

**“Working Together to Respond to Climate Change”  
Annex I Expert Group Seminar in Conjunction with the OECD Global Forum on  
Sustainable Development**

**Argentina**  
**Country Case Study on Domestic Policy Frameworks for Adaptation  
in the Water Sector**

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## **Domestic Policy Frameworks on Adaptation to Climate Change in Water Resources Argentina Country Case Study**

### **1. Overview of water resources and their main use.**

The South American continental part of Argentina's territory, of about 2,800,000 km<sup>2</sup>, extends along 3700 km between south latitudes 22° and 55°. This great latitudinal expansion and a great altimetric variation determine a wide climatic variety, from the subtropical climates in the North to the cold ones in Patagonia, alongside a predominant moderate climate in most part of the country. It is also worth mentioning that 76% of the territory is under arid or semi-arid conditions, as it receives a mean annual precipitation of less than 800 millimetres.

The surface water resources has an average flow of about 26,000 m<sup>3</sup>/s. Even though this figure may seem quantitatively generous, it is necessary to point out that the spatial distribution is very unbalanced, since 85% of the country's surface water corresponds to the Argentinean territories of the La Plata River's basin, specifically to the Bermejo, Paraguay, Uruguay and Paraná Rivers, among its main water courses, concentrating most of its population and productive activity. At the other extreme there are arid or semi-arid provinces, with river basins of scarce rainfall and less than 1% of the whole surface water. Another notable characteristic is Argentina's location as a downstream country in the La Plata Basin.

The last National Census, carried out in 2001, registers a total of approximately 36,300,000 inhabitants, and thus the annual average offer of surface water per inhabitant can be expressed as a flow of around 22,600,000 litres/inhabitant/year, greatly superior to the generally accepted minimum water stress value of 1,000,000 litres/inhabitant/year. Nevertheless, some provinces, such as Tucumán, Córdoba and San Luis, already show values per capita inferior to that one. At the same time, it must be emphasized the high degree of urbanization, reaching 89.3% of the population - taking into account towns of more than 2000 inhabitants - as opposed to the rural population of 3.4% - grouped in localities of less than 2000 inhabitants - and a scattered rural population (open field dwellings) of 7.3%; whereas only the Great Buenos Aires (Buenos Aires Autonomus City and districts around) concentrates the 32% of the total population, with about 11.5 million inhabitants.

As to groundwater, recent studies reveal that 30% of the utilised water corresponds to this sort of source. Important aquifers of the country have been surveyed, based on great knowledge in some cases, like in the provinces of San Juan and Mendoza, which are strongly dependent on them. Recently, Argentina, together with Brazil, Paraguay and Uruguay, have embarked on the "Project for the Environmental Protection and Sustainable Development of the Guaraní Aquifer System", located in geologic formations found at different depths in an important extension of the La Plata Basin, and considered one of the most important freshwater reservoirs in the world.

The demand data indicate that, out of an average of 34,000 million cubic meters of water per year (about 944,000 litres/inhabitant/year) used between 1993 and 1997, 71% were devoted to irrigation, 13% to drinking water supply, 9% to livestock water and 7% to industrial uses<sup>1</sup>.

For the Metropolitan Area of Buenos Aires - the major concentration of population of the country - the amount of drinking water supplied by the concessionary company Aguas Argentinas S.A. reached a daily average of 4,321,149 m<sup>3</sup> or 557 litres/inhabitant/day in 2005, while the average consumption was estimated as an average of 383 litres/inhabitant/day<sup>2</sup>.

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<sup>1</sup>Calcagno, A., Gaviño Novillo, M. and N. Mendiburo, 2000. Informe sobre la gestión del agua en la República Argentina, Comité Asesor Técnico de América del Sur (SAMTAC), Asociación Mundial del Agua (GWP) ([www.eclac.cl/dnri](http://www.eclac.cl/dnri)).

<sup>2</sup><http://www.aguasargentinas.com.ar/home.html>

Water supply and sanitation management is decentralised into regional, provincial and municipal jurisdictions, showing a great variety of organising modalities which reflects the organisation complexity of the sector.

In the Autonomous City of Buenos Aires and 17 surrounding districts of the Province of Buenos Aires the services are provided by a private limited liability company. In the provinces there are Provincial Organisations dependent upon the Provincial Governments, with different autarchy and autonomy levels (provincial directorates, state companies, state limited liability companies) and private limited liability companies, concessionaires of the services. At municipal level, it can be found Municipal Organisations depending upon the Municipal Governments - being generally centralised (municipal directorates, state companies) - as well as private operators – concessionaries of the services – such as limited liability companies, cooperatives and neighbouring organisations.

Water supply and sanitation services are operated by a total of 1,548 companies or organisations, with 70% private entities. The private concessionary companies serve about 61 % of the urban population.

Regulation and control of the concessions are exerted by the concedent states (national, provincial or municipal) through regulating entities. Given the autonomy of provinces in relation to natural resources, there does not exist a regulating centralised system at national level <sup>3</sup>.

Independently of its juridical status, all those organisations and companies have their respective tariff regimes, directly established by the provincial governments - in the case of public agencies - or discussed between the regulatory entities and the private organisations, in the framework of their concession contracts. Those tariff regimes should be the main source for investments devoted to rehabilitation and maintenance of a generally old infrastructure and to expand the services. However, as tariffs are sometimes established by taking into account not only economic but also social and political criteria, they may not cover all operation costs and investment needs. Consequently, some kind of explicit or implicit subsidies are frequently involved.

Among the existing plans, it is important to mention those of the *National Entity of Water Works for Sanitation* (ENOHSA)<sup>4</sup>, financed by the Interamerican Development Bank (IDB) and the World Bank (IBRD-BIRF), destined for extending the services to the population that has not got drinkable water yet. Generally the credits are destined for public providers but there have been also some loans for private providers.

The Autonomous City of Buenos Aires, the Federal Capital of Argentina and its great metropolis <sup>5</sup>, has the following main water-related problems to be solved : a) to promote a rational use of water in order to prevent overuse; b) to keep a good quality for drinking water; c) to mitigate the impact of floods; d) to reduce the rising of water tables; e) to allow the multiple use of the La Plata and other rivers within its geographical area; f) to control domestic and industrial pollution and water-borne diseases <sup>6</sup>.

As regards water supply and sanitation, the situation is very diverse in the different administrative units within the Metropolitan Area. While the Autonomous City has 99.8% of services coverage, in the Great Buenos Aires, there are districts, such as Vicente López, with coverage of 98.7% and 98.6% of water supply and sewerage networks respectively, together with others, such as Merlo, with only 37.2% y 20.9% respectively.

Concerning flood mitigation, it is interesting to remark the *Master Plan for Hydraulic Management and Floods Control* <sup>7</sup> which is being carried out by the Government of the Autonomous City since 1998. It

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<sup>3</sup>Calcagno, A.T., 2001. Proyecto JAWA-OEA, Evaluación de los modelos institucionales existentes para la gestión integrada de los recursos hídricos, Informe sobre Argentina

<sup>4</sup>Ente Nacional de Obras Hídricas de Saneamiento

<sup>5</sup>The Ciudad Autónoma de Buenos Aires with 2.776.138 inhabitants, and the 24 “Partidos” (administrative units) of Great Buenos Aires with 8.684.437 inhabitants, have 31,61% of the Argentinean population (Population, Homes and Housing National Census 2001, [www.indec.mecon.ar](http://www.indec.mecon.ar)).

<sup>6</sup>[www.fundacionciudad.org.ar](http://www.fundacionciudad.org.ar)

<sup>7</sup>Plan Maestro de Ordenamiento Hidráulico y Control de Inundaciones.

includes structural and non-structural measures: defences in La Boca and Barracas neighbourhoods; conduits for drainage of the Maldonado, Vega, White and Medrano creeks; construction of underground reservoirs in critical points of the city for temporary storage of flood excesses, and a Flood Early Warning Network<sup>8</sup>.

## 2. Institutional arrangements

### 2.1 Water Institutions

Subsequent diagnoses of the Argentinean institutional framework coincide in pointing out that water resource management is characterised by sectorial fragmentation. The lack of inter-institutional coordination and the deficiency of communication and information exchange between the different dependencies result in both function superpositions and responsibility dilution, favouring the development of inter-jurisdictional and inter-sectorial conflicts (especially between competitive uses such as irrigation and hydroelectric energy generation). These conflicts have been chiefly started off over flow quotas, management of flood water exceeding volumes and the contamination of interprovincial water courses.

Given the federal nature of its government system, there is no single national water authority in Argentina. However, both nation and province-wide, there is a wide and diverse number of organisms that intervene in its management.

The national main organism for water resource management is the *Undersecretariat of Water Resources (SSRH)*<sup>9</sup>, in the *Secretariat of Public Works (SOP) in the Ministry of Federal Planning, Public Investment and Services (MPFIPyS)*<sup>10</sup>. Its objectives, among others, are: the assistance to the SOP for the elaboration and execution of the national water policy and the proposal of the regulatory framework regarding water resources, relating and coordinating the actions of the other jurisdictions and organisms involved in water policy; the elaboration and execution of programmes and actions related to the management of shared international water resources and interprovincial water regions; the formulation and execution of infrastructure. and the development of water programmes and actions.

Other national organisms involved in water resource management are: a) *Ministry of Internal Affairs (MI)*<sup>11</sup>, which represents the National Government in some inter-jurisdictional basins and intervenes in searching solutions for the conflicts related to interprovincial water resource management; b) *Ministry of Foreign Affairs, International Commerce and Cults (MRECIyC)*<sup>12</sup>, which intervenes in matters that involve water resources shared with the bordering countries; c) *Secretariat of Agriculture, Livestock, Fisheries and Food*<sup>13</sup>, in the *Ministry of Economy and Production (MEP)*<sup>14</sup>, which supervises the execution of programmes for the rehabilitation of irrigation areas and for the recovery of flooded or salinised areas; d) *Secretariat of Energy*<sup>15</sup>, in the same Ministry, which develops basic schemes to make water basins hydroelectrically profitable, coordinating the compatibilities and priority uses with other areas; e) *Undersecretariat of Harbours and Navigable Ways*<sup>16</sup> in the MPFIPyS, involved in all matters related to navigation; f) *National Council of Scientific and Technical Research*<sup>17</sup>, in the *Ministry of Education, Science and Technology (MECyT)*<sup>18</sup>, with

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<sup>8</sup>[http://www.buenosaires.gov.ar/areas/obr\\_publicas/plan\\_hidraulico/?menu\\_id=309](http://www.buenosaires.gov.ar/areas/obr_publicas/plan_hidraulico/?menu_id=309)

<sup>9</sup> Subsecretaría de Recursos Hídricos.

<sup>10</sup> Secretaría de Obras Públicas, in the Ministerio de Planificación Federal, Inversión Pública y Servicios

<sup>11</sup> Ministerio del Interior

<sup>12</sup> Ministerio de Relaciones Exteriores, Comercio Internacional y Culto

<sup>13</sup> Secretaría de Agricultura, Ganadería, Pesca y Alimentos

<sup>14</sup> Ministerio de Economía y Producción

<sup>15</sup> Secretaría de Energía

<sup>16</sup> Subsecretaría de Puertos y Vías Navegables

<sup>17</sup> Consejo Nacional de Investigaciones Científicas y Técnicas

<sup>18</sup> Ministerio de Educación, Ciencia y Tecnología

several centres dedicated to water matters; g) *National Meteorological Service (SMN)*<sup>19</sup> and *Navy Hydrographic Service (SHN)*<sup>20</sup>, in the *Ministry of Defence*<sup>21</sup>, which collect and process meteorological and hydrological information; h) *Argentinean Naval Prefecture*<sup>22</sup>, which depends on the MI, and intervenes in water contamination incidents; i) *Dam Safety Regulating Organism (ORSEP)*<sup>23</sup>, which controls dam safety including the design and follow-up of contingency plans; j) *Secretariat of Environment and Sustainable Development (SAyDS)*<sup>24</sup>, in the *Ministry of Health and Environment (MSyA)*<sup>25</sup>, which is the national authority in charge of the environmental preservation and protection, the implementation of sustainable development and the rational use and conservation of renewable and non renewable natural resources.

At the provincial level, the institutional situation is characterised by a great diversity. Nonetheless, there are some common features. First of all, by following Section 124 of the National Constitution, the main responsibilities regarding water resources planning and management are exerted by the provinces. Thus, the submission of water abstraction licenses; the overseeing of reliable supply of safe drinking water; flood and drought predictions, plans, management and recovery actions, and the ownership of dams and reservoirs, among other issues, are in principle under the responsibility of the provinces. Nevertheless, given the fact that water resources are generally shared by two or more provinces and by taking into account the magnitude of investments required to deal with the frequently complex water problems and the necessity of keeping an equitable distribution of available resources, the Nation has also generally played a very important role, having even had, until the beginning of the 1990s, the ownership of national companies devoted to the construction and operation of large works, such as dams.

As regard the setting of environmental standards, it is also a responsibility of the provinces. However they should be based on the criteria that the Nation should established, following Section 41 of the National Constitution.

Management acquires diverse characteristics according to the main local interests and conflicts originating in water supply and demand. Irrigation management in the arid region and management of extreme climate harmful effects – particularly floods – in the humid region, are two significant axes of this task.

Several models have been adopted by the provinces for management of their water resources. For example, in Mendoza, the water administrative organisation, the *General Department of Irrigation (DGI)*<sup>26</sup> is included in the Provincial Constitution. The Province delegates water resources management into the DGI, which at its time does the same with users' organisations for water management in their respective irrigation areas. The funds coming from tariffs charged for the concession of water use rights, allow to perform an effective management of the resource, monitor its availability and uses and deal with conflicts adequately and with low costs.

In the case of the Province of Buenos Aires, a recently approved Water Code establishes an autonomous entity, the Water Authority<sup>27</sup>, in charge of planning; record, concession and protection of water use rights as well as police power, among other functions.

In the Province of Santa Fe, the *Provincial Directorate for Hydraulic Works (DPOH)*<sup>28</sup> – in the *Ministry for Water Affairs*<sup>29</sup> – is in charge of flooding control. There exist Basin Committees - depending upon the DPOH

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<sup>19</sup> Servicio Meteorológico Nacional

<sup>20</sup> Servicio de Hidrografía Naval

<sup>21</sup> Ministerio de Defensa

<sup>22</sup> Prefectura Naval Argentina

<sup>23</sup> Organismo Regulador de Seguridad de Presas Dam Safety Regulating Organism

<sup>24</sup> Secretaría de Ambiente y Desarrollo Sustentable

<sup>25</sup> Ministerio de Salud y Ambiente

<sup>26</sup> Departamento General de Irrigación.

<sup>27</sup> Autoridad del Agua

<sup>28</sup> Dirección Provincial de Obras Hidráulicas

– which are in charge of the maintenance of works to keep drainage conditions, as well as of the construction of minor complementary works and the promotion of agrohydrological techniques adapted to regional characteristics. Consequent costs are partly afforded by the provincial government - through the provision of machinery and spare parts – and partly by the basin farmers – through a tax proportional to their respective property areas - in order to cover operating costs.

## 2.2 Climate Change Institutions

In Argentina, there is a growing interest in understanding the Climate Change phenomenon and its impacts. In this respect, the rules and regulations and the national institutions reflect the efforts tending to acknowledge it, by implementing policies and actions meant to efficiently reduce greenhouse gas (GHG) emissions , in order to contribute to the same process undertaken within the international framework.

In terms of the social vulnerability associated to climate change and variability, Argentina is facing two tough challenges of different sorts: on one hand, the probability of catastrophic impacts, such as floods and drought and, on the other, the institutional vulnerability on carrying out mitigation and adaptation processes in the long term.

Several international agreements have been signed on the subject, starting with the adherence to the United Nations Framework Convention on Climate Change (UNFCCC) (1993)<sup>30</sup>. The national repercussion of it was the creation of the *Argentinean Office for Joint Implementation*<sup>31</sup>, today called *Argentinean Office for Clean Development Mechanisms* (OAMDL)<sup>32</sup> (1998). In addition, Argentina has adopted the Objectives of the Greenhouse Gases Reduction Programme (1999), has adhered to the Kyoto Protocol (2001), has created the *Climate Change Unit* (UCC)<sup>33</sup> within the SAYDS (2003), and has also been developing diverse research programmes, such as the *National Programme on Climate Scenarios*<sup>34</sup>.

Currently, the SAYDS includes the organisms destined to define the policies and actions, and for assessment on the subject, the UCC and the OAMDL.

The UCC was created in order to establish a specific area that should *propose and propitiate actions* meant to meet the ends and goals comprised in the UNFCCC and *elaborate the national strategies* referred to climate change mitigation. Among its functions, the unit has to propose and propitiate the development of local acknowledgment actions for climate change mitigation, as well as to elaborate and propose global strategic courses of action – derived from the UNFCCC – that may give way to the formulation of national policies and programmes related to mitigation and GHG emission reduction activities. And it should propitiate the preparation of the national communications on climate change.

In the same framework, the OAMDL is within the UCC, as a multi-sector and coordinating organism meant to support the development of actions in accord with the mechanisms indicated by the Kyoto Protocol, through the formulation of policies on climate change – particularly those related to clean development mechanisms. Among its concrete actions, the OAMDL carries out projects identification and assessment. Within this Office, hierarchic members of other ministries and secretariats, as well as representatives of the private sector and non governmental organizations, are invited to participate.

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<sup>29</sup>Ministerio de Asuntos Hídricos

<sup>30</sup>The United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Convention to Combat Desertification (UNCCD), the Agreement on Biological Diversity, the Convention for the Protection of the Ozone Layer (Vienna), and the Protocol on Substances that Deplete the Ozone Layer (Montreal)

<sup>31</sup>Oficina Argentina de Implementación Conjunta

<sup>32</sup>Oficina Argentina de Mecanismos de Desarrollo Limpio

<sup>33</sup>Unidad de Cambio Climático

<sup>34</sup>Programa Nacional de Escenarios Climáticos

### 2.3 Institutions related to climate change impacts on water resources

The main governmental institutions directly related to the matter of flood disasters in Argentina<sup>35</sup> are: a) the already mentioned SSRH and b) SUCCE<sup>36</sup>, *Central Sub-Unit of Coordination for Emergency*<sup>37</sup>, both depending on the SOP, in the MPFIPyS; c) *Emergency Federal System (SIFEM)*<sup>38</sup>, in the MI; d) *Directorate for Civil Protection*<sup>39</sup>; e) the Warning Systems of the La Plata Basin and of other provincial basins, installed within the *National Water Institute (INA)*<sup>40</sup> of the SSRH; f) the provider of disaster images, the *National Commission for Space Activities (CONAE)*<sup>41</sup>; g) *Climate and Water Institute*<sup>42</sup> in the *National Agricultural Technology Institute (INTA)*<sup>43</sup> of the SAGPyA; h) *Directorate for Social Emergencies*<sup>44</sup> in the MSyA; i) *National Plan for Fire Management*<sup>45</sup> in the SAyDS; j) *National Directorate for Traumas, Emergencies and Disasters*<sup>46</sup> and *Sanitary Emergencies Committee*<sup>47</sup> in the MSyA; k) *White Helmets Commission*<sup>48</sup> in the MRECIyC. It should be stated that there are also other institutions, such as the already mentioned SMN and SHN (see 2.1), which provide useful information for these extraordinary situations.

Among other non governmental institutions involved in response to disasters, the following can be mentioned: CARITAS, Red Cross, Habitat for Humanity, Doctors of the World and Doctors without Borders, and the *National Council of the Federations of Volunteer Fire Fighters of the Argentine Republic*<sup>49</sup>.

In terms of disaster attention, there are normative antecedents oriented to incorporating articulation functions between institutions (warning, military, safety and civil society organizations). In 1999 the interinstitutional coordination function for disaster management was formalised with the establishment of the above mentioned SIFEM within the *Office of the Head of the Cabinet of Ministers*<sup>50</sup>, the highest hierarchy after the Presidency of the Nation.

This System worked very efficiently during 2000 and 2001, convening from that interministerial position the main national governmental institutions related to the different aspects of disaster management; coordinating their specialised functions and activities, and initiating a fruitful interchange with the corresponding institutions at provincial level. However, posterior changes of location of SIFEM towards a more sectorial location within the governmental structure caused a reduction of its convening capacity<sup>51</sup>, together with a discontinuity in its policies and management model.

An outstanding sector for sustainable development, which directly relates water resources and climate change, is the energy sector, especially through the hydroelectric generation process. In 2003, the primary energy production reached 86,006 Mtep, out of which 46.3% corresponded to natural gas, 43.1 % to petroleum and 4.2% to hydroelectric energy. In that way, the hydrocarbons represented almost 90% of the whole production.

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<sup>35</sup>Natenzon, C. and Viand, 2005. Gestión de los desastres en Argentina. Instituciones nacionales involucradas en la problemática de las inundaciones. Mesa Redonda "Manejo integrado, riesgo y vulnerabilidad social". 6º Encuentro de Geógrafos de América Latina – EGAL

<sup>36</sup>Subunidad Central de Coordinación para la Emergencia (SUCCE), 1995. "Estudios ambientales regionales para el proyecto de control de inundaciones. Informe final. Ministerio del Interior"

<sup>37</sup>Subunidad Central de Coordinación para la Emergencia

<sup>38</sup>Sistema Federal de Emergencias

<sup>39</sup>Dirección de Protección Civil

<sup>40</sup>Instituto Nacional del Agua

<sup>41</sup>Comisión Nacional de Actividades Espaciales

<sup>42</sup>Instituto de Clima y Agua

<sup>43</sup>Instituto Nacional de Tecnología Agropecuaria

<sup>44</sup>Dirección de Emergencias Sociales

<sup>45</sup>Plan Nacional de Manejo del Fuego

<sup>46</sup>Dirección Nacional de Traumas, Emergencias y Desastres

<sup>47</sup>Comité de Emergencias Sanitarias

<sup>48</sup>Comisión Cascos Blancos

<sup>49</sup>Consejo Nacional de Federaciones de Bomberos Voluntarios de la República Argentina

<sup>50</sup>Jefatura de Gabinete de Ministros

<sup>51</sup>Barrenechea and Natenzon, 2000. Defensa civil y segunda reforma del Estado en Argentina. Modificación del encuadre institucional.

The hydroelectric energy, which was equal to 270 Mtep in 1970, increased to 3,650 Mtep in 2003, while the nuclear production reached its record in 2003, with 2,210 Mtep, representing 3.2% of the internal offer.

The annual electric energy generation reached 92,974 GWh in 2003, out of which the hydroelectric generation was 31,821 GWh, representing 36% of the total, percentage that has been maintained to date<sup>52</sup>. But, if the joint hydraulicity is high, its share within the electric supply may reach 50%, whereas in years of low hydraulicity, it is reduced to 30%.

The power plants located in the Comahue and Litoral regions provide 85% of Argentina's annual hydroelectric supply. That is why is very important, to study in depth the effects of climate change on hydroelectricity, with a focus in the basins of the Paraná and Uruguay rivers (Litoral) - with a rainfall regime - and of the Limay and Neuquén rivers (Comahue) – with a mixed rain-snow precipitation regime.

As regards to hydroelectric production, until the beginning of the 1990s, two state-owned companies, Agua y Energía Eléctrica S.E. and Hidronor S.A., were in charge of the construction and operation of most of the power plants. At that time, following the privatisation process implemented in Argentina, those two companies were subdivided into “business units” and offered for concession to private enterprises, which are currently in charge of the operation of those power plants. Nowadays, two binational hydroelectric plants are also operating. They are Salto Grande – shared by Argentina and Uruguay – on the Uruguay river, and Yacypetá – shared by Argentina and Paraguay – on the Paraná river.

### **3. Legal Framework**

#### **3.1 Water Legislation**

Argentina is organised as a republic, has a representative federal government and is made up of 23 provinces, plus Buenos Aires Autonomus City, its Federal Capital. According to the Constitution (Section 124) “the provinces have the original dominion over the natural resources existing in their territory”, that is, water – among the other natural resources – are owned by the provinces. Regarding matters directly or indirectly related to water resources, the Constitution establishes that the Nation wields jurisdiction over the navigation, the interprovincial and international commerce, the international relations, the celebration of international agreements, admiralty and marine jurisdiction, as well as over the dictation of the Civil, Penal, Mining, Commerce and Social Work and Security Codes.

The last constitutional reform, in 1994, included Section 41, which establishes several warranties relative to environment and natural resources. Its third paragraph gives to the Nation the jurisdiction “to dictate the norms with the Minimum Protection Assumptions<sup>53</sup> and to the provinces those necessary to complement them, those not altering the local jurisdictions”.

There are also concurrent powers, whose exercise corresponds indistinctly and simultaneously to the federal and provincial orders. The National Congress is empowered “to regulate the free navigation of inland rivers” and “to provide for the prosperity of the country and the advance and welfare of all the provinces”, promoting, among other activities, the construction of navigable canals and the exploration of inland rivers”. These latter attributions are concurrent with those of the provincial states.

After eleven years from the constitutional reform in 1994, the Environment General Law N° 25675/02 was dictated, which sets up the leading principles of the international environmental law, the definition of

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<sup>52</sup>Secretaría de Energía de la Nación and Comisión Nacional de Energía Atómica (CNEA)

<sup>53</sup>Presupuestos mínimos de protección

environmental harm and the launch of compensating funds for unforeseen events; it also sets the objectives and principles of the environmental policy<sup>54</sup>.

It may be said that there is no national water law. Numerous projects for a national or federal water law were submitted by the Executive Power or by diverse legislators over the years, without reaching the sufficient support for its sanction. The current national legislation is thus constituted by the rules and regulations mainly comprised in the Civil, the Commerce, the Mining and the Penal Codes and in federal laws, such as the ones on energy, navigation, transportation, harbours, environment and natural resource protection, etc., which comprise rules directly or indirectly related to water. At the same time, the Nation has ratified international agreements on shared waters, loans of international credit institutions for drinking water supply and urban and rural sanitation works and multiple-use water works, among others.

In 1996, tasks were started in order to comply with the “*minimum assumptions*” requirement of the National Constitution. And since May 2005, the project for a “Law adopting the Argentina’s Water Policy Leading Principles and other related matters as guidelines for the Nation’s Policy”, is under consideration.

In December 2002, the Law N° 25688 was promulgated. This law, called “Regime for Water Environmental Management”<sup>55</sup>, is pending for regulation and has been the object of many criticisms and even judicial submissions that seek its declaration as unconstitutional<sup>56</sup>. Most provincial water authorities concur, with slight differences, in that the law takes over provincial competencies that are not delegated to the Nation<sup>57</sup>.

Representatives from the SAYDS and the SSRH have jointly proposed, on request of the Commission on Environment and Sustainable Development<sup>58</sup> of the Senate, criteria “to be considered in a potential modification of the Law N° 25688”; these criteria are currently under consideration in the mentioned Commission of the Senate. Nevertheless, even if this law is modified, there is still pending the dictation of a more comprehensive, national or federal law, which should translate the *Leading Principles of Water Policy*<sup>59</sup> (See 5.1) shared by all the provinces into a common set of rules and regulations, and also seek, within a Nation’s perspective, the compatibilisation of potentially conflictive issues.

Not all the constitutions of the 23 Argentinean provinces and of Buenos Aires Autonomous City comprise principles or concepts explicitly referring to water and its relation with environment. Most of the references are dedicated to the recognition of the inhabitants’ right to a healthy environment and the obligation to preserve and protect it in their own and the future generations’ benefit. The first provincial water law (Mendoza) is more than one century old, but it was only in the middle of the 20<sup>th</sup> century that specific legislation on the matter was adopted in most Provinces. In the 1970’s the phase of the contemporary laws started, comprising water policy principles and the adopted institutions obeyed to avant-garde judicial criteria with an interdisciplinary approach. During the last third of the 20<sup>th</sup> century, laws were promulgated to gather and regulate concepts such as water policy and planning, water emergencies, water risk areas, bioenvironmental impact, business concessions of water-related works and services, more flexible use priorities, basin committees, interprovincial waters, surface water sources and aquifer protection, hydrographic basins as planning and administration units, etc.<sup>60</sup>

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<sup>54</sup>Cafici, M., 2005. Aportes al Desarrollo Sustentable, Serie de documentos del Centro de Estudios sobre Agricultura y Recursos Naturales (CEARN)

<sup>55</sup>Régimen de gestión ambiental de aguas

<sup>56</sup>Pinto, M., 2003. Consideraciones sobre la pretendida norma de presupuestos mínimos ambientales en materia hídrica. A propósito de la Ley 25.688, La Ley. Suplemento de Derecho Ambiental, Año X, No 2, 29 de abril, Buenos Aires.

<sup>57</sup>Petri, D., Rohrmann, H. and J. Pilar, 2005. Posición del COHIFE sobre la ley No 25.688. Régimen de Gestión Ambiental de Aguas, La Ley. Suplemento de Derecho Ambiental, Año XII, N° 1, 11 de mayo, Buenos Aires.

<sup>58</sup>Comisión de Ambiente y Desarrollo Sustentable

<sup>59</sup> Principios Rectores de Política Hídrica

<sup>60</sup>Magnani, C., 2001. Derecho de Aguas. Instrumentos normativos y regulatorios de la gestión de los recursos hídricos, Curso Internacional de Posgrado sobre Gestión Integrada de los Recursos Hídricos, Universidad Nacional de Buenos Aires, Secretaría de Ciencia y Técnica e Instituto Argentino de Recursos Hídricos, Buenos Aires.

Given the dominion of provinces on water resources and to the fact that 90% of them are interprovincial, planning and management tasks should be shared by the riparian provinces of a certain river. This circumstances led to the establishment of organizations with the participation of provincial jurisdictions and – in most of the cases – of the Nation. At present the following entities are active<sup>61</sup>: a) *Interjurisdictional Committee of the Colorado River*<sup>62</sup> (COIRCO - Buenos Aires, La Pampa, Mendoza, Neuquén and Río Negro); b) *Interjurisdictional Authority of the Limay, Neuquén and Negro Rivers Basins* (AIC)<sup>63</sup> - Buenos Aires, Neuquén and Río Negro); c) *Regional Commission of the Bermejo River* (COREBE<sup>64</sup> - Chaco, Formosa, Jujuy, Salta, Santa Fe and Santiago del Estero); d) *Interjurisdictional Technical Commission of the Pasaje-Juramento-Salado River Basin*<sup>65</sup> (Catamarca, Salta, Santiago del Estero, Santa Fe and Tucumán); e) *Interjurisdictional Technical Commission of the Salí-Dulce River Basin*<sup>66</sup> (Catamarca, Córdoba, Salta, Santiago del Estero and Tucumán); f) *Azul River Basin Authority* (ACRA)<sup>67</sup> (Chubut and Río Negro); g) *Interjurisdictional Commission of the La Picasa Lagoon Basin*<sup>68</sup> (Buenos Aires, Córdoba and Santa Fe); h) *Executing Committee of the Plan for Environmental Management of the Matanza-Riachuelo Basin*<sup>69</sup> (Buenos Aires and Autonomous City of Buenos Aires); i) *Committee of the Northwest of the Pampean Plain Water Region*<sup>70</sup> (Buenos Aires, Córdoba, La Pampa, San Luis and Santa Fe).

In all the previously mentioned organizations the Nation participates as a member, with the exception of the cases of the Interjurisdictional Commission of the La Picasa Lagoon Basin and ACRA.

As an example of agreement for water abstraction, it is interesting to note that one of the roles of COIRCO is supervising the compliance of the “Unique Programme for Habilitation of Irrigation Areas and Distribution of the Colorado River Discharges”<sup>71</sup> agreed by the five riparian provinces, on the basis of the results of optimisation and simulation models especially developed. In the case of low flows, the Programme contemplates that the structure of distribution of water among the provinces should be respected and, for extraordinary low-flow conditions declared as such by a law, priority will be given to those crops whose total harm is the major one. And in such cases, COIRCO should adjust temporarily the discharges derived towards the riparian provinces.

At international level, Argentina shares the water resources of several of its main basins with its bordering countries, being particularly significant those corresponding to the La Plata River Basin, where several international entities have been established, with the participation of Argentina and its neighbouring countries.

As a first step, in 1967, the *Intergovernmental Coordinating Committee of the Countries of the La Plata Basin* (CIC)<sup>72</sup> was created and, on 23 April 1969, the Ministers of the five riparian countries (Argentina, Bolivia, Brazil, Paraguay and Uruguay) signed the Treaty of the La Plata Basin which, in its Article I, only paragraph, says: “The Contracting Parties agree to unite efforts with the objective of promoting the harmonious development and the physical integration of the La Plata Basin and of its area with direct and considered influence”. “With that purpose, they will promote within the ambit of the basin, the identification of areas of common interest and the promotion of research, programs and works, as well as the formulation of operative agreements or juridical instruments they consider necessary and that tend to” – among other purposes – “a)

<sup>61</sup>Pochat, V., 2005. Entidades de gestión del agua a nivel de cuencas: experiencia de Argentina, CEPAL, Serie Recursos Naturales e Infraestructura, N° 96, Santiago, octubre.

<sup>62</sup>Comité Interjurisdiccional del Río Colorado

<sup>63</sup>Autoridad Interjurisdiccional de las Cuencas de los ríos Limay, Neuquén y Negro

<sup>64</sup>Comisión Regional del Río Bermejo.

<sup>65</sup>Comisión Técnica Interjurisdiccional de la Cuenca del Río Pasaje-Juramento-Salado.

<sup>66</sup>Comisión Técnica Interjurisdiccional de la Cuenca del Río Salí-Dulce.

<sup>67</sup>Autoridad de la Cuenca del Río Azul.

<sup>68</sup>Comisión Interjurisdiccional de la Cuenca de la Laguna La Picasa.

<sup>69</sup>Comité Ejecutor del Plan de Gestión Ambiental y de Manejo de la Cuenca Matanza-Riachuelo (Buenos Aires and Ciudad Autónoma de Buenos Aires).

<sup>70</sup>Comité de la Región Hídrica del Noroeste de la Llanura Pampeana.

<sup>71</sup>Programa Único de Habilitación de Áreas de Riego y Distribución de Caudales del Río Colorado

<sup>72</sup>Comité Intergubernamental Coordinador de los Países de la Cuenca del Plata.

give facilitation and assistance as regards navigation; b) promote reasonable utilisation of water resources, especially by means of the regulation of watercourses and their multiple and equitable development; c) achieve the preservation and the improvement of animal and vegetal life; ...; h) promote other projects of common interest and especially those that have relation to the inventory, assessment and development of the natural resources of the area; i) integral knowledge of the La Plata Basin”.

The La Plata Basin Treaty is broadly comprehensive as regards its competence on plans, projects, works, and programs in the catchment’s area. Nevertheless, it is not proposed as an exclusive option for riparian states, but as a framework agreement that could add special benefits to its global scheme. Accordingly, it states that "The provisions of this Treaty shall not prevent the Contracting Parties from concluding specific or partial bilateral or multilateral agreements designed to achieve the general objectives of the development of the Basin”.

It was in 1973 that a push toward the realization of joint projects was begun, bi- and trilaterally. Thus, Argentina participates in several organisations: a) on 19 November 1973 Argentina and Uruguay signed the Treaty on the La Plata River and the corresponding Maritime Boundary which deals with jurisdictional matters, navigation, fishing, bed and subsoil, pollution prevention, pilotage, works, scientific research, and rescue operations, among other aspects of the river system. It also set up two permanent commissions, the *Administrative Commission of the La Plata River (CARP)*<sup>73</sup> and a Joint Technical Commission for the adjacent maritime zone and the overlapping common fishing zone<sup>74</sup>; b) on 3 December 1973 the *Yacyretá Binational Entity (EBY)*<sup>75</sup> was originated, by agreement between Argentina and Paraguay, with the purpose of constructing Yacyretá development; c) on 26 February 1975, Argentina and Uruguay agreed on the establishment of a special body for their shared stretch of the Uruguay River. The regulation of water uses, namely navigation, works, pilotage, bed and subsoil resources, fishing, pollution prevention, jurisdiction, and settlement of disputes procedures are expressly dealt with. An Administrative Commission (CARU)<sup>76</sup> was set up under this agreement<sup>77</sup>; d) in 1980, Brazil and Argentina agreed upon the use of their shared stretch of the Uruguay River and decided to build the Garabí dam as a joint project.

It should be added to this system of binational commissions and entities those established before 1973: a) in 1946 the *Joint Technical Commission of Salto Grande*<sup>78</sup>, created by Uruguay and Argentina to carry out a joint hydraulic project, and b) in 1971 the *Argentinean-Paraguayan Joint Commission of the Paraná River*<sup>79</sup> (COMIP), in charge of the administration of the stretch shared by both countries and of the development of Corpus Christi multiple-purpose project<sup>80</sup>.

A repetition of the activity pattern of the 1970s can subsequently be seen in the creation of the *Administrative Binational Commission of the Lower Basin of the Pilcomayo River*<sup>81</sup>, by Argentina and Paraguay, in September 1993; of the *Trinational Commission for the Development of the Pilcomayo River Basin*<sup>82</sup>, by Argentina, Bolivia, and Paraguay, in February 1995, and the *Binational Commission for the Development of*

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<sup>73</sup>Comisión Administradora del Río de la Plata.

<sup>74</sup>Comisión Técnica Mixta del Frente Marítimo.

<sup>75</sup>Entidad Binacional Yacyretá

<sup>76</sup>Comisión Administradora del Río Uruguay

<sup>77</sup>del Castillo Laborde, L. 1999. The Plata basin institutional framework, in Management of Latin American river basins: Amazon, Plata and São Francisco, ed. by A. K. Biswas, N. V. Cordeiro, B.P.F. Braga and C. Tortajada. United Nations University Press. Tokyo

<sup>78</sup>Comisión Técnica Mixta de Salto Grande

<sup>79</sup>Comisión Mixta Argentino-Paraguaya del Río Paraná

<sup>80</sup>Barberis, J.A. 1988. La Plata River Basin. Interregional Meeting on River and Lake Basin Development with Emphasis on the Africa Region. Addis Ababa

<sup>81</sup>Comisión Binacional Administradora de la Cuenca Inferior del Río Pilcomayo

<sup>82</sup>Comisión Trinacional para el Desarrollo de la Cuenca del Río Pilcomayo

the *Upper Basin of the Bermejo River and the Grande River of Tarija*<sup>83</sup> by Argentina and Bolivia, in June 1995<sup>84</sup>.

For its part, in the navigation field, the *Intergovernmental Committee for the Paraguay-Paraná Waterway (Cáceres Port-Nueva Palmira Port)*<sup>85</sup> (CIH) was established by the five countries, being one of its most important achievements to produce the Waterway Transport Agreement, entered into force on 13 February 1995).

In relation the numerous basins along the border between Argentina and Chile, the *Argentinean-Chilean Working Group on Shared Water Resources*<sup>86</sup> was created with the purpose of performing inventory and management planning activities in the basins with shared water resources by both countries.

The main rivers in the La Plata Basin generally have more problems regarding high rather than low flows. However, droughts are frequent in the Lower Pilcomayo River Basin due to low flows in winter months. This river is characterised by a very irregular annual regime and, at the same time, the transport of a very large amount of sediments, which cause the interruption of its bed and a very variable distribution of water over the Argentinean and Paraguayan banks. In the framework of the Binational Administrative Commission of the Lower Pilcomayo River Basin, Argentina and Paraguay have agreed an equitable distribution of its discharges towards their respective territories, equivalent to about 50% for each one of the countries.

### 3.2. Climate Change legislation

The laws, resolutions, decrees and dispositions relative to Climate Change are based on the participation and commitments contracted on signing international agreements: the 1985 Vienna Convention for the Protection of the Ozone Layer; the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer; the UNFCCC, signed in Rio de Janeiro in 1992, during the Conference on Environment and Development (UNCED), and its ratification in 1994; the Kyoto Protocol signed in 1998; the convention celebrated in Bonn at the end of 1999, where Argentina presented the national goal of reducing the greenhouse gas emissions within the framework of its productive sphere; and the ratification and coming into force of the Kyoto Protocol at the beginning of 2005. All these protocols were impelled by the sanction of the Law 25438/2001, which fosters - among other intentions - to keep the signed agreements and international commitments active.

In Argentina the environmental legislation destined for attending to climate change conserves the constitutional spirit mentioned before, and adds the objectives and interests specified in the UNFCCC and other international agreements. Among them, it is worth mentioning the following:

- Law 24930 on Agreements, promulgated in 1998, on the ground of the adherence to the agreement of Cooperation in Environmental Matters between Argentina and Brazil. Among other problems, they consider Climate Change and the Ozone Layer, postulating the organization of scientific exchange in relation to the use of power sources and substances that deplete the ozone layer.

- Resolution 1125/01, of the former *Secretariat of Sustainable Development and Environmental Policy*<sup>87</sup>, for the creation of the National Programme on Climate Change Impacts.

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<sup>83</sup>Comisión Binacional para el Desarrollo de la Alta Cuenca del Río Bermejo y el Río Grande de Tarija

<sup>84</sup>Pochat, V. 1999. Water-resources management of the Plata basin, in Management of Latin American river basins: Amazon, Plata and São Francisco, ed. by A. K. Biswas, N. V. Cordeiro, B.P.F. Braga and C. Tortajada. United Nations University Press. Tokyo

<sup>85</sup>Comité Intergubernamental de la Hidrovía Paraguay-Paraná (Puerto Cáceres – Puerto Nueva Palmira)

<sup>86</sup>Grupo de Trabajo Argentino-Chileno sobre Recursos Hídricos Compartidos

<sup>87</sup>Secretaría de Desarrollo Sustentable y Política Ambiental

- Disposition 166/01 of the *Undersecretariat of Environmental Regulation and Policy*<sup>88</sup>, which creates the National Programme of Alternative and Sustainable Energies and Fuels, for studies and developments on primary energies (aeolian, solar, hydrogen) and their transformation, components and weight in the mitigation of the GHG.

- Resolution 1076/01, of the *Directorate of Environmental Policy*<sup>89</sup>, promotes the accomplishment of regional investigation and development projects, on the production of the different biofuels (ethanol, methanol, biodiesel, bio-crude oil and methane).

- On preparing the COP 10, the Resolution N° 736/04 (UCC) was released, for the foundation of the Commission for the Connection with Civil Society Organizations.

- Resolution 248/05, National Programme of Climate Scenarios, related to the compliance with the commitments emerging from the ratification of the United Nations Framework Convention on Climate Change.

- National Decree 1070/ 05, the creation of the Argentinean Carbon Fund (FAC), following international recommendations, and related to the purpose of maximizing Argentina's participation in the international carbon market by means of the development of CDM projects.

In the provinces, there are scarce examples of laws that promote the development and generation of renewable energies, as in the case of Buenos Aires, Chubut, and Santa Cruz, which contemplate incentives regarding kWh prices and exemptions in real estate taxes.

#### **4. Impacts of climate change (or extreme weather events) on water resources (e.g., floods, droughts, storms, etc.)**

##### **4.1. Hazards or cause factors**

Within the national territory natural processes take place and negatively affect the population and the economy. The examination of catastrophic events, systematically made on the basis of nationwide journalistic information<sup>90</sup> between 1971 and 2003, shows the following disaster types, decreasingly: floods, storms, urban fires, snows, fires of biodiversity, contamination, droughts, gales, hailstorms and frost. The first two represent more than 50% of the records. Nevertheless, given the agricultural profile of the national economy, in spite of not being registered as numerous, the droughts have negative economic impacts of great scope.

The regional distribution of hazardous natural processes in relation to disaster occurrence is the following:

- the Central region (Buenos Aires and Córdoba Provinces): Droughts. Floods. Severe storms. Tornados.
- the coast of the La Plata River (on Buenos Aires Metropolitan Area): Floods produced by *sudestadas* (strong southwest winds) and precipitations. Heat blows.
- the North-eastern region (Formosa, Chaco, Santa Fe, Misiones, Corrientes and Entre Ríos Provinces): Floods. Extraordinary low flows. Severe storms.
- the North-western region (Jujuy, Salta, Tucumán, Santiago del Estero, Catamarca, and La Rioja Provinces): *Yungas* (hot tropical valleys) with high hydro-geological risk. Fast floods originating in intense summer storms. Desertification. Severe storms.

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<sup>88</sup>Subsecretaría de Ordenamiento y Política Ambiental

<sup>89</sup>Dirección de Política Ambiental

<sup>90</sup>Herzer, H., Caputo, M.G., Celis, A. et al . 2004. Gestión de riesgos de desastres ENSO en América Latina, Informe Final IAI 2004 ENSO-Argentina, Centro de Estudios Sociales y Ambientales.

- the Cuyo region (San Juan, Mendoza and San Luis Provinces): Risk due to fast floods originating in intense summer storms. Droughts. Desertification.
- the Patagonian region (Neuquén, Río Negro, La Pampa, Chubut, Santa Cruz and Tierra del Fuego Provinces): Temperature increase. More frequent intense precipitations; fluvial valley floods. Glacier diminution. Floods. Wood biomass fires. Desertification. Coastal erosion.

On that matrix, the possible climate changes could generate unforeseen impacts or intensify or moderate some of them. According to reports of 2005<sup>91</sup>, two sorts of expected changes in the future climate can be appreciated. On one hand, forecasts anticipate slow, gradual changes, temperature increase; increase or diminution in precipitations, and sea level rise. On the other hand, an increase in the frequency of occurrence and in the intensity of severe or extreme climatic events is expected.

For preparing climate change scenarios for Argentina, the Global Model HadCM3 (UK) on IPCC scenarios has been utilized. So far, the subjects of discussion were related to scenarios named A2 and B2. The results show a trend of increase of precipitation in most of the central-northern region, Uruguay, South of Brazil and the southern extreme of Argentina. This increase is larger for scenario A2 than for B2. A remarkable trend to decrease of precipitation is also observed for the central region of Chile, and the Argentinean Region of Cuyo, Province of Neuquén and the western part of Río Negro and Chubut. These scenarios indicate a continuity of the climatic trends observed during the last decades.

Differences for surface temperature were simulated for three future decades, 2020, 2050 and 2080, considering 1961-1990 as reference period. The expected increase for temperature is larger in lower latitudes and tends to decrease towards upper latitudes. The expected ranks of temperature increase are between 2.4 and 5° C for 2080, according to scenario A2, and between 1.6 and 3.6° C according to scenario B2<sup>92</sup>.

The country is inserted in the La Plata Basin, South American region that has had the greatest positive tendency in precipitations of the planet during the twentieth century. All sorts of floods have also become more frequent since then. More than 80% of the biggest floods in the Paraná and Paraguay rivers have been registered in the past 30 years. One of the causes of the increasing vulnerability to floods in the riverside zones is the amplified hydrological response of the region's rivers along with the increase in precipitations.

The magnitude of the change observed in precipitations and flows during the last decades, as well as the benefits and damages that have been associated to these changes, have been important. The flows increase of up to 30% since 1970 implies that with the same installed capacity, the hydro-energetic system has been producing more energy than the one initially expected. The possible relation of these tendencies to Climate Change would allow drawing conclusions about the time scale in which the new conditions will last, and about the sign of the possible future tendencies. The studies of the National Communications (1998 and 2005) showed that, a) in the oases dependent on snow melting, the driest conditions of the High Andes could diminish the available water, and b) in the coast of the La Plata River, an increase in the already existing floodings may occur.

#### a) Snow Melting Oases

In the oases case the provinces which can be affected are located in the Cuyo Region (with 7.36% of the country's inhabitants) and the Patagonian Regions (with 5.62% respectively). These Provinces, with an important area of arid and semiarid lands, would be very affected by climatic change.

For example, the variation of the Summer mean temperature in the Province of Mendoza would increase

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<sup>91</sup> Second National Communication on Climate Change, 1° Report on System and Power Infrastructure Vulnerability. 2005.

<sup>92</sup> Barros, V. et al , 2005. Cambio Climático en el Río de La Plata

1.5°C every 25 years<sup>93</sup>. In this Province, an accelerated retrocession of the Andean glaciers is expected in a term close to 40 years, with the consequent high hydrological risk.

On the other hands, studies carried out by the *Research Centre on Water and Atmosphere*<sup>94</sup> (CIMA) for the 2<sup>nd</sup> National Communication (2005) show the following percentual variations that might have the discharges of Patagonian rivers for 2080, on the basis of the average results of the climatic change scenarios A and B (precipitations): - 46,66% for the Colorado River; - 25,88% for the Negro River; - 21,04% for the Senguerr River and +12,50% for the Gallegos River. Thus, reductions of the discharges of about 1918, 6908 and 322 hm<sup>3</sup> are observed for the Colorado, Negro and Senguerr rivers respectively. On the contrary, for the Gallegos River an increase of 135hm<sup>3</sup> in its discharges would be expected. Summarising, the discharge variations expected for the Patagonian rivers between 2005 and 2080 for average values of the assumed scenarios show – in general - a reduction. Such reduction decreases from North to South and, at the southern extreme of the region, it turns into a moderate increase.

#### b) The coast of the La Plata River<sup>95</sup>

The La Plata River has an initial width of 50 km, which widens gradually together with an increase of its salinity towards its exterior boundary at the Atlantic Ocean where it becomes 200 km wide. It is characterised by a very low slope (0.01 m/km) which favours a maritime-type dynamics, with tides of astronomic origin or forced by the winds coming from the ocean. The “*sudestadas*” or storms with strong winds from the South-East are a characteristic phenomenon. They push waters towards the interior of the river and cause flooding along the low Argentinean bank. They have durations from a few hours up to 2 or 3 days.

The main changes in the mean river level will be related to: a) a sea level rise of between 1 and 2.6 meters which will cause the increase in the already existing 30 to 50 cm floodings; b) the expected rotation of northwestern winds towards the East (trend observed in the last 30 years), with a magnitude lower than sea level rise - maybe only 5 to 10 cm – which will be added to the extraordinary floods.

## 4.2 Impacts

According to information from the World Bank for 1998, the economic loss due to frequent floods reached up to 1.1% of the Gross National Product, which led Argentina to be considered one of the most affected countries in the world. Another problem originating in both Climate Change and the changes in the use of the land is the increase of erosion with its negative impacts, such as the increment in the sedimentary burden, which is transported by the water systems and interferes with navigation, fills the reservoirs and alters the aquatic biological systems, reducing the primary production.

Here are some examples of what is stated above:

- The meteorological emergency caused by the so called phenomenon of “El Niño” Current, occurred between August 1997 and April 1998, generated serious damages in the Argentinean riverine zone, destroying productive and infrastructural sources in the provinces of Formosa, Chaco, Misiones, Corrientes, Entre Ríos and Santa Fe. The climatic emergency also affected some of the regions of the provinces of Córdoba, La Pampa, Chubut and Santiago del Estero. The floods obliged to the evacuation of more than 150,000 people and the damage was estimated between USD 2 and 2.5 billion.

- The most recent phenomenon in the country, the overflow of the Salado River in Santa Fe in 2003, was unusually dramatic, due to its intensity and surprising outburst, as well as to additional problems, such as, the lack of integrated policies of disaster monitoring, prevention and attention, and the weak public policies of

<sup>93</sup>Grupo II del Panel Intergubernamental sobre Cambio Climático IPCC, 2001

<sup>94</sup>Centro de Investigaciones del Mar y la Atmósfera

<sup>95</sup>On AIACC LA 26 Report. In: [www-atmo.at.fcen.uba.ar/~lcr/libros/Cambio\\_Climatico-Texto.pdf](http://www-atmo.at.fcen.uba.ar/~lcr/libros/Cambio_Climatico-Texto.pdf). 2005

risk management. At the moment of the disaster, 139.886 persons were displaced and 27.928 households were affected. Damages and losses were evaluated in USD 1,024 million, corresponding USD 753 million to the productive sectors (agriculture, livestock, industry and commerce), USD 180 million to infrastructure and USD 91 million to the social sectors<sup>96</sup>.

- As to dam-related floods, it must be pointed out that they are caused by the occupation of the floodable valleys of the rivers with population and very valuable crops. Most of the dams imply a considerable regularization of the rivers, which modifies the flood frequency on the plain. The largest flood plains are the ones of the Paraguay River and the Medium and Low stretches of the Paraná River. Two thirds of the biggest floods of these rivers are related to certain phases of the El Niño period or to some other climatic event identifiable in the waters of the Paraná (at the triple frontier Argentina-Brazil-Paraguay).

- Another different case is the one of the oases in Cuyo, comprised between 29° S and 36° S and affected by dry conditions in the High Andes<sup>97</sup>. However, there have been identified environmental conditions that assure the water supply, simultaneously and congruently considering the tendencies of demography, renewable natural resource and energy production and service supply, for the future populations of the region.

- In Argentina, the primary activities (agriculture, livestock, mining, forestry and fishing) represent more than 80% of the total production. The impacts of these activities have got 60 million hectares currently subjected to moderate to serious erosive processes, with an annual increment of 650,000 ha. In the arid and semi-arid regions of the country there are about 9 million inhabitants that represent 30% of the whole population and whose average per capita incomes are inferior to the national average, whereas the percentage of households with unsatisfied basic needs doubles the national average<sup>98</sup>.

- The arid regions of the country have 10% of the surface water resources (2,600 m<sup>3</sup>/s), that together with groundwater allow the irrigation of more than 1,250,000 hectares in the so called irrigation oases. But deficiencies in the irrigation infrastructure, the inadequate systematization of the land, water mismanagement and deficits in the technical assistance to producers have led to having around 40% of the surface with problems of salinisation and freatic layer shrinking<sup>99</sup>.

During the agricultural campaign 2005-2006, in the Humid Pampean region, important losses in several cereal crops have been recorded due to drought conditions resulting from the lack of rainfall during a considerable period. Lack of moisture led the farmers to reduce seeding of wheat in one million hectares (ha). On the other hand, of the 5.1 million ha cultivated, other 300,000 ha were lost because of drought, and the respective yields were less than those of the previous campaign (2.500 kg/ha versus 2.630 kg/ha). All that resulted in a reduction of 25% of the total product (12 million tonnes versus 16 million tonnes produced in 2004-2005).

As an hypothesis developed on the basis of recent past cases, the drought could also reduce the soybean production of the country in about 10 to 15%, which would lead to economic losses of around USD 150 to 200 million<sup>100</sup>.

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<sup>96</sup>CEPAL, 2003. Evaluación del impacto de las inundaciones y el desbordamiento del río Salado en la provincia de Santa Fe, República de Argentina en 2003, restricted distribution, 89 p., Buenos Aires. A summary of this document can be seen in: [www.eird.org/esp/revista/No7\\_2003/art6.htm](http://www.eird.org/esp/revista/No7_2003/art6.htm)

<sup>97</sup>Project ARG/95/G/31-PNUD-SECYT, Buenos Aires, 1997: "Vulnerability of the Cuyonean oases comprised between 29° S and 36° S, due to drier conditions in the High Andes".

<sup>98</sup>PAN – Programa de Acción Nacional de Lucha contra la Desertificación (Programme of National Action to Combat Desertification). [http://www2.medioambiente.gov.ar/suelo/programas/pan/srnyds\\_bid/default.htm](http://www2.medioambiente.gov.ar/suelo/programas/pan/srnyds_bid/default.htm).

<sup>99</sup>Tomasini, D., in [http://www.agro.uba.ar/apuntes/no\\_3/desierto.htm](http://www.agro.uba.ar/apuntes/no_3/desierto.htm)

<sup>100</sup>Jiménez, J.C. and M. Asad, 1999. Anexo B: Manejo de los recursos hídricos en Argentina. Aspectos económicos y financieros. Document prepared for the World Bank

([http://lnweb18.worldbank.org/ESSD/ardext.nsf/18ByDocName/ArgentinaWaterResourcesManagementPolicyIssueNotesThematicAnnexesFeb252000-Spanish/\\$FILE/ArgentinaWRMPolicyIssuesNotesThematicAnnexesSpanish.pdf](http://lnweb18.worldbank.org/ESSD/ardext.nsf/18ByDocName/ArgentinaWaterResourcesManagementPolicyIssueNotesThematicAnnexesFeb252000-Spanish/$FILE/ArgentinaWRMPolicyIssuesNotesThematicAnnexesSpanish.pdf).)

However, maize was the most affected crop. Seeding was reduced in 400,000 ha with respect to the previous period and drought caused yields to fall between 30 to 80%, according to the region considered<sup>101</sup>.

Some other sources, such associations of producers and private consulting groups have estimated that losses for the country can reach USD 1,000 to USD 2,000 million in export incomes, by considering USD 11,895 million obtained during the previous campaign<sup>102</sup>.

## **5. Water related policy plans and strategies related to the water sector and the process of their development**

### **5.1. Policies, plans and strategies related to the water sector**

Argentina does not have a national plan for water resource management, as it was stated in the institutional section (2.1). Nonetheless, actions have been carried out in this respect. Among them, the project for the Argentina's Water Resource Management Master Plan, from the SSRH, the elaboration of which started in 1994 as an instrument of programming, budget assignment and management control. The first step, between 1994 and 1996, was to carry out a Preliminary Diagnosis of Water Resource Management.

A subsequent task consisted of defining and searching consensus on a set of principles for the management of the whole country's water resources (*Water Policy Leading Principles*<sup>103</sup>), elaborated and debated by all the jurisdictions. The utilized methodology, "from the bottom to the top", got the consensus starting from documents conceived in the provinces. It was based on provincial and regional workshops that convoked members of the provincial water authorities and of other sectors that participate in or are affected by the water resource and environment management. As a result of the mentioned workshops, a preliminary document was submitted at the "First National Meeting on Water Policy", held in December 2002. It was at that meeting that representatives of organisms from the water area of the provinces and of the Nation signed an agreement to create the *Federal Water Council*<sup>104</sup> (COHIFE), which was formally constituted in 2003.

The final document sets out the courses of action integrating the technical, social, economic, legal, institutional and water-environmental aspects of the water resource management in pursuit of a sustainable development. The statement of these political courses of action or guidelines of the integrated water resource management is meant to guide legislators and orient the public administrators.

In September 2003, most jurisdictions signed the *Federal Water Agreement*<sup>105</sup> through which they adopted the Water Policy Leading Principles and agreed to submit them to the Nation's Congress in order to get a set of rules and regulations through a National Framework Law of Water Policy. They also explicitly committed themselves to compatibilise and instrument such principles in the policies, legislations and management of water in their respective jurisdictions.

The agreement of all jurisdictions on those basic guidelines constitutes a fundamental first step for the definition of future strategies and plans at provincial and national levels.

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<sup>101</sup> Bolsa de Cereales, 2006. Perspectiva del clima y los cultivos durante la campaña agrícola 2005/2006., 30 January (<http://www.bolcereales.com.ar>)

<sup>102</sup> Müller, H., 2006. "Bajará la recaudación por retenciones", La Nación, 5 January

<sup>103</sup> Principios Rectores de Política Hídrica

<sup>104</sup> Consejo Hídrico Federal

<sup>105</sup> Acuerdo Federal del Agua

The Decree N° 1381 of 2001 established the so-called “Water Infrastructure Tax”- as a percentage of the price of gasoline - in the whole National Territory, in order to promote the development of water work infrastructure projects.

The purpose of the latter is the recovery of the productive lands, flood mitigation in rural zones, and drainage and protection of the road and railway infrastructure in rural and peri-urban zones, starting with the regions under water emergency at that time. The application of this Decree allowed the establishment of the *Federal Plan for Flood Control (PFCI)*<sup>106</sup>, that includes the reactivation of a great number of works and the start of others in various productive zones of several provinces. They are regulation works, urban defences, construction and reaccommodation of canalizations, dredging, bridge extensions, etc.

There are other programmes financed by multilateral credit organisms. The meteorological emergency caused by “El Niño” phenomenon, during August 1997 and April 1998 (see section 4.2) moved the national government to get financial aid from the Inter-American Development Bank, through the Loan Contract N° 1118/OC-AR<sup>107</sup>, to partially subsidise the Emergency Programme for the Recovery of the Zones affected by Floods, carrying out activities of mitigation, reconstruction and rehabilitation of the socioeconomic infrastructure, and the design of prevention activities to reduce the damage of similar phenomena in the future. Out of the USD 300 million of the Loan, 265.4 million were assigned to the Reconstruction Component and 25 million to the Prevention Component. The Local Counterpart was USD 200 million.

In their turn, the Provinces of Buenos Aires, Chaco, Corrientes, Entre Ríos, Formosa, Misiones and Santa Fe, and Buenos Aires City requested, through the Nation, financial aid to the International Bank of Reconstruction and Development (IRDB-BIRF) and to the Japan Export Import (JEXIM), thus formalizing the Loan Contract BIRF/JEXIM 4117-AR<sup>108</sup> to subsidise the *Programme for Protection against Floods (PPI)*<sup>109</sup>. The total sums are: USD 200 million (IRDB), USD 100 million (JEXIM) and USD 100 million (Provincial Counterpart). Another group of provinces, such as Salta, Tucumán, Chaco, Córdoba and Misiones requested, through the Nation, financial aid to IRDB-BIRF, thus formalizing the Loan Contract BIRF 4273-AR<sup>110</sup> to finance the Programme of Protection in case of Flood Emergency “El Niño”. The financing sum is USD 420 million.

Especial Executing Groups were established at national level and in each of the participating provinces, known respectively as Central Sub-Unit of Coordination for Emergency. (SUCCE)<sup>111</sup>. and Provincial Sub-Units of Coordination for Emergency. (SUPCEs)<sup>112</sup>. SUCCE is in charge, among other functions, of monitoring, control and supervision of the project at national level; of supervision of the administrative, accountancy and financial management of the SUPCEs, and of verification of the technical execution of studies and works contracted by the SUPCEs

The programmes consists of structural and non-structural measures. The structural measures contemplate works for the protection of urban areas, productive lands and infrastructure. The non-structural ones comprise activities such as, among others: a) technical assistance for establishing or strengthening of the capacity of each province to face flood problems, b) preparation of plans and regulations for land use in flood-prone zones; c) installation of an early warning system; d) coordination of activities of the warning system and the civil defence; e) preparation of shelters for the probably affected sector of the population; f) organisation of education and public awareness campaigns<sup>113</sup>.

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<sup>106</sup>Plan Federal de Control de Inundaciones ([http://hidricos.obraspublicas.gov.ar/plan\\_federal.htm](http://hidricos.obraspublicas.gov.ar/plan_federal.htm))

<sup>107</sup>[http://ucpfe.minplan.gov.ar/BID1118\\_MARCO\\_GALERIA.htm](http://ucpfe.minplan.gov.ar/BID1118_MARCO_GALERIA.htm)

<sup>108</sup>[http://ucpfe.minplan.gov.ar/PPI\\_MARCO\\_DESCRIPCION.htm](http://ucpfe.minplan.gov.ar/PPI_MARCO_DESCRIPCION.htm)

<sup>109</sup>Programa de Protección contra Inundaciones

<sup>110</sup>[http://ucpfe.minplan.gov.ar/ELNI%D1O\\_MARCO\\_DESCRIPCION.htm](http://ucpfe.minplan.gov.ar/ELNI%D1O_MARCO_DESCRIPCION.htm)

<sup>111</sup>Subunidad Central de Coordinación para la Emergencia

<sup>112</sup>Subunidades Provinciales de Coordinación para la Emergencia

<sup>113</sup>[http://www.corrientes.gov.ar/hacienda/entes-ministro/supce/web/supce\\_archivos/frame.htm#slide0074.htm](http://www.corrientes.gov.ar/hacienda/entes-ministro/supce/web/supce_archivos/frame.htm#slide0074.htm)

## 5.2. Policies, plans and strategies related to the Climate Change sector

On the ground of the commitments established on approving the Kyoto Protocol (Law 25438) and its subsequent ratification in 2005, the Argentinean government has been complying with providing annual information about the socially produced emissions and the emission and absorption sources of greenhouse gases not controlled by the Montreal Protocol. On this lane, it has committed to reducing the total emission of these gases to a value inferior in not less than 5% to that of 1990, during the commitment period comprised between 2008 and 2012.

The National Executive Power has decided to deepen the impulse and diffusion of clean development mechanisms (CDM). Therefore, it formally promotes the development of projects on climate change and clean technology transfer. Hereby they are mentioned only some of the projects that may be considered to be the result of the political reading of the evaluations and recommendations of the national communications system.

The *Argentinean Carbon Fund* (FAC)<sup>114</sup> was created (National Decree 1070/05), following the international recommendations and in relation to the purpose of maximizing Argentina's participation in the international carbon market through the development of CDM projects.

During the year 2005 several legislative projects were submitted, revealing the growing interest of the decision-makers in the use of renewable energy sources. For example:

- The 2005 Law Project "Regime for the National Promotion of the Use of Renewable Sources of Energy destined for Electric Energy Production", approved by the Nation's Senate. This project takes into account several aspects missing from the above mentioned Law 25019, particularly because it covers all sources of energy (aeolian, solar, geothermic, tidal and hydraulic – up to 15 MW installed capacity – biomass, landfill gases, treatment plant gases and biogas), although it is oriented only to electricity generation and does not cover the thermic installations of the *New and Renewable Energy Sources* (FNRE)<sup>115</sup>.
- The Santa Fe Law Project that declares of "provincial interest" the generation and use of alternative energies.
- The 2005 Ordinance Project of Rosario to regulate the obligatory incorporation of low temperature solar energy systems for production of sanitary hot water.

As to the private sector, the *Argentinean Institute for Standardisation and Certification*<sup>116</sup> (IRAM) has elaborated a series of rules and regulations for equipments using solar energy by means of photovoltaic and photothermic conversion and a set of regulations and testing methods for biodiesel.

Among the mitigation measures taken, there is the response of the oil companies, which invested in technology for the refining plants, that optimized the processing of their products: production of higher-octane gasoline and less-sulphured diesel oil. Nevertheless, these measures do not respond to a national plan, as there is no regulation for the efforts to adopt technological innovations for vehicles, such as the incorporation of catalytic converters to the engine exhaust, and those which imply the replacement of the most polluting sources by Compressed Natural Gas.

Between 1998 and 2005, a series of rules and regulations were promulgated to control the electric sector at national level, such as the Law N° 25019/1998, the Decree N° 1597/1999, and the National Regime for

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<sup>114</sup>Fondo Argentino de Carbono

<sup>115</sup>Fuentes Nuevas y Renovables de Energía

<sup>116</sup>Instituto Argentino de Normalización y Certificación

Aeolian and Solar Energy (which establishes a system of promotion of the research and use of non conventional and renewable energies, tax benefits applicable to capital investments destined to the installation of aeolian or solar power plants or equipments, as well as the remuneration to be paid for each KWh effectively generated by installed aeolian systems that supply their energy to wholesaling markets and/or to public service).

As regards projects related to renewable sources or sources tending to reduce the GHG emissions which have been submitted to the Argentine Office for Clean Development Mechanisms, there are 36 private projects for renewable resource power production (biofuel, biomass kettles, hydroelectric stations, aeolian power, aeolian turbines, mixed aeolian-hydroelectric generation) that, in case they get started and monitored, could reach a reduction of the GHG of about 7,915,297 tonnes of CO<sub>2</sub> per year, and would mean an investment of about USD 426,600.

As to future scenarios for electric energy total demand, it is estimated for 2005-2020 a medium growth rate of 5.2%, slightly inferior to that of the last 14 years, despite the crisis experienced between 2000 and 2001.

The strategic planning for hydroelectricity development envisages projects such as the elevation of the reservoir operating level in Yacyretá (8,000 GWh) and the future development of the projects: Garabí (5,000 GWh), San Javier (5,000 GWh) and Roncador (4,800 GWh) on the Uruguay river and Corpus Christi (19,000 GWh) on the Paraná river.

At international level, Argentina is participating – in a joint effort with the other countries which integrate the CIC – in the development of a project, financed by the Global Environment Facility (GEF), called “A Framework for the Sustainable Management of the Water Resources of the La Plata Basin, with respect to the Hydrological Effects of Climatic Variability and Change” which has, among other specific objectives, to advance the practice of integrated water resources management and adaptation to climatic change, by increasing the knowledge and decision-making capacity of the country-based institutions and technicians responsible for the scientific analysis and prediction of climatic change phenomena and their social, economic and environmental impacts<sup>117</sup>.

## **6. Preparedness to extreme weather events (and future climate change) (national, regional or local measures, warning systems, information, emergency plans, etc.)**

To date, and given the novelty of the problem, there are no specific and concrete preparation measures, in the institutional area related to Climate Change, to face current or future extreme events. This can be observed in the national scope by analysing the objectives of the "National Strategy for Climate Change Mitigation": contributing to design and consolidate, in the short, medium and long term, a set of norms, policies and programs for energy, industry, natural resources, agriculture, farming, transportation and urban development matters, that involve the whole society, so that they allow to control and reduce the GHG emission growth rates without putting at risk the economic growth nor the wealth redistribution<sup>118</sup>.

However, in the water resource spheres related to disaster attention the country has got a long tradition that, with its ups and downs, is still valid. The country's institutions for the attention to extreme events related to water phenomena have, in this respect, a great potential to incorporate preparation, mitigation and adaptation measures to face possible climate change impacts. In particular, the Information and Hydrological Warning

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<sup>117</sup> United Nations Environment Programme (UNEP), Global Environment Facility (GEF). 2003. Concept Document for Sustainable Water Resources Management in the La Plata River Basin, prepared by the Intergovernmental Coordinating Committee of La Plata River Basin Countries (CIC) and the General Secretariat of the Organization of American States (GS/OAS)

<sup>118</sup>[www2.medioambiente.gov.ar/cambio\\_climatico/enmcc/elaboracion.htm](http://www2.medioambiente.gov.ar/cambio_climatico/enmcc/elaboracion.htm)

System of the La Plata Basin in Argentina, the use of satellite images to anticipate extreme events and the contingency plans are especially relevant.

### **6.1. Information and Hydrological Warning System of the La Plata Basin in Argentina.**

During the floods of 1982 and 1983, extraordinary in magnitude and duration, a Hydrological Warning Operative Centre (COAH) was established, the development and operation of which were assigned to the former National Institute of Water Science and Technology (INCYTH), nowadays the National Water Institute (INA). It is important to point out that Argentina, as a downstream country, is affected by the hydrometeorological events that occur in Brazil, Paraguay and the south-east of Bolivia.

This System's responsibility is to transmit information about the situation of the rivers of the Basin and to warn, as early as possible, the national and provincial organisms in charge of water emergency control, of navigation, and of the population and environment protection, about the occurrence of situations of strong floods or low flows, making thus possible the response of the organisms in charge of Civil Defence, among others.

Among its main functions, the Warning System must coordinate the information received from the following organisms:

- Joint Technical Commission of Salto Grande (CTM), binational institution of Argentina and Uruguay for the management of the hydroelectric power station Salto Grande, operator of 139 hydrometric conventional stations and 42 telemetric stations in the river basin.
- Yacretá Binational Entity, a hydroelectric power station jointly operated by Argentina and Paraguay, which has a telemetric hydro-meteorological network of 25 stations that transmit hydrometric and rainfall data and wind parameters.
- National Meteorological Service (SMN), in charge of the observations and evaluation of the meteorological situation, with its own operative network of 114 weather stations, getting also GOES 12 geo-stationary meteorological satellite images and operating the ETA model (version 2000).
- Argentinean Naval Prefecture, daily observations (two readings) of 75 hydrometric stations, of the National Directorate of Navigable Ways<sup>119</sup> (DNVN).
- National System for Water Information of the Undersecretariat of Water Resources (SSRH), which covers the Argentine fraction of the La Plata Basin with a hydrologic network. The System elaborates and publishes the Annual Hydrologic Statistics<sup>120</sup>.
- National Directorate of Navigable Ways, which has a 24-station network operated by the concessionary company responsible for the dredging, signalling and maintenance of the main navigable route, Santa Fe - Atlantic Ocean.
- National Institute of Agricultural Technology (INTA), with its own network of agro-meteorological stations.
- National Commission for Space Activities (CONAE)(see also 6.2).
- Regional Commission of the Bermejo River (COREBE)<sup>121</sup>, interjurisdictional organism of six Argentinean provinces and the Nation, which has got a Hydrologic Information System (SIH) of the Bermejo Basin, with 12 hydrometric stations installed on the Bermejo, Iruya, Pescado and San Francisco rivers, and a water gauging station on the Tarija Upper River. The information is daily updated on the Internet ([www.corebe.org.ar](http://www.corebe.org.ar)).
- Provincial Organisms with diverse measurement networks (especially rain gauges) with different degrees of development.

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<sup>119</sup>Dirección Nacional de Vías Navegables

<sup>120</sup><http://www.obraspublicas.gov.ar/hidricos/>

<sup>121</sup>Comisión Regional del Río Bermejo

So far the System has been gradually improving its data base and has developed and implemented hydrologic and hydrodynamic forecast methods and models since 1988.

A pending objective is to improve the data acquisition system through the installation of telemetric stations on the Argentinean territory; particularly, to increase the number of hydrometric and rain gauge stations, and to improve the communication system so that the data can be transmitted at an adequate rate.

In addition, for twelve years the Andean Regional Centre of the INA has been operating a Hydrologic Warning System to prevent floods in the area of Great Mendoza; and the Semi-Arid Region Centre provides hydrologic warning service to the cities of Villa Carlos Paz, Mina Clavero, Cura Brochero and other numerous localities of the Punilla Valley, in the Province of Cordoba<sup>122</sup>.

## 6.2 Detection of hydro-climatic extreme events

The Cycle of Space Information for Emergency Management - identified by the National Space Plan as one of the priority areas for application of space information - is in charge of the surveillance and follow-up of natural or anthropogenic emergencies and disasters.

The National Commission for Space Activities (CONAE) is part of the Federal Emergency System (SIFEM). Specifically, within the latter, it participated in the implementation of the Information and Warning System for the whole country and collaborates in associated pilot projects. The CONAE provides the official institutions involved in emergency attention with the space information captured by its terrestrial stations, for free.

Space technology plays an important role in supplying information which, combined with other relevant geo-referred data, allows to get risk maps and to identify areas under disaster<sup>123</sup>.

## 6.3 Contingency plans

The Argentinean institutions directly responsible of contingency attention (see section 2: DNPC and SIFEM) so far do not have contingency plans for specific hazards.

In the framework of the La Plata Basin Treaty, Argentina has a Cooperation Treaty with Uruguay (1987), to prevent and combat the aquatic contamination incidents caused by hydrocarbons and harmful substances.

As to multilateral instances, the most developed and pertinent in terms of contingency matters is the Environment Sub-Group N° 6 of the *Southern Cone Common Market* - MERCOSUR<sup>124</sup>, created in 1995 (Taranco Declaration). In the MERCOSUR Framework Agreement on Environment, signed in 2001, one of the actions the Member States committed to is "... to provide timely information on environment disasters and emergencies that may affect the other Member States, and, when possible, technical and operative support" (Section 6k). Since then the subject was a permanent debate issue up to the newer additional Protocol on cooperation and assistance in case of Environment Emergencies. This Protocol was approved (Decision N° 14/04), it has an indefinite duration and will come into force 30 days after the fourth ratification instrument that must be created by the member states (Section 11). Specifically, this Decision has an Annex, a form denominated "Environment Emergency Notice/Request for International Assistance", which includes accidents or contingencies related to hydro-climatic extreme events.

For dams safety, ORSEP (see section 2), has been fostering the preparation of contingency plans for dams under concession.

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<sup>122</sup><http://www.ina.gov.ar/>

<sup>123</sup> [www.conae.gov.ar/emergencias/emergencias.html](http://www.conae.gov.ar/emergencias/emergencias.html)

<sup>124</sup> Mercado Común del Cono Sur, integrated by Argentina, Brazil, Paraguay and Uruguay

And , at provincial level, there are examples related with preventive aspects, as in the case of Resistencia city in the Province of Chaco, where the government has prepared an evacuation plan facing Paraná river floods<sup>125</sup>.

## **7. Possible new (short-term and long-term) measures that can be taken to improve adaptive capacity to climate change**

Risk reduction and other adaptive capacity to climate change (CC) strategies need to be multisectoral and interdisciplinary in nature and comprise a wide range of interrelated activities at the local, provincial, national, regional and international levels. They involve the adoption of suitable regulatory and other legal measures, institutional reform, improved analytical and methodological capabilities, appropriate technologies, capacity building, financial planning, public education, community involvement and awareness.

Risk reduction and management policies should take highest priority in development plans at all levels. Authorities need to ensure an institutionalized dialogue mechanism and adopt an integrated, comprehensive and multihazard strategy for risk reduction, including the whole cycle of disaster management (prevention, preparedness, mitigation, response, recovery and rehabilitation). This can more appropriately be provided by taking into consideration socioeconomic and cultural factors and actively involving the civil society, from the international to the local level.

Effective institutional strengthening should involve elements such as: a) appropriate legal frameworks that address integrated flood and drought management approaches based on risk management strategies with due consideration to the development processes; b) informed decision-making based on sound scientific knowledge, as well as local knowledge; c) an information base that supports planning and a proactive response to disaster mitigation and reduction; d) a participatory and transparent approach that includes a representative range of stakeholders in the decision-making process; e) regional and subregional approaches, strategies and cooperation arrangements where rivers span two or more national or provincial boundaries for a harmonized approach; f) partnerships among different levels of government, civil society, private sector groups and communities; g) decentralized decision-making through provincial and local authorities and basin committees, including the provision of adequate resources and clarifying the division of responsibilities at various levels; h) effective policies to regulate further growth of human settlements in risky areas including appropriate economic policies, such as fiscal incentives for orientation of economic activities away from disaster-prone areas; i) shifting from top-down, predominantly engineering approaches for flood or drought management to a more integrated and proactive approach<sup>126</sup>.

International projects can help by enumerating alternatives, but the country itself needs to establish and implement the necessary policies and to develop its own expertise in the scientific and engineering challenges to be faced, as well as a body of dedicated individuals who are able to interpret the complex issues concerned for those required to make policy decisions. Such specialized personnel need to be trained, hired and retained in service, so that they may serve their country in these tasks<sup>127</sup>.

Risk and vulnerability assessments, involving all sections of society, are a prerequisite to identifying the areas at greatest risk and the most appropriate risk management measures for a given region or community. Risk

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<sup>125</sup><http://www.chaco.gov.ar/emergencia/PlanEvacuacion1.html>

<sup>126</sup> Adapted from UN-WATER. Water Hazard Risks, A Priority for Integrated Water Resource Management, Document developed in support of the World Conference on Disaster Reduction (WCDR), 18–22 January 2005, and the Envisaged Programme Outcome Document tentatively entitled Building the Resilience of Nations and Communities to Disasters: Elements for a Programme of Action 2005–2015.

<sup>127</sup> UN Conference on Environment and Development (Rio de Janeiro, 1992). Agenda 21, Chapter 18. Protection of the quality and supply of freshwater resources: application of integrated approaches to the development, management and use of water resources. [www.un.org/esa/sustdev/documents/agenda21/english/agenda21chapter18.htm](http://www.un.org/esa/sustdev/documents/agenda21/english/agenda21chapter18.htm)

maps should be used to notify all development authorities of areas exposed to hazards. It is vital to understand the interplay between hazards, the development process and poverty in order to ascertain how current and future development planning and implementation can increase vulnerability and risk. Continued collaboration between climate scientists and water managers is crucial to make available the best prediction and forecasting tools to water managers<sup>128</sup>.

Particularly, in order to improve the institutional management capacities at national and provincial levels it would be necessary: a) to establish a Risk Management Unit at national level – on the basis of an improved SIFEM (see 2.3) - with a supra-sectoral character and the highest possible institutional hierarchy in order to articulate the capacities of all the pertinent public and private organizations and of the representatives of the civil society, b) to define the risk management cycles for each of the types of potential disasters, identifying its specific characteristics, its probability of occurrence in the different zones of the country and the forecasted evaluated impacts; c) to disseminate the available knowledge on local hazards, risks and vulnerabilities resulting from CC impacts, as a basis for decision-making (risk management). Relevant information comprises basic meteorological and hydrological data (collected for some of the institutions mentioned in 2.3: SSRH, SMN, SHN, CONAE, INTA) ; forecasts and predictions for short, medium and long terms (prepared by SMN, INA, SHN, INTA), risk maps for different probabilities of occurrence of determined phenomena (elaborated by national institutions, such as INA, CONAE and INTA, and provincial water management organisations), etc. The information should be provided – through pertinent communication media (internet, radio, TV, telephone, fax, publications, etc., according to circumstances and availability) - to public and private organisations involved in the different phases of the cycle of disaster management - from prevention to rehabilitation- such as those numerated in 2.3 at national level and their similar at provincial or local level; d) to establish – through participatory mechanisms – coordination systems and responsibility circuits as a function of each phase of the cycle for disaster management; e) to elaborate – from a participatory diagnosis – procedures and requirements in order to assist in the preparation of local contingency plans and establish methodologies and distribution of responsibilities for local risk management.

In order to reduce the social vulnerability to disasters it would be convenient to perform the following tasks: a) to survey, organise and evaluate sectoral information related to social vulnerability (health, housing, jobs, food, transport, access to land property, access to credit, training, education, etc.) with especial reference to minorities (ethnic, age, gender) and for rural and urban environments, in order to create a national system for diagnosis of sectoral social vulnerabilities from hazards related to CC; b) to develop widely comprehensive social networks for local management of vulnerability reduction, for fostering individual, communitarian and institutional responsibilities, including education campaigns in primary and high schools all over the country.

In order to know the scope of specific hazards already affecting the national territory and that may increase due to CC impact, it would be advisable to identify, survey and systematize information on those hazards (floods, drought, storms, snow and glacier melting, warmth sudden increase in urban areas), to be incorporated to the diagnosis, at national and provincial level.

In order to evaluate and manage the main risks in the country, it would be necessary to develop a Federal Program for Catastrophe Prevention and Risk Management in order to provide instruments for strategic follow-up to the proposed Risk Management Unit, on the basis of the knowledge of hazards and vulnerabilities, and including prevention, mitigation and adaptation strategies.

## **8. Recommendations (Development of administrative capacity (institutional and legal), mechanisms (risk management, information, inter-agency cooperation, stakeholder process, etc.)**

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<sup>128</sup>Adapted from International Strategy for Disaster Reduction (UN-ISDR), [www.unisdr.org/](http://www.unisdr.org/)

In order to mitigate the effects of floods or drought, all components of the cycle of disaster management - rather than just the crisis management focus still prevalent throughout the world – should be taken into account.

Flood and drought preparedness holds the potential to bring together vital elements of management: a) co-ordination of government actions at national level – through an improved SIFEM (see 2.3) or similar institution or co-ordinating leading organisation – and at provincial and local levels, with the technical and financial support of the Nation; b) co-ordination between various agencies; c) understanding of vulnerable sectors; d) flow of information (see 7) within and between governments, coming from their respective specialised institutions; e) co-ordination of requests for assistance; f) efficiency of allocation of natural, financial and human resources on the basis of a thorough analysis of regional and local vulnerabilities and respective response capacities.

Local hydrological and meteorological data are the basis for risk assessment, effective building standards, planning controls and other regulations that enable houses and other infrastructure to meet adequate safety criteria for the users and the occupants. Such planning initiatives should ensure the continuity of economic activities. Data and information need to be government-funded and made available as a public good. The extent to which a hazard becomes a disastrous event has much to do with the planning, early warning and protective measures taken. An efficient warning system should deliver accurate information on likely events in a timely manner. It requires a rapid, dependable and people-centred distribution system for forecasts, advisories and warnings to all interested parties, and a prompt and effective response to warnings from both the government and public. The existing meteorological and hydrological warning systems operated mainly and respectively by the SMN and the SHN, and the INA - besides other institutions with a more localised scope - have been providing very valuable forecasts for many years, without interruption. The main problem they have to face is the not always sufficient availability of basic information due to reduced and sometimes diminishing number of gauging stations. In that regard, a special effort should be made to maintain and widen the existing networks, covering especially large areas without enough or any instruments.

The following activities are recommended : a) to develop, update periodically and widely disseminate risk maps, the results of indicators of disaster risk and vulnerability and related information (at different scales) for decision-makers, the general public and communities at risk; As mentioned in 7, these tasks can be carried out by national institutions, such as INA, CONAE and INTA, and provincial water management organisations, together with the support of other agencies devoted to the collection and processing of economic and social data, as the INDEC, *National Institute for Statistics and Censuses*<sup>129</sup> ; b) to improve the existing, and to establish and periodically review and maintain information systems as a part of early warning systems with a view to ensuring that rapid and coordinated action is taken in cases of alert/emergency; e) to improve institutional capacities to ensure that early warning systems are well integrated into governmental policy and decision-making processes and emergency management systems at the national, provincial and local levels.

In order to improve capacities, it is recommended: a) to support the development and sustainability of the infrastructure and the scientific, technical and institutional capacities needed to research, observe, analyse, map and forecast natural and related hazards, vulnerabilities and disaster impacts; b) to support the development and improvement of relevant databases and the promotion of full and open exchange and dissemination of data for assessment, monitoring and early warning purposes, at international, national and provincial levels; c) to support the improvement of scientific and technical methods and capacities for risk assessment, monitoring and early warning, through research, partnerships, training and technical capacity building; d) to promote the application – through Case Studies - of in situ and space-based earth observations, space technologies, remote sensing, geographic information systems, hazard modelling and prediction, weather and climate modelling and forecasting, communication tools as well as studies on costs and benefits

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<sup>129</sup>Instituto Nacional de Estadística y Censos

of risk assessment and early warning; e) to establish and strengthen the capacity to record, analyze, summarise, disseminate, and exchange statistical information and data on hazards mapping, disaster risks, impacts, and losses; f) to support the development of common methodologies for risk assessment and monitoring.

As regards international emerging risks – situation of particular interest for Argentina, downstream country in most of its rivers shared with its neighbouring countries - it would be necessary: a) to cooperate internationally to assess and monitor transboundary hazards, and exchange information and provide early warnings through appropriate arrangements, such as, inter alia, those relating to the management of river basins; b) to research, analyse and report on long-term changes and emerging issues that might increase vulnerabilities and risks; c) to improve the capacity of authorities and communities to respond to disasters.

Disasters can be substantially reduced if people are well informed and motivated towards a culture of disaster prevention and resilience, which in turn requires the collection, compilation and dissemination of relevant knowledge and information on hazards, vulnerabilities and capacities. Key activities would comprise:

Information management and exchange: a) to provide easily understandable information on forecasts, disaster risks and protection options to citizens in high-risk areas, in order to encourage them to take action to reduce risks and build resilience. The information should be elaborated based on Case Studies in different regions, which incorporate traditional and indigenous cultural knowledge and behavior; b) to strengthen networks among disaster experts, managers and planners across sectors and between world regions, and create or strengthen procedures for using available expertise when agencies and other important actors develop local risk reduction plans; c) to promote and improve dialogue and cooperation among scientific communities and practitioners working on disaster risk reduction, and encourage partnerships among stakeholders, including those working on the socio-economic dimensions of disaster risk reduction; d) to promote the availability, use and application affordability of recent information, communication and space-based technologies and related services, as well as earth observations, to support disaster risk reduction, particularly for training and for the sharing and dissemination of information among different categories of users; e) to establish that institutions dealing with urban development provide information to the public on disaster reduction options prior to constructions, land purchase or land sale.

Warning systems to forecast drought will make possible the implementation of drought-preparedness schemes. Integrated packages at the farm and watershed level, such as alternative cropping strategies, soil and water conservation and promotion of water harvesting techniques, could enhance the capacity of land to cope with drought and provide basic necessities, thereby minimizing the need for emergency drought relief. At the same time, contingency arrangements for relief are needed for periods of acute scarcity<sup>130</sup>.

Governments, at the appropriate level, with the support of the relevant international organisations, should strengthen regional and national warning systems, with particular emphasis on the area of risk-mapping, remote-sensing, agrometeorological modelling, integrated multidisciplinary crop-forecasting techniques and computerized food supply/demand analysis .

With respect to assessment and research, it would be advisable: a) to develop improved methods for predictive multi-risk assessments and socioeconomic cost–benefit analysis of risk reduction actions at all levels, and incorporate these methods into decision-making processes at international, national and provincial levels; b) to strengthen the technical and scientific capacity to develop and apply methodologies, studies and models to assess vulnerabilities to and the impact of climate and water-related hazards, including the improvement of monitoring capacities.

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<sup>130</sup>UN Conference on Environment and Development (Rio de Janeiro, 1992). Agenda 21, Chapter 12. Managing fragile ecosystems: combating desertification and drought, <http://www.un.org/esa/sustdev/documents/agenda21/english/agenda21chapter12.htm>

As regards environmental and natural resource management, key activities would include: a) to encourage the sustainable use and management of ecosystems, through better land-use planning and development activities to reduce risk and vulnerabilities; b) to implement integrated environmental and natural resource management approaches that incorporate disaster risk reduction, including structural and non-structural measures, such as integrated flood management and appropriate management of fragile ecosystems; c) to promote the integration of risk reduction associated with existing climate variability and future climate change into strategies for the reduction of disaster risk and adaptation to climate change, which would include the clear identification of climate related disaster risks, the design of specific risk reduction measures and an improved and routine use of climate risk information by planners, engineers and other decision-makers.

Land-use planning and other technical measures comprise, among others, the following aspects:

a) incorporation of disaster risk assessments into the urban planning and management of disaster-prone human settlements, in particular highly populated areas and quickly urbanizing settlements; b) incorporation of disaster risk assessment into rural development planning and management, in particular with regard to mountain and coastal flood plain areas, including the identification of land zones that are available and safe for human settlement; c) in close collaboration with existing networks and platforms, cooperation to support globally consistent data collection and forecasting on natural hazards, vulnerabilities and risks and disaster impacts at all scales.

And, in order to foster public awareness, it would be necessary to promote the engagement of the media in order to stimulate a culture of disaster resilience and strong community involvement in sustained public education campaigns and public consultations at all levels of society.

23 March 2006