upload/unwater_new/docs/UNW_status_report_Rio2012.pdf.

UNESCO and ANA (2005), *Evaluation of National Programs of the National Water Resources Plan – PNRH.*

Varella, P. (2014), "Progestão: O programa de consolidação do Pacto Nacional pela Gestão das Águas", *Revista Águas do Brasil*, 11th ed., pp. 12-15, available at: http://aguasdobrasil.org/portfolio_item/edicao-11-2014-o-comite-de-bacia-como-articulador-politico-das-aguas.

Varella, P. (2013), "O Pacto Nacional pela Gestão das Águas", *Revista Águas do Brasil*, 6th ed., pp. 24-25, available at: http://aguasdobrasil.org/portfolio_item/edicao-6-2013-ano-internacional-da-cooperacao-pela-agua.

Venanzi, D. and C. Gamper (2012), "Public investment across levels of government: The case of Basilicata, Italy", OECD, Paris, available at: www.oecd.org/gov/regional-policy/basilicata_edited.pdf.

Chapter 4.

Water allocation as a policy instrument in Brazil

This chapter discusses how water is being allocated in Brazil and highlights some of the main achievements thus far. While acknowledging the diversity of contexts and arrangements across the country, the chapter also identifies several weaknesses, which need to be addressed so that water effectively contributes to broader policy objectives in Brazil in the fields of economic development, social equity and environmental performance.

Introduction

This chapter explains why water allocation matters in Brazil: a robust water allocation regime can make the most of economic development opportunities, protect the environment and promote the equitable use of water. It also reviews in more detail the state of play for water allocation in Brazil and explores options for reform.

The term "water allocation" is used in this report to describe the process and tools involved in sharing water resources amongst different water users. This includes establishing water resource plans that define the availability of water and granting water permits to individual water users. It also includes allocating water resources over the long term, as well as seasonal adjustments to the amount of water available to different users, and the allocation of both surface waters and groundwater.

The chapter builds on a series of consultations, in Brasilia and the São Marcos and São Francisco basins, which provide international good practice examples; the authors' own experience in other countries; from literature; and from the OECD Survey on Water Allocation Regime (OECD, 2015).

The first section sets the scene and explains why allocative efficiency is increasingly important in Brazil. The subsequent sections explore several elements of well-designed allocation regimes, including the definition of the resource pool; setting priorities for water allocation and the role of water permits; and governance arrangements for water allocation. Particular attention is given to legacy issues, which are an issue that will need to be addressed.

Water allocation: An emerging issue in Brazil

The adoption of a systematic approach to water allocation is relatively new in Brazil and the implementation of water allocation policy remains the exception rather than the rule. Both federal, state and basin levels play a role in water allocation. At the national level, the National Water Agency (Agência Nacional de Águas, ANA) implements the National Water Resources Management System (Sistema Nacional de Gerenciamento de Recursos Hídricos, SINGREH) and regulates water uses in federal water bodies. State water agencies define rules and issue entitlements for state water bodies. At both levels, water resources councils define general rules and deliberate on water conflicts. River basin committees define priority water uses and approve river basin plans. In some instances committees are supported by river basin agencies.

The National Water Resources Council (Conselho Nacional de Recursos Hídricos, CNRH) is responsible for approving general criteria for allocating water, including the granting of water permits. At a more local level, criteria for water allocation have been traditionally defined by federal or state government agencies. In principle, priorities at the basin level are set by basin committees in water resource plans.

Consistent with the global experience, more sophisticated approaches to water resources management have developed in those parts of Brazil where water scarcity has led to shortages and conflict. This has particularly been the case in the semi-arid Northeast, in parts of the South and Southeast, and around some of the larger cities. More recently, uncoordinated growth in agriculture, as well as development in other sectors, has increased conflicts related to access to water in other parts of the country as well.

Box 4.1. **OECD Survey of Water Resources Allocation**

In 2014, the OECD undertook a survey of water allocation regimes in OECD member countries and partner countries (Brazil, the People's Republic of China, Colombia, Costa Rica, Peru and South Africa). The responses reflect varying examples of allocation at different scales (national, state/provincial or basin) or specific type of freshwater source (e.g. treated wastewater). They cover 37 examples of allocation regimes across 27 countries. Results from the survey are referred to throughout this chapter.

The survey captures key elements of allocation regimes, including:

- General contextual information at national level: to provide the overarching institutional and legal context within which water allocation regimes operate and signal recent efforts to identify areas where water scarcity is becoming a problem. Respondents are also requested to signal any recent or on-going reforms of allocation regimes.
- Key elements of the allocation regime: to provide a detailed view of the functioning of specific allocation regimes, the questionnaire captures information about specific examples. In countries where there are a number of different approaches to water allocation (for example, different allocation regimes for surface or groundwater, or variations in allocation from one province/state/river basin to another) we recommend that several examples from each country are provided. The specific information being collected relates to:
  - Physical characteristics of the water system concerned. This includes variability of flow, the nature of existing infrastructure (if any), as well as an estimation of the relative share of water uses.
  - How the available resource pool is defined. This includes identifying if there is a clear limit on consumptive use and if so, how it is defined. It also includes information about how a number of factors are taken into account in determining the available resource pool, including environmental flows, base flow requirements, climate change, etc.
  - How users access water. This section documents if and how water entitlements are defined and administered. It covers the main types of arrangements: informal, administered regimes (priority ranking), based on economic instruments (prices, markets).
  - How access to water works in practice. Building on the previous section, it includes more detailed information on the characteristics of entitlements (e.g. possibility to trade, lease or transfer) and the possibility to restrict new entrants.
  - How exceptional circumstances are managed. This concerns unplanned events or "shocks" that negatively impact on the water resource. It captures information on how such shocks are defined and managed, in terms of the implications for water allocation.
  - How access is monitored and enforced. This covers whether and how withdrawal for various categories of users is monitored and describes the sanctions for non-compliance (if any).

Source: OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

The more sophisticated approaches that have been adopted when water availability is not sufficient to meet all water demands include the use of negotiated water allocations and water resources compacts. Negotiated water allocations involve a periodic process of negotiation among water users operating out of a reservoir, with the objective of adjusting the water available to users under their existing water entitlements based on seasonal water availability (Box 4.2). Water resource compacts are sets of rules defined by the ANA in consultation with governments and water users, and applied to a river or other water body. They can define reference flows at various points throughout the basin (as a basis for allocation decisions) and establish different levels of security according to rules agreed with water users and institutions. Water resources compacts and negotiated water instruments are given the force of law by way of a resolution made by either the ANA or the relevant state water agency, or both. Where compacts or negotiated water allocations are in force, any water permits must include conditions requiring the water user to comply with the rules set by the compact or agreement.

Achievements to date

Significant progress has been made in developing and implementing Brazil's water allocation system. Key elements of the framework that have been established and which directly or indirectly guide the allocation of Brazil's water resources include:

- The National Water Resources Plan. The current plan was approved by the CNRH in 2006. A subsequent review has identified 22 priorities for the period 2012-15.
- State water resources plans have been completed in 18 of Brazil's 27 states, with an additional 5 nearing completion.
- Interstate river basin water resources plans, of which nine plans have been completed, covering over 50% of the country (see Chapter 2).
- State river basin or management unit water resources plans, of which more than 100 have been completed.
- The national water use database system, which is fed directly by water users via the Internet and can be integrated with state databases.
- The National Registry of Water Resources Users (Cadastro Nacional de Usuários de Recursos Hídricos, CNARH), which allows for the recording, storage and retrieval of information relevant to water resources management, including information to support assessments of water availability, identify potential conflicts among water users and support contingency planning for critical events.

Efforts to regularise existing water users and bring them within the water permitting system have been productive. The combination of campaigns to raise awareness and the development of decision support systems to assist with the processing of water permits have resulted in more than 7 000 water permits being issued for water users in federal rivers and over 200 000 water permits throughout the country.

Water charges have been implemented in four federal river basins and by five state governments. A charge has also been established for the use of water for hydroelectric generation, which is charged 0.75% of the value of the energy produced. The charges have the potential to support water allocation measures by incentivising the rational use of water and providing funding to support the implementation of water resources plans and to defray water resources management administration costs.

Water resources compacts have now been established in at least eight river basins. Negotiated water allocations have been used for more than 18 years in more than 100 reservoirs. As noted above, these compacts and agreements set limits on the total volume of water available for allocation and establish rules for sharing water during periods of scarcity.

Box 4.2. **Water allocation in the São Marcos and São Francisco River basins**

The São Marcos Water Resources Compact establishes a mechanism for reconciling the demands of the agriculture and hydropower sectors within the basin. The compact defines the limits of irrigated agriculture in each basin state, in line with a basin cap on water consumption. It also includes further criteria for the granting of new water permits, including that irrigation must demonstrate a minimum efficiency of 85% (assuming pivot irrigation technology is being used). The ANA and the relevant state agencies are responsible for the permanent enforcement of the compact.

The water allocation planning process for the São Francisco has resulted in a sound basis for future decision making. Even though the draft water resources plan prepared by the ANA was not ultimately adopted, the planning process has brought together significant information related to water use, water availability and water demands in the basin, as well as the identification of potential criteria to guide allocation decisions. From a technical perspective, the planning process provides a template for undertaking similar processes in other basins.

These two basins are presented in more detail in Annexes 3.A4 and 3.A5.

Plans that cannot guide allocation decisions

Despite these achievements, practical implementation of Brazil's water allocation framework remains limited and challenging. This section highlights the lack of systematic criteria to guide allocation decisions in Brazil.

While water resource plans are required to define the priorities and other criteria that will be used for allocating water within the basin, in practice plans often do not address these matters. Moreover, plans generally do not factor in cyclical events such as droughts and thus lack clarity in terms of priority of water use in times of crisis when water entitlements may need to be reduced. In the absence of clearer direction from water resource plans, water permits and other entitlements to water are often allocated on a "first come first served" basis. Decisions are based on reference flows that may have been determined by the relevant water agency but are not set out in a transparent way or in a binding regulatory instrument. As basins become more constrained, such an approach is likely to become problematic.

The National Water Resources Plan is too broad to set priorities, and fails to link to the broader development strategy and co-ordinate decision making. Equally, the plan does not provide any strategic guidance on how water is to be allocated between different geographic or administrative regions, leaving questions of the sharing of transboundary rivers and inter-basin transfers to be decided on a case-by-case basis, at the basin or regional level. Furthermore, river and state basin plans claim directions, which are not implemented due to lack of buy-in from the relevant stakeholders and policy makers having to take corresponding measures or allocate funds.

Despite the existence of several fora for developing and reconciling plans, sectoral planning occurs largely in isolation, frequently unconnected to the water resources planning process. In addition, the National Water Resources Plan does not provide clear guidance on how issues between these and other sectors should be resolved.

This places the responsibility for many allocation decisions with river basin committees or state agencies – entities whose water allocation priorities may differ from those at the national level. Such issues are exacerbated by challenges related to the double dominion[1] over water management, and the inconsistencies in approach to allocating water from hydrologically connected water sources.

Rising costs of allocation inefficiencies

Failure to address the limitations of water allocation in Brazil is likely to result in further conflicts over water and limit the potential for the allocation of water resources to contribute to developmental, economic and other objectives. As demand for water increases, these issues and challenges are expected to come into sharp relief, and could result in the following consequences:

- Negative impacts on existing water users, including the potential to undermine their economic viability, for example, where their water supply is diminished as a result of water being allocated to other sectors or users.
- Disincentives for investment in water-dependent development. Uncertainty with respect to current or future availability of water may lead local governments or private investors to not take up potential development opportunities. At the same time, there is potential for overcapitalisation, where investors proceed with a development only to discover that the quantity or reliability of water required is not available.
- Failure to maximise the potential of existing water resources. In basins where water resources have become a limiting factor to economic growth, maximising the benefits to the economy and the community of water resources development will require more sophisticated approaches to water allocation. In the absence of such approaches, full allocation of the available water resource is unlikely, and where water is allocated, the mechanisms or incentives may not exist to ensure it is used efficiently and/or for the "best" available use, whether in terms of economic, social or environmental outcomes.
- Failure to achieve national, state and local development objectives in water-related industries. Targets in respect of agricultural expansion, hydropower development and other water-dependent industries are unlikely to be met unless a more strategic approach is adopted to water allocation, with criteria better aligned with broader development and social objectives.
- Loss of freshwater ecosystem services and failure to achieve ecological objectives. Increased demand for water for consumptive purposes will inevitably mean changes to existing flow regimes, with likely consequences for river processes, dependent ecosystems and related ecosystem services.
- Increase in conflict between sectors and users. The above factors are likely over time to heighten existing conflicts between different sectors and water users, as well as to lead to new conflicts.

Box 4.3. **Measuring the economic costs of misallocation or changes in water allocation**

In a recent assessment of the role of water in the US economy, the United States Environmental Protection Agency (US EPA) noted the importance of developing tools that will support analysis of the economic implications of changes in the use of water across sectors, as well as analysis of the economic consequences of water shortage. Considering the ripple effects of changes in water availability, demand and allocation on the economy, computable general economic (CGE) models have a decisive advantage.

Fadali, Rollins and Stoddard (2012) note: The literature includes many examples of CGE models that have been used to examine the economic consequences of alternative water projects, allocations, or prices, as well as the effects of increasing scarcity. The existing literature on water-CGE models gives examples of the types of general equilibrium effects that cannot be accounted for in partial equilibrium methods. A good example of how a CGE can identify secondary effects is described by Hassan and Thurlow (2011), who use a multi-regional CGE model of South Africa to compare water trade liberalisation policies. They find that creating a water market amongst rural farmers improves the welfare of rural farmers but hurts the urban poor because the prices of cereals increase when the price of irrigation water increases, encouraging farmers to grow higher value vegetable and fruit crops rather than grains. In this example, higher water prices lead to different crop mixes, price changes for agricultural commodities and different income effects for urban and rural poor.

The types of economic problems concerning the value of water resources that lend themselves to CGE approaches tend to include the following elements: 1) the value of water as an input to one or more industrial sectors in a well-defined regional economy is a relatively high proportion of the total value of the output of those sectors; 2) those sectors are integrated into the rest of the regional economy, so that secondary effects in other markets are likely a result of changes in sectors that rely directly on water resources; 3) the regional borders of the economy to be modelled are well defined in terms of water use, such as a hydrological basin, a watershed, a water utility district or rivershed; 4) there is sufficient use for a water CGE model (in developing simulation scenarios that are policy relevant) to justify the investment in designing, developing and calibrating it.

Reviewing existing water CGE models with applications in the United States, Fadali, Rollins and Stoddard further signal:

- An attempt to model the economic effects of reducing the amount of water used for crop irrigation to alleviate salinisation of irrigated land in California's Central Valley, determining a shadow price for water that would be diverted from agricultural production. They evaluated this shadow price in the context of water prices in nearby urban areas, and found that urban water users could easily afford to compensate rural farmers for the marginal value product of the water taken out of irrigation agriculture.
- Research where a fixed ratio of water to land was used to model the economic consequences of water withdrawn from agriculture for various environmental purposes. They found that recreation benefits were not large enough to compensate for lost agricultural activity.
- The use of a dynamic CGE model to compare economic outcomes of building an additional dam versus allowing short-term water trades between agricultural water users and municipalities in south-eastern Colorado, concluding that the water trades did not impoverish rural regions and would meet urban demands more cheaply.
- Similarly, using a model that simulated population growth and increasing water demand, researchers found that allowing short-term water trades between agricultural sectors and municipal water providers in north-eastern Colorado would mean an increase of about 8% in the price of municipal water and 10% in the price of agricultural water. In contrast, a simulation of population growth without a water market predicted an increase of 25% in the price of municipal water and no increase in the price of agricultural water.

Box 4.3. **Measuring the economic costs of misallocation or changes in water allocation** (*cont.*)

The impact of the adoption of different allocation regimes on economic outcomes is highlighted by the case of the Murray-Darling basin in Australia. Economic modelling led by the National Water Commission indicated that the adoption of a water-trading system as part of the water allocation framework had reduced the impact of drought on regional gross domestic product in the southern part of the basin from AUD 11.3 billion to AUD 7 billion over a five-year period. This is not to say that water trading is necessarily appropriate in all situations, but rather to highlight the significant economic differences that can be linked to different allocation outcomes.

Sources: Hassan, R. and J. Thurlow (2011), "Macro-micro feedback links of water management in South Africa: CGE analyses of selected policy regimes", *Agricultural Economics*, Vol. 42, No. 2, pp. 235-247; US EPA (2013), "The importance of water to the U.S. economy: Synthesis report", Office of Water, United States Environmental Protection Agency, Washington, DC, November, available at: http://water.epa.gov/action/importancefwater/upload/Importance-of-Water-Synthesis-Report.pdf; Fadali, E., K. Rollins and S. Stoddard (2012), "Determining water values with computable general equilibrium models", report submitted to Industrial Economics, Inc. for presentation at "The Importance of Water for the U.S. Economy: Technical Workshop", 19 September, available at: www.unr.edu/Documents/business/esnr/Determining_Water_Values_with_Computable_General_Equilibrium_Models.pdf; National Water Commission (2012), *Impacts of Water Trading in the Southern Murray-Darling Basin Between 2006–07 and 2010–11*, Commonwealth of Australia, Canberra, available at: http://archive.nwc.gov.au/__data/assets/pdf_file/0009/21996/NWC_7019_WTR_Full.pdf.

Technical considerations

This section reviews technical requirements that can improve allocative efficiency in Brazil. It focuses on the key requirements and some of the main features of well-designed allocation regimes: the definition of the water available for allocation, the definition of environmental flows and their relative weight in allocation decisions.

Key requirements

The CNRH is responsible for approving general criteria for the granting of water permits, while specific priorities are set by basin committees via water resource plans. In this context, "criteria" include:

- the mechanism for determining the volume of water available for allocation (i.e. setting the consumptive/non-consumptive balance)
- the approach to prioritising between basin, administrative regions, sectors and users, including at different timescales
- the prerequisites that must be met before a water permit or other entitlement is granted.

Each of these aspects needs to be considered in setting water allocation criteria. It is important to stress that the allocation criteria, although central, are only one element of the allocation regime. Further, while there is a range of technical tools and methods that can be used to develop and apply allocation criteria, and there are significant lessons from the international experience in this regard, there is no single or "right" approach to setting criteria.

Allowing for flexibility when setting criteria will be important, as what is appropriate (such as the approach to assessing availability, or determining priorities) is likely to vary between basins and regions. Furthermore, determining priorities for allocation of water,

deciding whether water for hydropower should be favoured over irrigation, is a strategic question. The response will be dependent on the broader political agenda and long-term development and other related priorities. Again, there are a range of tools and methods for assessing the economic, hydrologic and other impacts of different scenarios, but ultimately decisions on priorities will usually be a strategic rather than technical matter.

The following sections consider the requirements for an allocation regime (including allocation criteria) that can improve the performance of Brazil's water management system. In considering issues and options, the following five objectives are used as an overarching guide to the outcomes sought:

1. To allocate water, now and in the future, to reflect broad policy objectives. In particular, this requires allocation decisions to be aligned with broader social, environmental and economic development planning instruments and objectives.
2. To balance water security for water users and flexibility for water managers. An inevitable tension exists between: *i)* the need to provide a level of security and certainty for water users that water will be available to them in accordance with their entitlement and that their entitlement will not be arbitrarily cancelled or varied, while *ii)* allowing water managers sufficient flexibility to respond to changing circumstances.
3. To ensure equity in the way opportunities and risks are shared, including equity as between different regions, sectors or users. The approach to allocating water should provide a basis for considering the costs and risks to different parties associated with alternate allocation scenarios, and for balancing and sharing the benefits.
4. To minimise transaction costs. The allocation of and future adjustments to water entitlements need to be made at least cost for society, meaning at the same time that they do not deter investment in water efficiency and high-value water uses, and that they do not absorb undue amounts of time and resources.
5. To promote compliance. This requires the ability to monitor whether various parties are taking water in a way that is consistent with their water entitlements, as well as the capacity to take action in the event of non-compliance. It also implies an understanding on the part of water users and other stakeholders of their rights and obligations under the water allocation regime.

These five objectives can read as an operational declination of allocative efficiency. In many ways, these objectives apply to water allocation in many other countries and situations. A number of special considerations apply given Brazil's particular circumstances. These include:

- The large spatial extent and diversity of Brazil's river network. This includes diversity in respect of hydrology, geomorphology and ecology.
- The significant differences across the country in terms of water supply, water demand and levels of water resources development.
- The large number of individual users who directly abstract water from surface or ground sources, and the associated administrative, monitoring and enforcement challenges.

- The constitutional arrangements for water management and how responsibilities for water allocation and management are shared between federal and state governments.
- The different levels of economic development and the different nature of the economy and economic opportunities across the country.
- Different levels of capacity within different jurisdictions to implement and enforce water allocation measures.

Above all, these factors imply the need for flexibility in the water allocation system, to allow adaptation to local conditions, while at the same time providing guidance through a consistent overarching framework.

Where relevant, each of these objectives and factors are considered in the following discussions on different aspects of the allocation regime.

Determining the water available for allocation: Defining reference flows

Total average annual flows of rivers in the Brazilian territory are around 180 000 m^3/s, although the variable nature of these flows means that a lesser volume is available for allocation. Typically, the water available for allocation will be determined based on statistical reference to one or more elements of the flow regime.

In Brazil, "reference flows" are used as the basis for defining available water resources and determining whether water is available for allocation, such as when taking decisions on issuing water permits. Approaches to setting reference flows vary between rivers and jurisdictions. Examples include:

- The flow equalled or exceeded for 95% of the time (Q_{95}). This is the most common approach to reference flows in Brazil.
- The flow equalled or exceeded for 90% of the time (Q_{90}). This is a less restrictive approach to defining the available water. Allocating water based on the Q_{90} will result in a higher volume of water being available for allocation, but at a lower reliability – i.e. there is a greater probability that the total volume allocated will not actually be available in a given year.
- The minimum flow over a seven-day period with a ten-year recurrence period ($Q_{7\text{-}10}$). This is likely to be a more restrictive approach than adopting the Q_{95}, resulting in a lower volume of water being available for allocation, but at a very high level of reliability.

For example, at a national level, the actual water available for allocation is estimated to be roughly 4 550 m^3/s out of the total annual flows for 91 000 m^3/s, based on the Q_{95}. Water availability can be considered for different timescales, such as based on average annual or monthly flows, and will typically be set for various control points. Table 4.1 shows water availability at different locations within in the São Marcos River basin. In addition to annual availability, the Q_{90} and Q_{95} for the month of August were also considered as part of the allocation planning process, given it is the month with the lowest average flows.

The adoption of different approaches to setting reference flows (e.g. Q_{90} vs. Q_{95}) by jurisdictions should not be considered undesirable. Rather, different circumstances – such as the hydrology of a particular river system, the type of water use within the region (and hence appropriate level of risk of non-supply), the timing of peak demand or the nature of

the water supply infrastructure – are likely to dictate the need for different approaches to setting reference flows across the country. The flexibility to adjust the approach to determining available water should be retained.

Table 4.1. **Water availability in the São Marcos River basin (m^3/s)**

	Q_{95}	Q_{90}	Q_{95} August	Q_{90} August	$Q_{7,10}$
Springs of the São Marcos River	3.0	3.61	2.21	2.59	1.94
São Marcos at the HPP Batalha	24.10	31.01	18.4	22.12	15.90
Mouth of the São Marcos	54.51	55.65	54.09	54.12	52.71
Samambaia stream	1.10	1.40	1.01	1.05	0.64
Córrego do Barreiro creek	0.47	0.77	0.27	0.37	0.31

Consistency is, however, important:

- In setting reference flows for rivers that are hydrologically connected. For example, where state and federal rivers interact, it would be advantageous to have mechanisms in place that ensure a common approach is adopted to setting reference flows. This issue is discussed further within the context of addressing the challenge of the double dominion.
- In the application of the defined reference flows to allocation decisions. For example, by ensuring a consistent approach to assessing permit applications against reference flows, and in setting the conditions on water permits to align with the relevant reference flow.

The approach to setting reference flows means that entitlements, such as water permits, granted in accordance with the reference flow will carry an inherent level of reliability (e.g. 95% reliability of supply where based on the Q_{95}), provided all water in the basin or related region is managed on the same basis.

The Brazilian approach – whether $Q_{7,10}$, Q_{95}, or even the less restrictive Q_{90} – results in a level of reliability for water users that is high by international standards, particularly for use in irrigation (Box 4.4). The flip side is that it results in a lower volume of water being available for allocation. Depending on the hydrology of the particular river, the difference in volume under Q_{95} versus, Q_{75}, for example, may be significant. In river systems that are highly intermittent or variable, the difference is likely to be greater.

One advantage of this approach is that it simplifies the management and enforcement process. The higher reliability means that there are likely to be fewer periods when water users cannot access their full quota. In many instances this potentially removes or reduces the need for a process for determining annual or seasonal allocations to individual users. This, in turn, simplifies the monitoring process: for example, irrigators can be granted water permits linked to a fixed irrigable area, which does not need to be adjusted annually. Compliance can focus on the irrigated area, without the need to monitor the actual volume of water abstracted at any given time. In practice, water permits granted by the ANA include a number of conditions, including monthly and annual volumes, and compliance is assessed against those conditions.

This type of approach is common in river systems with relatively low demand; that is, where water use demand and the associated volume of water allocated is less than the total available. However, as demands increase more flexible approaches could offer greater capacity to maximise the benefits available from the river system. Notably:

- By basing allocations on low flow periods. However, such an approach does not allow for a greater draw on the resource during periods of abundance. Providing capacity for water users to take more water during periods of high flow would increase the pool of water available for allocation. It also has the potential to encourage different patterns of water use, for example by encouraging industries or agriculture that can utilise greater volumes of water during periods of high flow, or by promoting infrastructure for the capture/abstraction and storage of water for later use. While the ANA already defines monthly volumes for water permits (thus allowing for more nuanced entitlements that provide access to more water during high flows), such an approach is not adopted by state water agencies.
- Adopting a common approach to reliability for all water users does not recognise the different impact on the range of water users as a result of water shortfalls. Different geographic regions, water sectors and individual water users are likely to have significantly different needs and risk profiles. Adopting a more flexible approach to defining reliability can make more water available for use and contribute to a more economically efficient allocation of water.

There are various options available for adjusting approaches to reliability. This could simply involve adopting a lower threshold (e.g. Q_{85} or Q_{80}) when setting reference flows, and accepting a higher level of risk for water users. Alternatively, it would be possible to determine reference flows by setting different levels of reliability for different regions and/or purposes. For example, a certain volume of water could be granted at one level of reliability (say Q_{95}) and additional water granted at lower levels of reliability. Finally, it may be possible to allow water users to vary their volume and reliability, based on individual requirements.

Changing approaches to setting reference flows offers significant potential to address water shortages in heavily contested basins. However, introducing greater flexibility to the setting of reference flows – such as by allowing different levels of reliability for different users or by allowing for different abstraction volumes at different times of the year – would require more sophisticated approaches to allocation and management. This could involve some or all of the following:

- Including additional conditions on abstraction on water permits, such as monthly volumes of water, rather than simply specifying a maximum annual volume (permits granted by the ANA already include monthly volumes, but those granted by state agencies do not).
- An annual allocation process, to determine how much water is available to different users under different conditions and at different times.
- The ability to monitor compliance with those allocations.
- Support relevant water users, including ensuring they are fully informed of the basis of their water entitlements, the underlying reliability and how water is to be shared under different conditions.
- One option could be to establish a different category of water permit which allowed for users to take water during a more limited window of opportunity, e.g. during periods of high flow. The ANA already defines water permits with reference to monthly volumes, but state agencies do not include such detail and flexibility. Revised management arrangements (e.g. defining water permits differently, more intensive monitoring requirements) would only need to apply to

those permits that were operating under the non-standard approach to water allocation.

Box 4.4. **Defining limits on abstraction: Results of the OECD survey**

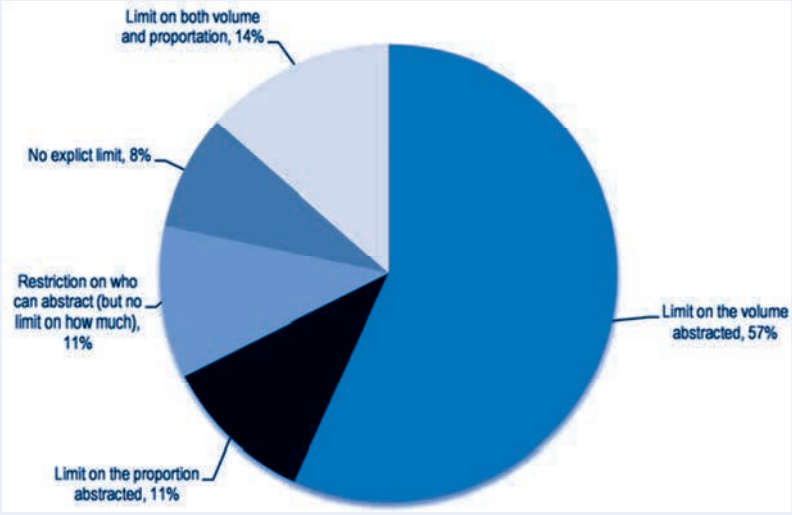
Respondents from 27 countries were asked if there is a clear definition of the limit on consumptive use and, if so, how this limit is defined, among the following options (Figure 4.1):

- a limit on the volume of water that can be abstracted
- a limit on the proportion (e.g. percentage of flow) of water that can be abstracted or
- restrictions on who can abstract water (but no limit on how much water can be abstracted).

A significant majority of allocation regimes (81%) have a clear definition on the limit on consumptive use. A limit on the volume abstracted is the most common type of definition (60%). Thirteen per cent of examples have a restriction on who can abstract water (but no limit on how much), with only a few examples (9%) which use a limit on the proportion abstracted, with another 9% reporting that limits are set both in terms of volume and proportion. Three examples report having no explicit limit on abstraction: the Czech Republic, the Netherlands and the Yukon Territory in Canada.

Of those allocation regimes with an explicit limit on abstractions, 41% indicated that the amount of water available for consumptive use in the resource pool is linked to a river basin management plan, 35% indicated that it is linked to another planning document. A quarter of respondents (24%) indicated that the limit is not linked to any planning document. For those examples that have linked the limit on consumptive use to an official planning document (river basin management plan or otherwise), 62% indicated that the document was a statutory instrument that must be followed, while 38% indicated that the plan was considered a guiding document.

Figure 4.1. **Proportion of allocation regimes according to type of limit on abstraction**



Source: OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

Box 4.5. International approaches to defining reliability and managing risk

Approaches to defining the reliability or assurance of supply vary with the local context, and can be affected by the hydrology of the relevant basin, the nature of the supply arrangements (e.g. whether water supply is supplemented by a reservoir or wholly dependent on the run of the river), and the purposes for which water is used. These and other factors contribute to the likelihood and consequence for a water user to receive less than their nominal entitlement in a given year. The different approaches also reflect different approaches to risk.

In South Africa, the Inkomati Water Allocation Framework established levels of assurance for different sectors within the Inkomati River basin. The allocation process assumed primary domestic needs required 100% assurance of supply. Strategic uses (such as power generation) required 99%, industrial 98% and urban supply 95%. A range of different levels were set for irrigation, ranging from 95% for high-value crops to 70% for opportunistic crops. This approach of adopting a relatively high assurance of supply (generally over 85%, and with most water allocated at 95%) meant that water would be available under those entitlements in the majority of years and thus removed the need for an annual allocation process. However, the approach also meant that less water was available for allocation. Twenty-five per cent more water could have been allocated if annual demands were met for only 90% of the time, and 46% more water could have been available at an 85% assurance than if demands are to be met in all years.

In the People's Republic of China, water allocations are typically made to achieve a reliability of 70-75% for agriculture and 95-98% for urban and industrial users. In some instances, more tailored approaches are adopted. For example, in the case of the Jiao River, in Fujian Province, all allocations are based on runoff at 97% reliability. As such, the plan is designed to only operate in 3% of years, as it is only during the extremely dry periods that there are water shortages and some sharing mechanism is required.

In Australia, the approach adopted varies between states, and in the case of irrigated agriculture, is significantly influenced by the dominant crop types within the particular basin. In those areas dominated by permanent crops, such as grapes or fruit trees, water within reservoirs is commonly allocated to ensure a high level of reliability, whereas in regions dominated by annual crops, a more aggressive approach to allocation is often adopted, which results in a greater volume of water being available for allocation, but also increases the risk of annual shortages. Increasingly, the allocation systems in Australia are providing greater flexibility to the individual user to determine and manage their own level of risk. This has included through allowing water users to purchase both high and low reliability entitlements on the water market, or to convert their existing entitlements to a different level of reliability. For example, this might involve a reduction in the nominal entitlement, but an increase in the reliability of supply of that volume. Such approaches involve moving away from defining particular reliabilities for different sectors, and instead providing the flexibility to individual users to account for their own circumstances. In respect of urban (drinking) water supplies, there has also been a shift away from defining urban water entitlements based on annual or daily reliability (which has historically been set at 95-98%) to focus on the "levels of service" provided to households, and thus better articulating the circumstances under which households may be restricted in their water supply, and the nature and expected duration of those restrictions.

Adopting a less conservative approach to reference flows in a basin necessarily carries additional risks. It is important that the nature of water use within the basin is understood, as is the likelihood and consequence of water users receiving less than their full quota: the impact of a shortfall in urban water supply will be significantly different to the impact on irrigators growing annual crops. As such, different approaches are likely to be warranted depending on the make-up of water users within the basin.

In some instances it may also be appropriate to define the allocable pool by more than a single reference flow. For example, defining reference flows at Q_{95} gives an indication of the likelihood (i.e. 95%) of water users receiving the full volume under their entitlement. However, it does not provide information on the water supply situation during the remaining years, i.e. the 5% of years when less than full supply is expected to be available. The impact on water users during those years will vary significantly depending on the level of water scarcity, i.e. how much less than 100% of their entitlement water users receive, and the duration of the scarcity. Particularly in the urban context, it is critical to understand what water will, in fact, be available during periods of scarcity, and how long water users can expect water shortages to last.

The implications of climate change for water availability should be considered in setting reference flows, as well as more broadly in structuring the water allocation regime. Presently little consideration is given in the allocation process to the potential consequences of climate change. Climate change will:

- add to the inherent uncertainty associated with freshwater systems, a critical factor to consider in establishing reference flows and more broadly allocation regimes
- make historic flow data no longer appropriate as a reference for decision making
- affect water demand, across and within years.

In the context of a changing climate, the definition of reference flows would benefit from the adoption of a precautionary approach. Moreover, changes need to be monitored. A forward-looking approach is required, in assessing availability and demand for water. Annex 4.A1 lists countries which factor climate change in their water allocation regime (based on the OECD survey): half of respondents factor in climate change; this translates, at minimum, into enhanced monitoring of water flows and recurrent revision of water resources plans. Box 4.6 refers to the Australian experience in more detail.

Box 4.6. **How climate change is factored in water allocation in Australia**

There are a number of ways that issues related to climate change are managed under the water allocation framework in place in Australia. Measures which directly or indirectly respond to the uncertainty associated with climate change include:

- Considering the possible impact of climate change on rainfall, catchment hydrology, and hence water availability. This has typically involved scenario analysis which looks at a range of possible outcomes based on different global climate models.
- Providing flexibility within the allocation system to allow for ongoing and future adjustments, both in respect of the total volume of water allocated and who that water is allocated to. This has included periodic reviews of allocation plans and the introduction of water markets.
- Assignment of risks associated with changes to water allocation as a result of climate change. Notably, the National Water Initiative provides that water entitlement holders bear the risk of any reduction or less reliable water allocation arising from reductions to the consumptive pool as a result of seasonal or long-term changes in climate (NWI, clause 48).

Environmental flows

Setting reference flows should involve consideration of non-consumptive water demands, including environmental flows (e-flows), which indicate the flow regime required to sustain ecosystem services at the required level. The importance of environmental flows is now widely recognised, and legislation in many countries enshrines the requirement that environmental water needs be considered as part of the allocation process (Box 4.7).

Box 4.7. The definition of e-flows: Results from the OECD survey

A significant majority (76%) of respondents to the OECD survey indicated that minimum environmental flows are defined. A wide range of methodologies to do so was reported. For example, in Israel, in some places a minimum quota of water has been set aside and must be allocated to ecosystems. In Slovenia, the ecologically acceptable flow is set depending on the type of water use and type of ecological needs. In England and Wales, environmental flow indicators are used as an indicator of the flows required by the environment. In Portugal, minimum environmental flows are determined on a case by case basis. In China, the warning-level river flow against the drying out of a downstream river course shall not fall below 200 cm^3/sec at Xiaheyan hydrological stations. In the Murray-Darling basin, Australia, the Basin Plan limits water use at environmentally sustainable levels by determining long-term sustainable diversion limits for both surface and groundwater resource. A key component of the Basin Plan is the environmental watering plan, which co-ordinates all environmental watering across the basin.

Of the examples indicating that minimum environmental flows/sustainable diversion limits are taken into account, 82% take freshwater biodiversity into account in the definition of e-flows and 64% take terrestrial biodiversity into account. For example, in France, the minimum biological flow and the reserve flow required are based on the observation of ecological needs.

Note: Information on data for Israel: http://dx.doi.org/10.1787/888932315602.

Source: OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

Freshwater systems provide a wide range of ecosystem services, and those services depend on particular flow regimes. This includes many services beyond traditional "conservation" objectives, and can include services such as flood attenuation or the provision of water for human consumption. Failure to provide adequate environmental flows can lead to a wide range of negative, and often unexpected, impacts (Box 4.8). Further, international experience shows it is extremely difficult to recover water for the environment once it has been allocated for consumptive use (see the section on addressing legacy issues). This highlights the importance of reserving appropriate flows for environmental purposes from the outset.

It does not follow from the considerations above that environment should be given priority *vis-à-vis* other water uses. The point is that due consideration should be given to the needs of the environment (in particular, freshwater ecosystems) from the outset and the likely consequences of reductions or other changes to instream flows: understanding how much water ecosystems need to provide the services on which our well-being relies is a requisite to factor the environment in allocation decisions. Underestimating these needs can be very costly in the end (either because ecosystems may fail to function or because their protection or restoration will be more costly at a later date); overestimating them results in lost opportunities for other valuable purposes.

Box 4.8. **Impacts of failing to consider environmental flows**

Freshwater systems provide a wide range of ecosystem services. Changes to the natural flow regime can impact on the ability of a river to provide these services. Poor water allocation practices can mean that many of the services that rivers provide – for free – can be lost, with significant impact on dependent human communities. Examples from the international experience include:

- Heightened flood risk – such as in Yellow River, China, where overallocation resulted in the build-up of sediment and changes to river morphology. This led to the river being perched above the floodplain, and created a significant increase in the risk of flooding. Dedicated flows, representing around 35% of the mean annual flow, are now provided as part of the allocation regime to improve sediment movement as part of efforts to reduce the risk of flooding.
- Saltwater encroachment and related environmental declines – such as in the Indus River, Pakistan, where overallocation and massively reduced flows at the river mouth led to salt water intruding around 64 kilometres inland, resulting in the loss of approximately 1.2 million acres of farmland.
- Outbreak of pest species – such as in the Orange River, South Africa, where hydropower development resulted in more stable base flows, thus creating a habitat for blackflies. This led to blackflies reaching pest proportions, with significant impacts on cattle production.

Declines in fish and other aquatic populations – such as in the Yangtze River, China, where changes to the downstream flow regime as a result of construction of the Three Gorges Dam have caused a decline in juvenile fish stocks of the four major carp species of up to 95%, with subsequent effects on fisheries production.

Source: Speed, R. et al. (2011), *Policy Measures, Mechanisms, and Framework for Addressing Environmental Flows*, International Water Centre, Brisbane, Australia.

There is limited consideration of environmental flows in Brazil: they are not established by law, and states usually consider them to be the remaining flows. The CNRH, through Resolution 127/2011, has defined the concept of a "residual flow" (in the report, the word "minimal flow" is used instead). The resolution does not, however, define environmental flows. When considering a new investment, the Energy Agency can make a specific study about e-flows in one particular basin, and its recommendation will apply. Formally, the licencing body has the last word, and each state has its own criteria.

In setting the pool of water available for consumptive purposes, allocation regimes implicitly determine the volume of water that will be retained within a river system and hence the environmental flows that will be provided. In Brazil, in most instances, water has been allocated to the environment by default, rather than by design. Basic hydrological methods have been used to define the pool of water available for allocation. This has by default determined what water is left within the river. For example, within the São Marcos, in Goiás 50% of the Q_{95} is available for allocation. The remainder is retained within the system and can therefore be considered the "environmental flow". Minas Gerais uses the more restrictive reference flow of $Q_{7,10}$, with the allocable pool again based on 50% of this flow. In the São Francisco, a flow requirement of 1 300 m^3/s at the mouth of the river has been established by the federal environment administration. The requirement was adopted within the Basin Water Resources Plan and has been used to place restrictions on reservoir operation. The flow was set to satisfy a range of requirements, including environmental needs, but is not based on a detailed scientific understanding of the values or requirements of the river system.

Basic hydrological methods to determine e-flows, like the Tennant method, rely on the establishment of relationships between flow and ecology. In the case of the Tennant method, the original relationships were based on observations of how stream width, depth and velocity (in terms of suitable fish habitat) varied with discharge on 11 small mountain streams in the United States. Because of the wide natural variation in river hydrology and ecology throughout the world, these relationships are unlikely to have universal application, and their uncritical application to rivers in Brazil, and elsewhere in the world, is difficult to justify.

In the Brazilian context, the approach to e-flows when allocating water is effectively an arbitrary mechanism for reserving a portion of the flow. Adopting such an approach poses risks on two fronts: 1) that flows are not adequate to maintain important ecosystem services which may then be lost; and 2) that more water is retained for environmental purposes than is required to achieve the desired outcomes, thus unnecessarily limiting the size of the consumptive pool.

Critically, environmental flow assessments are ultimately an input to a socio-political process. While the natural sciences can provide information on what the implications will be for different parts of the environment of changing the flow regime, it is a socio-political decision as to what ecosystem services should be protected, and hence what environmental flows should be provided. Importantly, simply because an environmental flow study identifies the flow requirements to maintain particular ecosystem services, it does not necessarily follow that priority must be given to allocating water for those purposes. Environmental flow studies are simply a tool to allow for informed decision making.

Sophisticated (and detailed/expensive) environmental flow assessment methods are not always required. There is a wide range of methods available for determining environmental flows, including hydrology-based methods, which can provide useful information to decision makers. Ultimately, the nature of the assessment process should be based on the complexity of the system being considered and the risks associated with changes to the flow regime.

Environmental flows should be set at the basin scale to achieve clearly defined environmental outcomes. Flow requirements should be determined based on an understanding of the flow regime, its role in contributing to river health and environmental services, and the risks associated with changes to the flow regime. Importantly, research shows that different elements of the flow regime serve different purposes when it comes to maintaining ecosystem processes and services. Environmental flows should thus consider the timing, frequency, duration and magnitude of flows that are required to achieve the desired outcomes.

Reserving a gross volume of water for environmental purposes when setting reference flows is likely to support the maintenance of base flows. However, other measures may be required to ensure the required environmental flows are achieved. For example, reservoir release rules may be necessary to achieve medium- or high-flow objectives at the required times, for example to ensure the higher flows required for the movement of sediment, to periodically inundate wetlands, or to trigger fish spawning or migration. Brazil's conservative approach of commonly only allocating water based on the Q_{90} or Q_{95} flows means that it is less likely that water abstractions will impact on flow pulses or floods. However, hydropower operation is likely to change the flow pattern, and these impacts should be carefully considered and operating rules set accordingly.

Setting priorities for water allocation

The water allocation process fundamentally involves determining which regions, sectors and water users will be entitled to the available water resources. This requires a process for prioritising uses and users. It is necessary to consider who should be responsible for setting priorities, how those priorities should be determined and where they should be set out. Notably, priorities can be set at multiple levels, such as national, basin or regional scales, and with different levels of granularity. Prioritisation can also be required at different timescales – for example it can be necessary to establish priorities for granting long-term entitlements to water, as well as the process for prioritising between different entitlement holders during periods of scarcity.

Among the general criteria defined by Law No. 9 433 of 1997, human and animal water consumption is given priority during periods of water scarcity. The law also requires that water permits respect the priorities of water use defined in relevant water resources plans, the multiple uses of water, the water quality classification and requirements for navigation. No further priorities are presently set at the national level.

Box 4.9. **Sequence of priority uses: Results of the OECD survey**

Nearly all allocation regimes surveyed have an established hierarchy of priority uses. In most cases, the hierarchy is used to establish priority access to water during times of scarcity, when "exceptional circumstances" have been declared, such as in the case of drought. Some allocation regimes use the sequence of priority uses to determine which uses should receive water entitlements in cases where there is competition for access to water.

In nearly all allocation regimes surveyed, domestic and human needs were defined as the highest priority use. The exception is the Netherlands, which privileges national security purposes (in the form of dyke maintenance), a small number of Canadian provinces and water uses in Israel. Besides the Netherlands, only two other countries include water uses for national security purposes among the sequence of priority uses: France (related to cooling of nuclear power plants) and Hungary. The most commonly reported second priority was either agriculture or environmental uses. Some allocation regimes have a very detailed designation of priority uses (six distinct levels in the case of Hungary and Mexico). Others designate only one or two priority uses as compared to all others (Brazil, Estonia, wastewater reuse in Israel, and Slovenia). The various ways in which the sequence of priority uses is defined are summarised in Annex 4.A2.

Source: OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

As noted earlier, in the absence of allocation criteria, water entitlements are often granted on a "first come, first served approach". As basins become more constrained, such an approach is likely to be problematic. It is an approach that has the potential to benefit first movers and to encourage hoarding. Existing requirements that water be used provide one mechanism to address the issue of hoarding, but may not be adequate over time, as they do not guarantee that water will be used efficiently. Similarly, there are likely to be issues with incremental approaches to granting entitlements, such as the potential to undermine the reliability of existing users or environmental flow objectives. Finally, and most importantly, it reduces the likelihood of water being allocated in a way that aligns with broader development objectives and priorities.

These challenges may be best addressed through a planned approach to determining consumptive water availability and for prioritising the allocation of that water, in normal times and in periods of shortage. On paper, Brazil's water allocation system provides a mechanism for doing so; the challenge is in implementation.

In setting priorities, the allocation criteria within water resources plans should ideally define how water is to be shared:

- Between different geographic or administrative regions. Plans should identify the water available at different spatial scales, for example by incorporating the current (administrative) approach of defining reference flows at different locations within water resource plans. Examples of approaches to defining the water available to different administrative regions that share a transboundary river are discussed in a separate section. To the extent that inter-basin transfers are contemplated, this water should also be captured within the plan.
- Between different sectors. Plans should identify what water is to be reserved for particular sectors or purposes. In some instances it may not be necessary to determine how water is allocated across all sectors, or at least it may only be necessary to reserve a portion of the allocable water for one or other sector, with the remaining water available for any purpose on application.
- Over different time scales. Plans should identify both priorities for the granting of long-term entitlements to water (i.e. water permits), as well as how water will be shared during periods of scarcity. Separate sharing arrangements may be required for periods of extreme drought. While negotiated water agreements presently provide one mechanism for managing variability in supply, providing greater certainty around the process for sharing water during times of shortage may reduce conflicts between water users and the administrative burden on resource managers, as well as provide greater certainty to users. This issue links closely with the approach to defining entitlements – entitlements should to be specified in a way that facilitates adjustments during times of scarcity.

On each of these issues, plans may identify, for example, a specific volume of water, or alternatively it may be appropriate to instead set out the process for determining how water will be allocated in line with certain principles.

Identifying the highest priority for allocation within a region or basin does not mean that all other water users need be excluded. For example, where water for irrigated agriculture is considered the highest priority within a basin, this should not necessarily exclude opportunities for hydropower development or other uses. The multipurpose use of basins (and individual reservoirs) offers the opportunity to increase the benefit derived from existing water supplies (see the dedicated section below).

In this regard, a distinction should be made between prioritisation and optimisation. The prioritisation process determines which regions or sectors should be given preference in allocating water, while the optimisation process seeks to ensure that water is allocated effectively and efficiently, in accordance with those priorities. Prioritisation is a strategic issue, which should consider factors beyond the water sector and needs to recognise broader social, environmental (ecosystems), economic and developmental objectives. It ensures that water will be allocated in ways that reflect development strategies. Optimisation is primarily a technical process, relying on various tools to identify the best approach for achieving the strategic objectives for the basin.

Determining priorities

Determining allocation priorities should ideally involve consideration of how to ensure: 1) water is allocated to reflect broad policy objectives, while 2) achieving equity in the way opportunities and risks are shared. To the extent that these two objectives are in conflict with one another, it is likely to require a political decision on what the priorities for the basin should be – for example in deciding between the rights of existing water users over the need for water to be reallocated to new users to support long-term development goals.

In some instances, it may be possible to set priorities at the national level. For example, in most countries drinking water is given highest priority, and environmental flow requirements are set aside before other water is made available for abstraction. Such an approach would be broadly consistent with the existing allocation framework in Brazil. Establishing national priorities would provide guidance to allocation decisions at the basin and state level, while allowing for divergence from the national priorities in some situations based on local context (for instance, some environmental issues could be more prominent in the Amazon region, to account for the global significance of the region as regards mitigation of carbon emissions). A set of national priorities would also provide a basis for allocation decisions where the relevant basin or state plan is silent on the issue of priorities.

While it may be possible to identify general principles, in most instances it is likely that priorities will ultimately need to be determined on a case-by-case basis. In doing so, relevant considerations may include:

- Existing arrangements. For example, current water usage including water use patterns, the water use efficiency of existing uses and any potential for savings, the level of dependency of existing users, and the social and economic impacts of any changes to their allocations.
- Future requirements. For example, demand projections based on population growth or predicted changes to relevant industries.
- Strategic objectives. For example, national or regional development or economic objectives, such as targets for agricultural production or electricity production.
- The costs and benefits based on an assessment of the financial, economic, and social costs and benefits of different allocation alternatives.
- Alternatives. Consideration of alternatives available to different sectors. For example, whether alternate water supplies are available for a particular sector/user, or whether different locations can provide equal or better opportunities.

Tools to assist prioritisation

A range of tools and approaches exist for determining how priorities might be given effect through water resources plans and subsequent water allocation decisions. A number of methodologies for converting broad allocation principles into water entitlements are discussed below.

Hierarchy approaches divide water based on sectoral priorities. For example, water may be first allocated to meet all the needs of the highest priority sector (typically domestic water supply), followed by the needs of the second highest priority, and so on.

Such approaches have the advantage of being simple. Hierarchical approaches can be appropriate where long-term priorities for the basin are already clear, and provide a straightforward mechanism for setting aside water to allow for those priorities. For example, if a decision is taken that agricultural development is to be the priority within a basin or region, then the required volume of water can be reserved to meet the identified agricultural needs, with any remaining water available for allocation to other sectors as required. The limitation of such approaches is that they may not be able to address the complexity and uncertainty inherent in heavily developed (and stressed) basins where multiple factors may need to be considered. A hierarchy approach is adopted by water resources plans in Spain (Box 4.10).

Box 4.10. **Approaches to prioritising water allocation**

The 1998 South Africa Water Act requires that water is allocated to a "reserve" ahead of all other priorities. The reserve includes water: 1) to meet basic human needs; and 2) for ecological purposes. Typically, priority is then given to: 3) meet requirements under international or inter-state allocation agreements; and 4) for strategic purposes, such as power supply. The balance of the available water is then allocated amongst remaining users.

The 1985 Spanish Water Act lists a national allocation hierarchy, starting with domestic water supply, followed by agriculture, then hydropower generation, other industrial uses, aquaculture, recreational uses, navigation, and finally "other uses". River basin plans can modify these priorities and establish their own allocation hierarchy provided that domestic water supply remains the highest priority. Environmental flows are considered a prior restriction, and sit above all other uses with the exception of domestic water use.

The Australian Water Act 2007 requires that the Murray-Darling basin "promote the use and management of the [Murray-Darling] basin water resources in a way that optimizes economic, social and environmental outcomes". The act also requires the plan to provide water for critical human water needs and to meet environmental requirements as priorities.

Multi-criteria approaches consider a range of factors (costs, benefits, demands, etc.) as part of the allocation process. Such approaches recognise that there is often not a single factor that will drive decision making, but rather that a balance needs to be struck between multiple considerations.

Strategic development approaches typically aim to optimise outcomes across a range of complex and often competing benefits, while allowing for uncertainty. This may involve combining elements of hierarchical approaches (e.g. to give effect to one or more clearly defined strategic objectives) with multi-criteria assessments (to take account of a range of other factors in an effort to optimise the overall outcome).

Market-based approaches rely on market mechanisms for allocating water. Such approaches typically involve defining the water available for allocation, and allowing potential water users to purchase their water entitlement, for example through an auction or tender process. Alternatively, water charges can be set at a level that drives water usage by those sectors with the highest value use.

These methods are not entirely distinct, and there can be significant overlaps or combinations of methods used. For example, strategic development approaches will often incorporate elements of multi-criteria approaches. Likewise, a hierarchy approach could be adopted to identify the volume of water reserved for key sectors (say irrigation, or hydropower). The allocation of that water amongst individual water users could then be undertaken through a tender or auction process, thereby balancing strategic objectives with a process that promotes economic efficiency at the user level.

The preferred approach could either be applied as part of the process of preparing a water allocation plan, or alternatively the plan may itself prescribe the method/criteria to be used in taking future allocation decisions. For example, a multi-criteria assessment could be undertaken as part of the planning process, which would result in a hierarchy of priorities being identified. The plan could then define that hierarchy, providing a straightforward mechanism for future allocations.

Supporting measures for allocation and implementation issues

Several tools exist for translating allocation principles into concrete water management. They include water management plans, water permits, collective entitlements, and enforcement and monitoring tools. Brazilian experience with them is analysed below. The comparison with international good practice highlights room for improvement.

Prerequisites

Even where water is available for allocation and an application for a water permit is consistent with the stated priorities for the basin, it can be appropriate to define conditions that must be satisfied before a water permit is granted. Such an approach is proposed in Brazil.

Internationally, prerequisites commonly include measures to ensure the efficient use of water. For example, applications for water permits may be required to meet water efficiency standards. Different benchmarks might be set for different crops, regions and/or industries. In setting benchmarks, it can be relevant to consider:

- Efficiency levels based on existing industry practice within the basin or region, given new water users will have to compete with those water users.
- Efficiency levels based on best industry practice, locally, nationally and/or internationally.
- The cost and benefit associated with achieving different levels of efficiency. For example, in a water-abundant region it may be more difficult to justify the higher cost to a water user of setting a higher standard for water use efficiency.

In some instances it may be possible to set national standards. However, for a country as large and diverse as Brazil, considerable flexibility will be required, particularly with respect to agriculture, to recognise the different climatic conditions, soil types, industry pressures and levels of water available.

Other prerequisites that might be considered include measures to assess and minimise the environmental impact of the water use. For example, some countries require “land and water management plans”, which aim to ensure not only efficient water use, but also to manage risks to land and water as a result of that water use, such as risks related to salinity or impacts on groundwater tables or watercourses. In addition, approvals may be required to ensure that the

proposed works (e.g. pumps for abstracting water) are consistent with the proposed use and will not have any adverse impact on the local environment.

Box 4.11. **Benchmarking water use efficiency: The South African experience**

As part of the preparing the Inkomati Water Allocation Framework, a benchmarking exercise was undertaken to determine appropriate efficiency rates for informing water allocation decisions. For the irrigation sector, baseline water use efficiency was determined for each crop type in each irrigation district. Several options were considered, including: 1) benchmarking against the most efficient user in any area (where actual water use was measured); 2) modelled crop water use factors could be determined for each area based on crop needs and climate data; or 3) a combination of crop water needs and conveyance system efficiencies. It was decided that option 4), based on the ratio of the crop water requirements to the volume of water released at the headworks minus the return flow, would provide the most suitable means to benchmark irrigation demands for any irrigation area.

The weighted average ratio for irrigation areas in the Inkomati was found to be 69% (i.e. 69% of the water abstracted was applied to the crop). Studies showed that this could be improved to 85% with minimal investment. The average crop water requirement varied between some 7 500 and 12 000 m^3/ha/yr depending on crop types and local climate conditions. This meant that an average abstraction from the river system could be set at some 9 500 m^3/ha/yr.

It was not possible to determine benchmark water use efficiencies for each industrial user in the basin, but benchmarks were determined for the three biggest users, a pulp and paper mill, and two sugar mills. The paper mill was benchmarked using the international best practice using expected water use per air-dried tonne. The consumption of water in the sugar mills was initially benchmarked on international best practice for water use per crushed tonne of cane at 0.15 m^3 per tonne of crushed cane. However, as this would have required a significant investment by the mills, a revised benchmark of 2 m^3 per tonne was established based on discussions with the mill, which was still significantly lower than the use at the time of 13 m^3 per tonne.

In Ontario, the Permit to Take Water Programme combines suites of tools to be used in normal times and in periods of low flow (Box 4.12). The application process explicitly distinguishes risk categories and adapts the procedure to potential tensions on the resource. A manual was developed by the Ministry of Environment (Province of Ontario) that sets out the decision-making process generally followed by the ministry: it is intended to explain to applicants, proponents and the public the requirements and considerations that are generally taken into account when reviewers are evaluating a proposed or existing water taking (see Ontario Ministry of the Environment, 2005).

The role of water permits

Water permits are the primary mechanism for granting water entitlements at the user level. A similar approach to water permits is adopted across federal and state jurisdictions. This includes specifying the location where water may be taken, the volume that may be taken, the purpose water may be used for, and (in case of agriculture) area of land that may be irrigated. While there are benefits from uniformity, the optimal approach to defining water entitlements is likely to vary depending on the complexity of the situation. A balance needs to be found between consistency with broad water policies and adjustment to local contexts. There are a number of important issues to be considered with the way water permits are defined and managed.

Box 4.12. **Ontario's Permit to Take Water Programme**

Water takings in Ontario have been managed since 1961 under a Permit to Take Water (PTTW) Programme, which promotes responsible stewardship and fair sharing of water resources. The Ontario Water Resources Act and related regulations authorise a director to issue permits for most takings of ground or surface water greater than 50 000 litres per day. Water taking for ordinary household purposes, the watering of livestock, poultry, home gardens or lawns, and for firefighting purposes is exempt from the requirement to obtain a permit.

The programme addresses concerns about ecosystem protection, impacts to water quality and water supplies, and notification of affected municipalities and conservation authorities. Every PTTW safeguards against cumulative impact. No permit guarantees a water supply for permitted taking and every permit holder is required to monitor and modify water taking so that it does not cause interference.

The programme also implements the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement, signed by Ontario, Quebec and the eight Great Lake US states in December 2005, which prohibits diversions of water out of the Great Lakes-St. Lawrence River, Nelson and Hudson Bay basins and also prohibits, subject to strictly regulated exceptions, new or increased diversions of water from one Great Lake watershed to another.

The regulation requires that all permit holders collect and record the daily volume of water taken, and report their water-taking data annually to the ministry. Actual water use data are increasingly being used to inform water budgeting work, water conservation and water use efficiency in Ontario. The ministry responds to reports of interference and unauthorised takings and carries out inspections to ensure water takings are protective of the watershed.

A water charge is applied to highly consumptive industrial and commercial users. It recovers a portion of the costs the province incurs to administer its programmes that promote conservation, protection and management of Ontario's waters, and their efficient and sustainable use.

Risk-based Permit Application

The *Permit to Take Water Manual* guides the ministry in delivering on regulatory requirements for permit decisions. Permit applications are identified under three risk categories:

- Category 1 is lowest risk and is generally reserved for renewals for the same or lesser amount where there is no history of interference complaints.
- Category 2 is for new or expanded takings applications which must be certified by a qualified person.
- Category 3 is highest risk and requires that a qualified person prepare a study that assesses the proposed water taking and includes conclusions and recommendations for the consideration of the ministry.

The province's water-taking rules ensure tough reviews of water-taking applications and, if approved, require stronger water conservation measures. New or expanded consumptive water taking in watersheds that already experience high demands are no longer allowed, subject to highly regulated exceptions.

The province addresses the potential for cumulative impact by considering the additive or compounding effects of water-taking activities, typically at the watershed scale. From a water-taking perspective, unacceptable interference with other water use or with natural functions of ecosystems signal cumulative effects that may be occurring.

Ontario Low Water Response Plan

The Ontario Low Water Response Plan is used to co-ordinate a provincial and local response in the event of extended dry weather conditions or drought. It builds on existing relationships between the province, conservation authorities, local governments and stakeholders.

The Permit to Take Water Programme provides local water response teams with information about water uses during times of extended dry weather conditions or drought. No Permit to Take Water authorises water taking when the flows or levels in the source of water cannot sustain water taking without causing impact on other users of the water or on the natural functions of the water source.

Box 4.12. **Ontario's Permit to Take Water Programme** (*cont.*)

The local conservation authority or provincial district office is the lead agency responsible for confirming a watershed condition and for establishing a water response team, which consists of local water users and other representatives (e.g. First Nations, provincial, municipal and conservation authority representatives).

The severity of low water conditions are classified into levels of action required: Level 1 (conservation), Level 2 (conservation, restriction) and Level 3 (conservation, restriction, regulation). A Level 3 declaration represents the most severe condition and occurs when essential water taking (e.g. drinking water supply) is imperilled. Precipitation and stream flow indicators are used to determine the condition level for watersheds. If the situation moves into Level 3, the action is taken to ensure compliance with existing permits. This may include stopping water takings that are interfering with other uses or ecological functions of Ontario waters or for essential uses.

Note: Contribution of Sharon Bailey, Food Safety and Environmental Policy, Ontario's Ministry of Agriculture and Food, Canada.

Including in the conditions of water permits a reference to land area that may be irrigated and purpose is a common approach internationally, and has a number of benefits, including facilitating monitoring and compliance. Such an approach can also be used to achieve broader policy objectives such as ensuring that water is allocated to particular sectors. However, such conditions can limit the capacity of water users to be more innovative in how they use their water. By focusing on the resource itself (i.e. the water abstracted) rather than the use (e.g. the defined purpose or in the case of irrigation the area irrigated), it can be possible to implement more flexible approaches to water allocation. Area-based entitlements can present a particular challenge to the efficient use of water. While efficiency is assessed at the time of granting water permits, this only represents an assessment at a single point in time, and there is no clear mechanism available to adjust permits, for example as new technologies become available. This increases the importance of having incentives for water users to be efficient (see the discussion on economic instruments below).

More broadly, limits on flexibility of use may act as a barrier to efficiency and prevent the optimal use of water. For instance, in critical basins, states have stopped issuing entitlements, preventing newcomers from accessing the resource. Similarly, while water entitlements are not formally attached to land, entitlements are only transferred at the same time as the related land holding is transferred. This may prevent water from being used at maximum value for society.

Entitlements are precarious water rights in Brazil. Entitlements are granted for 35 years and can be renewed (irrigators claim the return on investment for a dam and irrigation equipment is 15 years). Concessions for water supply and hydropower generation are issued for 35 years. Entitlements are revised at the end of the period or when the water resources plan indicates the need for revisions. In practice, entitlements will be changed if there are issues regarding water supply and sanitation or if there are water conflicts. Human consumption remains the number one priority. Box 4.13 provides an overview of approaches internationally.

Box 4.13. **Duration of water entitlements: Results of the OECD survey**

In most cases, water entitlements are time bound, either with or without an expectation of renewal. Half of the allocation regimes surveyed grant water users' entitlements for a given number of years and then allow the periodic renewal. However, in Chile (both the Limarí River basin and the Maipo River 1st Section), entitlements are granted in perpetuity (without conditions relating to beneficial use). In the Murray-Darling basin, Australia, as well as the three examples from Israel (wastewater reuse, large-scale desalination and local/regional water corporations), entitlements are granted in perpetuity, but conditional upon beneficial use. The allocation regimes that have time-bound entitlements report a wide range of time periods for which entitlements are granted. The time period is typically dependent on the type of water use or user. Hydropower is afforded the longest duration by far. Annex 4.A3 provides a range of illustrations.

Note: Information on data for Israel: http://dx.doi.org/10.1787/888932315602.

Source: OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

There is a perverse incentive to apply for permits for more than what is needed and only use a portion of it. That is, there are benefits, but few downsides, for users to apply for more water than required. In several cases, authorisations granted 20 years ago are too large. In these areas, water permits need to be revised. In Goiás, 7% of pivots are not active, but they still have an entitlement. Internationally, "sleeper" licences – that is, entitlements that have been granted but are not used – have often presented challenges. This issue is discussed further below in the section on legacy issues.

The law allows for permits to be revised when water resources plans indicate they should, or to be suspended (temporary or definitively) under specific circumstances, including non-compliance with the terms of the water permit, subject to appropriate justification. In both cases, no compensation is payable to the entitlement holder. For instance, the ANA has the right to terminate the entitlements of low productivity users without compensation, if that was defined in the water permit. At the same time, it has been suggested that some water users see their permits more as the end point of a bureaucratic process rather than a legal right to take water. This situation has two consequences: 1) water rights holders do not have a high level of security about water use – this may hinder investment in water dependent projects, including water efficiency measures; and 2) this can reduce the extent to which a water user values water entitlements, and thus reduce their effectiveness as a regulatory (and, potentially, economic) instrument.

Despite the potential for permits to be cancelled, in many jurisdictions the regular renewal of permits creates an expectation that permits will be renewed as a matter of course. This can trigger equity issues, if expectations are not addressed in a transparent way. This can create political (and at times legal) barriers to adjusting permits, if and when required. However, maintaining flexibility will be important for the government as a resource manager, particularly during the period when water entitlements are first established, given the significant uncertainties that typically exist during these transition periods.

Reliability of supply is a central element of what constitutes a water entitlement: entitlements should be defined based on a volume of water and the reliability at which it is expected to be available. While reliability is considered as part of the initial allocation process when granting water permits, the underlying reliability is not clearly defined. This creates the risk of reliability being undermined over time, such as by incremental licensing. Defining levels of reliability as part of the terms of a water permit, or via the relevant water resource

plan, does not mean that water supply is guaranteed on an annual basis, but that the total water resource will be managed in such a way as to protect reliability over the long term.

Collective entitlements

Managing groups of water users as a collective, through a collective (single) entitlement, offers an option for simplifying management requirements at least in some circumstances. Such an approach depends on devolving responsibility for management to local users, either through a water users' association or some other entity. The resource manager (i.e. the ANA or the relevant state agency) is then only concerned with ensuring compliance with collective entitlement, and not the water use of individual water users. Internationally, such approaches are common where there is a single off-take point from a watercourse, for example where all the users are located within a single irrigation distribution scheme. While local "catchment management authorities" exist in many countries, examples of water users managing a section of a river under the terms of a single authorisation are far more limited.

A key advantage of using collective entitlements is that they reduce the number of compliance points and hence the time and cost to government involved in monitoring. Such an approach is also likely to foster a culture of compliance amongst users, as it increases recognition that the water allocation process is a zero-sum game, such that where users take more than they are entitled to, this will deny others from receiving their fair share.

In addition, devolving management responsibility potentially provides water users with greater flexibility in how they use the resource: provided they meet the overriding obligations with respect to total water usage, the collective is free to implement its own measures for adjusting annual allocations amongst users, and to adopt its own risk profiles.

The prerequisites to allow collective entitlements to work are likely to include the following:

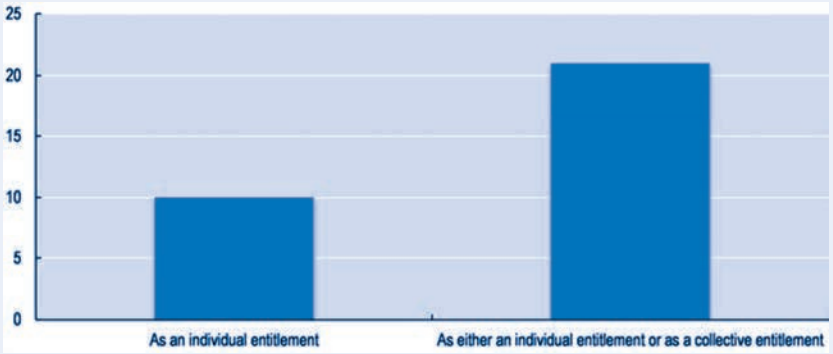
- a relatively homogenous group of water users with shared interests
- the water user group would need to be located within a part of the basin that allowed for a group allocation to be defined in such a way that it is possible to determine whether the collective has complied with its entitlements, such as by monitoring of inflow and outflow to the region
- capacity to enforce, either against the collective or against individuals on behalf of the collective
- existence of a legal entity to take on the management responsibility and to hold the collective entitlement.

Importantly, there would need to be sufficient incentive for water users to take on the management responsibility. Collective entitlements would not remove the need for water resources management – they simply shift that responsibility to the water users. For example, depending on the approach adopted by the collective, monitoring of individual water use may still be required. Likewise, individual (unofficial) water "permits" may still be issued and managed by the collective. As such, there will be a cost to water users of running the collective. The new arrangements would need to offer sufficient benefits (e.g. from increased flexibility) for users to choose to move away from the existing arrangements. Moving to collective entitlements without water user support would be unlikely to be successful.

Box 4.14. **Collective entitlements: Results of the OECD survey**

Private entitlements can take several forms, including an individual entitlement (to an individual person), a collective entitlement (to a group of persons/organisation/city) or an alternative arrangement. Figure 4.2 indicates the number of allocation regimes that report that entitlements are granted to individuals (ten examples) and the number of regimes in which an entitlement is granted to either an individual or a collective body.

Figure 4.2. **Number of allocation regimes with individual or both individual and collective entitlements**



Source: OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

For allocation regimes where collective entitlements are possible, a number of arrangements to allocate water among specific users were reported. For example:

- In the Murray-Darling basin, Australia, for collective irrigator groups with a collective entitlement, the entitlement is defined as a share of the collective entitlement based on the rules of association of their membership. For urban authorities providing town water supply, individuals enjoy unlimited supply on a pay for use basis (typically on a full-cost basis). Different levels of restriction may be imposed to further limit demand and subsequent use in periods of low allocation to the urban entitlement.
- In Alberta, Canada, in the case of collective entitlements, allocation of water among individual users within a group of users is based on a bargaining process and informal trading.
- In the Yellow River basin, China, collective entitlements are assigned to an institution representing water users. Irrigation districts and public water companies access water to consume by paying a fee. In some irrigation districts authorities assign water abstraction rights to clients under a permit system.
- For Costa Rica, in the case of collective entitlements, the Ministry of Energy and Environment grants a concession to each society of water users according to the Water Law. These societies have the authority to decide internally the form of water distribution amongst their members through agreements of its general assembly of members, or through its own regulation.
- Finally, in the case of France, the recently created single collective management bodies (OUGC) provide a structure and incentives for irrigators to devise their own rules to allocate a set volume of water among themselves at the catchment level. These rules are subject to approval by the Ministry of Ecology, Sustainable Development and Energy.

Source: OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

When properly designed, collective entitlements can be an incentive for water users to coalesce in associations. This can be the case when collective entitlements are granted a higher level of security, or minimal level of monitoring.

Monitoring and enforcement

Capacity to monitor and enforce needs to be a fundamental consideration in designing water allocation mechanisms, including the way water entitlements are defined at a regional, sectoral or user level.

In Brazil, the capacity to monitor water use and to enforce water policies varies greatly from one state to another, but monitoring and evaluation information remains overall a key challenge to enhance decision making of the states. Compliance is a major challenge and very much influenced by cultural factors. The large number of small water users and the lack of a culture of compliance contribute to the problem, as does the limited use, high cost and maintenance issues associated with water meters.

Separate monitoring and enforcement issues will exist with respect to: 1) compliance by the states with obligations under plans with respect to transboundary rivers; and 2) compliance by individual water entitlement holders with the terms of their water permits. With respect to transboundary rivers, the critical issue will be to allocate water between the states – such as in setting reference flows for boundary points – in a way that facilitates some form of monitoring or audit process.

Enforcing compliance by states with allocation requirements under a transboundary water resources plan can be problematic, both from a legal and practical perspective. In practice, given the difficulties with imposing fines on states, the most likely measures for enforcement against individual states are likely to be the following:

- "Name and shame" approaches, through a transparent mechanism, such as an audit or other reporting arrangement, where those states that are not complying with their obligations are placed on the public record. This can create political pressure to comply.
- Economic measures, such as making the disbursement of revenue (e.g. charges), funding or other support to the states conditional on compliance with the relevant water resource plan provisions.

For individual entitlement holders, monitoring water use is well recognised as an expensive exercise, particularly where there is a large number of small users, scattered across a large area. Monitoring arrangements should be tailored to meet local needs and to maximise the value from the monitoring effort. For example, approximately 80% of water use is by 20% of users. This suggests that options may exist to focus efforts on a subset of the water user population – such as major users or those in high-risk/high-demand regions.

Options exist for identifying priority areas for monitoring, for example through remote sensing technology, or *de facto* water use measures such as electricity consumption or crop production. These options should be considered at the same time as, and combined with, water allocation strategies.

Water entitlements need to be defined such that it is possible to readily identify whether a party has acted in accordance with the right. For example, where an entitlement defines the volume of water that can be taken, it should be possible to measure whether that condition has been complied with. Mechanisms are then required to determine that

water entitlements are complied with. For example, at a regional level, this may require monitoring cross-boundary flows. At the individual abstractor level it will require metering of individual take.

Penalties for breaches should be set at a level that provides a real disincentive to non-compliance. Fines should be sufficiently high so that they are not seen as a mechanism for "buying" water on a seasonal basis. Similarly, where non-compliance occurs in an effort to avoid payment of water charges, the penalties for breach will need to be sufficiently high that abstractors will be encouraged to pay the water charge, rather than the risk of paying a fine.

Developing a culture of compliance and strengthening the enforcement capacity of water agencies (at both federal and state levels) will be critical. This is likely to require the support of the majority of the water users for the ongoing reforms, which in turn requires awareness of the underlying reasons for changes (e.g. for limits on water abstraction), for users to recognise the risks to them under the status quo (e.g. having their entitlements undermined by illegal use) and for users to understand the collective benefit from change. More broadly, this requires users to be engaged in the reforms to the allocation process.

Transaction costs

As noted earlier, the allocation and management of water entitlements should be at least cost for society. Costs associated with the allocation system include: 1) direct costs to government from administering the water allocation system, including water resources planning, issuing and managing permits; 2) direct costs to water users resulting from the bureaucratic process; and 3) opportunity costs, as a result of disincentives for investment in new developments or efficiency gains associated with existing water use.

The water allocation system should be structured to minimise transaction costs, meaning that it should not deter investment in water efficiency and high-value water uses, and at the same time should not absorb undue amounts of time and resources.

Opportunities for minimising transaction costs are likely to exist at all stages of the allocation process. This includes:

- At the planning stage, for example through developing common, streamlined approaches to preparing plans where possible, while recognising the need for plans to be adapted to the local situation.
- As part of the water permitting process, for example by providing clear allocation criteria and practical decision-support tools.
- As part of the permit renewal process. For example, to the extent that permits are renewed at the end of their period of validity, consideration should be given to whether the renewal process provides any additional information to assist management. Options may exist for improving the utility of the renewal process, as well as streamlining it.

As with all bureaucratic processes, minimising transaction costs requires consideration of the costs and benefits of all components of the allocation system, and ensuring that administrative steps are only mandated where they offer a net benefit. A systematic assessment of such costs is beyond the ambition of this report, but anecdotal evidence suggests that at least some water users see the process as cumbersome and

bureaucratic, confirming that there might be room for manoeuvre to minimise transaction costs when allocating water in Brazil.

Economic instruments for water allocation

Economic instruments are widely used internationally in water resources management. They include both market (e.g. trading) and non-market (e.g. pricing) mechanisms. This section considers both options.

Box 4.15. **Abstraction charges for water allocation: Results from the OECD survey**

A majority of allocation regimes report that abstraction charges are in place. The proportion of allocation examples indicating that an abstraction charge is paid (breakdown by category of user) is summarised in Figure 4.3. Among categories of uses that pay an abstraction charge, industrial use is the most common. Nearly 70% of allocation regimes apply an abstraction charge to industrial users. Sixty-one per cent of allocation regimes apply a charge to agriculture, 58% to hydropower producers, 56% to domestic users and 47% to energy production (other than hydropower).

Among the allocation regimes with abstraction charges, volumetric usage is the most common basis for the charge. In the case of industrial and domestic water, 70% of allocation regimes use volumetric usage as the basis for the charge. Of the allocation regimes that indicated that abstraction charges were in place, fewer than half of the examples indicated that water scarcity was reflected (in some way) in the charge, casting doubts on the capacity of the charge to respond to water policy objectives.

Figure 4.3. **Proportion of allocation regimes with an abstraction charge**

Per category of use

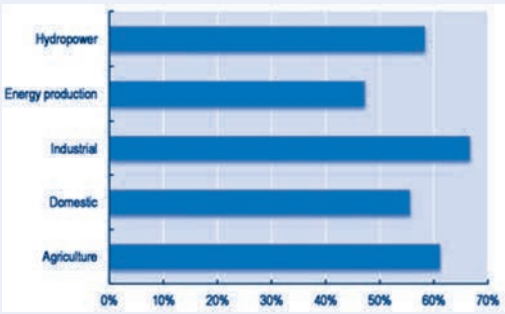
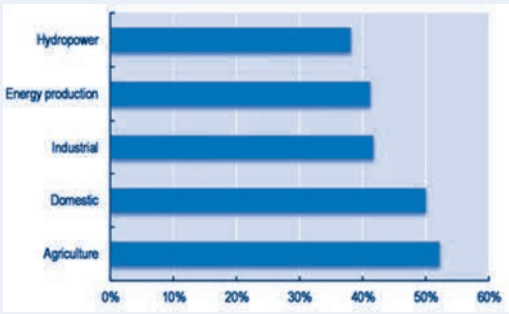


Figure 4.4. **Proportion of allocation regimes reflection scarcity in an abstraction charge**

Per category of use



Note: The figures do not include Japan, where abstraction charges are set by prefectures.

Source: OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

Economic instruments are not uncommon in Brazil. In the context of water management, they are used as revenue-generating mechanisms, not as water policy tools (although, by law, they should be). River basin committees have full power to set water charges, and the ANA or state agencies do the operational work of billing and returning money to the river basin committees. However, committees have not exercised such power to use water charges as a water policy tool – water charges have been established in only four basins – and charges are kept low. This may reflect low willingness to charge, rather than affordability issues. Also, water charges have not been implemented in basins with chronic water scarcity (the Northeast). Instead, they have been implemented

in basins with pollution problems, in the Southeast. Still, water charging has the potential of being implemented and used as a water policy tool in regions with water scarcity (e.g. Northeast) or high competition among water users (e.g. São Marcos watershed).

Although it has a distinct origin, the fee paid by hydropower generators illustrates how an economic instrument can shift from a revenue-generating mechanism to a water policy instrument.

Box 4.16. **Using an economic instrument to reconcile local and national priorities**

As noted above, hydropower production is considered a national priority. Hydropower is produced where reservoirs are located and transported to the point of use through a national grid. Transportation affects efficiency as some power is lost on the way. However, the system fails to recognise local issues regarding water availability and competing demands for water.

Energy producers pay a flat fee as a compensation for the use of water, proportional to areas flooded by the reservoirs they manage (6.75% on the volume of energy generated). That fee is the same all over the country. There might be good reasons why this fee is flat and similar nationwide. However, from a water management perspective,[1] such a fee could be revised, to reflect local availability of water and competition to access the resource: the fee could be increased in basins where water is scarce and competition between hydropower and other users (e.g. farmers) is fierce; the fee could be decreased in basins where water is abundant and competition to access it is low.

The overall revenues from this tax at national level would be the same, so that the financial resources presently used for implementation of the national water resources policy are not affected. The modulation of the tax at basin/reservoir level could result from a mix of *ex post* and *ex ante* mechanisms. Such a tariff structure would not require additional monitoring, as both water level in the reservoirs and water turbinated are known by the hydropower generation operator. Such a scheme could catalyse information sharing among different water users.

The objective is not to generate additional revenues, but to create an incentive to first use reservoirs where water is abundant: the national sourcing strategy would then reflect opportunity costs of using water in particular reservoirs/basins. Using the fee as an economic instrument for water management would also contribute to a better alignment of water and energy policies, reconciling a national priority (hydropower production) with local conditions of water use.

Note: 1. Should the charge be used to drive the location of hydropower dams, it would need to reflect other dimensions than water availability.

By law, revenues from water charging must be earmarked to the basin committee and to water management projects within the basin. According to Article 22 of the Water Law, the amounts collected by water use charges will be invested primarily in the watershed in which they were generated. This article provides that the payment of administrative and institutional bodies' costs is limited to 7.5% of the total collected. However, because the charges are low, they do not cover the large investment costs of new infrastructure. Revenues from water charges are effectively managed by water agencies, which serve as executive agencies of basin committees.

The polluter pays and beneficiary pays principles are considered in some basins, but are not fully implemented. In a limited number of states, water users pay water charges based on either entitlement or actual use (the arrangements vary). In some cases, the introduction of water charges has resulted in water users reducing their water entitlement volume, as a step to reducing their total quantum of water charges. In most cases, water charges cannot drive water demand. It has proven difficult to increase them.

Based on preliminary discussions and observations: 1) economic analysis is hardly used to support decision making, on tariffs and charges, and on interstate transfers of water; and 2) there seems to be some resistance *vis-à-vis* water markets. Other options should be considered, except in selected contexts.

Presently, many measures are aimed at improving efficiency of highly inefficient water users. As the efficiency of those users improves over time, it will be important for the allocation and management systems to have capacity to then create incentives for other users to also improve their levels of efficiency.

While water charges can be effective in promoting efficient water use, they are unlikely to be a substitute for a cap on abstractions. International experience suggests that water charges alone are unlikely to provide a basis for ensuring water abstractions remain within sustainable limits.

Options for providing further incentives for water users to benefit from reducing their consumptive water requirements should be considered. When users pay a charge based on their water entitlement or water use that provides some incentive. Mechanisms for transferring water entitlements or water allocations between users are another option to consider. Notably, there are many ways that water trading/transfers can be facilitated – including establishing mechanisms that recognise sensitivities and legal constraints that result from water's status as a public good and which meet public policy objectives, for example by limiting the transfer of water between sectors or regions. The Chinese way (Box 4.17) is a good illustration of an approach to facilitating water transfers where there was reluctance to introduce a fully market-based water rights and trading system.

Box 4.17. **Transferring water rights across sectors in China**

Water trading is now used in a large number of countries to allow water to shift between water users and uses, and in an effort to promote economic efficiency in the allocation of water.

The Chinese Ministry of Water Resources has adopted water trading as one mechanism to address growing scarcity of water supplies, particularly in northern China. Regulations allow for a water permit holder to trade any water that has been saved through an "application of efficient practices". Some of the best examples of water trading being implemented in China are in the Yellow River basin. There, government water agencies have facilitated the transfer of water entitlements held by irrigation districts to water-hungry businesses. The transferee businesses were selected by government following a call for expressions of interest, and based on strategic/governmental priorities.

The businesses "buying" the water entitlements were required to pay the cost of irrigation modernisation, such as the lining of irrigation channels, with the water saved through improved efficiencies then transferred to the businesses by way of new water permits. The water permits for the irrigation districts were reduced by the equivalent amount.

The process was regarded as a win-win situation, as it allowed industry to access water within an otherwise fully allocated system, and provided capital for irrigation modernisation, leaving farmers with an improved distribution system and lower distribution costs.

The Chinese experience demonstrates how water trading can be implemented in a way that allows greater flexibility for water entitlements to shift between users, while at the same time retaining a high level of government control of the process and ensuring that the trading is consistent with requirements under the Constitution that water remains the property of the state.

Options suitable for Brazil might include the capacity for water users to be compensated for reducing their water entitlement and returning water to the consumptive

pool for redistribution by government, or government-facilitated transfers of water between users. Such measures are discussed further in the following section on legacy issues and reallocation of water.

Addressing legacy issues

Legacy issues can present a particular challenge to implementing a new water allocation regime. Significant water entitlements already exist in Brazil; more than 200 000 water permits have been granted, and it is assumed that this only represents some of the total water users in the country. The allocation regime is also affected by legacy issues as a result of past practices. For instance, prior to 1997, irrigation extension plans did not factor water availability, and current plans for increases in agriculture appear to continue to do so, or at least to assume water will be available over the long run. The needs and rights of existing water users are important for a number of reasons.

Firstly, existing users are important to the extent that it is necessary to bring them within the water allocation system, such as where water users do not currently hold a water permit or other authorisation, or where existing authorisations need to be made compliant with a new allocation framework (Box 4.18 shares experience with such situations in Queensland, Australia). Significant effort has already been invested in regularising existing use.

Box 4.18. **Regularising water permits: The experience of Queensland, Australia**

In Queensland, Australia, the establishment of secure water rights and the creation of water markets required the conversion of a range of existing water authorisations into tradable "water entitlements". This involved changing the way individual entitlements to water were defined. Historically, water licences and other approvals had adopted a variety of approaches, including authorisations based on the installed works (e.g. approval for a pump of a particular size), or for irrigating a defined area. The new management regime required a move away from approvals based on works or use, and instead that entitlements be defined by reference to the volume of water that could be taken and the conditions under which it could be taken. This adjustment of existing water authorisations was, inevitably, a contentious one.

The creation of the new rights involved a two-step process. Firstly, a water resources plan was prepared for each river basin. This plan identified the total volume of water available for allocation, defined water reliability and environmental flow objectives, and set principles and criteria for the conversion of existing authorisations into new water entitlements. The criteria included, for example, tables listing different pump sizes (as per existing authorisations) and the conversion factors. Similarly, factors were identified for converting area-based licences to volumetric entitlements.

On completion of the water resource plan, a separate process was run to prepare a resource operations plan, which was designed to give effect to the water resource plan. The resource operations plans each included as a schedule a table listing the existing authorisations and the conditions of the new entitlements that were to be granted in place of the existing authorisations once the operations plan was approved. Water users and other stakeholders were consulted and able to make submissions on the draft water resources plan and draft resource operations plan. Amongst other things, this allowed for any objections raised by water users to be considered collectively, rather than on a case-by-case basis, given that a change to the rights of one water user would likely impact on other users. On approval of the resource operations plan, the "old" entitlements were cancelled and new entitlements issued by the state water agency.

The rights of existing users are also an important consideration where it is necessary to adjust existing use to make water available for other (higher priority) uses. Brazil's Water Law provides for adjustments to existing users within certain bounds. For example,

in establishing the São Marcos Compact, it was necessary to revise Batalha's water permit in order to increase the amount of water allocated to consumptive use upstream of the dam, up to the limit allowed by law, which was a 5% of reduction in expected energy production. In addition, the current process of regularising water entitlements can involve an element of reallocation, for example to the extent that the process may only grant water permits based on assumptions of efficient water use, rather than current practice.

When regularising existing use, as well as in making adjustments to water entitlements, it is relevant to consider factors including:

- equity – such as the extent to which the rights of those first in time should be respected
- efficiency benchmarks – for example, whether existing users should be granted entitlements based on their current use, or based on potentially higher efficiency standards
- legal protections – the extent to which the law protects existing rights from changes and/or provides for compensation in the event that rights are altered
- financial impacts of different alternatives – such as where investments have already been made based on existing entitlements or existing use.

Ultimately, once a river basin is fully allocated or "closed", providing some mechanism for reallocation of water amongst users is essential, otherwise allocations become fixed at a point in time and there will be no scope for new, water-dependent development to occur. Previously there were some limited instances in Brazil of water being reallocated, but there is no clear mechanism in place to allow for this to occur on a general basis.

Reallocation of water entitlements can be either voluntary or mandatory. Under voluntary mechanisms, users are given the capacity and incentive to reduce their own entitlements, with the "saved" water then either returned to a common pool (for allocation by government) or sold directly to another water user (under a water market approach). Mandatory measures involve government-dictated adjustments to existing water entitlements.

Reallocating water away from existing users to new users is a challenging process, and internationally there are very limited cases where this has been successfully achieved (Box 4.19). Perhaps most commonly, reallocation has been undertaken by reducing entitlements based on the potential for efficiency gains, with the cost of those gains met by government, the water user or the beneficiary of the savings (e.g. where the saved water is transferred to a third party). Economic instruments, such as water charges or water trading, also offer a mechanism for either encouraging water users to use less water (to reduce costs or to benefit from trading opportunities) or to allow for new water users to purchase water entitlements.

Box 4.19. **The challenge of reallocating water**

Globally, there have been very few successful efforts to compulsorily reallocate water once entitlements have been granted. Examples, and the approaches adopted, are discussed below.

Over-abstraction of water lead to the drying out of significant sections of the lower Yellow River for extended periods of time, including at one stage hundreds of kilometres of the channel remaining dry for over 200 days – an occurrence without historical precedent. The 1987 Yellow River Water Allocation Plan imposed a top-down approach to defining water entitlements of the 11 provinces that rely on the river. After nearly 15 years of failed efforts to implement the plan, it was finally made a reality through the combination of a strong basin committee with direct control over key infrastructure on the river, together with regulations issued by the powerful State Council. Cross-boundary flow requirements are set and managed in real time to ensure compliance with the plan. Since its implementation in 2002 there have been no further instances of the river running dry.

Mexico has been implementing a programme aimed at recovering water previously allocated to farmers through: 1) modernising the irrigation systems (e.g. by introducing drip irrigation practices) and to convert crops from those of high water needs and very low social and economic value to others requiring much less water but having much higher socio-economic value, thereby allowing the amount of water recovered to be subtracted from the overallocations in exchange for subsidies; and 2) by acquiring water rights by fixing a price for each cubic meter recovered. The Lerma-Chapala Basin Program to modernise irrigation invested USD 28 million from 2003 to 2006 to benefit 13 500 hectares which have been rehabilitated and upgraded. Although there are isolated examples of increased efficiency and water savings, there is currently no comprehensive and solid assessment of the overall effectiveness of these investments.

The Inkomati basin in South Africa was used as a pilot to test a reallocation policy aimed at addressing racial inequities in the existing water entitlement regime. An allocation framework was developed, which identified the capacity for reducing the water entitlements of existing white farmers and reallocating that water to black farmers. While a framework was developed, it has not yet been implemented due to technical and political challenges.

The Australian government has undertaken a major water reallocation programme within the Murray-Darling basin. With funding of AUD 12.9 billion, the "Water for the Future" programme has targeted improving water use efficiency, securing water supplies and improving river health. A key aim of the programme has been to improve environmental flows in the basin. This is being achieved through a combination of voluntary buybacks of water entitlements (primarily from irrigators) and investment in irrigation efficiency upgrades, with a percentage of the "saved" water being held by the Commonwealth Environmental Water Holder and used for environmental purposes. The buyback programme aims to reduce water abstractions by around 25% to achieve sustainable diversion targets set by the basin water resources plan.

Governing water allocation

As noted previously, governance responsibilities relevant to water allocation are split between federal and state bodies (see Chapter 2 for a more detailed analysis). The ANA implements the national water resources management system and regulates water uses in federal water bodies. State water agencies define rules and issue entitlements for state water bodies. At both levels, water resources councils define general rules and deliberate on water conflicts. River basin committees, at times supported by river basin agencies, define priority water uses and approve river basin plans. The scope for adjustments to existing governance arrangements is naturally limited by the Brazilian Constitution and, to a lesser extent, existing laws.

When looking for options to strengthen the governance framework to support water allocation, consideration needs to be given to the following factors:

- efficiency: ensuring efficiency in the way tasks are carried out and avoiding duplication of effort
- accountability: ensuring responsibilities are clearly defined and that issues do not fall "between the cracks"
- capacity: ensuring that those charged with responsibility for undertaking allocation tasks have sufficient technical capacity and resources
- scale: ensuring allocation decisions are taken at the most appropriate level.

The double dominion

The double dominion provides both challenges and opportunities. Inconsistent approaches to setting reference flows and managing water permits can create conflicts, as can the absence of defined flow requirements for transboundary rivers. There is also the potential for allocation decisions to be taken at a state or basin level (and based on state or local priorities) on matters of national significance and in conflict with national priorities. For instance, while hydropower generation is a national priority, in some basins (e.g. São Marcos), irrigated agriculture may have more value. In such circumstances it is difficult to balance priorities between nation-wide energy needs and regional development. Stakeholders in the basins may fail to see the big picture, and national players may fail to consider local issues.

At the same time, the current arrangements offer opportunities for economies of scale from a management perspective (to the extent that the ANA leads or supports decision making), which can also link to capacity issues, particularly given increasingly sophisticated approaches to water management. There are also the benefits of a more holistic approach to basin management, which is supported by retaining greater control over management decisions at a higher level.

The ANA's involvement in managing federal rivers increases the connection between high-level water policy and on-the-ground realities, which is likely to result in better outcomes in the long term. At the same time, the potential for duplication and the need for co-ordination are likely to result in inefficiencies in management. The double dominion creates the risk of issues "falling between the cracks" or for agencies to deny responsibility for addressing more challenging problems.

Devolution of responsibility may be a solution to some allocation issues. This is consistent with the Constitution and with the 9433 Water Law (Article 14, 1st paragraph) and there has been a precedent: the ANA has signed an agreement on the management of federal rivers with the Federal District, Minas Gerais, São Paulo and Ceará; these precedents confirm that devolution works well and is in line with the decentralised approach to water management in Brazil. Devolution will be contingent on sufficient capacity at the local level, which appears to be an issue in many states and can also be subject to "tenders": such an "*à la carte*" decentralisation process ensures consistency with the Constitution, gives the ANA the opportunity to warrant that federal waters will be allocated in ways that are consistent with policy objectives, and provides an incentive for states to strengthen their capacity. An instrument such as the Pact could be used to accompany such a gradual devolution of responsibility.

At the same time, ensuring local decisions are taken with regard to national priorities may require clearer guidance on certain allocation issues. For example, the National Water Resources Plan potentially offers a mechanism to identify more clearly where national priorities for water allocation should lie.

An alternative option may be to devolve responsibility to manage interstate water bodies to interstate commissions (where they exist, as in Piancó-Piranhas-Açu), based on the model of the Danube or Rhine Commissions in Europe. Should this model work well, more interstate commissions could be encouraged. Canada has the ability to establish "equivalency agreements" with provinces that meet federal standards to avoid duplication of effort at the federal and provincial level. The Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement was signed in 2005 by eight US states and two Canadian provinces, to regulate and promote co-operation as regards diversions and water withdrawals in this vast and complex hydrological system. In Australia, the federal government has no competency to manage rivers under the Constitution, but has recently been referred powers by the state governments to assume some responsibilities for the Murray-Darling River basin (Box 4.20).

Box 4.20. **Managing water resources within a federal system: The Australian experience**

The Murray-Darling River basin in Australia crosses four states and accounts for the majority of Australia's irrigated agriculture. While constitutional responsibilities for water allocation primarily sit at the state level, a basin agreement (in various forms) has been in place between the states and the federal government for nearly 100 years, starting with the River Murray Water Agreement, signed in 1917. These agreements have been amended periodically by agreement to reflect changing needs and challenges. The Murray- Darling Basin Agreement was first signed in 1987, although various amendments have followed. It includes detailed sharing arrangements for the lower part of the basin. It defines minimum monthly flows to be delivered to South Australia, and shares the remaining water in the lower Murray equally between Victoria and New South Wales. The agreement also includes a cap on further development and abstractions across the basin, by reference to baseline conditions in 1994.

In late 2008 the states referred certain powers in respect of planning and management of the basin to the federal government. This referral was made possible by the passage of identical legislation by state and federal legislatures. This allowed for the passage of the first national water law, the Water Act 2007, which also allowed for the creation of a more powerful basin authority and for the preparation of the first whole-of-basin plan, which was approved in November 2012.

The new basin plan sets sustainable diversion limits – for both surface and groundwater – for catchments throughout the Murray- Darling basin. The plan specifies "sustainable diversion limits" for the sub-catchments across the basin. These define the maximum average annual volume of water that may be abstracted from the sub-catchment. These limits, together with the existing Murray-Darling Basin Agreement, define the water available for allocation within the four basin states. This water is allocated via state water allocation plans prepared for each sub-catchment by state water management agencies in accordance with state laws. The Water Act 2007 provides for an accreditation process, whereby state allocation plans must be certified as consistent with the basin plan and its sustainable diversion limits. This process involves the state submitting the proposed allocation plan to the Murray-Darling Basin Authority. The authority reviews the plan and submits the plan, along with the authority's recommendation, to the Federal Water Minister. The minister then decides whether to accredit the plan.

Any option would benefit from a clarification of roles and responsibilities and from mechanisms that promote a sense of mutual dependency and that encourage collaboration and mutual adjustments across federal and state authorities. Compliance mechanisms are essential. Water governance reform at large and the Pact can help in this regard.

Defining boundary flows

According to the Constitution, rivers crossing or serving as state or national boundaries fall under the federal domain, while groundwater and all other surface water, except reservoirs built by the federal government, are considered under state domain. The Constitution also provides that the federal level must define criteria for issuing water entitlements, including concessions for large infrastructure: these are effectively water allocation criteria. The responsibility for the definition of general criteria for issuing water permits was attributed to the CNRH by the 1997 Water Law.

In some cases, boundary conditions, such as minimum stream flow, are defined for those points where a river's jurisdiction changes from state to federal and vice versa, or where a federal river runs through state boundaries. According to Decree 3.692/2000, the ANA should set minimum flows (and maximum pollutant concentration) in the transition from state to federal rivers. For example, in the Piranhas-Açu River, the ANA defined a minimum stream flow at the boundary between and Paraíba and Rio Grande do Norte states to protect the interests of both upstream and downstream water users. Such arrangements are, however, the exception rather than the norm. A consistent approach to defining transboundary flow requirements, as part of the setting of reference flows (see above) is required.

Box 4.21. **Defining water allocations in transboundary rivers**

Internationally, there has been a range of approaches taken to allocating water between different administrative regions. Examples include:

- Cross-boundary flow requirements – the Colorado River Compact (United States) shares water between the upper and lower basin states by requiring a certain volume to pass a control point (downstream of the Hoover Dam) each year. The passing flow requirement must be met based on a ten-year rolling average.
- Minimum guaranteed volume – the Lerma-Chapala Allocation Agreement (Mexico) guarantees the city of Guadalajara a fixed annual volume of 240 hm^3 from the basin.
- Mean annual or monthly diversions – the Yellow River Water Allocation Plan (China) shares water between 11 provinces. The actual volume available each year is adjusted up or down based on seasonal conditions. A similar approach is adopted in the Indus River (Pakistan) in sharing water between states.
- Percentage of available flow – the Jin River Water Allocation Plan (China) shares water between local governments within Fujian Province. The plan defines the percentage of the available flow that will be available to each region during periods of low flow.

In each of these examples, the relevant administrative body (e.g. a state water agency) is responsible for managing water use within the allocated amount, for example through a water permitting system that regulates water abstractors.

In areas of high connectivity between surface and groundwater, consideration needs to be given to how to allocate water in a way that recognises the impacts of withdrawals from one source upon the other. This may require agreement between state and federal authorities around the total quantity of water available and the process for determining how that will be allocated. It is important to take into consideration that the federal government can establish national criteria for water allocation, as foreseen in the 1988 Constitution (Art. 21, XIX), and the 9433 Water Law (Art. 35, X) states that the National Water Council is responsible for establishing general criteria for water permitting, which obviously may include criteria for conjunctive use of surface and groundwater.

Lessons from the international experience include: 1) finding the right balance between providing certainty to different regions and uses while retaining flexibility to adjust to new circumstances; and 2) adopting a level of sophistication of approach based on the complexity of the situation and the nature of the existing governance arrangements.

Sectoral involvement in water allocation

Despite the existence of several fora for developing plans, significant sectoral planning occurs largely in isolation, frequently unconnected to the water resources planning process:

- Hydropower is the sector that comes with the most developed plans for future developments, which helps make the case for its water demand. The sector is a national priority and is designed to supply electricity nationally. Although subject to water permitting, it has strong political backing and ample autonomy in terms of project implementation.
- The Ministry of National Integration is in charge of public irrigation and construction of infrastructure. The Ministry of Agriculture is in charge of policy regarding private irrigators, with a view to stimulate private initiatives. The potential is huge, as the studies that were done consider moving from 6 million hectares of irrigated land to 14 million by 2030. It is estimated that 75% of the water is available (based on an assessment made in 1999); the remaining 25% are expected to be generated through water efficiency gains. It is not clear whether these estimates take into account future changes in water availability and demand from other sectors, and future conflicts over supply present as a real possibility.

It is also relevant to note that there is a significant asymmetry between the energy and agriculture sectors, in terms of sectoral planning and capacity, which likely influences the dynamics of water allocation negotiations. The need for and mechanisms to improve inter-sectoral involvement in water resources management, including water allocation, is discussed in detail in Chapter 2.

Multipurpose management of reservoirs

The multipurpose management of reservoirs can contribute to alleviate tensions between hydropower and other water users, essentially farmers. According to the 1997 law, the National Policy for Water Resources is based, among other criteria, on the principle that the management of all water resources should always provide for multiple uses. Although hydropower inventory studies do not go into the same breadth or detail as river basin plans, they must take into account multiple water uses and potential interactions with the proposed hydropower projects in the assessment and comparison of the different cascades, with a view to minimise potential conflicts and ensure the most efficient use of the resource.

However, multipurpose management of reservoirs is an issue in several basins. In São Francisco, the drought had been anticipated by a number of previsions. However, the national operator of the power system (Operador Nacional do Sistema, ONS) has failed to reflect it in the management of reservoirs and has over-reduced the stock of water. This raises several questions. Tools need to be defined for multipurpose management of dams and reservoirs (in addition to ones already used for the planning of hydropower plants). While stakeholders are generally expecting more administrative/regulatory requirements,

consultation and direct voluntary exchanges among stakeholders (inter- or intra-sectors) could be more efficient in terms of transaction costs and time.

Multipurpose management of reservoirs aims at reconciling upstream and downstream uses. Storage creates new opportunities to use water up-stream (e.g. on the Durance River in France, see Box 4.22), the reservoir has created opportunities for recreational use, which now affects the management of the lake). It contributes to mitigating common risks (e.g. floods) as well. Qualitative elements need to be factored in, such as sedimentation (which may generate constraints regarding minimal flows).

Box 4.22. **Managing multipurpose reservoirs: The experience of Électricité de France**

The Serre-Ponçon Dam and reservoir, designed, commissioned (in 1960) and operated by Électricité de France (EDF), is located in the Durance and Verdon River system in south-east France. It is an architectural structure of outstanding importance comprising 32 hydropower plants. The system enables the production of 6.5 billion kWh of renewable electricity and an output of 2 000 MW within 10 minutes. It supplies drinking water and water for industrial purposes to an entire region and irrigates over 150 000 hectares of farmland. The reservoir has guaranteed storage of 450 million m^3 of water in summer (200 Mm^3 from Serre-Ponçon and 250 Mm^3 from the Verdon) allowing a total annual withdrawal of about 1 800 Mm^3. The dam not only generates the first form of renewable energy in the region, but regulation of water flow for irrigation has also allowed the development of agriculture in the area. Moreover, the dam facilitates control of flooding in the region. In addition, the Serre-Ponçon reservoir also provides many new water-related recreation and tourism activities.

Integrated management of the water resource for the whole basin generally satisfies the different uses and environmental requirements. However, tensions arise at times when water availability is or may be limited (such situations are becoming more frequent due to climate change and population growth). Under the original arrangement between the irrigators and EDF, the different constraints and requirements meant that EDF could not take advantage of the flexibility of the hydropower reservoir, and much of the water was used inefficiently. As a result, EDF implemented a voluntary bilateral Water Saving Convention with the two main irrigators, for a six-year period with the possibility of adjustment if better results than expected are achieved. The agreement is based around the irrigators using less water to meet their needs (i.e. using water more efficiently). The irrigators stand to benefit on the one hand from being remunerated by EDF based on the water savings they make, and on the other hand from there being more water stored in the reservoir thereby mitigating scarcity risk. EDF benefits from having more water available throughout the year. Thereby EDF enjoys more hydropower generation and more power at peak periods throughout the year when energy prices are high. An economic methodology was developed to support the convention, based on “energy loss method”; it is in the public domain.

The Water Saving Convention was so effective that an additional agreement was signed in 2003 and another in 2006 to increase the savings target from 44 to 65 and then 90 million m^3. This led to a reduction in agricultural consumption of water from 310 million $m^3$to 201 million m^3 in 6 years. This is a real win-win situation. As the convention was a real success, a new one was recently signed, and new stakeholders are joining in, such as the river basin agency.

A mirror model is also possible, where irrigators pay the power utility to access and benefit from the water stored in the reservoir. For instance in the south-west of France (Adour-Garonne basin), farmers can compensate EDF for limiting the potential of energy supply of a particular reservoir. The same energy loss methodology is used to calculate the cost to hydropower generation of new external constraints or new water users and provide a basis for the discussion of a fair compensation.

Note: Contribution of Emmanuel Branche, Électricité de France, personal communication.

Several institutional options can be considered: to operate a reservoir, with a convention for multipurpose use; to be part of a convention that mentions multipurpose use and managed by a third party; to benefit from support in the context of a convention (e.g. to cool thermal plants).

Conclusions and recommendations

Key tensions that exist within the water allocation system, and which are not unique to Brazil, include:

- balancing the need to respond to issues in the short-term with taking time to "get it right"
- balancing the need for security and certainty of supply (at the regional, sector and user levels) while allowing flexibility for water resource managers to respond to changing circumstances
- balancing preferred or optimal outcomes with the need to be practical and pragmatic
- balancing strategic considerations and the desire to align allocations to meet national priorities with the need to respect existing rights.

Determining priorities for the allocation of water is a strategic question, and will be dependent on the broader political agenda and long-term development and other related priorities. The allocation process should be structured accordingly.

Brazil's water allocation regime should be designed with a view to address the demands that will come as some basins become fully allocated, and potentially overallocated. The challenges associated with adjusting allocation mechanisms and individual entitlements mean it is preferable to have in place approaches that can adjust to changing circumstances, including changes in availability of water, in the demand from different users, and in government's social, economic and environmental priorities.

Allowing for flexibility when setting allocation criteria will be important, as what is appropriate is likely to vary between basins and regions. At the same time, some consistency will be required, to align with national priorities and to manage transboundary flows.

Key considerations in setting allocation criteria should be:

- to allocate water, now and in the future, to reflect broad policy objectives
- to balance water security for water users and flexibility for water managers
- to ensure equity in the way opportunities and risks are shared
- to minimise transaction costs
- to promote compliance.

In addition, governance matters. There are limits to what any individual agency or stakeholder can do. Collaboration with others will be required. The following recommendations consider the respective roles of different institutions. When appropriate, incentives are proposed to stimulate initiatives at several institutional layers.

Recommendation 1: Define the resource pool so as to maximise benefits and contribute to water use efficiency

The wide range of circumstances across the country supports the need for different approaches to setting reference flows. The flexibility to adjust the approach to determining available water should be retained. Consistency is, however, important in

setting reference flows for rivers that are hydrologically connected and on the application of the defined reference flows to allocation decisions.

Suggested action: A consistent approach should be taken to setting reference flows in hydrologically connected river systems, including consistency between states. Basin plans for federal river basins provide one opportunity to achieve this objective, by bringing state agencies together to agree on appropriate benchmarks. In addition, institutional arrangements should be used to incentivise a revision of reference flows in different basins and states: making the case for reform by demonstrating the potential benefits of reference flows that are less conservative and that reflect the risk profile of water users; using incentives to promote reform (e.g. by granting more autonomy or support to states that consider appropriate definitions of reference flows).

The Brazilian approach to setting reference flows results in a level of reliability for water users that is high by international standards, particularly for use in irrigation. This results in a lower volume of water being available for allocation. As demands increase, such an approach offers little flexibility to maximise the benefits available from the river system. Basing allocations on low flow periods does not allow for a greater draw on the resource during periods of abundance and adopting a common approach to reliability for all water users does not recognise the different impact on different water users as a result of water shortfalls.

Changing approaches to setting reference flows offers significant potential to address water shortages in heavily contested basins. However, introducing greater flexibility to the setting of reference flows – such as by allowing different levels of reliability for different users or by allowing for different abstraction volumes at different times of the year – would require more sophisticated approaches to allocation and management. One option could be to establish a different category of water permit, which allows for users to take water during a more limited window of opportunity; revised management arrangements would apply to those permits.

Suggested action: Greater flexibility should be incorporated into the approach to setting reference flows with a view to transferring to water users more responsibility for determining the appropriate levels of risk of failure of supply. Existing approaches to setting reference flows should be reassessed with a view to adopting more sophisticated approaches to defining reference flows in those basins that are stressed. This could include one or more of the following adjustments to current practice:

- Adopting a less conservative approach to setting reference flows across the basin/region.
- Identifying and allowing for the allocation of different flows/volumes of water that would be available at different levels of reliability. These could be allocated for specific sectors or users, depending on priorities for the basin and user demands.
- Establishing a mechanism that allows for individual users to determine their own levels of risk. This could involve either different sharing arrangements (in the case of water supplied from reservoirs) or access rules (in the case of water supplied from “run of the river”).

Such changes may require adjustments to the way water entitlements are defined to account for access rules related to different elements of the hydrograph.

Where reference flows are adjusted, careful assessments will be required of the potential impacts on water users of lower levels of reliability, particularly where changes might affect urban/domestic users. Further, existing methods of defining reliability do not provide adequate guidance on the impact on water users of shortfalls during periods of extreme shortage.

Suggested action: When setting reference flows in rivers that supply large or majority urban usage, consideration should be given to including additional statistical metrics and projections (with reference to a changing climate) to define not only the frequency of less than 100% of entitlements being available, but also the expected severity and duration of any shortages in urban water supply.

Change and uncertainty are critical considerations in setting reference flows, as well as in more broadly building a water allocation system. Climate change, rapid land-use change, and urban and industrial development add additional layers of uncertainty to the allocation and planning process. These have the potential to change catchment hydrology, water availability, water demands and priorities for allocation.

Suggested action: The water allocation system should be flexible, adaptable and forward looking. In setting reference flows and assessing availability of water, consideration should be given to possible changes within the catchment, including to climate. Allocation decisions should be based on a precautionary approach to water allocation, which recognises the inherent uncertainty and associated risks.

Suggested action: When defining the resource pool, pay attention to the contribution environmental flows make towards maintaining ecosystem services. As river systems become more heavily contested, the risks to freshwater ecosystem services increases, as does the need for a rational basis to support allocating water for environmental purposes (an important issue in the case of the São Francisco basin, among others). The justification for protecting flows for environmental purposes needs to be clear and defensible, and linked to goods and services provided by the freshwater system and valued by society. Flow requirements should be determined based on an understanding of the flow regime, its role in contributing to river health and ecosystem services, and the risks associated with changes to the flow regime. The challenge of reallocating water once entitlements have been granted for consumptive purposes reinforces the need to determine and, where appropriate, reserve water from the outset to maintain ecosystem services.

Establishing reference flows and defining the allocable pool should ideally involve:

- identification of the ecosystem services provided by the relevant freshwater system, as well as prioritising which of those services are to be protected
- assessment of the flow regime required to maintain those services at the desired level.

Therefore, in setting the consumptive pool of water available for allocation, consideration should be given to the ecosystem services provided by freshwater ecosystems, the flows required to maintain those services and the priority which should be given to those services.

It does not follow that ecosystem services are granted priority over other users (see the following section). However, understanding how much water is required to support valuable ecosystems is a requisite to balance the needs of different communities.

Federal environmental institutions should raise the issue across all stakeholders, by demonstrating the multiple (economic, social and environmental) benefits of fully considering the importance of different elements of the flow regime for the provision of freshwater ecosystem services. In this regard, the environmental agencies should take the leadership for action.

Recommendation 2: Redesign selected policy instruments

The focus here is on water resources plans, priorities for water use, the status of water permits and the use of economic instruments to allocate water.

Plans should define clear and binding water allocation guidelines, including:

- The water available for allocation. In many instances, permit decisions are based on reference flows as determined by the relevant water agency, but these are not specified in a water resources plan.
- Priorities for allocation, as required by law but seldom established.

Use river basin plans to guide water allocation

Including these items within relevant plans would allow them to be translated into regulatory guidelines, allowing plans to shift from a "programme" approach, which always requires someone else to implement, to a "target" approach. Targets could be easily incorporated into water permit systems, and if they were not met, sanctions could be imposed.

While negotiated water agreements presently provide one mechanism for managing variability in supply, providing greater certainty around the process for sharing water during times of shortage may reduce conflicts between water users and the administrative burden (transaction costs) on resource managers, as well as providing greater certainty to users. Again, to the extent that water resource plans can set out clear parameters for sharing water under different circumstances, this will simplify the negotiation process and potentially reduce both cost and the potential for conflict.

A planned approach to regularising existing water users is likely to provide the most efficient and consistent mechanism for bringing current users within the entitlement system. Water resource plans provide an ideal tool for identifying the process and criteria for regularisation of use.

Suggested action: Set water resources plans that guide water allocation decisions:

- At the national level, plans should focus on strategic issues including: 1) Establish national priorities for allocation/national principles for establishing priorities. These should guide the development of water resource plans and should act as the default in the event that a water resource plan does not identify priorities for allocation. Basin plans would be required to consider the national priorities/principles, but could make adjustments based on local priorities. 2) Establish guidelines on the inclusion of water allocation criteria in water resource plans, including with respect to the way reference flows are defined, the process for setting priorities and prerequisites for the allocation of water. 3) Establish a mechanism to allow for a federal decision on sharing of water between regions or basins (transboundary flow requirements and inter-basin transfers) in the event of a deadlock at the basin or regional level.

- At the basin and state level: Require all basin plans to include strategic guidelines for water allocation including through defining: 1) priorities for water use within the basin; 2) the limits for water use by specific regions and different sectors and the basis on which that water will be released to different users; 3) targets for water use efficiency.

Priorities for water allocation are not presently well articulated. In many instances, water permit decisions are taken on an *ad hoc* basis. As basins become more constrained, this "first come, first served" approach to allocation is likely to be problematic, inequitable and economically ineffective. These challenges may be best addressed through a planned approach to determining consumptive water availability and for prioritising the allocation of that water, in normal times and in periods of shortage.

In prioritising water uses, allocation criteria should take account of actual conditions and: 1) future requirements in the basin; 2) strategic objectives; 3) the costs and benefits of different allocation alternatives; and 4) the alternatives available to different sectors.

The national Water Resources Plan has the potential to provide greater clarity on national priorities for the allocation of water, and for the allocation of water between different regions and basins. In many cases, issues related to sharing of water between basins (i.e. inter-basin transfers) and between states will be best addressed at the regional or basin level provided: 1) supporting frameworks exist at the national level, such as agreed principles for allocation criteria and for managing transboundary watercourses; and 2) there is adequate technical capacity and resources at the state and basin level. However, in the absence of agreement on such matters, it will be necessary for the federal level to be able to intervene to break any deadlocks. Equally, a decision at the federal level may be necessary where there is an overriding national objective that must take priority.

Establishing one (or more) priority uses for a basin or region should not mean that other uses be excluded. There are a range of tools and approaches available to optimise the benefits from existing water supplies in a way that preserves the status of priority users while allowing additional beneficial use of the resource. The multipurpose use of reservoirs offers one such example. Providing flexibility within the allocation framework, particularly for water entitlement holders, will allow water users, reservoir operators and other stakeholders to be innovative in identifying ways to allow multiple uses to co-exist.

Suggested action: Ensure that establishing basin or regional priorities for water use does not necessarily exclude other water use. Provide the flexibility to support multipurpose use of reservoirs, where appropriate.

Streamline water permits

In setting prerequisites for water allocation, flexibility is appropriate given the diverse nature of Brazil's water users. A common framework for setting prerequisites would, however, aid consistency and efficiency. Similarly, adopting consistent standards to issuing and defining water permits would assist with a range of issues, including management of the double dominion. Exceptions to common standards should be permissible, provided there is a clear rationale for departing from the norm.

The current approach (occasionally used) of including an irrigated area on water permits may support some management objectives, but it limits the flexibility of water users to determine the best use of their entitlement. Removing such conditions would be consistent with an approach that focuses on regulating access to the resource within

sustainable limits, while allowing individual users to determine how to best manage their share of that resource.

Suggested action: Consideration should be given to removing from water permits the terms that relate to the area that is allowed to be irrigated and other terms that limit the flexibility of water users and hamper improvement of efficiency, on a trial basis to identify opportunities for increasing the flexibility for water users.

Despite the potential for permits to be cancelled, the regular renewal of permits creates an expectation that permits will be renewed as a matter of course. This can create political and legal barriers to adjusting permits.

Suggested action: Establish explicit and transparent protocols for the renewal of permits; reassess the need for renewals in all instances and provide a more streamlined approach to ensure that it offers benefit to resource managers and/or users.

Reliability of supply is a central element of what constitutes a water entitlement. While reliability is considered when granting water permits, the underlying reliability is not clearly defined. This creates the risk of reliability being undermined over time.

Suggested action: That water permits include as a condition the anticipated level of reliability and that the basis for achieving that reliability, such as sharing rules and limits on further allocation of water, is clearly articulated in the relevant water resources plan (or elsewhere as appropriate).

Water use efficiency standards can help improve levels of efficiency by providing a benchmark for assessing existing use as well as applications for new water entitlements. Flexibility will be required in setting standards, as water requirements will vary significantly based on the use and the location.

Suggested action: Establish water use standards for different water uses and regions for assessing applications for new water permits and for renewal of existing permits.

Collective entitlements offer a mechanism for reducing management requirements and providing greater flexibility to water users. While these will be relatively straightforward to implement where users all take from a single location, such as a reservoir, such arrangements would be more challenging to implement where users are spread across a reach of a river. More work will be required to identify those areas where collective entitlements can be implemented.

Suggested action: Collective entitlements should be considered as a viable option for devolving management responsibility to water users, subject to the willingness of water users to take on the responsibility and the capacity of the relevant water management agency to monitor and enforce compliance with the entitlement. A guideline should be developed identifying the process and mechanisms required to support implementation of collective entitlements.

On all these issues, the federal agency has a limited impact on state or basin level policies. As mentioned earlier, institutional arrangements can be used to provide incentives to states and basin organisations to consider smarter permit systems: making the case for reform, developing guidance documents, providing incentives, through targeted support or more autonomy.

Make the best use of economic instruments

Economic instruments offer the potential to improve the economic efficiency of water allocation. Water charges offer significant potential to encourage more efficient water use and to drive improved allocation of water resources, as well as providing a valuable revenue source. Amongst other things, introducing water charges has the potential to better align the volume of water applied for and the volume of water expected to be used, which may counter the current incentive for some users to apply for more water than is really required.

Suggested action: Consider a range of economic instruments (essentially pricing tools); set incentives for authorities in charge to overcome the lack of willingness to charge; build capacity, including on economic analysis, at different levels of governments; share information about accompanying measures to facilitate the reform of water pricing.

Mechanisms for transferring water between users also offer potential to drive more efficient water use. Further, as river basins become fully allocated, it will be necessary to have mechanisms in place that support reallocation of water between users. This can allow new users to access water, for water to be reallocated to higher priority users, and can provide an incentive for existing users to be more efficient. Options exist for allowing water transfers amongst users in a way that is consistent with constitutional provisions on water rights, and which can be managed in a way that protects and promotes both social and economic outcomes.

As an initial step, water transfers could be trialled under limited circumstances, for example limited to certain basins and/or limited periods of time during the year. Transfers could focus on either long-term rights (transferring all or part of a water entitlement) or the annual volume of water available to different users. Options to consider include:

- Government facilitated reallocation of water, either compulsory or voluntary. For example, allowing water users to return water to a common pool for reallocation, with compensation paid for the entitlement returned.
- Market-based mechanisms, where water users can transfer water voluntarily amongst themselves.

Suggested action: A suitable mechanism for reallocation of water amongst water users be developed that is consistent with Brazil's policy objectives, which encourages efficient water usage, and which allows new entrants to access water within fully allocated basins.

Recommendation 3: Govern water allocation

Monitoring arrangements should be tailored to meet local needs and to maximise the value from the monitoring effort. Given that a relatively small number of water users abstract the bulk of water, options may exist to focus efforts on a subset of the water user population. Collective entitlements also offer an option for simplifying monitoring arrangements.

Finally, developing a culture of compliance and strengthening the enforcement capacity of government agencies (at both federal and state levels) will be critical. This is likely to require the support of the majority of the water users for the ongoing reforms.

Suggested action: 1) Identify different monitoring options available, including the costs, benefits and limitations associated with each option, as well as determining suitability for different situations/purposes. 2) Identify priority areas for implementing targeted or more sophisticated monitoring arrangements. 3) Engage with water users to generate a culture of compliance.

Ensuring compliance by states with allocation decisions related to transboundary rivers is inevitably problematic. At a minimum it will be critical to ensure that basin plans define the water available to different states in such a way that it supports monitoring and assessing whether a state has complied with their obligations.

Suggested action: Explore options for: 1) auditing and publicly reporting on compliance with obligations with respect to transboundary rivers; and 2) establishing financial incentives for compliance/penalties for non-compliance.

The challenges related to the river basin committees are discussed in detail in Chapter 1. Regarding water allocation, one of the consequences of the existing governance arrangements has been that water resources plans set out neither the priorities nor the directives for the definition of volumes of water available for allocation, despite the legal requirement to do so.

Suggested action: A fall-back position should be established, whereby the relevant executive agency (the ANA or state agency) is able to set binding allocation criteria for a river basin in the event that the relevant basin committee does not do so.

The ANA should retain a central role in allocation and permitting decisions. This increases the credibility of the organisation and its understanding of on-the-ground issues. Over time, however, it would be appropriate to transition towards passing greater responsibility to the state agencies, or to other bodies. There has been success with devolution from federal to state agencies and this is likely to lead to better outcomes in the long term.

Suggested action: Address issues related to the double dominion. The following options for addressing the double dominion should be considered:

- Devolution of responsibility from the ANA to state government agencies. This could, for example, be via a tender process, and would be dependent on the local agencies demonstrating sufficient capacity; the Pact would provide an appropriate context.
- Referral to the ANA of some state responsibilities for water management.
- Establishment of inter-basin commissions to take responsibility for shared river basins.

Water resource plans for federal rivers effectively act as water-sharing arrangements between states. While state councils are represented on the technical chambers of the National Water Council and on basin committees, the states do not directly prepare nor approve such basin plans. This is considered a significant challenge to successfully implementing sharing arrangements for federal rivers.

Suggested action: A mechanism should be developed whereby all relevant basin states are directly involved in preparing and approving any water resources plan for a federal river. This could be through revised membership of the National Water Resources Council, or by introducing a new step into the approvals process.

The support and understanding of the water user community will be critical to ensuring the success of the above recommendations. Amongst other things, such support and understanding will be critical with respect to:

- implementing any measures related to collective entitlements
- implementing more sophisticated arrangements for reference flows, defining reliability of entitlement and specification of water entitlements
- developing a sense of the value of water entitlements, and the importance of a strong allocation system to protect the long-term interests of water users
- developing a culture of compliance, including a recognition that the water allocation process can be a zero-sum game, and that non-compliance by other water users can impact on the rights of others.

Suggested action: Develop a communication and engagement strategy to inform and involve water users in the development and implementation of changes to the water allocation regime.

Note

1. As noted above, the Brazilian Constitution divides ownership over water resources between the Union (for rivers which cross state boundaries) and federal states.

Annex 4.A1.
How climate change features in water allocation regimes

Table 4.A1.1 lists countries that factor climate change in their allocation regime, based on the OECD survey (OECD, 2015).

Table 4.A1.1. **How climate change features in allocation regimes**

Country/province	Is climate change taken into account in water allocation?	In what way?	What arrangements are in place to accommodate the potentially adverse impacts of climate change on the resource pool?
Australia **(Muray-Darling basin)**	Yes	Potential climate change impacts are partially addressed through limits on abstraction and allocation rules, which ensure less water is available for consumptive use in drier years	– Water resource plans made for the purposes of the basin plan need to specify how water resources will be managed during extreme events, including extreme dry periods. As part of this requirement, the water resource plan needs to provide that, if new scientific information suggests a change in the likelihood of an identified extreme event occurring (for example, due to climate change), consideration must be given to whether, as a result of this new information, the water resources should be managed differently – The water allocation regimes respond to climate variability (and potentially climate change) by allocating less water to consumptive uses in drier years. In addition to this, the ten-year review cycles (or sooner) for the basin plan, that will inform the making of new water resource plans in ten-year intervals, may provide an opportunity to incorporate new knowledge about climate change, including impacts on the resource pool, and implement management arrangements to accommodate these impacts
Austria	Yes	Climate change impact on changes in availability of resources is investigated scientifically on a regular basis	In Austria, only about 3% of available water resources are used. However, changes in availability due to climate change impacts and consequences for water management are subject to regular scientific investigations; results are considered in river basin management plans; no significant major changes are expected in the mid-term
Alberta, **Canada**	Yes	The government has established a work plan for climate change adaptation. The first step is to develop future hydro-climate scenarios for major watersheds. Some of the work is funded by Natural Resources Canada through the Prairie Regional Adaptation Collaborative	Watershed management plans, groundwater research and ongoing water conservation measures undertaken by industry and Albertans
Newfoundland, **Canada**	Yes	Flooding issues	Hydrometric monitoring
Nova Scotia, **Canada**	Yes		Monitoring of both surface water and groundwater resources throughout the province
Prince Edward Island, **Canada**	Yes		Allocations are not a right and can be revoked or altered. Climate changes impacts would be evaluated when future reviews of allocated amounts are undertaken to ensure that allocations and usage remain sustainable
Quebec, **Canada**	Yes	In development	– 2013-2020 Quebec Climate Change Action Plan[1] – Strategy for Climate Change Adaptation[2]

Table 4.A1.1. **How climate change features in allocation regimes** (*cont.*)

Country/province	Is climate change taken into account in water allocation?	In what way?	What arrangements are in place to accommodate the potentially adverse impacts of climate change on the resource pool?
China (People's Republic of)	Yes	An annual water regulation plan will be formulated based on water forecasting for the next year	Emergency Plans for Drought Relief in the Yellow River Basin (Trial) was released by the Yellow River CC
Colombia	Yes	Climate change is reflected in terms of extreme weather events (floods and droughts)	Formulation of the document prepared by the National Committee for Economic and Social Policy (CONPES 3451, 2006) which establishes policy guidelines to recover and conserve the ecosystem of the Fúquene, Cucunubá and Palace lagoons. Update of the Arrangement and Management Basin Plan of Ubaté-Súarez, incorporating risk management components and conditions of climate variability
Denmark	Yes	As background data on the water balance in future planning instruments	All municipalities in Denmark have to make a risk-based plan, which explain how to cope with the climate changes due to water
England and Wales	Yes	Climate change is taken into account through the water resources planning process and through the use of time limits. Many existing licences are not flexible enough to take climate change into account	The Catchment Abstraction Management Strategies process includes an ongoing assessment of water availability and the application of regulatory tools to address issues. This, however, has its limitations and England and Wales are looking to abstraction reform to introduce a more adaptive system
France	Yes	Water users are encouraged through water agencies to reduce their water use to anticipate a decrease in water availability. Abstractable volumes have to be redefined after a few years	
Hungary	Yes	Water resources are recalculated in every 10-15 years	There are no arrangements in place
Israel[3]	Yes	The treatment of wastewater to replace freshwater is one way to adapt to climate change. More treatment facilities are planned to answer future demands and to have surplus capacity, in case of dry years	– Improving the level of treatment in all treatment facilities to allow a wider range of uses for treated wastewater, including for potable uses – Promoting the use of treated wastewater for agriculture by subsidies and ensuring supply – Encouraging industrial plants to treat their own wastewater and to reuse it – Treated wastewater is also used to revive and sustain wet ecosystems
Korea	No		For adaptation to climate change, the Korean government is building on Smart Water Grid and desalination for extreme drought. The Smart Water Grid is an advanced water resources management system linked with ICT. It combines multiple sources of water (e.g. rainfall, river water, desalination, reservoirs and wastewater reuse)
New Zealand	Yes	When deciding on limits for surface and groundwater, climate change is considered. The plan also has provision to review these limits when investigations reveal climate change is having an effect on water flows or groundwater yields	Council reviews minimum flows and allocable flows when investigations indicate that climate change is affecting surface water flows and sustainable yields in groundwater
Portugal	Yes	In the planning process	There is a regular monitoring, and a connection with Spain (through the "Albufeira Convention"). Also the river basin plan addresses the impacts of climate change

Table 4.A1.1. **How climate change features in allocation regimes** (*cont.*)

Country/province	Is climate change taken into account in water allocation?	In what way?	What arrangements are in place to accommodate the potentially adverse impacts of climate change on the resource pool?
South Africa	No	Assumed it is accommodated in stochastic analysis of water flows	Constant improvement of hydrology used in stochastic tools.

Notes: 1. www.mddefp.gouv.qc.ca/changementsclimatiques/pacc2020-en.htm.
2. www.mddefp.gouv.qc.ca/changementsclimatiques/strategie-adaptation-en.htm.
3. Information on data for Israel: http://dx.doi.org/10.1787/888932315602.

Source: OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

Annex 4.A2.
Sequence of priority uses: Results of the OECD survey

Figure 4.A2.1. **Sequence of priority water uses in selected countries**

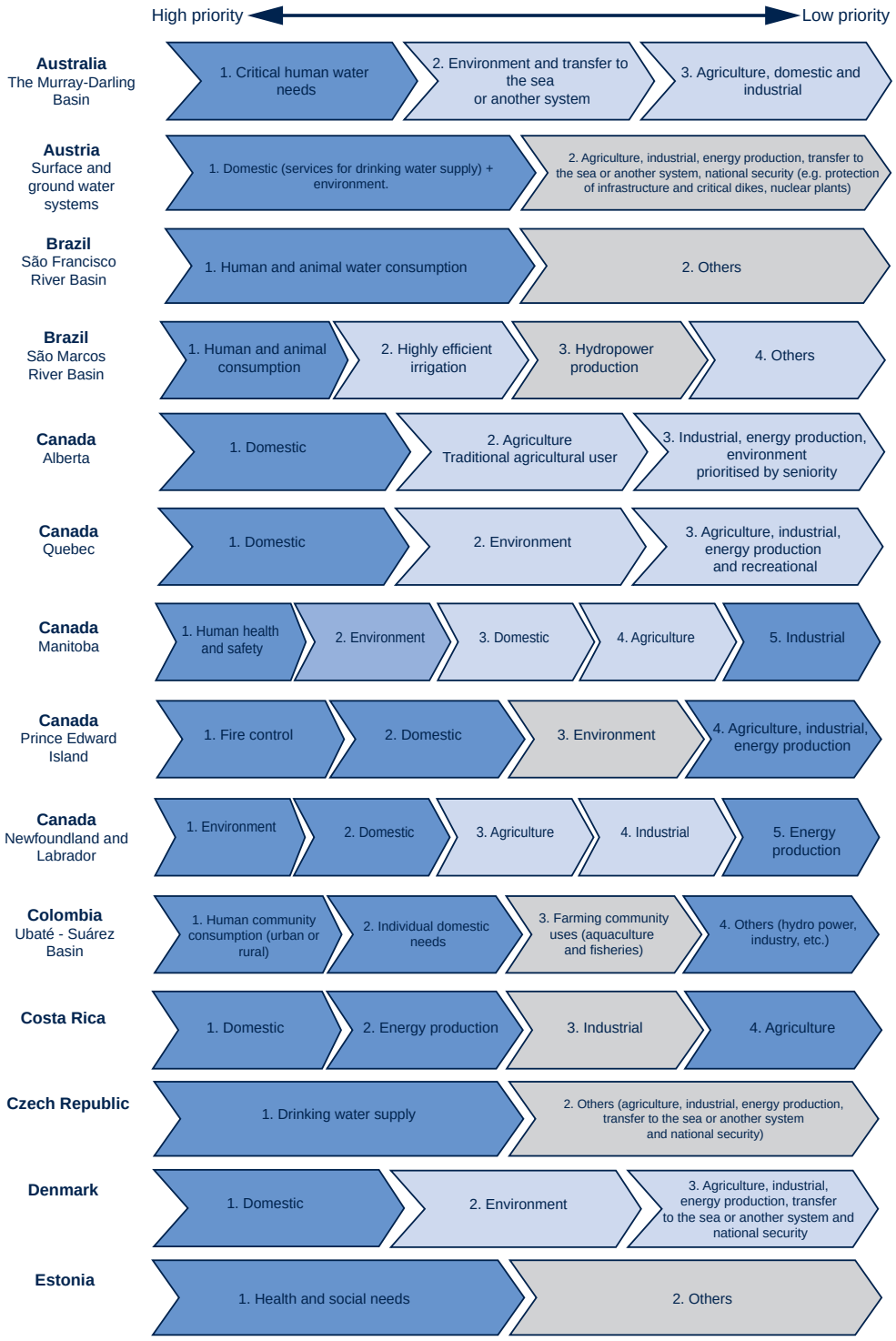
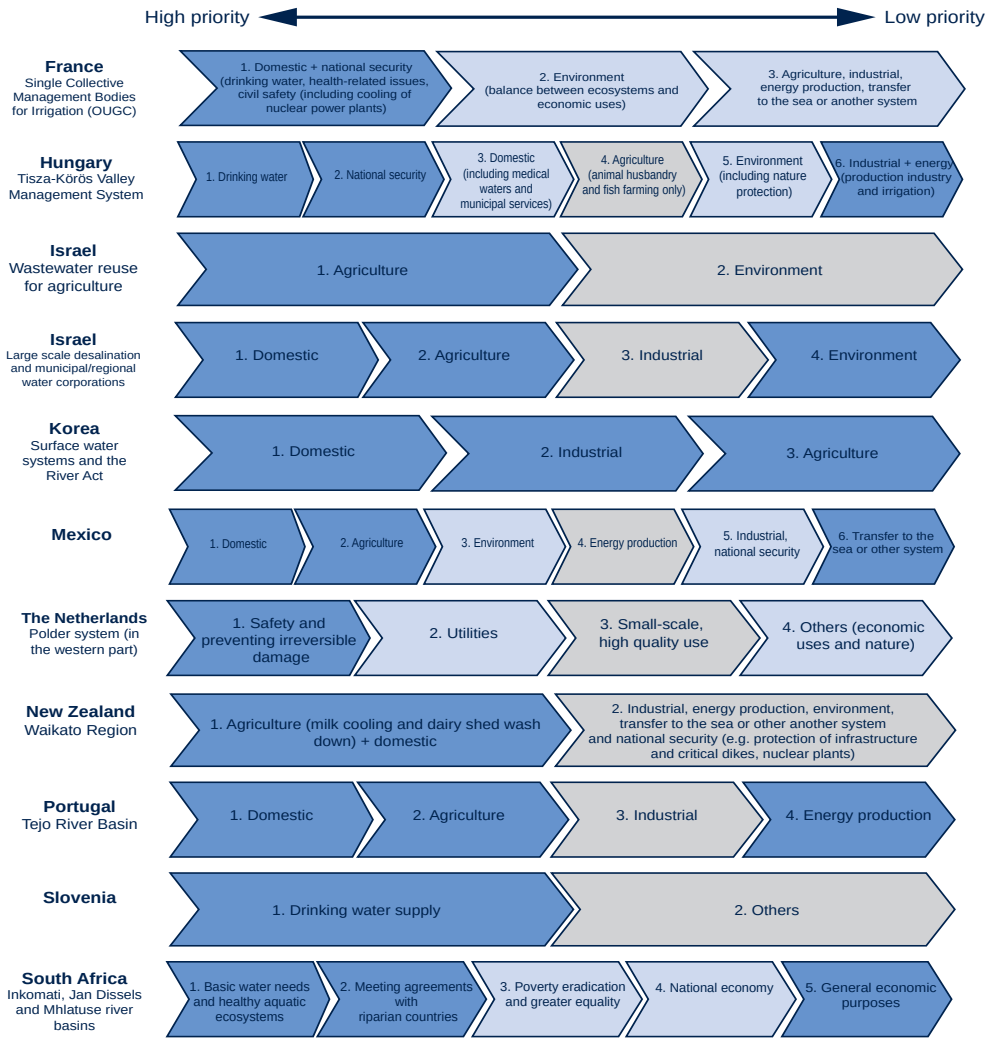


Figure 4.A2.1. **Sequence of priority water uses in selected countries** (*cont.*)



Source: OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

Annex 4.A3.
Duration of water entitlements in selected countries

Table 4.A3.1. **Duration of water entitlements in selected countries/basins**

Example	Reference to number of years entitlements are issued for
Australia (Murray-Darling basin)	In perpetuity, conditional on beneficial use
Austria (surface and groundwater systems)	– No more than 90 years (e.g. for hydropower plants) – 12 years: maximum term of abstraction for irrigation purposes
Brazil (São Francisco basin and São Marcos basin)	– 10 years: irrigation of areas up to 2 000 ha; industry with maximum withdraw flow of 1 m^3/s; aquaculture; animal consumption; mining; others – 20 years: irrigation of areas over 2 000 ha; industry with maximum withdraw flow over 1 m^3/s; – 35 years: dams of flood control or hydropower generation and other hydraulic works; public water supply and sanitation
Canada (Newfoundland and Labrador)	5-50 years: depending on user
Chile (Limarí River basin and Maipo River's 1st Section)	In perpetuity
China (Yellow River basin)	A term of a given number of years (e.g. five to ten) with the expectation of renewal
Colombia (Ubaté-Suárez basin)	– Ten years: for concessions can be granted for a term not to exceed amount of years – Up to 50 years: for public services or the construction of public or social interest
France (single collective management bodies for irrigation, OUGC)	– Few years to several decades: permanent use like drinking water abstraction – Six months: temporary uses (seasonal uses and/ or irrigation)
Japan (Tone-Gawa River System)	A term of 10 years, with the exception of 20 years for hydropower generation
Korea (surface water systems under the River Act)	A term of ten years with expectation of periodic renewal
Luxembourg	A period of 5-20 years, which can be renewed
Mexico	A term of 5-30 years, with the expectation of periodic renewal
New Zealand (Waikato Region)	– A term of 15 years without expectation of renewal – However, under the Resource Management Act they can be issued for up to 35 years. Existing consent holders have the right to have an application for a new permit for the same activity to be considered before other applicants
Peru	In perpetuity, but conditional upon continuity of activity
Spain	A term of no more than 75 years
United Kingdom (abstraction licensing system in England and Wales)	A term of 12 years, linked to cyclical reviews of water availability in a catchment, with the expectation of periodic renewal

Annex 4.A4.
Case study: São Marcos – Mitigating past errors

São Marcos is a small basin, part of the Paranaíba River basin. Although a small tributary of a larger river, São Marcos is a federal river because it is a border between two states: Goiás and Minas Gerais. The main challenge is to manage the consequences of disorderly development of energy supply and irrigation, which resulted in overallocated and over-used resources. To date, the conflict over access to water has focused primarily on issues as between irrigators and the hydropower sector. However, in the future it is likely that shortages will additionally lead to conflicts between irrigators. The basin is considered in critical condition.

Background

São Marcos illustrates the consequences of the failure to anticipate the development of competing uses: irrigation started in the 1980s, creating tensions at places. Irrigation boosted agriculture productivity and revenues in the region (Goiás). The expansion of irrigation and the resulting increase of the water demand have generated imbalances between water availability and demand in the basin, especially in the region of the Alto São Marcos. More recently, agro-food industry has been generating additional tensions, as it needs water at the same time as irrigators. Irrigation creates more value than hydropower in the region; at places, farmers combine rain fed agriculture (in the rainy season) with irrigation (at both ends of the rainy season). The region is particularly suited to the production of high-value crops as a result of the climate, topography and soil types.

Plans do not provide criteria to set priorities for water uses and licencing (except for human consumption and animal needs that by law are considered as priority in times of scarcity). Federal authorities prioritise hydropower generation, while states prioritise irrigation. Goiás endeavours to stimulate the development of industry, which creates jobs and added value.

Since 1997, licences have been issued, without a plan to guarantee water was available. The reference study for granting water licences uses 1997 data; the most recent ones date back to 2005. Qualitative issues are even less prominent, as data is even scarcer, and there is no plan.

In São Marcos, it is estimated that some 40% of water uses have not been regularised. States do not know who irrigates what. There are roughly 500 irrigators in the basin, growing 40 different crops. A campaign to register users is underway. As registration improves, more conflicts will emerge. One question remains: how to issue licences to so many intakes? Some users seek registration to access bank loans (irrigators have access to credit when they can show they have a water permit to access the water they need; but knowledge on hydrology is poor).

Projections of growth in irrigated agriculture suggest that demand will significantly exceed available water supply over coming years. Existing hydropower developments within the basin may be affected by increased upstream abstractions, and a range of factors means that some existing hydropower developments are already only marginal in terms of financial viability.

Contributing factors, which are well recognised by the ANA and others, include the absence of state-level planning for irrigation development or for hydropower, as well as the absence of integrated sectoral planning. Specific management challenges include:

- lack of revenue, including funds to support a basin commission
- different approaches are adopted to setting reference flows within the different jurisdictions.

Proposed response

The approach put forward by the ANA to address these challenges involves:

- regularising existing water users, primarily through the granting of water permits
- establishing common allocation criteria for use across the basin
- promoting efficient water use, through a combination of training and a certification process
- establishing a user representative body, which could be devolved responsibility for managing elements of the annual allocation process.

Reference and minimal flows

Each state on each side of the river uses different criteria for reference flows of the tributaries: they contribute differently to the federal river. In São Marcos, Goiás defines the consumptive pool as 50% of Q_{95}; this derives from simplistic measures:

- the first option was $Q_{7\text{-}10}$, but then, minimal flows were too low
- Q_{90} was considered too permissive.

The ratio of 50% of Q_{95} is considered conservative. Until 2006, there was no reference flow rate, and only *ad hoc* measures were considered in Goias.

Minas Gerais has a more restrictive reference flow: $Q_{7\text{-}10}$. The consumptive pool is defined as 50% of the reference flow. This was defined by the State Water Resources Council. Alteration of the consumptive pool in Minas Gerais could be considered, if endorsed by the State Water Resources Council.

Convergence towards reference and remaining minimal flows in both states may be less important than co-ordination on overall allocation.

Issues regarding hydropower generation

Figure 4.A4.1 presents the hydropower plants (HPP) in operation or planned on the São Marcos River, as well as the water storage capacity available in reservoirs.

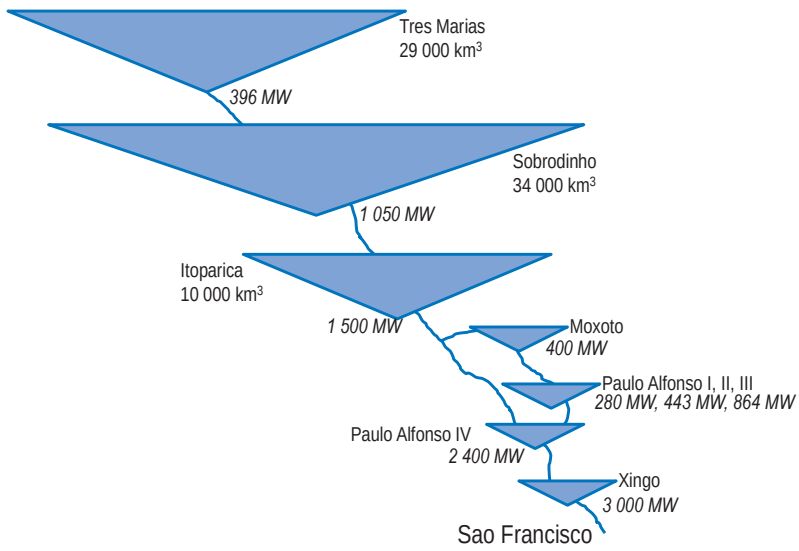
The Batalha HPP in particular has generated a lot of tensions. Figure 4.A4.2 presents the key milestones in Batalha HPP development.

Batalha is small, but located close to Brasilia. It was built with long delays. In the meantime, irrigation has developed, based on individual initiatives. The main limitation for irrigation was access to electricity. According to the Constitution, the production, transmission and distribution of electricity is a responsibility of the federal government, but a third party can provide such services upon federal concession, materialised in a contract. In the case of large hydropower plants (> 30 MW), a public auction is required

A corrigendum has been issued for this page. See http://www.oecd.org/about/publishing/Corrigendum-WaterGovernanceBrazil.pdf.

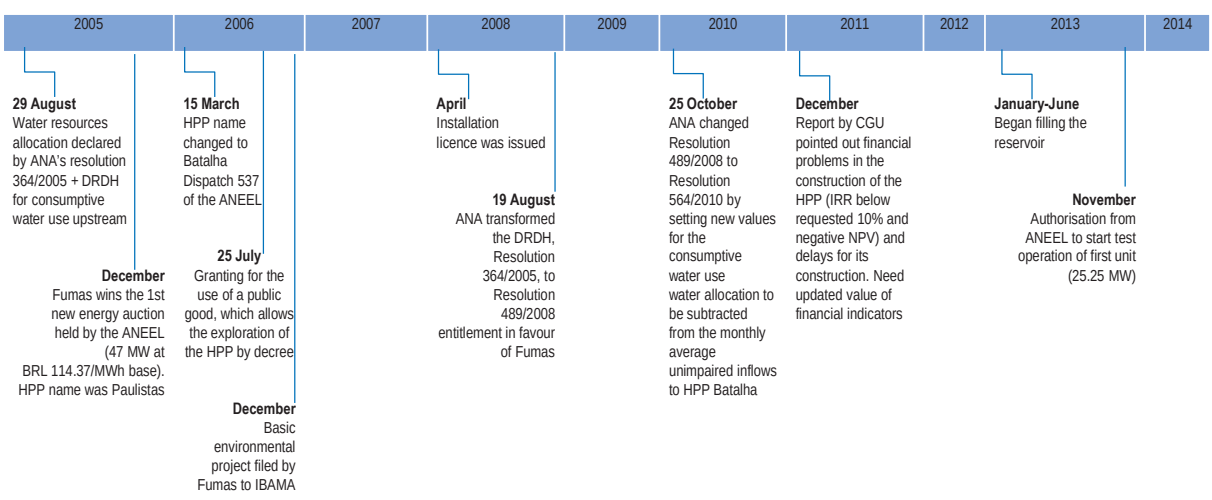
to select the company that will sign the concession contract to build and explore the HPP. A pre-requisite for that auction is a "declaration of reserve of water availability" (*declaração de reserva de disponibilidade hídrica*, DRDH), issued by the ANA in the case of federal rivers. The DRDH sets the limit for water consumptive use upstream of the HPP and is transformed (by an administrative procedure) into a water permit after the auction is completed. The water permit defines the water availability for energy production, which is translated into guaranteed energy output within the energy contract, a limit for further contract of energy supply.

Figure 4.A4.1. **Hydropower plants in São Marcos River basin**



Source: Adapted from ANA (2014), "Background report", OECD-Brazil Policy Dialogue on Water Governance, "Background report", Agência Nacional de Águas, Brasilia D.F.

Figure 4.A4.2. **Key milestones in Batalha's development**



Notes: CGU: Office of Comptroller General; IRR: internal rate of return; NPV: net present value.

Source: ANA (2014), "Background report", OECD/Brazil Policy Dialogue on Water Governance, Agência Nacional de Águas, Brasilia D.F.

The ANA has issued a DRDH and then a water permit to HPP Batalha, setting a limit for the consumptive use located upstream. That limit translates into water availability for hydropower production. Because the initial estimates of consumptive use were underestimated, the first water permit for HPP Batalha was reviewed, and the limits of 1.6 m³/s for 2010 and 7.5 m³/s in 2040 were increased to 7.6 m³/s in 2010 and 13.6 m³/s in 2040. That was in accordance with the federal legislation on energy production, which allows for a 5% change in the guaranteed energy output every five years, limited to a 10% change for the entire contract period. However, the changes in water availability have not impacted energy contracts yet.

The Brazilian Institute of Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis, IBAMA) and state environmental agencies assess the environmental impacts of new projects. They sometimes deny the licence; for instance, if the environmental regulations are not observed, even though the project is very good from an electricity supply perspective. There can also be issues regarding migration of fishes.

The law does not foresee that users can compensate others, who forgo their allocation. It could be considered in São Marcos (i.e. no sector pooling system). The transference of water permits is in the law, but with no compensation to the water user.

The role of the river basin committee

The river basin committee (at a larger level) has little resources: as water is not charged, the river basin committee receives small monies from the ANA, essentially for meetings. There are challenges in the issue of funding to support a river basin committee at this scale. The state of Goiás receives funding from hydropower (BRL 80 million a year) through financial compensation from hydropower generators, but the revenue is not earmarked for water management-related expenditures.

As a consequence, knowledge of water resource availability is weak. The river basin committee has no technical secretariat.

The river basin committee has recently approved a plan developed by the ANA. As a consequence, another plan for the part of the basin with Minas Gerais is under development, consistent with studies for the São Marcos sub-basin developed in the major plan for the Paranaíba River basin. An integrated plan for the São Marcos sub-basin is expected in the future, considering the areas of both Minas Gerais and Goiás. The committee has no power to implement the outcomes of its deliberations: a water management government agency (at state level) can bypass the recommendations of the river basin committee.

Discussion on the National Water Agency's report

In order to review the HPP Batalha's water permit and to limit water use for irrigation in the basin, the ANA developed studies and, in 2010, defined a water resources framework (Resolution No. 562) in co-operation with state government agencies. This water resources framework establishes a limit for annual water consumption upstream of the HPP Batalha. The limit also applies to states with areas within the basin and the corresponding irrigated area. Calculations are based on water availability (stream flows) and water demand. The idea was to transform the volumes of water used into surfaces of irrigated land, which are easier to monitor. This requires building on information and assumptions on the best available techniques and water efficiency. However, enforcement

and compliance remain a challenge, for both federal and state rivers; it is difficult to monitor the water use of hundreds of water users.

Nevertheless, São Marcos is acknowledged a critical area. There is consensus that things could be done differently. Therefore, the ANA set up a technical group three years ago, with irrigators, but not the other water users (energy, industry, drinking water). The plan was to close the basin and only deliver additional permits based on efficiency limits. In addition, the technical group produced a document proposing several actions to regularise and control water users, train them, certify water use efficiency and to create water user associations. Meanwhile, a Water Resources Plan for the Paranaíba Basin was developed and approved by the river basin committee. That plan does not include the proposed actions contained in the ANA's report, which is still awaiting implementation.

The main issue is how to manage the transition from a regime where the resource has been over allocated to a more sustainable one? What about compensations?

Additional considerations

States can create incentives for water users' associations (WUAs) to develop, but WUAs cannot be mandatory. Collective entitlements in the basin could work in theory, and could be pilot tested in São Marcos. Two issues will be: 1) the appropriate scale of the WUA; and 2) the self-regulation of collective title holders. Minas Gerais has been promoting collective entitlements since 2002, but authorisations are still granted to individual water users: WUAs essentially are mediators.

In addition, in a mid-term perspective, it may make sense to develop and operate the upstream reservoir (Mundo Novo) as a multipurpose dam. Such a strategy would catalyse the integration of sectoral plans into water resources plans and enable sectoral involvement in river basin management (Box 4.A4.1). Consultations would provide stakeholders with an opportunity to share a common language around this infrastructure and to better understand all parties involved. The design of the reservoir, its financing and operation and maintenance should be adapted to cope with multiple purposes.

Box 4.A4.1. **The Mundo Novo multipurpose reservoir: A sustainable solution for São Marcos**

The development of the Mundo Novo reservoirs upstream of the São Marcos River could contribute to solving the on-going and future water uses conflicts in the basin. This dam could be built and operated under a multipurpose concession (hydropower, agriculture and industry). Its future management would follow an annual cycle, which must take into account the hydraulic characteristics of the river, the various uses with their contractual obligations, and environmental requirements. Management must also, while satisfying other uses, find the economic optimum in order to produce electricity at the lowest possible costs and at the right moment, according to orientations from the national operator of the electric system (Operador Nacional do Sistema Elétrico, ONS).

This feeder lake, head reservoir, may constitute an active storage of 3 billion m³, a share of which could be guaranteed for irrigation of agricultural lands and for agro-industry (the respective needs of both sectors must be assessed and discussed).

The reservoir will manage the flow of the whole São Marcos River, and reduce seasonal variations. Flow regulation will benefit downstream hydropower plants (Batalha and Serra do Facao).

Box 4.A4.1. **The Mundo Novo multipurpose reservoir: A sustainable solution for São Marcos** (*cont.*)

The financing of the dam/reservoir could reflect the multipurpose management. A public-private partnership could be considered, where the agricultural and/or industry sectors could chip in and then benefit from a percentage of the water stored in the reservoir. As an illustration, the Serre-Ponçon Dam/reservoir in France was financed partly by the Ministry of Agriculture, allowing irrigators to benefit from a share of the available water. Water should be allocated based on a transparent and economic approach to support sustainable development of the basin. In addition, innovative business models could be considered in the operation phase, to harness beneficiaries. For instance, water users downstream the Mundo Novo Dam could pay for water rights: the downstream HPPs may increase their generation capacity thanks to more regulated flows; and irrigators will have access to secured water.

The ANA could be a catalyst for the implementation of this development, as the process is long in Brazil to develop such a hydropower plant and large reservoir. It could be an opportunity to explore a multipurpose approach, where all stakeholders are represented. This may require the creation of a platform for information sharing from the early stage of the process, to create a common language among sectors. Stakeholder involvement and engagement could create a showcase for multipurpose water management of hydropower reservoirs in Brazil and water sharing for the sustainable development of the São Marcos basin.

Note: Contribution of Emmanuel Branche, Électricité de France, personal communication.

Recommendations

There is no "silver bullet" to address the challenges faced in the São Marcos basin. A suite of measures will be necessary to maximise the benefit of existing supplies, to provide a level of certainty and security to water users, to allow water managers to respond to changing circumstances, and to improve the awareness and understanding of water users (and other stakeholders) of the availability of water and limitations on supply within the basin.

Some of the limitations around the availability of water within the basin are institutional, rather than physical, limitations: more sophisticated approaches to allocating and managing water availability are likely to make more water available for consumptive use. Such approaches come at a cost. In considering more sophisticated approaches, it will be necessary to ensure: 1) that the benefits of the revised approach outweigh the costs; and 2) that there is a funding mechanism available to support any increased costs.

Water charges offer a potential source of revenue. While there will inevitably be resistance to the introduction of any new charges on water users, users are more likely to be supportive if it is demonstrated to them: 1) that the charges they are paying are going towards basin management; and 2) that the new approach to management offers benefits to water users, and particularly to existing users. Such benefits might include (depending on the approach adopted) improved reliability or security of supply, or greater flexibility.

As for the general recommendations made in the aforementioned report by the ANA, the key considerations in addressing the challenges in the São Marcos relate to:

- determining what water is available for allocation, considering the required levels of reliability and the scope (from a management and enforcement perspective) to regulate access to different parts of the basin

- determining how that water should be prioritised amongst sectors and individual users, ideally in a way that is equitable, efficient and consistent with broader development objectives.

On the first of these questions – which fundamentally relates to what reference flow is appropriate – the São Marcos basin offers an opportunity to pilot the alternate approaches to defining reference flows, as discussed in the main recommendations. Detailed hydrological data for the river basin have not been considered and it is not possible to provide specific recommendations on what alternate reference flows might be appropriate.

The approach to setting the reference flows for the São Marcos vary between jurisdictions. There would be benefit from adopting a consistent approach (whatever that may be) that is applied across all relevant jurisdictions. This would ideally be defined as part of a transboundary water resources plan, which was agreed between the relevant jurisdictions.

One measure that is worthy of consideration is the notion of a water permit that allows for opportunistic abstraction of water during periods of higher flow. This could be implemented without the need for changing regulatory arrangements related to other water users.

Promoting efficient water use will be critical to maximising the value realised from the limited supplies available in the basin. Achieving this should involve:

- Ensuring permits are only granted in line with appropriate efficiency benchmarks.
- Providing for periodic review and adjustment of permits to account for changes in industry practice (notably for improved efficiency).
- Providing incentives for users to be more efficient. Such incentives could include water use charges (which penalise those who use more water) or opportunities to reallocate water to others (whether returning water to a common pool, trade, etc.) to allow users to benefit from using less.
- Providing incentives for users to use water at different times. For example, as noted above, this could include permits that allow for larger volumes to be taken outside of the typical peak months for water usage.

The measures proposed in the ANA's report with respect to water use efficiency – such as training for water users and a certification process – are strongly supported and are consistent with international best practice. It is not possible to comment on the specifics of the efficiency standards (e.g. proposed water usage): such matters vary significantly based on local conditions (crop and soil type, climate, etc.) and there is little benefit in comparing values with international approaches. In principle though, the approach adopted appears sound.

What does, however, appear absent in respect of the promotion of efficient water use is the flexibility and incentive for water users to adopt novel approaches to reduce or alter their water consumption patterns. The sorts of incentives and efficiency measures discussed in the body of the report (charges, scope for reallocation) should be explored in the context of the São Marcos.

The assessment undertaken by the ANA suggests that, even if the planned measures aimed at improving water use efficiency are effective, demand is still likely to exceed

supply over the medium term. This highlights the criticality of having in place measures to:

- Determine and define the water available for allocation (this is currently in place by way of ANA Resolution 562/2010, but there are challenges in its effective adoption by state government agencies).
- Define the share of the available water that will be allocated for different purposes. Ideally this should be addressed as part of a basin-level water resource plan, and done in consultation with the relevant sectorial agencies.
- Promote awareness, understanding and, ultimately, acceptance amongst water users and government agencies, of the limits of supply with in the basin.
- Allow for reallocation water within a "closed" basin.

Promoting awareness and understanding will require engagement and education with respect to the hydrological status of the river, and current and future demands on available supplies. Such an understanding will be critical to ensure that water-dependent development is undertaken in a way that is consistent with what water is, in fact, available, and to avoid the risk of agencies or individuals developing irrigated agriculture on the assumption that water will be "found" when it is required. Ultimately, expansion of irrigation will need to be managed based on availability of water, not just land.

Providing a mechanism for reallocation of water will become necessary in the event that all available water has been allocated. In the absence of a mechanism for reallocation, any future water-dependent industry will be constrained and opportunities for further development will be lost. Reallocation measures that might be considered include:

- government facilitated (voluntary or compulsory) reallocation
- user-to-user reallocation of water entitlements (such as through water trading).

Finally, due to its small size and location between two states only, the São Marcos may be suitable as a pilot case to experiment the devolution of responsibility for the management of federal rivers. The process should start by an assessment of the willingness of both states to take responsibility to manage the river in a co-ordinated way, and of their capacity to engage in such a collaborative effort.

Annex 4.A5.
Case study: São Francisco – Anticipating future crises

São Francisco is a large basin covering seven states. The river has several tributaries upstream (in Minas Gerais and West Bahia, essentially) and is essentially a channel (only intermittent tributaries) in the semi-arid region downstream. The river contributes a significant share (11%) of national hydropower generation. The main challenge is to avoid future crises that would result from the development of competing uses upstream and to favour the development of semi-arid regions downstream, which fully rely on the main stem. Some of the dams along the river attenuate floods and droughts, but cause environmental impacts downstream. Deforestation leads to erosion and increasing sedimentation in the basin, affecting transportation on the river. Some areas are identified as areas where water has been overallocated.

Background

Opportunities for development abound in the basin: mining and urban water uses upstream; irrigated agriculture (in the middle part of the basin); hydropower generation; transportation of economic goods (grain) along the basin (hampered by reservoirs and sedimentation). These developments may compete with one another. States have their own priorities and plans for the tributaries. In 2003, an integrated water resources plan prepared by the ANA catalysed the debate about the overall level of development wanted for the region; however, there are challenges in the implementation of that plan and sectorial visions still prevail.

Irrigators upstream claim they can multiply irrigated surfaces by two or three times, if they can secure water and power. They could use an aquifer, in the western part of the state of Bahia.

There are nine major reservoirs on the São Francisco River basin: Queimado, Três Marias, Sobradinho, Itaparica, Moxotó, Apolio Sales, Paulo Afonso I-IV and Xingó. Três Marias e Sobradinho are the largest. Figure 4.A5.1 presents the hydropower plants (HPP) in operation on the São Francisco River, as well as the water storage capacity available in reservoirs. Reservoirs are operated by the ONS, in the perspective of the national power grid. It is noteworthy that the ONS ignored signals of risks of droughts recently and failed to store more water in the reservoirs.

Fluvial transportation is an important non-consumptive use, as farmers and mining industries upstream use the river to transport merchandise within the basin. Navigation is restricted by siltation. In periods of drought, navigation may not be possible, generating operational losses for operating companies and producers upstream.

Groundwater is an important source of water supply to several communities and farmers and strategic groundwater reserves might be over exploited.

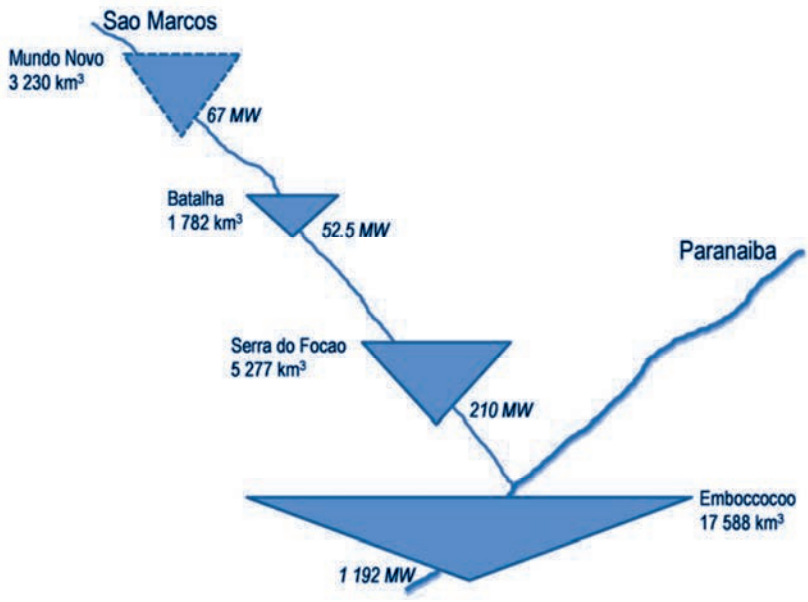
Pollution is an issue. In Minas Gerais and other parts of the basin, cities release untreated effluents. In the semi-arid region (downstream), the tributary rivers have no capacity to dilute pollutants. Rivers are supposed to be classified under specific categories associated to water quality standards, depending on dominant water uses. When there is no classification, all rivers are considered to be under Class II (water can be used with

A corrigendum has been issued for this page. See http://www.oecd.org/about/publishing/Corrigendum-WaterGovernanceBrazil.pdf.

simplified treatment). But classification only exists on paper and monitoring is weak; no deadline has been set for rivers to comply with water quality standards defined for their classification category. However, Velhas River, in São Francisco River basin, is a good example of improvement after the establishment of water quality targets.

The downstream, semi-arid part of the river is affected by activities upstream: absence of or inadequate wastewater treatment; lack of cyclical or controlled floods (now that the river is regulated through reservoirs), which contributes to siltation in the lower basin. In the semi-arid part of the basin, major water uses are energy production, irrigation and navigation. When flows are low, it is difficult to reach consensus on the operation of reservoirs. At low levels, it is not possible to save water in the hydropower reservoirs; if current drought conditions continue, energy production and navigation might be compromised. This will create tensions when water stored in reservoirs depletes. The questions are: how to adjust and what is the role of states?

Figure 4.A5.1. **São Francisco hydropower plants**



Source: Adapted from ANA (2014), "Background report", OECD/Brazil Policy Dialogue on Water Governance, Agência Nacional de Águas, Brasilia D.F.

The basin is affected for the third consecutive year of drought in the three downstream states. The ANA organises monthly meetings with water users (energy supplier, irrigators, fluvial transportation, water supply and sanitation companies). Hydropower generators manage their reservoirs; the ANA steps in, to reflect other voices.

States use different criteria to define reference flows: $Q_{7\text{-}10}$; Q_{95}; Q_{90} (Table 4.A5.1). These reference flows form the current criteria for issuing permits. Minas Gerais used to define the consumptive pool as 30% of $Q_{7\text{-}10}$. This is considered restrictive, but legitimate as water availability and demand are not known precisely. This standard was revised in 2011, as knowledge on water flows increased; now some differentiation at sub-basin level could be made.

Table 4.A5.1. **Criteria for reference flows in the São Francisco basin**

State	Criteria
Bahia	80% of Q_{90}
Minas Gerais	50% of Q_{7-10}
Pernambuco	90% of Q_{90}
Alagoas	90% of Q_{90}
Sergipe	90% of Q_{90}
Goiás	50% of Q_{95}
Distrito Federal	80% of Q_{90}

The current water resources plan was prepared in 2003. As part of the planning process, the ANA undertook an assessment of availability and future demands and prepared a proposed water allocation for submission to the river basin committee. This process included consideration of water demands for non-consumptive water uses and established rules for water allocation equity. The process resulted in a total water allocation of 380 m³/s, which would have been sufficient to supply all water demands in all scenarios, and which would represent a cap on future water consumption that corresponds to 21% of total water availability, estimated at 1 815 m³/s.

The ANA proposal was not approved by the basin committee, primarily as a result of political issues related to a proposed inter-basin water transfer, the São Francisco Transboundary Project. Rather, the basin committee approved a cap of 360 m³/s and preserved the existing state rules for issuing water permits.

The process of reviewing the 2003 Water Resources Plan has just commenced, with a new plan expected to be finalised in 2015. In the context of the revision, efforts are being made to quantify new demand and define the available flow.

The need to share water and risks

Divergence in state legislations leads to a sense of inequitable sharing of water and risks: “some save water so that others can waste it”. Revenues from hydropower financial compensation downstream are shared with municipalities and states upstream. Tensions emerge as states upstream tend to sit on the water and are reluctant to share it when they are not assured that water will be used efficiently.

Hydropower generators claim that restrictions are not equitably shared among users (hydropower vs. irrigators). They claim they have to manage water in a multipurpose perspective, while each user thinks about its own needs and makes claims regarding the management of the reservoir.

Irrigators claim some reservoirs should be dedicated to irrigation (not for human consumption). They argue irrigation is the condition for food safety, a national priority. This is a way to secure access and their investment.

Environmental permits make it difficult for irrigators to invest in their own reservoirs. The Forest Code can generate limitations (in preserved areas). Minas Gerais has revised the Forest Code. One question is: how can risks be allocated among users? For example, cutting 10% of water entitlements to everyone is not an option, as users will be affected differently.

River basin committees

The river basin committee is considered a legitimate instance to co-ordinate water uses, as it brings stakeholders together (the fluvial transportation sector could be better represented, though).

In Minas Gerais and Bahia, several committees exist at tributary level, and they have developed local plans. This is not the case downstream. In Minas Gerais, the basin is subdivided into ten sub-basins (for the main tributaries), each with one basin committee, and each has its own plan. The challenges each sub-basin faces are different: some face tensions between mining and urban water uses; others are dominated by irrigators.

River basin committees are the right instance to have discussions about water-related tensions. However, discussions tend to get more emotional than technical: river basin committees lack data and hard facts on which to base their discussions. Water supply and sanitation are not properly discussed. Sub-committees (at tributary level) tend to lose the big picture. River basin committees need rules for their operation (the role of a river basin committee, how to set an agenda, etc.), so that they remain focused and have the big picture (instead of focusing on selected projects). The ANA could set such rules.

Stakeholders are not accountable for the plans they develop.

Charging for water use

Charging can create room for manoeuvre and revenues to states. Ceará has good experience with such policies. Water charges create obligations for public and private actors to contribute to financing. Revenues collected from water charges (collected from water users) are totally earmarked for water in the basin.

While charging has generated some success in the federal rivers and one tributary, it is plagued with limitations:

- Charges are collected on a small basis only.
- Charges are too low to affect behaviour. Industry (80% have less than 20 employees) opposes indexation of water charges.

It is difficult to make irrigators pay for water: they claim that water charges would affect their profit margin and put them at risk; they also claim that they face constraints in the exploitation of their own property (e.g. top-of-the-hill reserves, for environmental purposes) and are not compensated; they also claim they have to clean the water they use. Charges for irrigators remain symbolic. It has been suggested to increase charges and earmark part of the revenues to a fund used to achieve specific performance targets.

The interbasin transfer to the Northeast

Four adjacent states in the Northeast region of Brazil are water scarce (among others): Ceará, Paraíba, Pernambuco and Rio Grande do Norte. Water stress has long been blamed for the Brazilian Northeast's poverty, economic under-development and even politics, with its direct effects including social and economic damages, internal migration and economic isolation.

The Ministry of Environment has decided to transfer water from São Francisco to supply the four states in the Northeast. The decision was taken to secure development of the Northeast arid region and to alleviate poverty.

This decision has triggered a lot of reactions from stakeholders in the São Francisco basin. One consequence has been the rebuttal of the water management plan developed by the ANA for the basin in 2003. Opponents argue that water users downstream of the basin would also benefit from additional government investment, as no water is available a few kilometres away from the channel: all tributaries of the São Francisco River in the semi-arid region are intermittent rivers only.

The proposed diversion is considered minimal (26 m^3/s, with multi-year average transfer estimated at 67 m^3/s) and should not affect the basin, as there is enough water to meet the water transfer and all other water demands planned in the basin. However, some fear the proposed diversion may prove to be too small and will be increased later on. Others consider that the costs of operating the water transfer project are higher than the value of the water diverted. The water transfer project will be built for 127 m^3/s: according to the ANA's regulation, that maximum flow rate will be allowed to be pumped during periods of water abundance in the São Francisco basin, as measured by the water level in the Sobradinho reservoir. In addition, some water will evaporate and be lost when the water transfer project crosses a large semi-arid area; the energy cost may be greater than the economic benefit. Also, water users in the basin challenge how the transferred water will be used, although the information is publicly available.

Discussions have focused on a series of compensation measures to revitalise the basin. A first set of measures were implemented by the CODEVASF (Company for the Development of São Francisco and Parnaíba Valleys, Companhia de Desenvolvimento dos Vales do São Francisco e do Parnaíba) during the last decade (2000-10). They covered control of polluting sources (sewerage, waste disposal, erosion), recovery of navigation on stretches of the river (funded by the Growth Acceleration Programme). The measures are being reviewed before a second tranche of ten years is implemented. The resources allocated to the programme of measures are limited (EUR 200 000).

The river basin committee may revise its position against the transfer, if the compensation measures are more ambitious.

The National Water Agency's plan to share water across states

The ANA supports the development of a water management plan, which essentially consists in allocating water across states and which covers several other aspects related to water management in the basin. It has been difficult to develop a plan at basin level, and to harmonise criteria for water allocation, charging, etc.

The plan will be developed by the river basin water agency, with the ANA's support if needed. The river basin committee will then discuss it. The plan could contain a proposal of volumes of water to be made available for each state, among several other aspects. It is expected to include investment plans and should set priorities for water use. Data on points of water withdrawal needs to be updated, notably in state rivers, to help build a consensus; in general the plan builds on old, secondary data. More surveys and regional studies would contribute to the plan's robustness.

The revision of the plan is an opportunity to discuss water allocation, to put more emphasis on charges, and to give more opportunities to improve water permit systems within the basin. A requisite is to develop capacities in state administrations, as there is a

disconnect between a strong ANA and weak states. The ANA is regarded by states as the partner which has competencies to define the rules, and an intermediate, a catalyst.

State authorities agree that restrictions and guidelines for water use should be set for every sector. Predefined rules should be made available, which apply when water is scarce. They could take the form of contingency plans.

The plan would benefit from better accountability of stakeholders and the governing bodies.

Recommendations

There are two distinct issues to consider in the São Francisco:

- the most appropriate technical approach to undertake an assessment of likely supply and demand requirements
- the governance mechanism and the extent to which it supports good outcomes in terms responses to and implementation of technical recommendations.

Both of the above issues will need to be addressed to achieve optimal outcomes and minimise conflicts within the basin.

Along the same lines, there is a challenge in ensuring both:

- technical assessments that recognise the political and practical realities of the situation
- governance arrangements and political drivers that recognise the physical reality of the situation.

In broad terms, the approach adopted by the ANA in preparing the draft Water Resources Plan in 2003 appears robust and consistent with standard international practice. The proposed approach of identifying reference flows for key locations across the basin should be adopted in the new plan.

The approach presently adopted to defining reference flows – 95%, $Q_{7,10}$, Q_{90} – is a low-risk approach. This limits the potential to access the full benefits of the river system. Also, there is an inconsistent approach as between the states. It is recommended that:

- To the extent possible, a consistent approach be adopted across states to setting reference flows and environmental flows. Where differences are proposed, the reasons for divergence should be clearly articulated and justified.
- Consideration be given to adopting a more aggressive approach to setting reference flows, including allowing for different levels of reliability for different purposes.

The approach of setting a cap, and managing excess demand through water use efficiency is appropriate. It is critical though that all parties recognise the physical limits of the system and plan accordingly.

The current approach to setting e-flows is based on an arbitrary mechanism which does not recognise the ecosystem services in the river or the potential impact on them of changes to the flow regime. This poses a risk to the various ecosystem services on which communities in the basin depend. It is recommended that, at a minimum, the current planning exercise include a desktop assessment of important ecosystem services provided

by the river system, and a high-level assessment of the risks to those services as a result of changes to the flow regime. Based on that assessment, a decision should be taken as to whether more detailed studies are required.

Prioritising the allocation of water should include consideration of equity issues, including equity in how risks are shared. For example, there are indications that the hydropower sector considers that water risk is not managed equitably. This is ultimately a strategic question. It is critical though that the process, whatever it may be, is transparent and set out in advance, to reduce potential for conflict and to allow different users to plan accordingly.

The revised Water Resources Plan should define priorities for water allocation as amongst regions and sectors. It should also identify any process required for adjusting the water available under entitlements on a seasonal basis.

Regarding water charges, there have been some instances of effective application but there are also significant challenges. There has been only limited collection of charges, although what is collected is earmarked for water management within the basin. However, the water charges paid by the electric sector are not earmarked for water management. A more sustainable funding model is required, particularly to support the work of the river basin committee. Consideration should be given to expanding the use of water charges and for consolidating a mechanism to ensure these funds are available for management of the basin.

The issue of the inter-basin water transfer out of the São Francisco highlights a number of matters relevant to both the basin as well as allocation of water nationally:

- importance of arrangements that allow for strategic decisions to be taken at the appropriate level regarding what water will be available to which regions
- while local interests are always relevant, it will often require decisions at a higher level to avoid local politics driving decisions, rather than national interest
- fundamental governance questions, as to who should have the say over who/which region/s benefit from particular water resources
- concerns over uncertainty as to whether transfers will increase in the future – highlight the importance of long-term planning and security for water users
- now that a decision has been taken at national level that the transfer will go ahead, it is a matter of determining how the water transfer project will be managed.

Consideration should be given to the role of the states in preparing and approving the Water Resources Plan. Given that the plan will (most likely) define water shares as between the states, it will be critical that the states are supportive of the proposed arrangements. To the extent that all states are not directly represented on the basin committee, a separate consultation process with state governments is proposed to ensure strong support for the final outcome.

Bibliography

ANA (2014), "Background report", OECD/Brazil Policy Dialogue on Water Governance, Agência Nacional de Águas, Brasilia D.F.

ANA (2013), *Relatório de Conjuntura dos Recursos Hídricos 2013* (*Water Resources Conjuncture Report 2013*), National Water Agency, Brasilia D.F.

ANA (2010), *Atlas Brasil Abastecimento Urbano de Água. Panorama Nacional*, Agência Nacional de Águas, Brasilia D.F., http://atlas.ana.gov.br/Atlas/forms/Home.aspx (last accessed 5 May 2015).

BNDES (2009), cited in: Valberg, A.H. (2011), "Brazil's role in environmental governance: Analysis of possibilities for increased Brazil-Norway cooperation", Report for the Norwegian Ministry of the Environment, Fridtjof Nansen Institute, Lysaker, Norway, available at: www.fni.no/doc&pdf/FNI-R0811.pdf.

Braga, B.P.F. and J.G. Lotufo (2008), "Integrated river basin plan in practice: The São Francisco River basin", *International Journal of Water Resources Development*, No. 24, Issue 1.

Fadali, E. , K. Rollins, S. Stoddard (2012), "Determining water values with computable general equilibrium models", report submitted to Industrial Economics, Inc. for presentation at "The Importance of Water for the U.S. Economy: Technical Workshop", 19 September, available at: www.unr.edu/Documents/business/esnr/Determining_Water_Values_with_Computable_General_Equilibrium_Models.pdf.

Hassan, R. and J. Thurlow (2011), "Macro-micro feedback links of water management in South Africa: CGE analyses of selected policy regimes", *Agricultural Economics*, Vol. 42, No. 2, pp. 235-247.

IBGE (2010), *Pesquisa Nacional de Saneamento Básico 2008*, Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro, available at: www.ibge.gov.br/home/estatistica/populacao/condicaodevida/pnsb2008/PNSB_2008.pdf.

IEA (2013), *IEA World Energy Statistics and Balances* (database), http://dx.doi.org/10.1787/enestats-data-en.

IEA/OECD (2013), *World Energy Outlook 2014*, International Energy Agency, Paris, http://dx.doi.org/10.1787/weo-2014-en.

Moreira de Camargo, T.R. et al. (2014), "Major challenges for developing unconventional gas in Brazil: Will water resources impede the development of the country's industry?", *Resources Policy*, Vol. 41, pp. 60-71.

Ministry of the Environment (2010), *Fourth National Report to the Convention on Biological Diversity*, Office of the National Program for Biodiversity Conservation – DCBio Brasilia.

National Water Commission (2012), *Impacts of Water Trading in the Southern Murray-Darling Basin Between 2006–07 and 2010–11*, Commonwealth of Australia, Canberra, available at: http://archive.nwc.gov.au/__data/assets/pdf_file/0009/21996/NWC_7019_WTR_Full.pdf.

OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

Ontario Ministry of the Environment (2005), *Permit To Take Water (PTTW) Manual*, Ottawa, Ontario.

Rodrigues, D. et al. (2014), "Contrasting American and Brazilian systems for water allocation and transfers", *Journal of Water Resources Planning and Management*, http://dx.doi.org/10.1061/(ASCE)WR.1943-5452.0000483.

SNIS (2014), *Diagnóstico dos Serviços de Água e Esgotos*, National Secretary for Basic Sanitation, Brasilia D.F., www.snis.gov.br/PaginaCarrega.php?EWRErterterTERTer=105.

Speed, R. et al. (2011), *Policy Measures, Mechanisms, and Framework for Addressing Environmental Flows*, International Water Centre, Brisbane, Australia.

US EPA (2013), "The importance of water to the U.S. economy: Synthesis report", Office of Water, United States Environmental Protection Agency, Washington, DC, November, available at: http://water.epa.gov/action/importanceofwater/upload/Importance-of-Water-Synthesis-Report.pdf.

World Bank (2013), *World Development Indicators* Database , Washington, D.C. http://data.worldbank.org/data-catalog/world-development-indicators.

Chapter 5.

Action plan for strengthening water governance in Brazil

This chapter sets a tailored action plan to put the suggested policy recommendations in practice through concrete milestones and clearly identified champion institutions. It is organised around the three dimensions of the policy dialogue: water governance, the National Pact for Water Management and water allocation. The action plan suggests practical steps, potential indicators and relevant OECD experiences.

Introduction

The great diversity of challenges in Brazil implies that there is no one-size-fits-all "toolkit" to provide directly replicable solutions. However, the diagnosis of current and future challenges in Brazil's water resources management and the lessons drawn by international experiences provide a solid basis to suggest a menu of options that can support better water governance and more robust water allocation regimes.

OECD work on the political economy of reform (OECD, 2013) highlighted common features to improve processes, many of which are relevant in the case of Brazil. These include the following dimensions:

- An electoral mandate for reform. The newly elected Brazilian government has a unique opportunity to raise the profile of water in the national agenda, building on the political commitments to improve water resource management within the National Pact for Water Management.
- Effective communication to persuade voters and stakeholders of the need for reform. Successful water reforms generate a wide range of benefits for different sectors. Effective communication and stakeholder engagement is critical to secure social acceptance and buy-in through greater awareness, willingness to pay and behavioural change.
- Solid research and evidence-based analysis to support policy design and enhance prospects for reform adoption. This report provides thorough evidence-based analysis on both the challenges and assets that Brazil should consider. OECD recommendations could pave the way for greater whole-of-government action in tackling the water challenge.
- Appropriate institutions, capable of supporting reform. The state empowerment behind the National Pact for Water Management can engage the range of relevant institutions in the reform process, and foster complementarity and synergies across levels of government and policy areas.
- Leadership. A clear political commitment is needed to design a long-term vision of the sector. The National Water Agency (Agência Nacional de Águas, ANA) has an important role to play in leading the change in co-operation with Ministries of Environment, National Integration, Cities, Agriculture and Planning, amongst others. But beyond central government, a great sense of responsibility should be strengthened at the state, basin and municipal level for an effective implementation of water policy.
- Time. Successful structural reforms and strategies are long processes to prepare, adopt and implement; and they often take several attempts. Complex changes like those required in Brazil's water sector will inevitably take years. Circumstances at all levels can change during the reform implementation period, and water reform can only be successful if it has the flexibility to adapt to shifting circumstances. Still, sequencing matters, to avoid locking in suboptimal solutions and costly revisions.

Therefore policy makers should bear in mind the following questions when designing both policy reforms and strategies for their adoption and implementation:

- Do the authorities have a clear mandate for change?

- How strong is the evidence and analysis underlying the arguments for reform?
- What more can be done to demonstrate the need for change and/or the desirability of the proposed solutions to the public and key stakeholders?
- Are there institutions to manage the reform effectively, or is there a need to create/strengthen such institutions?
- Does the reform have clearly identifiable "champions", in terms of both politicians and institutions responsible for taking it forward?
- What is the expected timeframe for design, adoption and implementation?
- What processes are in place to monitor the effectiveness of reforms achieving long-term water management objectives? Will reporting on progress be transparent? Is there a process which supports an adaptive management approach as external circumstances change (e.g. new problems arise, implications of climate change become better known)?
- How can stakeholders be engaged that may feel threatened by reform? Can they be persuaded to support it? To what extent can/should their objections be overridden? Should they be compensated for their anticipated losses – and, if so, how and to what extent?
- How can water management priorities be funded?

The following sections provide more specific guidance, a scoreboard of indicators and selected international references to support the implementation of the recommendations from the report.

Strengthening water governance

Several OECD countries have made significant efforts in relation to the above-mentioned principles.

- For instance, many good practices can be identified in terms of performance measurements, water information systems and databases (e.g. Spanish Integrated Water Information System [SIA], Portuguese National Water Resources Information System [Sistema Nacional de Informações sobre Recursos Hídricos, SNIRH], European Water Information System [WISE], Australian Water Resources Information System [AWRIS], France's national system of water information, etc.), or financial transfers (e.g. Dutch Delta Fund), inter-municipal collaboration (France, Mexico) or stakeholder engagement. These are valuable examples of specific instruments for co-ordinating water policy at the territorial level and between levels of government.
- Most countries have also made efforts to co-ordinate water with other policy areas, including spatial planning, regional development, agriculture and energy and to provide with integrated national strategic planning. The forthcoming, (2018) Environmental Planning Act in the Netherlands should replace all strategic plans by one integrated plan to be made by the central government and provinces, including aspects of spatial planning, the environment, water, landscape, agriculture, cultural heritage and energy infrastructure**.** In Portugal**,** the long-term National Energy Strategy is jointly prepared by Ministry of Economy and the Ministry of the Environment and Land Use Planning; in France, the master plans of development and water management (Schéma directeur d'aménagement et de

gestion des eaux, SDAGE) are co-ordinating hydropower operations and conservation of aquatic environments.

- OECD countries have also significantly strengthened their technical and financial capacity. This involves combining investment in water and sanitation ("hard") infrastructure and investment in institutions that directly influence water outcomes to ensure more effective and co-ordinated implementation ("soft" infrastructure).

Making the National Pact for Water Management happen

The National Pact for Water Management provides an important political incentive and seed money for water management at the state and river basin level. It should be seen as a catalyst to bring states and river basins on track towards their water resources management, which is commensurate with the challenge they are facing and in tune with national and state policy objectives.

The implementation of the Pact is still in a preliminary stage. The main challenge for the federal government therefore will be to ensure continuation of activities induced by the Pact after the first five years, but also to co-operate to achieve sustainable water management at state and basin levels. The challenge for many states will be to mobilise the resources needed for water management either from the state budgets or increasingly from the water charges.

The National Pact for Water Management can benefit from international experience within and outside the water sector for greater and result-oriented implementation.

- The European Water Framework Directive provides valuable lessons in terms of monitoring and enforcement. It requires member countries to produce several documents for the evaluation framework and established a "carrot and stick" approach for countries to comply with the Directive which could benefit the next generation of "National Pact for Water Management" in Brazil, if any.
- The monitoring of results under the Australia's National Water Initiative (NWI) can provide inspiration to the ANA's Pact implementation assessment. In 2011, a total of 28 performance indicators were developed to address the 10 NWI objectives. The assessment reviewed the extent to which the NWI had built strong and effective governance arrangements; improved the efficiency and productivity of Australian water use; improved the sustainability of water management; and impacted regional, rural and urban communities.
- Under the Canada Water Act agreements, several levels of governments share the financial burden of water-related projects: agreements for specific water programmes provide for the participating governments to contribute funding, information and expertise in agreed ratios. For ongoing activities, such as the water quantity survey agreements with each province, cost-sharing is in accordance with each party's need for the data. For study and planning agreements, it is usual for the federal government to meet half the costs and the provincial government the other half. The planning studies encompass interprovincial, international or other basins where federal interests are important. Implementation of planning recommendations occurs on a federal, provincial and federal-provincial basis. Cost-sharing of the construction of major infrastructure works is generally jointly funded by federal, provincial and municipal local governments.

According to the 2005 Portuguese Water Law, the ministry responsible by water resources policies can sign "programme contracts" in which responsibilities and costs are shared between national authorities and municipalities (there are no states or formal regions in Portugal). The contract establishes the requirements of both parties and means for supervision. This is a very constructive way of promoting co-operation between levels of government and sharing the financial burden accordingly. For the sake of transparency and accountability, contracts have to be made public. This helps to prevent corruption. According to the Water Law, this instrument can be also used with water users' associations and entities responsible for the management of multipurpose water systems but, in those cases, procedures are more complex given the private nature of those entities.

Managing the water allocation reform process

The OECD has reviewed the experience of water allocation reform of ten OECD and BRIICS (Brazil, Russian Federation, India, Indonesia, China, South Africa) countries (see OECD, 2015, for more details). Valuable insights can be drawn from these experiences, which can inspire Brazilian authorities and the ANA in particular, for the management of the reform process. Then, suggested actions are clustered under three broad OECD recommendations.

Make the case for reform

Several dimensions can contribute to making a strong case for reform: environmental, economic and equity considerations matter. Multiple examples highlight how concerns about growing water scarcity and insufficient water for ecosystems can figure among the key allocation reform drivers. Other drivers include efforts to improve the economic efficiency of resource use and the equity of resource management. The drive to improve economic efficiency was among the key reform drivers for Australia, Chile and Israel. In Australia, reforms to the water sector were part of a broader macroeconomic reform agenda captured under the title of "National Competition Policy".

Equity deserves particular attention. Equity in allocation was a primary driver of water reform in South Africa. Water allocation reform in South Africa was driven during the political transition to democracy in 1994 and formed part of a broader suite of legislative reform aimed at fundamentally transforming the South African political and economic context. The primary driver was the need to transform a society in which the black majority had been excluded from access to natural resources (including water) or the benefits derived from such natural resources. Thus, in 1994, around 95% of the water used in South Africa was in the hands of the white minority. The water allocation reform proposed in the 1997 White Paper on a National Water Policy for South Africa, and the ensuing National Water Act, were aimed at addressing this historical injustice.

Equity issues may arise from earlier reforms as seen in Chile. With the introduction of the Water Code in 1981, a rapid increase of requests for water use rights for speculation and hoarding purposes occurred,[1] which resulted in monopolistic behaviour and a reduction of water resources available for allocation to other potential uses (even though they were not actually being used). This created an impediment to the development of new investment projects on account of them not being allowed to acquire new rights (Pena, Luraschi and Valenzuela, 2004; Bitran and Saez, 1994; Donoso, 2003, 2011). To address this speculation and hoarding, the government introduced a non-use tariff for unused water. Once the water use right is determined to be "unused", the tariff is levied,

based on a system of escalating charges.[2] As a result of the reform of the Water Code in 2005, along with other measures, speculation and the hoarding of non-consumptive water use rights have been reduced (Pena, 2010) freeing up water to be accessed by a broader number of potential users, thereby improving the equity of allocation.

In Brazil, the National Policy Dialogue creates a platform to remedy key deficiencies of water allocation regimes in place and adapt to future challenges. Environmental and economic considerations have been given prominence. The distributional dimensions of any alternative allocation regimes have to be considered thoroughly.

Manage the reform over time

International experience confirms that water allocation reform takes time. It is an iterative process, which extends over many years. Allocation reforms have extended over multiple decades in the Murray-Darling basin, Australia, in Chile (from the enactment of the Water Code in 1981 to subsequent amendments over the following decades) and in the Yellow River basin, China, where the allocation regime has been in constant flux over the last 30 years. In South Africa, while the initial expectation was for medium timeframes for the full implementation of the provisions of the National Water Act adopted in 1998, 16 years later, there are still significant challenges in implementation.

Explore a variety of options

Policy options that seem appropriate from a technical perspective can be discarded by a number of factors:

- Limitations imposed by other policy areas (e.g. tax policy) can render some options not legally viable. For instance, in England and Wales, abstraction charges would be classed as a tax; as such, according to UK tax policy, they need to be predictable and stable; therefore, they cannot reflect scarcity.
- Conflicts with existing principles for allocation, such as the principle of “first in time, first in line” can reduce the options considered. In Alberta, Canada, proportional sharing of water during drought, where all users lose the same proportion of their entitlement, was considered as an option. However, this would be in conflict with the “first in time, first in right” principle, which the government and water users preferred to uphold.

Engage with stakeholders

Stakeholder engagement has multiple benefits. It is valuable for gaining a deeper understanding of the preferences of different water users and identifying what the proposed reform would mean for them. A recent OECD Survey on Stakeholder Engagement for Effective Water Governance indicates that inclusive decision making leads to better acceptability of decisions on water issues and a greater sense of ownership across the different actors (OECD, 2015). Both of these elements are critical for the effective implementation and sustainability of allocation reform.

However, stakeholder engagement does not come without difficulties. Achieving consensus is unlikely. In some cases, engagement can reveal a strong preference for sticking with the status quo, despite recognising existing problems. Stakeholders can also side-track reforms, when preferred solutions distract from the original aims of the reforms. For instance, in the case of abstraction licensing reforms in England and

Wales, certain stakeholders took a view that "markets were the answer, now what is the question?" Box 5.1 illustrates how stakeholders can be engaged with, at several phases of the reform process, including the identification and selection of preferred options.

Box 5.1. **Delays in the implementation of water allocation reform in South Africa**

The Water Allocation Reform programme in South Africa recognised early on that getting the pace of reform right was key: move too slowly and you are likely to see radicalisation of policy as the political imperative for redress increases, move too fast and you may threaten the economic value of existing water use, lose the value of improved management and face legal challenges. However, an overly technical and precautionary approach was taken, and 16 years after the adoption of the National Water Act (1998), there are still significant challenges in the implementation.

Compulsory licensing, which had never been implemented anywhere in the world previously, posed particular issues. The concept of compulsory licensing was introduced in the act as a method for the reallocation of water, primarily from the white minority to the black majority that had been excluded from access to water under Apartheid. This clause enables the minister to call for all water users and potential water users within a specified area to apply for new water use licences, and for the minister then, through a consultative process, to reallocate the water.

A number of factors have made compulsory licensing difficult to implement. The first was that all existing water users were required to register their water use with the Department of Water Affairs (DWA), in order to enable the DWA to have a clear record of who was using how much water and where. However, once a process was introduced to check on the accuracy of this registration and the legality of the water use, it was found that an extremely high proportion of the registered water uses were inaccurate, often irrigation farmers over-registering their water use. This required an intensive process of validating the registration, which is still ongoing. In addition, the failure to put in a requirement that the DWA was informed of any transfer of irrigated land ownership meant that the registration records were out of date where land had been sold. Since compulsory licensing was predicated on having a fairly accurate record of existing water use, this delayed the process.

This rigorous reconciliation process is also intensely legal in nature, which may also underpin the hesitancy the DWA has shown in rolling out the process. Legal challenges could delay the process considerably and the DWA may wish to be very sure of its position before tackling large and difficult compulsory licensing processes.

The definition of the reserve for ecological and basic human needs also posed a challenge early on. The act requires that the ecological and basic human needs reserve be determined prior to the consideration of any license application. However, there were initially no procedures in place for the determination of the ecological reserve. The South African aquatic ecologist community set to work in developing such procedures, facing the challenge of making the transition from a scientific analysis approach to developing assessment tools that would serve the purpose of the act. The need to determine the ecological reserve for significant water resources in the country prior to the consideration of license applications significantly delayed the issuing of licences for a number of years. In addition, the translation of the reserve requirements into licence conditions was often difficult. For example, where the reserve determination required a fluctuating flow in the river over different months, where a farmer wanted to construct a simple dam with no mechanisms for releasing such fluctuating flows. In addition, the monitoring of the achievement of the ecological reserve has been weak, and so there is a break in the feedback loop between the issuing of licences and the achievement of the ecological reserve.

Sources: Schreiner, B. (2014), "Water resources allocation reform in South Africa: Case study", background paper for the OECD project on water resources allocation (unpublished), Pegasys Consulting; Quibell, G. (2014), "South Africa's water allocation reform process and its application to the Inkomati transboundary basin", background paper for the OECD project on water resources allocation, unpublished.

Box 5.2. **Stakeholder engagement for water allocation reform: Selected international experience**

In Alberta, Canada, the reform leading to the development of the new Water Act involved public participation at several stages. These included the review of the 1931 Water Resources Act and policies, study visits to neighbouring states undergoing reform, and engagement of technical and legal water specialists to provide expert advice.

Stakeholder engagement also influenced the reforms in New Mexico, United States at several stages. A series of stakeholder forums provided an opportunity to suggest reform options and debate preferences related to these options. The 2002 drought prompted an interim Water and Natural Resources Committee of the New Mexico legislature to collect stakeholder opinions on how to best reform the water allocation system. Through this process, it was identified that the preferred option (though not a consensus) was to give greater authority to the Office of the State Engineer in terms of administering water rights, in locations where court adjudications were still pending (Bossert, 2013). While this court process was ongoing, a couple of parallel initiatives were taken to investigate the best way to reform the prior appropriation system, which included public hearings. Six stakeholder forums were held in several key cities in which participants were asked to give their views on four suggested reform options. In the end, neither of the options was preferred to the status quo. The discussion did, however, help reveal the range of opinions, dilemmas and tensions that exist among the stakeholders (case study interviews; Romero-Wirth and Kelly, 2012). In addition, stakeholders have been engaged in developing voluntary shortage sharing agreements, which clarify how water is to be shared during times of drought. These agreements have been largely successful, although mediation has been required in some cases.

In South Africa, extensive stakeholder engagement was embedded in the reform process, providing multiple opportunities to contribute to and influence the process at several stages. The reform recognised that the successful execution of compulsory licensing, while maintaining the rule of law and the right of access to the courts, was predicated on effective stakeholder participation. Significant objections to the proposed allocation schedule or significant appeals to the court could delay the process, and increase its costs significantly, perhaps to the point that it would become moribund. Hence, extensive stakeholder participation was considered essential to the reform process, to mitigate judiciary risks.

Source: OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

Negotiate accompanying measures

To mitigate the negative impacts of the reform, negotiating accompanying measures and striking compromises among divergent interests are often used to facilitate progress. This can include finding a middle ground on contested issues, such as water pricing, or providing an interim period to allow users to adjust to new allocation measures (e.g. prices, changes in entitlements).

Accompanying measures can also include compensation in exchange for agreement about reductions to existing water entitlements. Compensation can take various forms, such as financial transfers, access to innovation or permission to build storage infrastructures, as was the case in France. In France, over the course of the reform process, farmers would frequently ask for public support to finance the construction and operation of local storage infrastructure to capture abundant winter flows and store water to be used in the dry summer months. Successive governments found a compromise, whereby farmers affected by a reduction of their water licence would be compensated by a licence to build local storage infrastructures. While the compromise was acceptable to farmers, environmental non-governmental organisations disputed the measure, claiming that such infrastructures negatively affect landscapes and undermine farmers' incentive to

improve water efficiency. As a result, this approach generated significant delays for the reform, as: 1) discussions were initiated with several hundred local stakeholders; and 2) economic and ecological consequences of the operation and management of local storages capacities had to be considered.

While compensation issues are of particular concern in some reforms, in others, a balance was struck between giving greater flexibility to the system and maintaining the security of supply of senior entitlement holders. Alberta, Canada, is a good illustration. There was recognition among water users that strictly following the priority allocation principle may not be in everyone's best interest in times of drought. An example from the 2001-02 drought illustrated this clearly. In one basin, water entitlements were to be cut off for junior users (with licenses newer than 1959). However, this meant that potato growers with senior water entitlements could not send their produce to the processing plant, since it was cut off from water. To address this issue, while retaining the priority allocation principle, the preferred option made it possible for the senior licensees to temporarily assign seniority to some junior licensees. Assignments are used mainly to improve the position of junior licensees, whose supply of water is threatened by the priority principle ("first in time, first in line") in times of drought (Adamowicz et al., 2010). At the same time, the security of the allocation of a given entitlement is maintained. Such agreements can be entered into in anticipation of a dry period.

Tailor allocation regimes to degrees of scarcity

Considering the challenges attached to water allocation reforms, a differentiated approach to allocation can be used to tailor reform options to different circumstances. Both the cases of South Africa and England and Wales provide good illustrations.

South Africa's allocation reform recognised different approaches should be taken depending on water scarcity and the potential economic impact of allocation reform in a particular area, as follows:

- In catchments where water availability was not likely to limit growth, the focus would be on actively seeking opportunities for viable black or women owned enterprises that could be allocated water entitlements, without compromising existing users, or relicensing users.
- In catchments where water is becoming limited, but which were not prioritised for compulsory licensing, the process would not actively seek new water users, but would encourage water trading among water users. If viable black or women owned enterprises made application for licences, these would be issued, in effect slightly lowering the assurance of supply to existing users. Should the volume of water required by new Broad-Based Black Economic Empowerment (BBBEE) users warrant it, the catchment would be prioritised for compulsory licensing.
- In catchments prioritised for compulsory licensing, the process to put into place compulsory licensing would be pursued.

For England and Wales, the reform components to better link abstraction to flows and facilitate trading would only be introduced in catchments where there were clear environmental and economic benefits due to water scarcity and the potential for trading – so-called "enhanced catchments", where much of the benefits of reform would be found. Catchments that do not show clear environmental or economic benefits for enhanced reform would undergo basic reform only – "basic catchments". However, as the climate changes and the demand for water increases, the number of basic catchments is likely to

decrease. The impact assessment of the reform took account of the way in which particular elements of reform were likely to be implemented. Both reform options were estimated to have set up costs of GBP 10-16 million, with water shares being more expensive because of its increased complexity.

Timing matters

Experience with the reform of allocation regimes in OECD countries shows that timing matters. First, it is preferable to anticipate future problems than to remedy misallocation *ex post*, as remediation can be politically difficult and costly. Second, sequencing matters. The case of the Murray-Darling illustrates how the failure to understand the role of return flows and to take them into account in the allocation regime generated future costs (the expensive buy-back programme to secure environmental flows).

Therefore, the timing of reform is an important condition for success. On the one hand, it is neither possible nor desirable to undertake all steps at once. Resource constraints, the need to learn as you go, and to build the case for reform all limit the process. On the other hand, it can be valuable to provide for some quick wins, to provide encouragement to those involved, demonstrate the benefits of reform and generally to help build momentum.

Therefore a balance needs to be found between a long-term vision of the future of water allocation regimes in Brazil, and the capacity to seize opportunities when they emerge. On the one hand, reformers will benefit from a strategic view of how reforms will be rolled out. On the other hand, there is value in adjusting "as you go along": reformers need to be opportunistic. For example, the upcoming revision of the São Francisco Water Resources Plan offers the chance to test a number of the changes proposed to the allocation regime.

A couple of lessons derive from international experience with planning and staging the reform of water allocation regimes:

- The need to build capacity to either undertake reforms and/or to support reforms once made has to be carefully assessed and provided for. This is a role for the ANA, in consultation with state institutions. The Pact can be a useful instrument to secure the resources, provide the incentives and build capacity.
- Pilot studies for testing and "ground trothing" new concepts and refining approaches are critical, prior to rolling out reforms on a broader scale. In particular, recommendations related to water allocation reform, such as modifying approaches to reference flows or collective entitlements need to be tested on the ground, in a variety of circumstances, before they are rolled out.

In terms of urgency of reforms, the key one is putting in place caps (i.e. defining binding reference flows) as soon as possible, to avoid the problems that arise from last-minute grabs for water in advance of the introduction of limits on where and how much water can be taken. In parallel, priority should be given to regions and basins where tensions over water allocation already exist, or where tensions are likely to emerge or become fiercer in the near future. This "hotspot" approach is best suited to focus attention where the stakes are high and real.

Table 5.1. **Action plan for strengthening water governance in Brazil**

OECD Recommendation 1: Raise the profile of water as a strategic priority with broader economic benefits for the national political agenda				
Objectives	Practical steps	Potential indicators	Relevant international experience	Leadership
– Obtain a deeper political recognition of the importance of water policies at the highest level – Create strategic synergies across sectors with impact on water use and availability at national level – Reinforce the interaction of water policies with agriculture, livestock, irrigation, environment, land use, energy and water security, and public health policies – Highlight the importance of water resources management in the strategies of adaptation to climate change – Enhance the political visibility of water policies and insure the continuity of those policies – Recognise the importance of the state level of participation in water resources management, and encourage, when needed, a reprofiling of state institutions relevant for water management	– Align the National Water Security Plan with the Federal Pluriannual Planning (PPA) and other sectoral plans strengthening the links among them – Link water resources policies to risk management and urban development – Link water resources policies to agriculture, livestock, irrigation, environment, land use and public health policies – Clarify goals and targets for energy, agriculture, irrigation and industry, and link sectoral goals to overall water demand (quality and quantity) – Prioritise the greatest challenges (which may vary from one basin to another) and their direct implications for water allocation and quality – Link water to the broader agenda through a range of options, including: political commitment at high level, joint action of ministries, multi-lateral platform for horizontal co-operation on water-related policies, regular meetings of relevant stakeholders – Environmental education and promotion of a culture of responsibility and exigency – Give support to a proactive capacity building of the state and Federal District institutions relevant for water management	– Number of high-level initiatives to promote dialogue across cross-cutting issues – Number of best practices adopted (e.g. strategic planning) and monitoring their evolution – Number of intersectoral links identified – Number of infrastructure projects implemented through integrated intersectoral planning – Impact studies on territorial challenges having an impact on water – Environmental education and capacity-building programmes and outcomes	**National Strategic Planning:** –Netherlands (Environmental Planning Act, expected to be adopted by 2018) – South Africa (National Water Resource Strategy, 2013) – Australia (National Water Initiative, 2004) – France (master plans of development and water management feature hydropower operations and conservation of aquatic environments) **Horizontal co-ordination:** – South Africa (Water Sector Leadership group) – Australia (intergovernmental council, COAG) –Netherlands (Delta Commission)	– Presidency of the Republic – Ministry of Environment – Ministry of Planning, Budget and Management – Secretary of Water Resources – National Water Council – National Water Agency (ANA) – Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) – Ministry of Cities – Ministry of National Integration – National Secretary of Irrigation – Embrapa, National Institute of Meteorology (INMET) and National Supply Company (CONAB)

Table 5.1. **Action plan for strengthening water governance in Brazil** (*cont.*)

OECD Recommendation 2: Strengthen the power, influence and effectiveness of the National Water Resources Council and state water resources councils in guiding strategic decisions at the highest level				
Objectives	Practical steps	Potential indicators	Relevant international experience	Leadership
– Make the National Water Resources Council and the state and Federal District water resources councils more influential and more effective in promoting the integration of water policies with sectoral policies – Define five to ten strategic issues that the council should focus primarily on – Improve co-ordination of water resources planning with national, regional, state and sectoral planning – Ensure a better and effective representation of all stakeholders – Make the National Water Resources Council and the state and Federal District water councils less dependent on political changes and more relevant to decision making	– "Political upgrade" of the council through the frequent participation of the Minister of Environment; its persuasion of other ministers to participate personally in the most important sessions, and some regular (yearly) participation of the President of the Republic – Focus on a few "deliberative" issues (i.e. giving opinion on national plan or key legislation) and ensure the council's effective implementation, discharging the remaining issues to the government – Build consensus with other sectors of society and channel opinions of civil society through consultations, *ad hoc* meetings, interviews and written contribution on specific issues – Reassess the representativeness of the National Water Resources Council, namely by reassessing the electoral system for the selection of its members – Larger representation of state councils and river basin committees, ensuring that the representatives of these collegiate structures reflect the agreements reached in those structures and not personal or sectoral views – Improve communication with state, basin and municipal levels, and take better into account the interactions with other sectors and scales of water management (space, time, jurisdiction, institutional) – Strengthen the capacities and training of stakeholders and other representatives	– Careful assessment of the short- and long-term benefits yielded by the engagement process of civil society in terms of acceptability and sustainability, social equity and cohesion, capacity development and economic efficiency, and the degree of impact on the stakeholders involved – Assess the level of participation of the members of the National Water Resources Council – Assess the National Water Resources Council's quality of decision (through deliberations) distinguishing core functions and administrative issues – Devise indicators on the impact of decisions taken by the National Water Resources Council – Number of actions foreseen in the National Water Resources Planning being effectively implemented – Define policy indicators predicted in the National Water Resources Planning focused on result-oriented implementation	– South Africa – Canada (Canadian Council of Ministers of the Environment – Water priorities) – EU triple level of consultation	– Ministry of Environment – Secretary of Water Resources – National Water Resources Council – State water resources councils – National Water Agency (ANA) – Key water-related ministries

Table 5.1. **Action plan for strengthening water governance in Brazil** (*cont.*)

OECD Recommendation 3: Strengthen the effectiveness of basin institutions for result-oriented implementation and stakeholder engagement				
Objectives	Practical steps	Potential indicators	Relevant OECD experience	Leadership
– Enhance transparency and accountability through greater account (and balance) of the consultative and executive roles of basin institutions and deliberative and executive powers of public authorities – Enhance the capacity for preparing feasible plans and implementing decisions	– Reprofile the roles of basin institutions by clarifying executive powers and make them effective on the ground – According to the specific circumstances executive powers could be: 1) a basin agency linked to the state water agency 2) the state water agency itself 3) delegation of some powers to pre-existing entities in the basin like water users' associations – Create committees with a strong consultative role – Combine ample stakeholder engagement with a clear enforcement role of public authorities – Create and reinforce strict, accountable and monitored obligations of the state (and federal) agencies to consult with the "advisory" councils and the committees, and give thorough explanations when they do not follow their advice – Strengthen the role and improve the performance of the federal and state agencies as the authorities in charge of implementing and enforcing decisions, namely through mechanisms for monitoring that performance and improving its accountability – Ensure river basin plans have clear timelines and accountability for implementation of the recommendations – Ensure representativeness of collegial platform for legitimacy and buy-in – The procedures for selecting the members of the collegiate structures should be analysed carefully and obtain the agreement of all sectors – Establish criteria for guaranteeing an effective representation of all sectors in such forums – Code of conduct that obliges members to discuss all matters with the sector that they represent, obtaining their points of view and conveying them to the council or committee at stake	– Clear understanding of the engagement process framework in terms of line authority, level of engagement defined, proposed timeline, targeted objectives, expected outcomes, use of inputs and code of conduct – Informed and transparent identification and selection of stakeholders to be involved in the engagement process, based on a clear understanding of their roles, responsibilities, motivation and interrelations – Identification of unheard voices to ensure the representativeness of all categories that need to be consulted, informed and/or involved – Identification of new players and/or stakeholders to be considered – Share of sectoral stakeholders – Public awareness campaigns on water resources management and development – Capacity-building programmes for the main actors involved in the river basin committees – Assess the National Water Resources Council's quality of decision (through deliberations) distinguishing core functions and administrative issues –Define policy indicators (e.g. actions predicted in the water resources plans) focused on result-oriented implementation – Number of actions foreseen in the water resources plan being effectively implemented	– European Union: the Common Implementation Strategy (which is formulated and approved at three levels working in close co-ordination) –Spain: river basin councils are consultative bodies. All executive powers stay in the hands of the "*confederaciones hidrográficas*" that belong to the Ministry of Environment, when more than one region is involved, or to the autonomous government otherwise – In Portugal the 2005 Water Law considers the possibility of delegating to municipalities or users' associations some executive powers held by public administration based on specific agreements and keeping reserve powers – In the Netherlands, to add democratic legitimacy, there are general elections for water boards, and there are even some political parties specialising in this level of public authority – In Ontario, Canada source water protection committees represent a range of stakeholders (municipal, agricultural, aboriginal, etc.) and are responsible for developing plans to protect drinking water: quality and quantity	– Secretary of Water Resources – River basin committees – State water agencies – Basin agencies – National Water Agency (ANA) – State water resources councils – National Water Resources Council

Table 5.1. **Action plan for strengthening water governance in Brazil** (*cont.*)

OECD Recommendation 4: Enhance cross-sector co-ordination for greater policy coherence and consistency				
Objectives	Practical steps	Potential indicators	Relevant OECD experience	Leadership

– Guarantee that water is taken into consideration in all sectoral plans and ensure the most possible consistency among those plans
– Bring the discussion of those sectoral plans into the national and state water resources councils and engage the water sector in the consultation of related sectoral plans
	– Integration of water policies with development policies and plans as well as with environment policies and plans
	– Integration of water and land-use management:
	  – Strengthen the presence of municipalities in the state water resources councils and river basin committees
	  – Incorporate water concerns into regional and municipal land-use plans
	– *Ad hoc* protection measures and pedagogic action with the municipalities
	– Revise territorial planning legislation to incorporate water requisites
	– Further horizontal integration with sub-sectors and across water-related ministries (e.g. binding assessment of consequences on water before significant decisions are taken in related areas, such as spatial planning)
	– Promote multi-stakeholder workshops and discussion fora to address specific issues that are relevant for several sectors and build consensus across those sectors
	– Investigate hotspots in states and promote a permanent dialogue between the ANA and states to factor in emerging issues (e.g. climate change, water allocation)
	– Communication on the implementation programmes and related results to raise awareness
	– Assess implementation and adjust priorities and approaches as needed (adaptive management)
	– Create governance arrangements by theme (such as irrigation and sanitation)
		– Frequency of water impact assessment in the context of other (water-related) policies
		– Number of programmes to evaluate environmental impacts of water projects
		– Number of multi-stakeholders workshops and fora
		– Co-ordination mechanisms for cross-sector co-ordination:
		  – Planning
		  – Contracts
		  – Financial incentives
		  – Co-ordination group/meetings
		  – Legal requirements for co-ordination
		  – Conditionalities
		  – Joint programmes
		  – Partnerships (e.g. *ad hoc* authority, platforms for dialogue…)
		– Cross-sector plans and strategies:
		  – Climate change adaptation policy/strategy/plan with water resources management component
		  – Urban development plans with water resources plans
		  – Agricultural plan with water resources management component
		  – Energy policy/strategy/plan with water resources management component/ water security
		  – Flood policy/strategy/plan with water resources management component
		  – Wetland policy/strategy/plan with water
		  – Biodiversity policy/strategy/plan with water resources management component
			– In the Netherlands, since 2003 the Water Assessment has become obligatory for the formal spatial plans, such as municipal land-use plans and provincial spatial policy plans
			– The Department of Water's Water and Land Use Coordination Program in Australia focuses on the implementation of integrated land and water planning. It developed guidelines and decision support tools to assist land developers and decision makers in the implementation of better urban water management
			– In New Zealand, the Land and Water Forum represents a wider grouping of stakeholders, including agricultural, industrial, urban and environmental organisations with interests in water management. The aim is to conduct a collaborative governance process led by stakeholders, to recommend reform of New Zealand's fresh water management
			– In Canada, federal-provincial agreements provide co-ordination in key water sheds. For instance, the Canada-Ontario Agreement on Great Lakes Water Quality outlines objectives, results and specific commitments for implementation by seven federal and three provincial agencies. The governance structure engages stakeholders, First Nations and Métis communities. Regular public reporting on progress is required
				– National Water Agency (ANA)
				– Ministry of Cities
				– Ministry of Environment
				– Secretary of Water Resources
				– Ministry of Planning, Budget and Management
				– Ministry of Agriculture, Livestock and Food Supply
				– Ministry of Mining and Energy
				– National Water Resources Council
				– Ministry of National Integration
				– Embrapa, National Institute of Meteorology (INMET) and National Supply Company (CONAB)
				– State water agencies
				– State water resources councils
				– River basin committees

Table 5.1. **Action plan for strengthening water governance in Brazil** (*cont.*)

OECD Recommendation 5: Strengthen the capacity and financial sustainability of state-level institutions				
Objectives	Practical steps	Potential indicators	Relevant OECD experience	Leadership
– Greater empowerment and qualification of state water agencies to generate a cascade effect strengthening river basin institutions as well – Ensure that existing and future water institutions are provided with adequate means of operation – Ensure the best science and water data is being brought into decision-making processes	– Improve the technical capacity of state agencies to collect and use data – Ensure that state agencies are provided with staff commensurate with the tasks and responsibilities allocated to them – Incentivise institutional strategic analysis, based on key water problems to be faced, to promote reforms and improvements at the state level – Recruitment at all levels should be on a professional capacity basis – Get sustainable funding through: – more extensive payment of water charges – reliable and updated information to guide decision making in water charges – affordability studies and economic analyses to be carried out to asses users' capacity to pay – greater engagement of users through economic instruments (interest-pay-say principle) – use of royalties paid by the energy (hydropower) sector to finance state water systems	– Train staff on data collection and financial resources management and spending – Improve access to emerging science to inform decisions (e.g. climate change science and data, water quantity and quality data, etc.) – Water policy and management information: – Operational: related to the management of the resource: hydro-geological, records of availability, needs and consumption, cost recovery data, maintenance data, water quality data, etc. – Administrative: related to the management of the institution (e.g. including records relating to personnel, equipment, stores and finance) – Share of revenues collected – Diversity of sources – Investment plans, projections on expected outputs and affordability studies	– The EU Common Implementation Strategy – many EU countries such as France and the Netherlands where important principles guide the financing of water resources management, such as the "user pays" and "polluter pays" principles, and "interest-pay-say". – In Canada a wide range of tools is used to fund water infrastructure and management (e.g. user fees for municipal water services, infrastructure grants, water charges, water royalties)	– National Water Agency (ANA) – State water agencies – National Water Resources Council – State water resources councils – River basin committees – Ministry of Planning, Budget and Management

Table 5.1. **Action plan for strengthening water governance in Brazil** (*cont.*)

OECD Recommendation 6: Foster continuity and impartiality of public policy for long-term vision				
Objectives	Practical steps	Potential indicators	Relevant OECD experience	Leadership
– Promote a truly democratic model of water governance through participative structures to help improve the performance of public powers and fine-tune the purposes of its action – Counter to the extent possible unjustified changes associated to the political cycles, that cause disruption in water reform processes, without limiting, however, the legitimacy of executive and legislative democratic powers	– A professionally based recruitment of water professionals and mandates based on medium- and long-term consensual strategies to stabilising the activity of state and Federal District agencies – Build broad consensus around plans and other policy documents and instruments (the ANA can be a co-ordinating vehicle across ministries and levels of government to incentivise multi-annual perspectives) and establish agreed targets and deadlines	– Professional and impartial recruitment practices in the water sector – Assessment of capacity needs in water resources management at state level – Programmes for capacity development in water resources management institutions/organisations at state level – Assess stakeholder support for plans and policy documents and instruments	– In the European Union, the Water Framework Directive gives high importance to the participation of the stakeholders and society	– National Water Agency (ANA) – Ministry of Environment – Secretary of Water Resources – State water agencies – State and national water councils
OECD Recommendation 7: Foster experience-sharing at all levels to draw lessons from success stories and common challenges				
– Increase national awareness and reveal "natural" leaders and opinion makers in each state – Make water a public concern to increase public awareness	– Meetings of state councils and river basin committees at the national level – Discuss recurrent crises in the national and state water councils and give special attention to motivated members of these bodies – Enhance communication at different government levels through national and regional meetings focused on specific topics – Organise peer reviews at state and/or river basin level between river basins/states with similar water management issues	– Use of benchmarks for the assessment of outcomes from different states in the water resources system – Successful use of the inputs from the sharing process to achieve the desired outcomes – Monitoring of activities and updates – Dissemination of key messages after the meetings – Outcomes available to the public (e.g. reports)	– EU countries	– National Water Agency (ANA) – Ministry of Environment – Secretary of Water Resources – State water agencies – National and water resources councils

Table 5.1. **Action plan for strengthening water governance in Brazil** (*cont.*)

OECD Recommendation 8: Promote greater interactions with municipalities				
Objectives	Practical steps	Potential indicators	Relevant OECD experience	Leadership
– Foster interactions between levels of government and stakeholders – Give special attention to water services (supply and sewage) and to land-use management in which municipalities are key players according to the Constitution – Foster local integration of water policies with those of environment, sanitation and solid waste	– Economic analyses on the cost of inaction (including costs to the environment) of municipalities to raise their interest – Political commitment of mayors, with special emphasis on water services and land-use management in which municipalities have a key role – Fora on environment gathering state and city hall officials to foster technical dialogue – Contracts between the states and the municipalities for the implementation of goals set up at state level with consequences at lower levels	– Practical support and guidance by the ANA to create new institutions in the states – Initiatives undertaken between state water resources councils and agencies on water resource management – Multipartite contracts between state and municipalities – Number of actions foreseen by the Water Resources Plan and implemented by municipalities – Number of technical or financial support given by SINGREH entities by municipalities	– 2009 Istanbul Water Consensus (commitment of municipalities)	– Ministry of Cities – Mayors – Service providers – River basin committees – State water resources councils – National Water Council – State councils – National Water Agency (ANA) – State agencies

Note: The term “states” refer to all state federative units and the Federal District.

Table 5.2. **Action plan to make the Pact happen**

OECD Recommendation 1: Secure human and financial capacity for the Pact's outcomes to translate into public action				
Objectives	Practical steps	Potential indicators	Relevant OECD experience	Leadership
– Engage governors as much as possible in the implementation of the Pact and raise the profile of water issues on their political agendas – Implement goals concretely and effectively – Guarantee the sustainability of results after the five-year programme – Consider the Pact as an instrument for "institution building" through learning by doing	– Set up clear requisites for recruitment based on professional capacities (standardised and transparent procedures for hiring water professionals) – Public tenders hiring – Set up proper incentives (e.g. career plans, competitive salaries) for well-trained staff – Put in place customised capacity-building programmes – Define money-match mechanism – Improve capacities and enhance professional training, namely through career progression based on objective performance assessment	– Number and typology of water professional profiles secured – Number of water professionals at state, basin and local level – Administrative and staff category dissociated from political leadership – Assessment of capacity needs in water resources management at state level – Number of programmes for capacity development in water institutions/organisations – Number of programmes for in-service training of staff/professionals in water resources management – Number of research programmes in water resources management – Financial resources available for staff (salaries,benefits, pensions, etc.) – Education/training organisations or courses	– Netherlands, Administrative Agreement on Water Affairs signed in 2011 (efficiency gains through horizontal co-ordination) – EU, Water Framework Directive	– National Water Agency (ANA) – Presidency of the Republic – Ministry of Planning, Budgeting and Management (MPOG) – State governors – State water agencies – State councils – National Water Resources Council – River basin committees – Academia – Non-governmental organisations

Table 5.2. **Action plan to make the Pact happen** (*cont.*)

OECD Recommendation 2: Strengthen the monitoring framework and assess impact for greater accountability				
Objectives	Practical steps	Potential indicators	Relevant OECD experience	Leadership
– Adjust the policy – Improve decision making – Overcome asymmetry of information – Put pressure on state officials in implementing the goals	– Scale up success stories of basins or areas by state water resources councils – Information sharing with river basin committees – Set up a system of homogenous, comparable and replicable indicators – Impact assessment framework to learn from results and design a longer term strategy	– Input measures: resources (e.g. budget, capacity and time) used in what amounts to produce and deliver agreed targets – Process measures: the way in which activities are undertaken by a programme or project with the resources described – Output measures: capture the services activities produced (e.g. wastewater treated, service delivery) – Outcome measures: capture the dimension that is expected to change as a result of an intervention (policy, programme or project) and the outputs produced (e.g. quality improvements, improved groundwater recharge) – Impact indicators are used to track the performance of policies and programmes (i.e. water security)	– Italy: Accordi di Programma Quadro, APQ (indicate for each intervention the needed tasks and actors responsible for their implementation) – Australian National Water Initiative (28 indicators for the assessment) –EU Water Framework Directive (screening assessment, in-depth assessment, performance indicators)	– National Water Resources Council – National Water Agency (ANA) – Ministry of Environment – Secretary of Water Resources – State water agencies – State councils
OECD Recommendation 3: Foster transparency and regular information sharing for greater accountability and trust				
– Allow for more transparency and inclusiveness – Obtain greater buy-in and increase the willingness to pay from water users – Enhance the integration of horizontal, vertical and sectoral information systems that are relevant for water resources management	– Foster information sharing and stakeholder engagement throughout the implementation – A dedicated website, accessible to all – Set incentives for newcomers (public consultations) – Regular and voluntary updates and information sharing from national, state water agencies on how funds allocated are spent – Creation of technical chambers – Share information with stakeholders – Enforce the implementation of the Pact by putting pressure on reputational effect	– Reports freely accessible on state water resources management and development – Website dedicated to the state water resources management system – Number of programmes for information exchange and knowledge sharing of good practices – Existence of water information systems – Dissemination campaign	– Water Information System for Europe (WISE) (tool to provide up-to-date information to the EU institutions, feedback to member countries and transparency of the implementation process to the European citizens)	– National Water Resources Council – National Water Agency (ANA) – Ministry of Environment – Secretary of Water Resources – State water agencies – State councils

Table 5.2. **Action plan to make the Pact happen** (*cont.*)

OECD Recommendation 4: Support result-oriented and stakeholder engagement for stronger basin-level accountability				
Objectives	Practical steps	Potential indicators	Relevant international experience	Leadership
– Enhance the effective contribution of river basins to the implementation of the Pact – Build consensus on priority areas and ways forward towards improvement	– Workshops for dialogue across different stakeholders (not on procedural assessment or technical monitoring) – Clear understanding of the engagement process's framework in terms of targeted objectives, expected outcomes, use of inputs – Stakeholders map and involvement of "unheard voices" or "missing stakeholders" – Setting clear rules of the game across stakeholders to balance interests and avoid consultation capture by big users with vested interests in critical areas	– Involvement of general public, civil society, organisations and non-governmental organisations – Stakeholder priorities reflected in the implementation of activities foreseen by the Pact – Formal stakeholder structures established with clear roles and responsibilities in water resources management – On-going engagement (opportunity after formal public participation process to provide input, comment, raise concerns and awareness raising) – Meetings, conferences, seminars to raise awareness – Number of non-governmental organisations participating in supporting water-related priorities – Legal mechanisms for stakeholder participation	– River basin agencies/ confederations in France and Spain – Portugal creation and implementation of water users' associations (created by the 2005 Water Law with the possibility of delegation to them by the water authorities) – River Basin Commission of the Tecocomulco Lagoon (Mexico) (participatory watershed management on issues of land and water conservation and water conflict resolution) – England Catchment Base Approach (engagement and partnerships between public, private and non-profit sector for effective catchment governance) – South Africa Inkomati Catchment Management Agency (sub-catchment management fora and river operations committees gathering business, farmers, mining companies, municipalities, civil society to develop catchment management strategy)	– National Water Resources Council – State water resources councils – River basin committees – National Water Agency (ANA) – Ministry of Environment – Secretary of Water Resources – State water agencies

Table 5.2. **Action plan to make the Pact happen** (*cont.*)

OECD Recommendation 5: Create opportunities for experience-sharing across states and basins to foster bench-learning				
Objectives	Practical steps	Potential indicators	Relevant OECD experience	Leadership
– Learn from success stories and draw lessons from failure or slow progress	– Fora for group discussions (clustered around the management typologies and target framework) – Public information on meetings – Platform of dialogue at lower levels of government (e.g. between state, basin and municipal levels and between states in shared basins)	– Number of meetings across states of a same typology – Dissemination of key messages/ reports after each meeting – Monitoring of activities and updates on the Pact's achievements – Satisfactory/perception survey across levels of government to improve the dialogue	–EU Water Framework Directive – France "river contracts"/National Water Council – Portugal "contract programmes" between water authorities and municipalities – Canadian Council of Ministers of the Environment (CCME) Water Management Committee	– River basin committees – National Water Resources Council – National Water Agency (ANA) – Ministry of Environment – Secretary of Water Resources – State water agencies – State councils
OECD Recommendation 6: Set mechanisms to foster continuity and reap the full benefits of achievements, after the five years				
– Achieve established goals and commitments beyond the term of office of the governor that signed it	– A technical chamber established by the ANA with the engagement of the states overseeing the Pact implementation – Multi-annual budgeting and investment plans – Inclusive and bottom-up consultations on the way forward based on lessons learnt from implementation	– Broad political and stakeholder support for measures – Number of meetings of the technical chamber – Evaluation of Progestão resource allocation by the technical chamber – Room for revising and updating targets and goals to changing circumstances – Links between multi-annual strategic plans to annual budgets – Diversity of sources of finance in investment plans – Long-term investments – Maintenance of staff – Yearly monitoring and reporting	– Australian National Water Initiative (monitoring and assessment of results)	– National Water Resources Council – National Water Agency (ANA) – State water resources council – River basin committees – State agencies

Table 5.3. **Action plan for strengthening water allocation regimes**

OECD Recommendation 1: Define the resource pool so as to maximise benefits and contribute to water use efficiency				
Objectives	Practical steps	Potential indicators	Relevant international experience	Leadership
Take a consistent approach to set reference flows in hydrologically connected river systems, especially in the critical river basins	– Establish agreements among state agencies and the ANA that ensure the use of consistent reference flows in shared river basins – Revisit reference flows when revising or updating basins plans for federal rivers – Set incentives for alignment of reference flows, for instance in the Nationa Pact for Water Management , or by granting more autonomy to complying states	– Formal agreement, regulation or plan establishing consistent reference flows within each federal river	– Australia	National Water Agency (ANA), with state agencies
Encourage less conservative and more sophisticated reference flows in contested basins	– Adopt less conservative reference flows in federal rivers – Make the case for reform in state rivers, through economic analysis, proposal of a range of options, training of state agencies and assessment of impacts on water users and ecosystems, in selected basins – Adjust levels of reliability to characteristics of each water user	– Diffusion of reference flows that reflect the risk profiles of water users, at state level	– South Africa – Australia	National Water Agency (ANA), with state agencies
Consider flows required to sustain ecosystem services, as defined by the environmental agency in charge[1]	– Identify hotspots for ecosystems and assess water flows required to retain the services they supply – Make the economic case for sustained ecosystem services	– Priority ecosystem services identified in key basins – Environmental flows that reflect the needs of ecosystems, in selected basins	– China (Yellow River) – Australia (Murray-Darling River) – South Africa	National Water Agency (ANA); progressive state agencies

Table 5.3. **Action plan for strengthening water allocation regimes** (*cont.*)

OECD Recommendation 2: Redesign selected policy instruments				
Objectives	Practical steps	Potential indicators	Relevant international experience	Leadership
Set water resource plans that guide water allocation decisions	– Revise national guidelines on the role and the content of river basin plans (e.g. make sure water plans are set and comply with national priorities for water allocation, definition of reference flows, targets for water use efficiency, management of inter-state rivers) – Develop plans more focused on concrete guidelines and actions required to improve water allocation – Ensure greater involvement of state agencies in the development of the plans – Make sure the guidelines proposed in the plans are actually incorporated in the internal procedures of the ANA and other agencies – Define explicit priorities for water allocation in times of water scarcity within water resources plans – When defining guidelines for water allocation at the river basin level, consider greater national interests (when relevant) and key inter-state issues, especially in critical river basins – Require regular review to adjust for climate change and other external factors – Make the case for multipurpose use of reservoirs – Set a mechanism to (temporarily) substitute for river basin councils when they are unable to set proper guidelines for water allocation – Ensure the guidelines defined in the plans are incorporated in the budget and regulatory actions of each agency – Adopt a "problemshed" approach in the development of the plans	– Hierarchy of priorities for water allocation – National priorities are considered when setting water allocation in critical river basins – River basin plans define guidelines for water allocation – Regulations established by state agencies and the ANA based on guidelines defined by plans – Development of arrangements for the multipurpose use of reservoirs – Actions provided in water resources plans included in the budget of each institution (e.g. the ANA and state agencies) – Normative resolutions defining water allocation that incorporate the guidelines defined in the plans – Technical document proposing the scope of the plans at different levels with the criteria and guidelines for allocation	– France (multipurpose use of reservoirs) – China (National Water Plan) – South Africa (National Water Strategy) – Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement (US Great Lakes states and Canadian provinces – Ontario and Quebec)	National Water Agency (ANA), state agencies and sectorial agencies (with regards to incorporating plan guidelines into budget and sectorial actions)

Table 5.3. **Action plan for strengthening water allocation regimes** (*cont.*)

OECD Recommendation 2: Redesign selected policy instruments (*cont.*)				
Objectives	Practical steps	Potential indicators	Relevant international experience	Leadership
Establish explicit and transparent protocols for permit renewal	– Establish protocols for permit renewal in federal and state rivers – Consult with the National Water Resources Council to define protocols for permit renewal in order to induce adjustment in state procedures – Issue protocols	Increase in water use efficiency as a result of the requirements for water permit renewal	– Portugal (a new regime for granting water permits with three levels of complexity: concessions, permits and declarations) – Mexico[1] – Ontario	National Water Agency (ANA), with National Water Resources Council
Specify the level of reliability attached to each permit	Explain the rationale for reform to state agencies	Number of revision of water permits in times of scarcity (decrease in)	– Australia – South Africa	– National Water Agency (ANA) – State agencies
Establish water efficiency standards, by use and region	– Review national good practice – Consult with water users' associations – Set incentives for state agencies to set efficiency standards	– Water efficiency standards in water permits – Number of revision of water permits in times of scarcity (decrease in)	Great Lakes regional water conservation objectives (Canada and the United States)	– National Water Agency (ANA), state agencies – River basin councils, with support from the ANA and state agencies
Consider collective entitlements in basins with high levels of variability, especially for agricultural uses	– Set indications for spatial coverage and number of users in a typical collective entitlement – Identify institutional and monitoring requirements to support collective entitlements – Set incentives for the creation of water users' associations which may be granted collective entitlements – Undertake pilot studies	Number of collective entitlements	– Portugal, a specific legal regime for multipurpose water systems – France (single collective management bodies, OUGC)	– National Water Agency (ANA) – State agencies, with support from the ANA
Consider a range of economic instruments and develop mechanisms for water reallocation	– Make the economic case for water prices – Train state agencies – Propose a range of accompanying measures – Set incentives through federal support to water infrastructure – Set incentives to overcome the lack of willingness to charge	– Level of water charges for different users in different basins – Number of revisions of water permits in times of scarcity (decrease in)	– China (People's Republic of) – United States – Australia	National Water Agency (ANA), with state agencies
Develop mechanisms for water reallocation	– Review a range of options – Train state agencies – Propose/establish a range of accompanying measures to allow for reallocation	Number of revisions of water permits in times of scarcity (decrease in)	– China (People's Republic of) – United States – Australia	National Water Agency (ANA), with state agencies

Table 5.3. **Action plan for strengthening water allocation regimes** (*cont.*)

OECD Recommendation 3: Govern water allocation				
Objectives	Practical steps	Potential indicators	Relevant international experience	Leadership
Tailor monitoring to pressure on the resource	– Identify and assess a range of options for monitoring water abstractions and use (costs, benefits, requisites) – Develop national or regional inventory of monitoring "hotspots" – Train state agencies	Number of states which embark in targeted monitoring		– National Water Agency (ANA) – State agencies
Ensure compliance with arrangements for the management of transboundary rivers	– Set clear obligations for minimal flows for federal rivers – Monitor compliance, in contested basins	– Measurable and enforceable transboundary flow requirements defined – Compliance with transboundary arrangements	– Portuguese-Spanish conventions on Iberian transboundary rivers – China (People's Republic of) – Australia – United States	National Water Agency (ANA)
Address issues related to the double dominion	– Propose a range of options, and assess them (costs, benefits, requisites) – Consult with state agencies for a delegation mechanism, which reflects state capacities – Consider referral to the ANA of some state responsibilities, when requested or agreed with states – Establish inter-basin commissions to take responsibility for shared river basins	Clear definition of responsibilities for shared river basins among the ANA and state agencies	– European Union – Canada – Australia	National Water Agency (ANA), with state agencies
Communicate and engage with stakeholders to raise awareness and transparency	– Develop regional campaigns where required (critical basins and specific themes) – Engage with targeted stakeholders (institutions at state level, water users' associations, large water users)			National Water Agency (ANA), water councils (at national, basin, state levels)

Note: 1. Mexico is a good example for the normalisation of permitting.

Notes

1. For example, according to Riestra (2008) among the 15 000 m^3/s granted non-consumptive uses, right only 2 800 m^3/s was actually being exercised.

2. For example, the non-use tariff for the shortest time period (0-5 years) is determined by a pre-set rule. This charge doubles if the right is not used during 6-10 years and quadrupled from 10 years onward (Madden, 2010).

1. This information is required to define the resource pool. It does not follow that ecosystems have precedence over other uses. Indeed, in times of crisis, human consumption is the number one priority, as per Article 1 of the 9.433 Water Law.

Bibliography

Adamowicz, W.L., D. Percy and M. Weber (2010), *Alberta's Water Resource Allocation and Management System: A Review of the Current Water Resource Allocation System in Alberta*, University of Alberta/Alberta Innovates, Edmonton, Alberta.

Bitran, E. and R. Saez (1994), "Privatization and regulation in Chile", in: Bosworth, B.P. , R. Dornbusch and R. Laban (eds.), *The Chilean Economy: Policy Lessons and Challenges*, The Brookings Institution, Washington, DC.

Bossert, P. (2013), "Active water resource management", in: *Water Matters! – Background on Selected, Water Issues for Members of the 51st New Mexico State Legislature 1st Session* (Chapter 9), New Mexico University School of Law, Albuquerque, New Mexico, http://uttoncenter.unm.edu/publications.php (last accessed 5 May 2014).

Donoso Harris, G. (2011), "The Chilean water allocation mechanism, established in its Water Code of 1981", WP6 IBE Ex-post Case Studies, European Commission, December, available at: www.feem-project.net/epiwater/docs/d32-d6-1/CS30_Chile.pdf.

Donoso Harris, G. (2003), "Water markets: Case study of Chile's 1981 Water Code", Global Water Partnership South America, Santiago, July, available at: www.eclac.cl/drni/proyectos/samtac/inch01603.pdf.

Madden, E. (2010), "Chilean water policy: Transaction costs and the importance of geography", Carnegie Mellon University, thesis, Dietrich College Honors Theses, available at: http://repository.cmu.edu/hsshonors/65 (last accessed November 2013).

OECD (2015), *Water Resources Allocation: Sharing Risks and Opportunities*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264229631-en.

OECD (2013), *Making Water Reform Happen in Mexico*, OECD Studies on Water, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264187894-en.

Pena, H. (2010), "Copiapo: Realidades, desafio y lecciones. Presentación para 'existe sobreexploatacion del agua en Chile?'", Seminario nacional AHLSUD Capitulo Chileno A.G.

Pena, H. et al. (2004), "Water, development, and public policies: Strategies for the inclusion of water in sustainable development", South American Technical Advisory Committee, Global Water Partnership, Santiago, Chile.

Quibell, G. (2014), "South Africa's water allocation reform process and its application to the Inkomati transboundary basin", background paper for the OECD project on water resources allocation, unpublished.

Riestra, F. (2008), "Pago de patente por no uso de derechos de aprovechamiento", Direccion General de Aguas (DGA), Santiago, Chile.

Romero-Wirth, C. and S. Kelly (2012), *Water Rights Management In New Mexico and Along the Middle Rio Grande: Is AWRM Sufficient?*, Utton Transboundary Resources Center, Univeristy of New Mexico School of Law, Albequerque, New Mexico, http://uttoncenter.unm.edu/publications.php (last accessed 5 May 2014).

Schreiner, B. (2014), "Water resources allocation reform in South Africa: Case study", background paper for the OECD project on water resources allocation, unpublished, Pegasys Consulting.

Annex A.
List of stakeholders consulted during the policy dialogue

Institution	Name
ABAR – Associação Brasileira de Agências de Reguladoras (Brazilian Association of Regulatory Agencies)	Vinicius Benevides
ABDI – Agência Brasileira de Desenvolvimento Industrial (Brazilian Agency for Industrial Development)	Cássio Marx Rabello da Costa
ABDIB – Associação Brasileira da Infraestrutura e Indústrias de Base (Brazilian Association of Infrastructure Industries)	Giancarlo Gerli
ABES – Associação Brasileira de Engenharia Sanitária e Ambiental (Brazilian Association of Water, Sanitation and Environmental Engineering)	José Reinolds Cardoso Melo Sidnei Agra
ABRH – Associação Brasileira de Recursos Hídricos (Brazilian Water Resource Association)	Jussara Cabral Cruz Vladimir Caramori Borges de Souza
ADASA – Agência Reguladora de Águas e Saneamento do Distrito Federal (Regulatory Agency for Water and Sanitation of the Federal District)	Diógenes Mortari
AESA – Agência Executiva de Águas do Estado da Paraíba (Paraíba Water Management Executive Agency)	Pedro Crisóstomos Freire Rodrigo Rodrigues Felinto Gerald de Souza e Silva Ana Emília Duarte Paiva Maria Itaci C. Leal Lovânia Maria Werlang João Vicente Machado Sobrinho Porfírio Catão Cartaxo Loureiro João Fernandes da Silva
AESBE – Associação Brasileira das Empresas Estaduais de Saneamento (Brazilian Association of State WSS Public Operators)	Luiz Carlos Aversa José Carlos Barbosa
AGB PEIXE VIVO – Associação Executiva de Apoio à Gestão de Bacias Hidrográficas Peixe Vivo (Executive Association to Suport River Basin Management)	Célia Maria Brandão Fróes
Agência PCJ – Agência das Bacias dos Rios Piracicaba, Capivari e Jundiaí (Agency of Piracicaba, Capivari and Jundiaí River Basin)	Luiz Antonio Brasi Sergio Razera Eduardo Cuoco Leo
AGEVAP – Agência Pró-gestão das Águas da Bacia Hidrográfica do rio Paraíba do Sul (Agency of Paraíba do Sul River Basin)	André Luis de Paula Marques
AIBA – Associação de Agricultores e Irrigantes da Bahia (Association of Farmers and Irrigators of Bahia)	José Cisino Menezes Lopes
Amigos das Águas (Friends of Water)	Ivan Bispo André Brunckhuvsd
ANTAQ Agência Nacional de Transportes Aquaviários (National Agency for Waterway Transportation)	Rogério Menescal
ASSEMAE – Associação Nacional dos Serviços Municipais de Saneamento (Brazilian Association of Municipal WSS Public Operators)	Aparecido Hojaij Francisco Lopes Francisco dos Santos Lopes
AUA – Associação dos Usuários das Águas da Região de Monte Carmelo (Users Association of Monte Carmelo Region)	Fernando Costa Faria
BNDES – Banco Nacional do Desenvolvimento Econômico e Social (Brazilian Development Bank)	Luciano Coutinho

CAGEPA – Companhia de Água e Esgotos da Paraíba (Water Company of Paraíba)	Everaldo Pinheiro do Egito
CNA- Confederação da Agricultura e Pecuária do Brasil (Brazilian Confederation of Agriculture and Livestock)	Moisés Pinto Gomes
Comitê de Bacia Hidrográfica – BG (River Basin Committee –BG)	Yasmin Gonçalves Ferreira
Comitê de Bacia Hidrográfica – Dois Rios (River Basin Commitee – Dois Rios)	Margareth Naciff
Comitê de Bacia Hidrográfica – Lagos São João (River Basin Commitee – Lagos São João)	Dalva Mansur
Comitê de Bacia Hidrográfica – Paranaíba (River Basin Committee– Paranaíba)	Nara Nubia Santos
Comitê de Bacia Hidrográfica – Paranaíba (River Basin Committee– Paranaíba)	Simone José das Neves Assis
Comitê de Bacia Hidrográfica – Paraopeba (River Basin Committee – Paraopeba)	Breno Carone
Comitê de Bacia Hidrográfica – Piabanha (River Basin Committee– Piabanha)	Paulo Sergio Souza Leite
Comitê de Bacia Hidrográfica da Baía da Ilha Grande (River Basin Comittee of Ilha Grande Bay)	Pedro França
Comitê de Bacia Hidrográfica da Baía da Guanabara (River Basin Comittee of Guanabara Bay)	Cristiano de Brito Lafetá Marcos Lacerda Jaime Teixeira Azulay
Comitê de Bacia Hidrográfica do Baixo Paraíba do Sul (River Basin Comittee of Baixo Paraíba do Sul)	Sidiney Sampaio
Comitê de Bacia Hidrográfica do Guandu (River Basin Comittee of Guandu)	Júlio Antunes
Comitê de Bacia Hidrográfica do Jamari (River Basin Comittee of Jamari)	Edicarlos Fernandes Gobira
Comitê das Bacias Hidrográficas das Lagoas de Araruama, Saquarema e dos Rios São João e Una (River Basin Comittee of Lagos São João e Una)	Ricardo Senra
Comitê de Bacia Hidrográfica do Litoral Norte (River Basin Comittee of Litoral Norte)	Mirella Leôncio Motta e Costa Vamberto Freitas Rocha
Comitê de Bacia da Região Hidrográfica do Litoral Sul (River Basin Comittee of Litoral Sul)	Maria Edelcides Gondim de Vasconcelos
Comitê de Bacia Hidrográfica dos Rios Macaé e Rio das Ostras (River Basin Comittee of Macaé and Ostras)	Affonso Albuquerque Jr.
Comitê de Bacia Hidrográfica do Médio Paraíba do Sul (River Basin Comittee of Medio Paraíba do Sul)	Vera Lúcia Teixeira Sérgio Alves
Comitê de Bacia Hidrográfica do Paranaíba (River Basin Comittee of Paranaíba)	Bento de Godoy Neto
Comitê de Bacia Hidrográfica do Piabanha (River Basin Comittee of Piabanha)	Paulo Sérgio Oliveira
Comitê de Bacia Hidrográfica do rio Piancó-Piranhas-Açu (River Basin Comittee of Piancó-Piranhas-Açu)	João Azevedo Lins Filho João Bosco Vieira Marinho Laudízio da Silva Diniz Francisco Lopes da Silva
Comitê de Bacia Hidrográfica do rio Dois Rios (River Basin Comittee of Dois Rios River)	João Mendes

Comitê de Bacia Hidrográfica do São Francisco (River Basin Comittee of São Francisco)	Anivaldo de Miranda Pinto Delane Barros José Maciel Nunes de Oliveira Edison Ribeiro Santos Yvonilde Medeiros Wagner Soares Costa José Américo Formil
Comitê de Bacia Hidrográfica do São Miguel e Vale do Guarporé (River Basin Comittee of São Miguel e Vale do Guarporé)	Marlene Correia Tomazoni
CETESB-SP – Companhia de Tecnologia de Saneamento Ambiental de São Paulo (Environmental Sanitation Technology Company- São Paulo)	Otavio Okano Fabio Netto Moreno
CERHI RJ – Conselho Estadual de Recursos Hídricos do Estado do Rio de Janeiro (State Council of Water Resources – Rio de Janeiro)	Ediel Caldas Décio Tubbs Filho Madalena Sofia Avila
CERHI RO – Conselho Estadual de Recursos Hídricos de Rondônia (State Water Council of Rondônia)	Cátia Eliza Zufo Maria Lucilene Alves de Lima
CGEE – Centro de Gestão e Estudos Estratégicos (Center for Strategic Studies and Management)	Antônio Rocha Magalhães
CHESF – Companhia Hidro Elétrica do São Francisco (Hidroelectric company São Francisco)	Sonáli Cavalcanti Oliveira
CNI – Confederação Nacional das Indústrias (National Confederation of Industry)	Percy Baptista Soares Neto Shelley de Souza Carneiro
CNRH-CTPOAR – Câmara Técnica de Integração de Procedimentos, Ações de Outorga e Ações Reguladoras (Technical Chamber)	Ellen Kuntze Pantoja
CNRH-CTPNRH – Câmara Técnica do Plano Nacional de Recursos Hídricos (Technical Chamber)	Martha Sugai
COAGRIL – Cooperativa Agrícola de Unaí (Unai Agricultural Cooperative)	Everaldo Peres Domingos
CODEVASF – Companhia de Desenvolvimento do Vale do São Francisco e do Parnaíba (Development Company of the São Francisco and Parnaíba Valleys)	Athadeu Ferreira da Silva Márcio Adalberto
COGERH – Companhia de Gestão dos Recursos Hídricos do Ceará (Company of Management of Water Resources of Ceara)	Ubirajara Patrício Alvares da Silva
Independent consultant	Francisco Luiz Sibut Gomide Antonio Carlos Tatit Holtz Francisco José Lobato da Costa Rosana Garjulli
Compesa – Companhia Pernambucana de Saneamento (Sanitation Company of Pernambuco)	Sérgio Torres
COPPE-UFRJ – Instituto Alberto Luiz Coimbra de Pós-Graduação e Pesquisa de Engenharia (Alberto Luiz Coimbra Institute of Postgraduate and Engineering Research of the Dederal University of Rio de Janeiro)	Jerson Kelman
CRH-DF – Conselho de Recursos Hídricos do Distrito Federal (Water Resource Council of the Federal District)	Vandete Inês Maldaner
DAEE – Departamento de Águas e Energia Elétrica (São Paulo Water and Energy Department)	Luiz Fernando Carneseca Alceu Segamarchi Junior
EMBASA–- Empresa Baiana de Águas e Saneamento (Sanitation Company of Bahia)	Abelardo de Oliveira Filho Ana Paula Leal Meira
FIEMG – Federação das Indústrias do Estado de Minas Gerais (Federation of Industries of Minas Gerais State)	Patricia Helena Gambogi Boson
FONASC-CBH – Fórum Nacional da Sociedade Civil nos Comitês de Bacias Hidrográficas (Brazlian Forum of Civil Society for River Basin Committees)	João Clímaco S. de Mendonça

IADB – Inter-American Development Bank	Irene Altafin
ICOFORT – Agroindustrial (Company Agricultural Producers)-	Marcelo Flávio A. Teixeira
IBAMA – Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais (Brazilian Institute of Environment and Renewable Natural Resources)	Volney Zanardi Junior Regina Coeli Generino Cinthia Castro Henrique Cesar Lemos Jucá Marcelo Duarte Fonseca
IBRAM – Instituto do Meio Ambiente e dos Recursos Hídricos do Distrito Federal - Brasília Ambiental	Vandete Inês Madaner Luiz Aristides Rios Largura
IBIO – Instituto BioAtlântica (Bio Atlântica Institute)	Eduardo Figueiredo
IENSA –Instituto Educacional e Assistencial Nossa Senhora Aparecida (Nossa Senhora Aparecida Educational and Assistance Institute)	Maria Aparecida Borges Pimentel
IGAM –Instituto Mineiro de Gestão das Água (Minas Gerais Water Management Institute)	Thiago Figueiredo Santana Breno Esteves Lasmar Marilia Carvalho de Melo
IGARN - Instituto de Gestão das Águas do Estado do Rio Grande do Norte (Instutute of Water Management of the State of Rio Grande do Norte)	Josivam Cardoso Moreno
INEMA - Instituto do Meio Ambiente e Recursos Hídricos da Bahia (Institute of Environmnet and Water Resources of Bahia)	José George Santos da Silva Walter J. Filho Bruno Jardim da Silva
Irrigante (Irrigators)	Luiz Carlos Figueiredo Marcone de C. Cardoso Geraldo Severino Ronaldo da Silva Neiva
INEA–- Instituto Estadual do Ambiente do Rio de Janeiro (State Environmental Institute of Rio de Janeiro)	Leonardo Silva Fernandes Gisella de Sá Muniz Wilson Duarte Cinthia Avellar Martins Gláucia Sampaio Isaura Maria Ferreira Frega (Presidente) Leonardo Daemon Lívia Soalheiro Moema Acselrad Ricardo Marcelo Silva Rosa Maria Formiga Johnsson
IPAAM – Instituto de Proteção Ambiental do Estado do Amazonas (Institute of Environmental Protection of the State of Amazonas)	Antônio Ademir Stroski
IRRIGO – Associação dos Irrigantes de Goiás (Association of Irrigators of Goiás)	Wilson M Gonçalves
Ministério da Agricultura, Pecuária e Abastecimento (Ministry of Agriculture, Livestock and Food Supply)	Caio Tibério Dornelles da Rocha Pedro Celso Antonieto Demétrios Christófidis Gustavo Chaves Lopes Marcus Vinicius Martins Lineu Neiva Rodrigues
Ministério da Ciência, Tecnologia e Inovação (Ministry of Science, Technology and Inovation)	Antônio Marco Mendonça Sanderson Alberto Medeiros
Ministério da Defesa (Ministry of Defense)	Teresa Cristina Cavalcanti Soares
Ministério da Educação (Ministry of Education)	Lourival Inácio Batista

Ministério da Fazenda (Ministry of Finance)	Jefferson Milton Marinho
Ministério da Integração Nacional (Ministry of National Integration)	Francisco José Coelho Teixeira José Machado Cristiano Egnaldo Zinato Osvaldo Garcia
Ministério da Justiça (Ministry of Justice)	Guilherme Moraes Rego
Ministério da Saúde (Ministry of Health)	Jamyle Calencio Grigoletto Adriana Rodrigues Cabral
Ministério das Cidades (Ministry of Cities)	Ernani Ciríaco de Miranda Marcelo Lelis Osvaldo Garcia Gustavo Zarif Frayha Alex Fabiano Ribeiro Magalhães
Ministério das Relações Exteriores (Ministry of Foreign Affairs)	José Antonio Marcondes de Carvalho Davi de Oliveira Paiva Bonavides Leandro Magalhães Silva de Sousa Clarisse Souza Della Nina
Ministério de Minas e Energia (Ministry of Mining and Energy)	Gilberto Hollauer Vânia Maria Ferreira Igor Souza Ribeiro Luis Mauro Gomes Ferreira
Ministério do Desenvolvimento, Indústria e Comércio (Ministry of Development, Industry and Commerce)	Demétrio Florentino de Toledo Filho Beatriz Martins Carneiro
Ministerio do Meio Ambiente (Ministry of Environment)	Izabella Mônica Vieira Teixeira Marcelo Medeiros Ney Maranhão Geraldo Goes Franklin de Paula Junior Julio Thadeu Silva Kettelhut Adriana Cristina D. de A. Vasconcelos Tarcísio Tadeu Nunes Mirela Garaventta Adriana Lustosa José Mauro de Lima O.de Almeida
Ministério do Planejamento, Orçamento e Gestão (Ministry of Planning, Budget and Management)	Donivaldo Pedro Martins Raquel de Oliveira Alves Elisa Monteiro Malafaia Gilson Alceu Bittencourt Marco Antônio Pereira de Oliveira silva Paulo Henrique Siqueira Isobe
Ministério do Turismo (Ministry of Tourism)	Neusvaldo Ferreira Lima
ODEBRECHT	Luiz Gabriel Todt Azevedo
PLANA – Planejamento Ambiental Ltda (Environmental Planning)	Bruno Peres Oliveira Fausto Ulhoa
PRO LAGOS – Concessionária de Serviços Públicos de Água e Esgoto (Concessionaires of Public Water and Sewage Services)	Keila Ferreira Silva
Prospectiva Consultoria (Prospective Consult)	Filipe Bizarria do Carmo
REBOB – Rede Brasil de Organismos de Bacias Hidrográficas (Brazilian Network of River Basin Organisms)	Lupercio Ziroldo Antonio
SDS-SC – Secretaria de Estado do Desenvolvimento Econômico Sustentável – Santa Catarina (State Secreatriat for the Economic Sustainable Development- Santa Catarina)	Bruno Henrique Beilfuss

A corrigendum has been issued for this page. See http://www.oecd.org/about/publishing/Corrigendum-WaterGovernanceBrazil.pdf.

SEA –Secretaria Estadual de Meio Ambiente do Rio de Janeiro (State Secreatriat of Environment of Rio de Janeiro)	Carlos Francisco Portinho
Secretaria de Estado de Mineração, Geodiversidade e Recursos Hídricos do Amazonas (State Secreatriat of Mining, Geodiversity and Water Resources- Amazonas)	Daniel Borges Nava
Secretaria de Estado de Meio Ambiente – Pará (State Secreatriat of Environment of Pará)	Ronaldo Jorge da Silva Lima
Secretaria de Estado do Meio Ambiente – Amazonas (State Secreatriat of Environment of Amazonas)	Antônio M. Andrade
Secretaria de Mineração – Amazonas (State Secreatriat of Mining of Amazonas)	Jane Crespo
Secretaria do Meio Ambiente e Recursos Hídricos de Tocantins (State Secreatriat of Environment and Water Resources of Tocantins)	Aldo Azevedo Fabio Lelis
Secretaria dos Recursos Hídricos do Ceará (State Secreatriat of Water Resources of Ceará)	Francisco José Coelho Teixeira
SEDAM-RO – Secretaria de Estado do Desenvolvimento Ambiental de Rondônia (State Secreatriat of Environmental Development of Rondônia)	Miguel Penha Nanci Maria Rodrigues da Silva Tathyana Leal Vilson de Salles Machado
SEAGRO – GO - Secretaria de Agricultura Pecuária e Irrigação (State Secreatriat of Agriculture, Livestock and Irrigation)	Alecio Maróstica
SEMA-MT – Secretaria de Estado do Meio Ambiente – Mato Grosso (State Secreatriat of Environment- Mato Grosso)	Ana luiza Avila Peterline de Souza Médio Pinheiro
SEMARH-AL – Secretaria de Estado do Meio Ambiente e dos Recursos Hídricos de Alagoas (State Secreatriat for the Environment and Water Resources – Alagoas)	Artur Rogério Ferreira da Mata Paulo Eduardo Gomes Martins Luciano Braga Quirino Lima Edson Intaca Maruta
SEMARH-GO – Secretaria de Estado do Meio Ambiente e dos Recursos Hídricos de Goiás (State Secreatriat for the Environment and Water Resources – Goiás)	Luís Eduardo Machado Jacqueline Vieira da Silva João Ricardo Raiser
SEMARH - RN Secretaria de Estado do Meio Ambiente e dos Recursos Hídricos do Rio Grande do Norte (State Secreatriat for the Environment and Water Resources – Rio Grande do Norte)	José Mairton Figueiredo de França
SEMARH - SE Secretaria Estadual do Meio Ambiente e dos Recursos Hídricos de Sergipe (State Secreatriat for the Environment and Water Resources – Sergipe)	Ailton Francisco da Rocha
Sindicato dos Fazendeiros de Campos (Union Representative)	José do Amaral Ribeiro
SINDICON – Sindicato Nacional das Empresas Distribuidoras de Combustíveis e de Lubrificantes (National Union of Fuels and Lubricants Distributors)	Giuliana Talaminy Patrícia Mistura
SSRH – Secretaria de Estado de Saneamento e Recursos Hídricos de São Paulo (State Secreatriat of Sanitation and Water Resources – São Paulo)	Walter Tesch
UENF – Universidade Estadual do Norte Fluminense Darcy Ribeiro (State University of Norte Fluminense "Darcy Ribeiro")	João Gomes
UFBA – Universidade Federal da Bahia (Federal University of Bahia)	Raymundo Jose Garrido
UFC – Universidade Federal do Ceará (Federal University of Ceara)	Francisco de Assis de Souza Filho
UFRJ – Universidade Federal do Rio de Janeiro (Federal University of Rio de Janeiro)	José Paulo Soares de Azevedo
UnB – Universidade de Brasília (University of Brasilia)	Oscar de Moraes Cordeiro Netto
USP – Universidade de São Paulo (University of São Paulo)	Mônica Porto
USP – Universidade de São Paulo (Polytechnic School of University of São Paulo)	Rubem La Laina Porto
World Bank	Marcos Thadeu Abicalil
WWF – World Wildlife Fund – Brazil	Agnelo Lima Glauco Kimura de Freitas

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where governments work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

The OECD member countries are: Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Union takes part in the work of the OECD.

OECD Publishing disseminates widely the results of the Organisation's statistics gathering and research on economic, social and environmental issues, as well as the conventions, guidelines and standards agreed by its members.

OECD PUBLISHING, 2, rue André-Pascal, 75775 PARIS CEDEX 16
(97 2015 11 1 P) ISBN 978-92-64-23811-4 – 2015-17

OECD Studies on Water

Water Resources Governance in Brazil

Contents

Executive summary
Chapter 1. Setting the scene
Chapter 2. Water governance in Brazil: A state of flux
Chapter 3. Advancing Brazil's National Pact for Water Management
Chapter 4. Water allocation as a policy instrument in Brazil
Chapter 5. Action plan for strengthening water governance in Brazil

Consult this publication on line at ***http://dx.doi.org/10.1787/9789264238121-en.***

This work is published on the OECD iLibrary, which gathers all OECD books, periodicals and statistical databases. Visit ***www.oecd-ilibrary.org*** for more information.

OECD*publishing*
www.oecd.org/publishing

ISBN 978-92-64-23811-4
97 2015 11 1 P