CONTRIBUTION TO THE POLICY DIALOGUE ON WATER IN RUSSIA

IMPROVING THE USE OF ECONOMIC INSTRUMENTS FOR WATER MANAGEMENT IN THE REPUBLIC OF BURYATIA (LAKE BAIKAL BASIN)

INTERIM REPORT 2

ASSESSING AND EVALUATING OPPORTUNITIES FOR (POTENTIALLY) MORE EFFICIENT ALTERNATIVES

Commissioned by the OECD with the financial assistance of the European Union (support to the implementation of the EUWI EECCA component)

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The views presented in this Report are those of the authors and can in no way be taken to reflect the official opinion of the Government of Russia, the Government of the Republic of Buryatia, the European Union, the OECD or its member countries.
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List of Acronyms and Terms

**Acronyms:**

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<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>BNA</td>
<td>Baikal Natural Area</td>
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<tr>
<td>BOD</td>
<td>Biochemical Oxygen Demand</td>
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<tr>
<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation, and Liability Act</td>
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<td>DP</td>
<td>Diffuse Pollution</td>
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<tr>
<td>EAP Task Force</td>
<td>Task Force for the implementation of the Environmental Action Programme</td>
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<tr>
<td>EECCA</td>
<td>Eastern Europe, Caucasus and Central Asia</td>
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<tr>
<td>EHS</td>
<td>Environmentally-Harmful Subsidy</td>
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<tr>
<td>EUWI</td>
<td>The European Union Water Initiative</td>
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<tr>
<td>HTS</td>
<td>Hydro-technical structures</td>
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<tr>
<td>kg.</td>
<td>Kilogram</td>
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<tr>
<td>OECD</td>
<td>Organization for Economic Cooperation and Development</td>
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<tr>
<td>PROPER</td>
<td>Program for Pollution Control, Evaluation, and Rating</td>
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<td>RB</td>
<td>Republic of Buryatia</td>
</tr>
<tr>
<td>RF</td>
<td>Russian Federation</td>
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<tr>
<td>RCE</td>
<td>Recoverable Charges for emissions</td>
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<tr>
<td>SRF</td>
<td>State Revolving Funds</td>
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<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
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<td>UNDP</td>
<td>United Nations Development Programme</td>
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<tr>
<td>US EPA</td>
<td>US Agency for Environmental Protection</td>
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<td>WFD</td>
<td>Water Framework Directive</td>
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<td>WRM</td>
<td>Water resources management</td>
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<td>WSS</td>
<td>Water supply and sanitation</td>
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**Key terms used in the report:**

- **Water resources** – freshwater, brackish water and saltwater found in surface and underground water objects that is used or may be used;
- **Water object (water body)** – a natural or artificial water reservoir, waterway or other object, permanent or temporary mass of water characterized by temporal changes in the water table level, consumption and volume of water;
- **Water infrastructure** – a set of infrastructure facilities related to the use of water objects and/or prevention and elimination of the negative impact of water-related hazards, including hydro-technical structures, water supply and sanitation (WSS) systems, water treatment facilities, collection and removal of storm waters infrastructure, irrigation systems, buildings and structures used for monitoring and studying water objects;
- **Water sector** – a set of water infrastructure institutions and types of activity related to the use, research and protection of water objects, as well as prevention and elimination of the negative impact of water-related hazards.
Executive summary

The present report contains the results of a review of international practices of application of instruments for water resources management (WRM) and the assessment of a potential for using more efficient instruments in the Republic of Buryatia (RB), taking into account natural and institutional specificities of the region and Russia as a whole.

The review-based conclusions will be used to draw up recommendation for improving the instruments for water resources management in the Republic of Buryatia at the final stage of the present project.

Summarizing review of international practices

Water resources management in developed countries is implemented in an integrated manner with regard to the “water cycle” – water abstraction and use, waste water treatment and discharge into water bodies. Economic and administrative instruments are of primary importance for managing the water sector. Economic instruments are applied in cases when the level of potential damage to water resources is not critical. Prevention of large-scale irreversible hazards for the quantity and quality of water and water-related ecosystems is implemented with the help of administrative instruments (bans, standards, etc.). Information and other tools (for example, voluntary unilateral obligations) play a significant auxiliary role in the process of WRM.

An important WRM principle is the compensation of the cost of water use, including compensation of operating and capital costs, resource expenditures and environmental costs. However, in practice, full compensation of costs is rarely achieved even in the OECD countries – mostly due to social factors. The necessary minimal compensation is the so-called “sustainable compensation” of costs related to operation, technical maintenance of systems, rehabilitation of fixed assets within depreciation rates, i.e. compensation of some part of capital costs at the expense of end-use consumers and/or society as a whole (budget sources).

Water use (water abstraction) fee

The water use (water abstraction) fee is collected in vast majority of countries in the form of a water tax and water abstraction charges. The fee is collected to regulate the volume and structure of water consumption and mobilize financial resources. The balance of these two goals may differ. The water use fee is mainly set at municipal and regional levels and is frequently differentiated by water sources (ground or surface) and types of water users. The rates of the water abstraction fee depend on the scarcity of water and structure of consumption. As a rule, the cost of water as a resource for households is lower than for industries. Targeted use of the water abstraction fee for financing expenditures in the water sector is rather popular (although it is not 100% predominant).

Water supply and sanitation tariffs

WSS tariff setting proceeds from the objective of meeting target indicators with regard to the volume and structure of water consumption and assuring the balance of interests of consumers (affordability of services) and producers of water (financial sustainability).

The following types of WSS tariffs are used:

- One-off payment for connection ensuring an access to the service;
- Regular fixed payment, which is equal for everyone or depends on certain characteristics;
- Volumetric rates or a system of rates.

There are one- and two-part tariffs (payment). One-part tariffs may be fixed or volumetric, whereas two-part tariffs usually consist of a fixed and variable component.
Fixed tariffs do not depend on the volume of consumption, and in the absence of water meters they are the only possible tariffs. The obvious drawback of such tariffs is complete absence of any economic incentives for water saving. Volumetric tariffs can be divided into uniform volumetric tariffs (when payment is the product of the tariff by the metered water consumption), block tariffs (tariff rates are different for different volumes of water and the tariff rate changes step by step), and growing linear tariffs (the rate is the linear function of the consumption volume).

One-part volumetric tariffs can help to successfully address the task of creating necessary incentives for water consumers. However, their application may result in financial problems for WSS services suppliers (since their expenditures include both a variable and fixed component, and the latter one cannot be reduced). The advantage of two-part tariffs is the possibility of simultaneous creation of incentives for savings and for assuring the balance of interests of producers and consumers. This type of tariffs is mostly prevalent in developed countries.

At present the most popular structure of WSS tariffs in Europe is the two-part tariff with a fixed block component. In most cases, payment for water supply is made separately from payment for sanitation, and the latter frequently depends on the real cost of efforts aimed at compliance with environmental requirements to discharges (environmental costs). The alternative cost of water use is usually taken into account, but not in full.

The structures of WSS tariffs for industrial consumers applied in the world do not differ from the structures of WSS tariffs for households. In the absence of social restrictions, the most frequently applied principle is that of full compensation of expenditures. Within the structure of WSS tariffs for industrial consumers block tariffs are more frequently applied, compared to tariffs for households.

In EECCA and other developing countries tariffs, as a rule, are less sophisticated than in the OECD and EU countries because of less developed management institutes and lower prevalence of water meters. Simple volumetric tariffs (when meters have been installed) and fixed payments (if there are no meters) prevail. In EECCA countries public authorities play a rather important role in establishing tariffs and monitoring their amount.

In vast majority of developed countries tariffs are set at municipal and regional levels. Approaches to WSS tariff setting usually depend on the model of the WSS sector adopted in a relevant country. We can tentatively distinguish the English, French and German models or structuring the WSS sector. They differ in terms of the ownership rights to fixed WSS assets, types of operators, legal framework for activity (public law, contractual relationships), and approaches proper to handling tariff determination. Only the English model envisages the existence of an ad hoc tariff regulator (OFWAT in England), whereas most EU countries do not have such ad hoc authorities (economic regulators), although they (Spain, Italy, Portugal, Czech Republic and many other countries) may have a national tariff legislation and controlling bodies.

**Tariffs for irrigation water within irrigation systems**

The pricing in the irrigation sector is characterized by widely spread computation of the cost of irrigation water on the basis of the irrigated land area. This can be explained by the fact that the cost of water is frequently accounted for in the national systems for support of agricultural producers, within which the baseline measurement unit is the area of the cultivated land plot, as well as by historic reasons. In the short run, changes in the water cost but slightly affect consumption, because the required water consumption depends on the type of arable crops and production technology. Therefore, when water tariffs within irrigation systems are regulated, the emphasis is generally made on assuring the balance of cost coverage within irrigation systems and profitability of agriculture, rather than on regulating the scope of consumption. The only exception is the countries that are facing an acute shortage of water. The absence of payment for water as a resource within irrigation systems of the RB is at odds with international practices.
**Pollution taxes and charges for a negative impact on the environment; instruments for controlling and reducing diffuse pollution**

Taxes and charges for a negative impact of water-related hazards (pollution) are used in vast majority of countries. In theory, the rate of taxes or charges for discharge of pollutants should reflect the maximum costs related to pollution. This approach is rarely fully implemented, but it is viewed as a benchmark in developed countries. This group of instruments has been applied quite successfully in the EU countries (e.g. in the Netherlands) for several decades. The amount and structure of charges differ significantly, and, as a rule, the rate of taxes (charges) are differentiated by types of organizations-producers of pollution (polluters), types of discharged substances and other parameters. As evidences from practices, this toolkit is most efficient when the tax (charges) imposed on the polluter is substantial but not excessively high.

The scheme of recoverable charges for emissions (RCE) proved its efficiency within the framework of pollution charges. The mechanism of RCE is based on identification of a group of the similar polluters “competing” for the attainment of the goal of minimizing the level of emissions or discharges. The collected payments are fully refunded to polluters, but in a different proportion accounting for the organization’s environmental performance. The mechanism of RCE was first applied in Sweden and subsequently replicated in many countries. Its advantage lies in assuring a reasonable fiscal burden on payers.

**Trade in pollution permits/quotas**

Trade in pollution permits/quotas envisages the creation of a market of rights to pollution. Such markets are regulated by ad hoc legislation. The obvious advantage of this instrument is its flexibility and universal nature. It can also be successfully combined with other economic and administrative instruments. This approach is more loyal to polluters than administrative bans and standards. However, the administration of the trade in pollution permits/quotas is complicated, and the success of such trade implies the existence of a rather large market with numerous players. In general, the efficiency of the trade in permits/quotas, if compared to that of taxes, depends on the structure of the regulated activity. A useful experience in the area of trading permits/quotas has been gained by the USA and Australia.

**Economic instruments for controlling diffuse water pollution**

Diffuse water pollution (non-point source pollution) is the most difficult object for regulation. As practices have revealed, efficient management of such pollution is possible only through comprehensive application of administrative and economic instruments. A most popular economic instrument is taxation of individual types of products, the use or disposal of which implies substantial diffuse water pollution. These are taxes imposed on agrochemicals (pesticides, herbicides, mineral fertilizers, etc.). Practices of application of this group of instruments were rather successful, so much so that some countries managed to achieve a major reduction of pollution.

The foregoing taxes are frequently applied in package with specially created systems for collection of pollutant substances and materials (agrochemicals with expired shelf life, waste machine oils, batteries, etc.), as well as with other methods for encouraging the recycling of the aforesaid wastes. Collection of waste machine oil in Canada is an example of a successfully functioning system for collection of environmentally hazardous wastes.

**Alternative instruments**

A very successful alternative instrument for pollution reduction, including water pollution, is the set of requirements and standards for disclosure of information about discharges (emissions) and compliance with the requirements related to environmental pollution. This mechanism envisages the establishment of certain requirements and subsequent rating of polluters by the level of meeting these requirements. The instrument enables to raise public awareness, it is fully
transparent and does not imply major expenditures. The practices implemented in Indonesia became widely known. It carried out an information disclosure programme based on five categories for rating enterprises across the country. During the first six months of the programme implementation the discharges by participating organizations decreased by 43% and their ratings significantly improved.

A number of countries apply the so-called “strict liability” rules – an outright obligation to fully compensate the third parties for the cost of pollution removal and for other damages resulting from the activity of an enterprise or company. However, the practices of application of this instrument are controversial.

**Payments for ecosystem services and support for environment-oriented types of activity**

Payments for ecosystem services imply compensation by consumers of ecosystem services (i.e. services assuring benefits from ecosystems for consumers) to the entities that own (economically control) ecosystem resources. Introduction of payments for ecosystem services implies the creation of a market of services that were not formerly priced, although they generate economic benefits.

The most popular ecosystem services related to water resources management are as follows:

- Supply of assured quality water;
- Protection of bio-diversity;
- Preservation of aesthetic value of natural objects;
- Carbon-dioxide absorption.

Vast international experience of capitalization of environmental benefits and costs with the help of the mechanism of ecosystem services has been accumulated. This mechanism is used both by public authorities and private organizations. Ecosystem service provision is not only well-developed practically in all European states, but is also actively implemented in many developing countries (Columbia, Costa Rica, Ecuador and many other countries).

As evidences from global practices, the support for environment-oriented types of activity is extremely important for countries having ecologically clean territories and/or unique natural objects. Protection of such territories and objects makes it necessary to focus their economy on ecologically clean types of activity. There are a considerable number of examples of successful support of such economic activities. Significant indirect benefits from such support may be the development of environmental education and enhancement of environmental culture.

**Risks associated with water resources, and risk management instruments**

There are two major categories of risks associated with water resources: risks facing water resources (their quantity and quality) and related ecosystems; and risks of the negative impact of water-related hazards (mud-flows, floods, etc.). Risk management is defined as the establishment of mechanisms for monitoring, assessment, prevention and mitigation of relevant risks, minimization of damages, as well as implementation of measures aimed at controlling the existing risk factors. In a broader context, the WRM in general deals with water risk management.

In developed countries, risk management activities related to water resources are comprehensive, systematic and evidence-informed. Normally, measures aimed at risk prevention and mitigation of risk consequences include both administrative measures and incentives. The WRM systems contain two components: risk monitoring component and measures aimed at prevention (reduction) of risks and elimination of their consequences. Special attention is paid to risk assessment and approaches to risk reduction at the stage of making decisions on construction of buildings and structures.
The same principle is applied in risk management: if the potential damage is acceptable (not critically extensive), economic instruments, such as insurance, are applied; if it is unacceptably extensive, administrative instruments for reduction of risks and minimization of their consequences should be applied as well as engineering methods (protection against mud-flows, dams, etc.).

International practices of **risk insurance** against the negative impact of water-related hazards revealed the complexity of application of the standard commercial insurance methodology. Such risks are characterized by low probability of occurrence, large-scale consequences and problems for their geographical diversification. Therefore, a major share of insurance in the world is implemented by the public sector with due account for social factors, different probability of the negative impact of water-related hazards on different territories and the policy-holder’s efforts aimed at minimization of relevant risks.

**Targeted funds**

Developed countries widely practice targeted use of funds obtained as the result of collection of taxes and charges related to water resources. Revenues from targeted taxes and charges are frequently accumulated in ad hoc funds established at the national level (Delta Fund in the Netherlands), at the level of river basins (in France), or in individual regions and municipalities (in Germany). When using economic instruments for WRM, it is a good practice to balance the regulatory effects of the instruments and revenues from these effects, so as to attain certain target indicators.

**State support as an instrument for WRM**

A major part of the water infrastructure around the world is in public ownership. The state bears responsibility for regulation of the water resources’ use and for most of environmental measures. Public authorities are responsible for the water security of any country. Thus, regardless of the ownership rights to the fixed water infrastructure assets, the state is always a guarantor of the proper functioning of hydro-technical structures (HTS), WSS services provision, water resources protection and prevention of the negative impact of water-related hazards.

Almost in all countries the state provides the bulk of financing for the water sector. Fiscal systems bear the main burden of expenditures related to creation of HTS and assurance of their functioning, as well as to implementation of water protection measures.

The situation in the WSS sector is less homogeneous: fixed WSS assets there may be privately managed or owned. However, even if WSS assets are 100% privatized and financing is implemented on full-scale payback terms, public authorities actively participate in mobilizing investments in WSS and waste water treatment facilities. As practices revealed, without the public sector’s participation the cost of such investments would seriously increase, sometimes to an economically unreasonable degree.

Practices of state support to the water sector are versatile and envisage implementation of instruments of direct state support and indirect methods. Common features of the water sector support in developed countries are as follows:

1) focus on economic mechanisms and competition encouragement: economic instruments are prioritized if this is feasible and does not create critical risks; competition-based schemes for selection of recipients are widely used;
2) whenever possible, orientation towards full recovery of expenditures arising from creation of the water infrastructure and assurance of its functioning;
3) flexible decision-making, possibility of changing the earlier adopted decisions within the framework of approved procedures and/or public control mechanisms.
State support to the water sector plays a crucial role even in developed countries with market economy. Thus, over several dozen years, targeted funds for support of financing investments in the WSS sector on non-market terms have been successfully functioning in Austria. A large-scale system of allocation of soft loans and grants for renovation of WSS systems and implementation of energy efficient and ecologically clean technologies has been established in the United States. Sweden has been implementing an ambitious programme for institutional (information, analytical and methodological rather than financial) support to WSS organizations through the association of local governance bodies. Formally, there is no direct budget financing, and the active role of the state in the association’s activity is a key condition for the latter’s efficient functioning.

Potential for implementation of international practices by the Republic of Buryatia

The present report identifies the most promising WRM instruments, which are currently not adequately (efficiently enough) used in the RB, or not used at all. We recommend that the state authorities of the Russian Federation and RB should look into feasibility of applying the following instruments and approaches that have shown good results in other countries:

1. **Water use (water abstraction) fee:** changes in the rates accounting for the rarity of the resource and possible determination of interdependence between the amount of fee and technology of use (for industrial and WSS enterprises).
2. **WSS tariffs:** setting economically reasonable tariffs ensuring the full recovery of operating and capital costs with regard to depreciation of fixed assets (or compensations due to the difference between the amount of factual and economically reasonable tariffs), staged introduction of two-part tariffs.
3. **Introduction of payments for water as a resource** within irrigation systems, and once the sustainable payment practices become a reality – optimization of the amount and structure of rates accounting for water accessibility.
4. **Water pollution charges:** we recommend to differentiate the rates by territories and to gradually introduce more stringent discharge standards linked to existing production technologies (the approval of the list of best affordable technologies). We also recommend to use simulations to justify the introduction of the scheme of recoverable charges for emissions and optimal parameters of such charges.
5. Staged **implementation of the mechanism of trade in permits for discharge of** pollutants into water bodies (with indication of the transition period).
6. **Establishment of regulatory taxes:** for toxic agrochemicals (pesticides, herbicides and similar pollutants), as well as for consumer goods, which are potential pollutants of water resources and related ecosystems.
7. **Enhancing the system of waste management** (solid and liquid domestic wastes), promoting public policy of encouraging the reuse and recycling of ecologically hazardous wastes.
8. **Development of a mechanism for disclosure of the information related to** discharges (emissions) and observance of standards in the area of environmental pollution; eco-labelling of organizations-polluters.
9. Adaptation of international practices in the area of application of **instruments for protection of bio-diversity** (ecosystem services, etc.), as well as in the area of **facilitating environment-oriented types of activity.** In addition to support of tourism activity, which is one of the socio-economic priorities for the RB, other promising instruments are as follows: increasing and streamlining the amount of payments for the use of natural resources; creating the market of rights to fishing, rights to pollution; eco-labelling of products and goods manufactured in the Baikal natural area (BNA) – an ecologically clean zone.
10. **Enhancement of the risk management system** with regard to water-related hazards: establishment of a comprehensive risk management system and staged development of practices of life and property insurance against the negative impact of water-related hazards.
11. **System of state support to the water sector**: we recommend partial accumulation of revenues related to water resources and environment in specialized targeted funds; partial spending of state support funds to increase the affordability of long-term borrowings; development of inter-municipal cooperation and enhancement of the local governments’ role in decision-making.

12. Implementation of research aimed at finalizing the list of recommendations, conducting their detailed assessment and developing proposals with regard to a gradual **reform of environmentally-harmful subsidies** granted by public authorities on the territory of the RB.

It should be noted, that, many of the practices recommended were successfully implemented in developing countries which are comparable to the Russian Federation in terms of household incomes and institutional development (as well as the wealthier economies of the EU).

The foregoing list of instruments and approaches to WRM was partly discussed on July 4, 2014, at the meeting of the Inter-Agency Coordinating Group for the project implementation, which was founded by public authorities of the RB. The list (at least, most of its components) was already used in the first Interim Report on the project. Further work on the list will continue and its results will be used to generate recommendations in the Final Report.
Introduction

This report is part of a series of projects implemented under the aegis of the OECD within the EU Water Initiative, applied to the EECCA region. The project is financed by the General Directorate for Development and Cooperation (Devco) under the European Commission, jointly with the Task Force for the Implementation of the Environmental Action Programme for Central and Eastern Europe (EAP Task Force).

In September-December 2012, the OECD undertook a review of economic instruments for water resources management in the Russian Federation (OECD, 2013) hereinafter referred to as 2013 Report). Application of these instruments in the Republic of Buryatia was reviewed in the resulting research in more detail. The research contributed to the identification of core problems in the water sector of Russia, analysis and evaluation of economic instruments applied in Russia to manage water resources, and to the development of a number of recommendations for the improvement of the water sector management and broader application of economic instruments. The main conclusion of the aforementioned project is as follows: economic instruments currently have but a weak relation in addressing the core issues facing the water sector in Russia.

The 2013 Report contains a recommendation “it would be appropriate to fine-tune, further elaborate and supplement the preliminary recommendations regarding the Republic of Buryatia, following a detailed assessment of the use of economic instruments in the water sector of the Republic, as part of Lake Baikal basin”.

The present project is aimed at implementing the foregoing recommendation. The 2nd Interim Report is dedicated to the analysis of international practices and impact of WRM instruments that may be used in the RB.

Section 1 of the Report characterizes general approaches to and principles of WRM management developed in the world. Sections 2 – 6 focus on the analysis of the following instruments and approaches:

- Establishing water abstraction fees;
- Designing tariffs for water within the WSS sector and for irrigation water;
- Instruments for protection of bio-diversity and support for environment-oriented types of activity;
- Instruments for protection of water resources and ecosystems (taxes and pollution charges, other instruments);
- Instruments for water-related risk management;
- Mechanisms of state support to the water sector.

Special attention was paid to the analysis of the possibility and feasibility of application of international practices in the RB in the light of socio-economic, institutional and natural specificities of this region. The conclusions of the Report will be used to draw up recommendations for better use of economic instruments for water resources and water sector management in Buryatia at the final stage of the project.

1. Approaches to water resources management in international practices

In vast majority of countries water resources management (WRM) is an extremely important aspect of socio-economic development management in general. Water is a vitally important resource and an object of close attention of national governments and international organizations. To date, an ample experience of adopting various administrative decisions has been accumulated globally, and a theoretical framework for WRM has been developed. This experience and principles formulated on its basis were summarized in the deliverables of international organizations and associations – European Union, OECD, International Union for Conservation of Nature and Natural Resources, UN Environment Programme, etc.

Recommendation of the OECD Council on Water Management Policies and Instruments\(^2\) specify key recommendations with regard to target setting for WRM in the OECD countries. The document identifies the following key targets for WRM: protection against pollution and excessive use; protection of the water component of the environment, and appropriate water supply for communal, industrial and agricultural purposes. Similar targets are specified in most strategic documents of other international organizations and unions.

The OECD approach envisages a combination of various types of instruments for water resources conservation, protection of ecosystems and their bio-diversity. In cases when a potential damage is unacceptable, emphasis is laid on administrative instruments (bans, restrictions, standards, etc.). However, if a potential damage is local, insignificant or not critical (e.g. in the situation when one of numerous polluters exceeds quotas, but even then does not cause a critical damage to the ecosystem), incentives created with the help of economic instruments are prioritized.

Key EU document setting the principles for WRM is the EU Water Framework Directive (WFD) adopted in 2000 as a code of recommendations on comprehensive WRM, monitoring and assessment of the quality of water environment, protection of all types of water objects and coverage of all types of impact on these objects. The WFD stipulates that the EU environment policy should facilitate the attainment of the goals of conservation, protection and improvement of the quality of environment, careful and sustainable use of natural resources, and one of the principles of this policy should be prudence in combination with:

- Preventive measures;
- Rectification of the situation (if damage was caused to the environment) via taking measures with regard to the source of pollution;
- “The polluter pays” principle.

In addition, the WFD defines a principle of compensation of expenditures for water use, primarily, expenditures related to WSS. The principle of compensation of expenditures is explored in a range of EU and OECD documents and in significant number of research papers. In accordance with these documents and research papers, the pricing water and services related to the use of water resources should be based on maximum social costs.

The price of water should reflect the following components of the cost of this resource: operating, capital and administrative costs related to the use of the resource; the cost of lost economic opportunities for an alternative use of water, which opportunities had to be discarded (rent related to the scarcity of the resource), as well as environmental costs of water use by all involved parties (see Figure 1.1).

\(^2\) Recommendation of the OECD Council on Water Management Policies and Instruments [C(78)4/FINAL].
In theory, the pricing of water based on maximum social costs assures an efficient distribution of water resources. However, in real life, the pricing is rarely fully based on maximum social costs even in the developed EU and OECD countries. The complexity of this approach can be explained by the fact that if we want to determine a reasonable price of water, we should assess the cost of lost opportunities from its alternative use, as well as all costs related to water abstraction and use in monetary terms. There are a lot of methods applied in international practices to make such an assessment, which differ in terms of their complexity and cost. Direct full assessment of costs envisions an assessment of environmental costs of all involved parties. It is a complex and expensive procedure. There are more simple indirect assessment methods (see Annex A). However, any assessment in this area has an element of subjectivity. The second serious problem is the necessity of organizing the transfer of compensations to the persons/entities suffering losses through the reduction of volumes and quality of water, and redistributing the economic and monetary rent from the use of the resource. Such a transfer, as a rule, is not simple to organize, and is especially difficult from the political point of view (see subsequent sections of the Report). At the same time, admittedly, when payments and tariffs in the water sector are established they should at least provide for the compensation of direct operating, capital and administrative costs related to water use. These costs are estimated with due account for the cost of borrowings, if the latter are mobilized to create a relevant infrastructure.

Although this model for water resources pricing is incomprehensive, it is a theoretical framework for decision-making in the water sector of the EU and OECD countries. The pricing based on maximum social costs may be characterized as an ideal, to which developed countries gear their administrative decisions. Real-life pricing is implemented with due account for social criteria (including the affordability of water services to households) and financial sustainability criteria of the water sector organizations.

WRM comprises the management of the quantity and quality of water resources. The general OECD approach to the water sector management as management of natural resource exploitation is based on the combination of administrative and economic instruments and incentives. Moral and other incentives are second in importance.

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3 OECD (2010), Pricing in the area of water resources management, water supply and sanitation.
Starting from the 1980s-1990s, the approach based on combination of various types of instruments became most important. Previously, the predominant approach applied in the OECD countries was the administrative one. However, the practices of developed countries showed that the simultaneous use of various types of instruments creates an enormous regulatory potential and yields better results.

The most important economic instruments for WRM are as follows: taxes, payments for resource and for services provided by water systems, payments for ecosystem services; and state support to the water sector (subsidies). Each group of instruments is reviewed in a separate section of the present Report.

The integrity of the foregoing economic instruments assures the regulation of water use at different stages of the “water cycle”: water abstraction from surface and ground sources – independent use (including the use for industrial and agricultural needs), or the use within the systems of centralized water supply to consumers – centralized or local treatment of waste water and discharge of waste water into water objects, or re-using the treated water in the systems of recirculated water supply.

The main types of taxes and payments in the water sector are as follows:

- Payments for water as a natural resource (taxes and water use [abstraction] fee);
- Payments for services provided by water systems (including payments for WSS, which may include discharge fees), and for supply of irrigation water, as well as for ecosystem services;
- Charges and taxes for discharge of pollutants into water bodies;
- Other environment-related taxes and charges.

It should be noted, that, according to the OECD classification, the difference between payments/charges/fees and taxes lies in the fact that the first are made “in exchange” for supply of a certain service, whereas taxes are a sort of “uncompensated” payment. However, many countries consider payments/charges/fees to be taxes on the basis of their formal attribute – regulation by a respective legislative act (tax code or some other law). For example, in many EECCA countries (Belarus, Kazakhstan, Ukraine and some other) a “water tax” is levied, and the amount of “water tax” payments is determined on the basis of the volume of abstracted water. A similar instrument in the OECD countries is frequently referred to as “charges”, rather than a “tax”. Further on in the Report, when different instruments are reviewed, the general category of taxes and charges is analyzed (for example, taxes and pollution charges), and detailed specificities are provided in each case.

The aggregated practices of application of various WRM instruments in developed and developing countries enabled us to identify the following factors contributing to successful application of economic instruments for the water sector management.

1. **Quality of the information base and administrative potential:** the regulatory authority should possess the exhaustive information about those parameters of the water sector, with regard to which a certain administrative instrument is applied, as well as about benefits and expenditures of different entities/persons resulting from application of this instrument. The information base should also include the data about indicators of environmental safety.

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environmental damage, the cost of administration of the instrument, monitoring and controlling the observance of the established requirements.

2. **Appropriate institutional and legal structure**: the currently effective legal system and the system of law enforcement should clearly define proprietary rights and assure an efficient use of incentives with regard to legal entities and private individuals. The degree of observance of the principle of the rule of law is of critical importance for the success of application of instruments.

3. **Market structure**: are there effectively functioning market institutes? The level of competition and availability of comprehensive relevant information to the market players are also very important in this context.

4. **Political feasibility**: it is necessary to estimate, whether the persons/entities, with regard to which economic instruments are applied, possess a lobbying potential; whether the regulatory authorities are empowered to balance the interests of participants of relationships in the water sector. Another important political feasibility factor is the existence of corruption within the power bodies and the structures that actually apply the instrument. Yet another important aspect of political feasibility of a certain instrument is the nature and degree of its impact on the level of employment.

The analysis of applicability of WRM instruments (used in international practices) in the RB envisages an assessment of the institutional context in Russia and RB based on these criteria. It may turn out that the instrument successfully applied in some countries is not appropriate for this country or region, and vice versa.
2. Water use (water abstraction) fee

**Key parameters of the water use fee**

A water use fee in the form of water taxes and charges for water abstraction is collected practically in all developed countries of the world. The water use fee is charged for water abstraction both from ground and surface sources.

There is no common global scheme for collection of the water use fee. The implementation of this mechanism depends on the scarcity of water and the need to regulate the scope and structure of consumption, as well as on institutional specificities of countries and regions. Payment rates, mechanism of charging, criteria for differentiation of payments and the use of revenues depend on two major goals set for this instrument:

1) Management of the volume and structure of water use;
2) Mobilization of funds, in particular, funds allocated for financing the area of WRM.

In developed countries, the water use fee is usually established along with parameters of other WRM instruments. Parameters of the water abstraction fee in some OECD countries are shown in Table 2.1. Even in developed EU and OECD countries the amount of payment for water usually does not reflect the full cost of water as a scarce resource or the environmental costs related to water use. The rates of payments (per 1 cubic meter) considerably vary: for the countries sampled in Table 2.1 the minimal rate is 0.00071 euros (France), and the maximum – 0.84 euros (Denmark), i.e. a more than 1,000 fold difference. However, these figures should not be estimated out of context of payments and tariffs charged at other stages of the water cycle: in the developed countries decisions with regard to payments charged in connection with water use are usually made within the framework of a holistic analysis of all stages of this process. The data available at the OECD reveals that payments for ground water abstraction, as a rule, are higher than for surface water abstraction.

The water use (abstraction) fee is mainly established at the municipal (Australia, Canada, Japan, South Korea) and regional (Belgium, Germany, Italy, Spain, etc.) levels. There is a common practice of remitting payments to basin departments (France) and other authorities responsible for WRM (Northern Ireland, Portugal). If payments end up in regional and local budgets (or in the budgets of ad hoc WRM structures), there is a common practice of targeted use of revenues for the purposes of WRM. It means that the OECD countries mainly opt for establishing interdependence between revenues from the payment of the water abstraction fees and expenditures on WRM (via accumulating funds in ad hoc structures and funds, or via establishing interdependence within the budget framework of the public-law entity).

Payments for water are usually differentiated for different types of water users – residential sector, industries and agriculture. The amounts of the water use fee for various sectors in individual OECD countries are shown in Table 2.2. Traditionally, a reduced amount of the water use fee is established for agriculture, because this sector is subsidized in most countries (especially in the developed countries), whereas water consumption by this sector is huge. According to some experts, irrigation water may be quite affordable to agricultural producers if the share of expenditures on it in the production costs of agricultural products (not accounting for transportation to the sales site) does not exceed 10%. Thus, water pricing decisions should be made with due attention to the impact on the economic situation of agricultural producers. This criterion is very important although it cannot be the only one.

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7 Expert assessments related to the projects of development banks and Food and Agriculture Organization in the Asian countries were obtained from the OECD representatives within the framework of the project implementation.
Table 2.1 –Key parameters of the water abstraction fee in individual OECD countries

<table>
<thead>
<tr>
<th>Country, year</th>
<th>Source</th>
<th>Rate per 1 cubic meter</th>
<th>Consumer differentiation</th>
<th>Differentiation by other parameters</th>
<th>How revenues are used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium (Flanders), 2007</td>
<td>ground water</td>
<td>0.08 USD (basic rate)</td>
<td>A higher rate for drinking water</td>
<td>Differentiation by sources; payments depend on the ground water pressure</td>
<td>Revenues are accumulated in the fund for the protection of ground water and spent for target needs</td>
</tr>
<tr>
<td>Germany (data for 11 out of 26 federal lands), 2008</td>
<td>surface and ground water</td>
<td>0.015 – 0.31 euros; some federal lands have a fixed license price</td>
<td>In some lands – differentiation by the purposes of use</td>
<td>In some lands – differentiation by water objects</td>
<td>Revenues are spent in accordance with the laws of federal lands, and in most lands they are remitted to the water sector</td>
</tr>
<tr>
<td>Denmark, 2000</td>
<td>surface and ground water</td>
<td>0.84 euros (average rate)</td>
<td>Non-existent</td>
<td></td>
<td>Tax supplements the municipal budget</td>
</tr>
<tr>
<td>Netherlands, 2006</td>
<td>ground water</td>
<td>0.1883 euros (average rate)</td>
<td>Payments from farmers are collected if consumption exceeds 40 thousand cubic meters per year</td>
<td></td>
<td>Tax supplements the national budget</td>
</tr>
<tr>
<td>Poland, 2011</td>
<td>ground water</td>
<td>0.015-0.0255 euros</td>
<td>Differentiation by types of use</td>
<td>Differentiation by water objects</td>
<td>Data not available</td>
</tr>
<tr>
<td></td>
<td>surface water</td>
<td>0.009-0.0128 euros</td>
<td></td>
<td></td>
<td>Data not available</td>
</tr>
<tr>
<td>France (Seine-Normandy), 2008</td>
<td>ground water</td>
<td>0.024 euros (average rate)</td>
<td>Differentiation by types of use</td>
<td>Differentiation by the source and the basin department; payments depend on productivity</td>
<td>Revenues are accumulated by river basin departments and spent on WRM of the relevant basin</td>
</tr>
<tr>
<td></td>
<td>surface water</td>
<td>0.00071 euros (average rate)</td>
<td></td>
<td></td>
<td>Data not available</td>
</tr>
<tr>
<td>Czech Republic, 2011</td>
<td>ground water</td>
<td>0.0122 euros – basic rate 0.0813 euros – for supply of drinking water</td>
<td>A preferential rate is established for drinking water abstraction</td>
<td>Differentiation by water objects</td>
<td>Data not available</td>
</tr>
</tbody>
</table>

Table 2.2 – Water use (abstraction) fee rates by water consumers in individual countries, in USD, 2000

<table>
<thead>
<tr>
<th>Country</th>
<th>Agriculture</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed fee (for irrigation of 1 hectare)</td>
<td>Variable fee (for 1 cubic meter)</td>
<td>Fixed fee (for one year)</td>
<td>Variable fee (for 1 cubic meter)</td>
<td>Fixed fee (for one year)</td>
<td>Variable fee (for 1 cubic meter)</td>
</tr>
<tr>
<td>Australia</td>
<td>0.75-2.27</td>
<td>0.02</td>
<td>9.00-162.0</td>
<td>0.23-0.54</td>
<td>-</td>
<td>7.82</td>
</tr>
<tr>
<td>Brazil</td>
<td>3.50</td>
<td>0.004-0.032</td>
<td>-</td>
<td>0.40</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Canada</td>
<td>6.62-36.6</td>
<td>0.002</td>
<td>-</td>
<td>0.34-1.36</td>
<td>-</td>
<td>0.17-1.53</td>
</tr>
<tr>
<td>France</td>
<td>-</td>
<td>0.11-0.39</td>
<td>-</td>
<td>0.36-2.58</td>
<td>-</td>
<td>0.12-0.59</td>
</tr>
<tr>
<td>India</td>
<td>0.16-27.5</td>
<td>-</td>
<td>0.82</td>
<td>0.01-0.08</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Israel</td>
<td>-</td>
<td>0.16-0.26</td>
<td>-</td>
<td>0.36</td>
<td>-</td>
<td>0.26</td>
</tr>
<tr>
<td>Japan</td>
<td>246.0</td>
<td>-</td>
<td>-</td>
<td>1.56</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1.49-5.80</td>
<td>-</td>
<td>0.25-1.63</td>
<td>0.06-0.10</td>
<td>-</td>
<td>0.38-0.97</td>
</tr>
</tbody>
</table>


Approaches to correlation between the cost of water for industries and households vary and depend on the scarcity of water and economy structure of the country or region. Most commonly the cost of water as a resource for households is lower than for industries. However, the share of payments for water as a resource in the cost of industrial products is very small (less than 1% for most types of products).

The following mechanisms for determination of payments for water as a resource are most widely applied:

- Volumetric rate: the rate used as a multiplier for the volume of abstracted or used water;
- Fixed payment: payments made for a certain period; in agriculture the fixed rate is usually estimated per one hectare of irrigated area;
- Block tariff: a volumetric rate that depends on the volume of abstracted (used) water;
- Two-part tariff: a combination of the fixed payment and volumetric rate.

Mechanisms for determination of payments for water are reviewed in the context of tariff setting for WSS services in the next section.

**Examples of policies with regard to establishing water abstraction fees in individual OECD countries**

**Australia**, New South Wales: water producer prices are established by the Independent Commission for Regulation and Prices. The amount of payments is determined separately for WSS, industries and for use by irrigation systems.

The pricing ideology is based on full recovery of costs, which was successfully attained almost for all regulated rivers. In the early 2000s, during the reform of the system of payments for water, a **two-part tariff** was selected: it includes both a fixed and volumetric component – payments for an access to resources (for the right to abstract water) and for consumption (which is directly related to the factual volume of abstracted water).

The policy of full recovery of costs resulted in the price growth by the inflation rate plus 15% per year during 2001–2005 with regard to regulated rivers. Simultaneously, efforts have been

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8 To prepare his sub-section examples from the research paper “Pricing in the area of water resources management, water supply and sanitation” (OECD, 2010) were used.
made to increase the share of metered water (the number of rivers with regulated water abstraction has been increased).

**Germany:** the water abstraction fee is determined on the basis of two goals – regulation (reduction) of volumes of abstracted water and generation of revenues to finance environmental activities. The fee is collected in 11 federal lands and varies from 0.015 euros per 1 cubic meter (in Saxony) to 0.31 euros (in Berlin). Revenues are spent on environmental measures: protection of surface and ground water, forest restoration, soil conservation and treatment of polluted soil. In seven, out of eleven federal lands, one part of collected revenues is used to protect ground water.

**Canada:** in most provinces, major water consumers pay a fixed license fee for an access to water resources. These fees are used to cover expenditures related to the licensing programme, i.e. are in no way a water abstraction fee in the strict sense.

**Portugal:** until recently, no water abstraction fees were charged, although they were envisaged by the law. Since 2008, WSS service suppliers were obligated to include the water abstraction fee in retail tariffs depending on factual consumption and consumer category. 50% of revenues end up in the State Water Protection Fund, 40% are channeled to basin authorities, and 10% - to the State Agency for WRM.

**Improving approaches to water payments collection in the RB in the context of international practices**

The current system of water payments collection in the RB was reviewed in the 1st Interim Report under the present project⁹.

Collection of payments for water use in the RB is not used as an instrument to regulate consumption or as an incentive for more efficient water use. This is common for countries and regions that have no acute shortage of water. However, more efficient water use is important not only in the light of addressing the possible water shortage (which may never occur). Another consideration is much more important: water saving technologies frequently yield significant extra economic benefits in the form of production costs reduction (e.g. reduced electric power consumption for water supply) or increase in the production volume (with the same consumption of raw materials and other resources).

Hence, if a more efficient water use is not encouraged, it frequently means a disregard for one of major economic incentives for implementation of more efficient technologies.

In Buryatia and in the RF in general, the water abstraction fee is fully accumulated in the federal budget and spent in accordance with the usual procedures.

This approach is less frequently applied in other countries of the world than the targeted use of funds, although it is not unique. For example, this approach is used in some OECD countries (Denmark, Mexico, the Netherlands). There is nothing new about the RF’s approach to establishing water use (abstraction) fees for supply of drinking water and water for economic and domestic needs to households. The rates for water abstraction for residential sector water supply are lower than the rates for other consumers, which is a rather common practice in the world.

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3. Water tariffs within the WSS sector and irrigation system

3.1. Major types of tariffs

Approaches to tariff setting within the WSS sector and irrigation system are quite versatile. At present, there is no common global understanding with regard to which tariff structure caters best for the needs of WSS enterprises, consumers of their services and community in general. At the same time, international practices with regard to tariff policies in the WSS sector have been thoroughly studied and pooled together.

In general, cash receipts required for servicing WSS systems comprise the following components:

- One-off payment for connection providing an access to the WSS service;
- Regular fixed (constant) payment similar for all or depending on some characteristics (e.g. diameter of the pipe, or installed capacity of the water meter, cost of real property, number of devices consuming water, differentiated “standard consumption”);
- Volumetric rate (system of rates) used as a multiplier for the used volume of water, which was metered.

In all countries around the world the major amount of cash receipts in the WSS sector are payments for consumption (tariff revenue). The role of payments for connection in the overall structure of cash receipts is secondary, and computation of such payments is most frequently made on the basis of factual expenditures on development of relevant infrastructure (Box 3.1).

<table>
<thead>
<tr>
<th>Payments for connection: examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computation of the amount of payment for connection is most frequently done on the basis of assessment of expenses incurred. Accordingly, even one and the same supplier has different rates of payment, and there are no uniform rates.</td>
</tr>
</tbody>
</table>

For example, in the city of Indianapolis (USA) connection to water supply systems costs between 19 and 337 USD, and to sanitation systems – 2,500 USD (2010). The city of New York established a uniform payment for connection to water supply and sanitation – 200 USD, and in addition to this payment they charge a “fee for piped water” in the amount of 258 USD. The average cost of connection in Australia, Belgium, UK, Hungary, Netherlands and Czech Republic is comparable to or higher than in New York, whereas in Canada, Spain and Portugal it is much lower.

Source: OECD (2010) Pricing in the area of water resources management, water supply and sanitation

Two main types of tariffs – one- and two-part tariffs are used in the WSS sector. One-par tariffs may be either fixed or volumetric, whereas two-part tariffs usually include a fixed and variable component.

3.1.1. Description of types of one-part tariffs

**Fixed tariff**

A fixed tariff implies that the consumer regularly pays one and the same sum of money for water regardless of the volume of factual consumption of water (factual waste water removal). In the absence of meters a fixed tariff is the only possible one. This situation is rather common not only for developing, but also for some developed countries (for example, only a bulk meter is installed, whereas payments for individual water consumption are included in the housing cost).

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The fixed tariff is frequently differentiated for real property objects of different class and floor space, as well as for different income-groups of population. As regards water supply in irrigation systems, the unit of measurement for a fixed tariff, as a rule, is the area of the irrigated land plot.

The obvious drawback of fixed tariffs is as follows: consumers have no incentives whatsoever to save water, since changes in water consumption in no way affect the amount indicated in the bill for WSS services.

**Volumetric tariffs**

One-part tariffs may be structured so that payments will be charged on the basis of consumed and metered volume of water. There are three major types of volumetric tariffs:

1) Uniform volumetric tariff;
2) Block tariff;
3) Markup linear tariff.

**The uniform volumetric tariff** envisages that the amount of payment is the result of multiplication of the tariff for a unit of water by volume of consumption. If a uniform volumetric tariff is used, the consumer gets a clear signal about the marginal cost of additional water consumption. The advantage of this type of tariffs is that it can be easily understood and used by any consumer.

**Within the system of block tariffs,** tariffs for certain blocks of services (e.g. for 5 cubic meters of water per month per one household) are established, whereas a higher (progressive) or lower (regressive) tariff may be established for each subsequent “block” of services.

When a markup block tariff is used, the consumer pays a moderate sum of money for one unit of water – but only within the limits of the first block. As regards additional volumes of water, the consumer shall pay at a higher rate (established for the second block); and at a yet higher rate – for the third block, etc. The advantage of the markup block tariff is that it promotes the affordability of services and, at the same time, guarantees to less well-off consumers a minimal necessary volume of water at affordable price; it also encourages sustainable water use (those who consumer larger volumes of water take on marginal costs of water use).

The advantages of the block tariff are visible only in the event of correct establishment of the “boundaries” of blocks and the price of water in different blocks. Thus, the boundaries of the lower block should be adequate to assure minimal necessary consumption. However, if the boundaries are too wide, hardly any consumer will go beyond the boundaries of the first block, and the incentive effect will be insignificant. This effect will be in place if the difference in the price of water in different blocks is big enough.

A markdown block tariff envisages a reverse sequence: consumers pay more if the level of consumption is low (within the boundaries established for the first block); they pay less if they increase consumption up to the level within the boundaries of the second block; and yet less – for consumption within the boundaries of the third block, etc. Markdown block tariffs are used in the situation of abundance of water resources and sufficient capacities for water supply, when the water service provision to major industrial consumers implies for the water enterprise a reduction of average specific costs due to the effect of “economies of scale” covering the whole cycle (water rise, transportation, treatment). This tariff structure is rather rarely used in the world, and is primarily applied (when used at all) to industries.

When a markup **linear tariff is used**, the cost of one unit of water is gradually (not in an incrementally increasing manner typical of block tariffs) increased along with the growth of water consumption. The consumer gets a clear signal that the growing consumption will cost him more and more. This tariff structure is difficult in terms of its administration and has no obvious advantages compared to markup block tariffs. It is very rarely applied in practice.
3.1.2. Two-part tariffs

The use of two-part tariffs is explained by the fact that the cost of WSS services comprises a fixed and variable component. The fixed component of the two-part tariff (“subscriber fee”), as a rule, is used to redeem fixed costs of WSS enterprises – primarily, capital costs (including depreciation of fixed assets, and expenditures relating to debt servicing), staff wages and administrative costs. The variable component directly depends on the volume of consumed WSS services.

Methods of setting two-part tariffs differ. The fixed component may be either positive (flat rate) or negative (discount), whereas any of the above-mentioned structures (uniform volumetric tariff, markup or markdown block tariff, markup linear tariff) may be used for the volumetric component. To use a two-part tariff, it is necessary to have an efficient system for water consumption monitoring in place, and usually – the engagement of regulatory or controlling authorities. At the same time, both components of the two-part tariff should be promptly adjusted to changes in production costs.

Advantages of two-part tariffs are that incentives for sustainable water consumption are created simultaneously with controlling the attainment of full coverage of fixed costs and the achievement of economically reasonable level of profitability by the service supplier. Two-part tariffs enable to avoid the situation when a sharp reduction of water consumption results in uncompensated for losses of producers (or in the tariff growth, which becomes necessary to avoid these losses).

The main objection to the use of two-part tariffs is related to conserving inefficient fixed costs via fixed component of tariffs (for example, conserving excess capacities, which is particularly relevant in the post-Soviet countries). This argument is valid, therefore regulating bodies should especially consider the issue of increasing the efficiency of the fixed costs of WSS companies. The other objection is related to possible instability of volumetric tariffs. Some WSS experts believe that changes in volumetric tariffs can confuse consumers and deprive them of the long-term planning potential. Nevertheless, two-part tariffs are widely applied by developed countries, and most experts consider them more efficient than one-part tariffs. In the EECCA region these tariffs are less frequently used due to the fact that the quality of water monitoring systems in most countries of the region is lower than in the OECD states.

3.2. Practices of setting WSS tariffs and water tariffs in irrigation systems of the OECD countries

3.2.1. Determination of tariff structure

In most of the OECD countries tariffs are established at the municipal and regional level. This results in the situation when in one and the same country several tariff structures are used simultaneously. For example, each municipality in Austria independently selects a tariff structure proceeding from the principle of cost recovery and taking into account social factors, geographic and climatic conditions. In Mexico tariff structure is selected by each municipality in accordance with the legislation of relevant state. In federal states, for example, in USA and Canada, virtually all known tariff structures are applied.

In general, tariff policies of developed countries proceed from the necessity to meet target indicators with regard to volumes and structure of water consumption, as well as advisability of balancing the interests of water consumers (affordability of services) and service providers (cost recovery and assurance of sustainable financial status of the service provider).

**Tariffs for residential sector**
Tables B.1 and B.2 (in Annex B) contain the information on the structure of tariffs for drinking water and sanitation for households of the OECD countries, as of 2008. Usually, sanitation and waste water treatment services are paid for separately. In most cases, sanitation fees are based on water consumption volumes, although the structure and levels of tariffs for water supply and sanitation are different. In some cases, for example in the Northern Ireland, the volume of waste water removed is computed as a certain percentage of the water supplied.

In France, different tariffs are established for different consumer groups. Tariffs are different for large-scale consumers and retail consumers. In addition to this differentiation, WSS tariffs in France consist of a fixed and variable component (two-part tariffs). All water supplied to enterprise is carefully metered. The fixed component constitutes approximately 17%, and the variable one – 83% of the tariff on the average. Nearly 90% of municipalities use two-part tariffs for water supply and 38% municipalities – for sanitation services.

Belgium has no uniform system for tariff setting. Nevertheless, we can identify major common principles of tariff setting:

1) All enterprises use two-part tariffs based on the application of a fixed payments (on the average, they account for almost one third of water supply fees) and variable markup block tariffs, which assure an increase in the water supply fee if water consumption increases;

2) Full compensation for operators’ expenditures on production and service provision is a key criterion for tariff setting.

Ad hoc regional social funds related to water supply have been created in two out of three regions – in Walloon and Brussels regions. These funds provide financial support to the citizens who experience difficulties with full payment of water bills. In Flemish region each citizen, regardless of his income, is entitled to free-of-charge 15 cubic meters of water per year.

Denmark has no uniform system for tariff setting either. Tariffs are established by operators themselves building on the principle of full compensation for expenditures on production and provision of services. It results both in the high level of tariffs, and in considerable differentiation of tariffs across municipalities (the difference may be six fold or more). Denmark has the highest WSS tariffs among all EU countries.

Historically, two-part and block tariffs were widely popular in developed countries. At present, the most popular tariff model in Europe is the two-part tariff with a fixed block component. This can be explained by the fact that, on the average, fixed costs account for 70-85% of all expenditures of European water suppliers. However, the important trend of the last decade is the growth of the share of the fixed component in the payment within the framework of the two-part tariff (in some cases, implementation of a fixed rate was recorded). This is explained by the desire to strengthen financial sustainability of suppliers (a significant part of their expenditures are fixed costs) against the backcloth of the current trend towards reduction of water consumption, which trend is the logical result of water demand management measures.

Tariffs for industrial consumers


13 Ibid.

Structures of WSS tariffs for industrial consumers applied globally do not differ from tariffs for residential sector. Uniform volumetric tariffs are less frequently and block tariffs are much more frequently used with regard to industrial consumers than households (see Table B.3 in Annex B). Practices of application of markdown block tariffs with regard to industrial consumers are not as rare as with regard to households. Moreover, the principle of full recovery of costs is more frequently applied with regard to setting tariffs for industrial consumers. As regards industrial consumers in the OECD countries, separate charges for collection and treatment of waste water are most widely applied. More and more frequently, charges for waste water treatment are aligned not only with the volume of removed waste water, but also with the level of pollution of waste water (see Table B.4 in Annex B). This more accurately reflects the full cost of waste water treatment. There is also a practice of differentiation of payments for sanitation by types of economic activity.

**Tariffs for water used for irrigation**

The reviewed approaches to tariff setting can be fully applied to tariffs for water used for irrigation. However, pricing in the irrigation sector has a number of specificities.

Firstly, estimation of water cost on the basis of the area of irrigated land is a rather popular pricing model. This is explained by the fact that the practices of collecting payments for water used for irrigation purposes had started long before it became technically possible to accurately measure water consumption. In addition, the system of charging payments for water within irrigation systems is frequently aligned to the system of support to agricultural producers (and within this latter system the unit of measurement is usually the area of cultivated land). Volumetric tariffs are mostly used in the regions with dry climate, for example, in the countries of Mediterranean basin, or in the southern US states. The choice between these two approaches to pricing depends on specificities of climate and structure of agriculture.

Secondly, the establishment of payments for water used in agriculture, in vast majority of countries is an exclusive competence of public authorities. This is explained by economic specificities of irrigation activity (which is essentially a natural monopoly) and high sensitivity of agriculture to affordability of water resources.

Thirdly, the tariff structure and amount seriously affect the economic status of agricultural producers and the level of their produce competitiveness (especially, in water-short countries, or in countries with high tariffs for water within their irrigation systems). Nevertheless, changes in the cost of water but slightly affect consumption in the short run (the elasticity of demand to price changes is low) due to the fact that the necessary volume of consumption depends on the type of produce and technological level of production. In this connection, the key aspect of pricing water for agriculture is determination of the balance between the cost recovery and profitability of agriculture, whereas regulation of consumption volumes is second important. The only exception is the countries with an acute water shortage.

### 3.2.2. Tariff setting arrangements in the WSS sector

Tariff setting envisages that a balance of interests of service suppliers, consumers and the society as a whole should be secured. This balance of interests is to be found with regard to the activities specific to natural monopolies, which, in general, implies an engagement of public authorities.

Tariff setting arrangements are built on common approaches to organizing activities of the utility sector in respective countries.

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15 OECD (2010) *Pricing in the area of water resources management, water supply and sanitation*.
**British model** is characterized by 100% privatization of the WSS sector. WSS services are provided by private organizations that own property assets (fixed assets) in the WSS sector. The state controls their activities through ad hoc regulatory agencies (OFWAT in England), which bear responsibility for tariff setting and controlling the quality of services. Successful application of the British model is explained by the role of regulatory organizations and their performance efficiency, as well as by the level of independence of these organizations from the government and service operators. Regulators guarantee sustainability of service provision by operators via creating and maintaining market conditions with the help of the system of tariff regulation based on comparative competition\(^1\).

The **French model** envisages that the management and operation of WSS objects is implemented by private companies on terms of public-private partnership (PPP) contracts (as a rule, a lease contract or concession agreement). The PPP contract defines the rights and obligations of the operator, as well as long-term tariff parameters. The model envisages competition for the right to conclude a PPP contract, which rules out exorbitant tariffs and super profits (a monopoly rent). Within the framework of this model, there is no need in any tariff regulator. This approach was for the first time used in the 18\(^{th}\) century France, and then it quickly spread to other Mediterranean countries (Spain, Portugal, etc.)\(^1\). At present, this model is the most popular form of the private sector’s engagement in the management and operation of WSS systems in Europe.

Traditionally, within the framework of the **German model**, WSS enterprises are joint stock companies-owners of infrastructure objects. All 100% of shares (or the controlling interest) in these companies belong to municipalities. Municipal joint stock companies are responsible for provision of all utility services on the serviced territory; they may transfer some part of services to sub-contractors, and cannot implement any activity beyond the serviced territory. Tariff setting is within the range of responsibility of municipal authorities controlling the performance of companies reporting to them. The German model is applied in most countries of the Northern Europe\(^2\).

By far and large, only the British model clearly envisages the existence of authorities responsible for tariff regulation. It explains why most EU countries do not have an ad hoc regulatory agency for WSS, which could perform such functions as tariff setting and approval, or quality standards’ determination to control WSS services provided.

Within the framework of any model, national and regional authorities may approve general principles and methodologies for determination of tariff amounts. For example, in Portugal and Spain, these principles are approved at the national level, whereas local authorities are entitled to actually approve tariffs. In the Czech Republic, tariff setting is in the competence of municipalities, and the national government retained the right to control the amount of tariffs. In Spain, approaches to tariff computation are defined by territorial regulatory authorities, rather than by national authorities, and territorial authorities exercise control to assure that tariffs are reasonable.

The fundamental specificity of tariff setting arrangements in the WSS sector of developed countries is that tariff setting process is decentralized, which ensues from the economic nature of the sector directly “tied” to the situation in concrete enterprises and settlements. Therefore, tariffs are usually established at the municipal, and less frequently – at the regional level, regardless of the applied methodology for tariff computation.

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3.3. WSS tariff setting in the EECCA region

The quality of management institutes in the public sector of most EECCA countries is much lower than in developed countries. So far not all EECCA countries have developed an efficient system for water monitoring. As the result, most of these countries, especially the former soviet countries use less sophisticated tariffs than EU and OECD countries.

In Ukraine, mandates for providing appropriate quality utility services to the residential sector are assigned to local self-government bodies. They are not responsible for setting WSS tariffs and prices. Regional authorities are responsible for the interaction between the center and local governments with regard to delivery of these services, monitoring computations, regulating and controlling WSS prices and tariffs. Not more than 1/3 of water delivered to consumers is paid for on the basis of readings of water meters in Ukraine. Hence, the predominance of fixed tariffs there.

In Kazakhstan, as a rule, a uniform volumetric tariff for all consumer categories is used, and bills are divided into two parts: a tariff for water treatment and a tariff for waste water treatment. WSS tariffs are set on the basis of one of the following two methods – the method of “costs plus profit” (with annual revision of tariffs), and the method of “mid-term tariffs” (with approval of capital investment plan and control over its implementation). Operators are entitled to choose one of these methods, and the “costs plus profit” method is predominant.

The primary goal for the tariff policy in Armenia is to assure affordability of services for households, and the second important goal is to assure financial sustainability of enterprises. The process of installation of individual water meters in Armenia has mostly been successfully completed. Whenever water meters are in place, payments for water are charged on the basis of the factual consumption (if no meters are in place – on the basis of standard consumption). The advantage of this approach is the increased affordability of water, and the obvious disadvantage – the lack of financial sustainability of most of WSS service suppliers.

Armenia uses a uniform volumetric tariff – the same for all users. It includes three categories of expenditures: fixed costs; variable costs (which vary depending on the volume of supplied water, sanitation and water treatment services); and the cost of work with consumers (recording water meter readings, issuing bills and collecting payments). A bill is divided into three parts providing for separate billing for water, sanitation and water treatment. This approach promotes a more efficient management, contributes to making the management system more transparent, and rules out the possibility of cross-subsidizing in the WSS sector.

In general, simple volumetric tariffs (if water meters are in place) and fixed payments (if no meters are in place) prevail in the EECCA region. Two-part tariffs are rarely used, especially in post-Soviet states. The role of public authorities in tariff setting and controlling tariff amounts in the EECCA countries is bigger than in the OECD countries. Thus, in Belarus, Kirgizia, Moldova and Tajikistan tariffs are directly established by the authorities, and in Ukraine, Armenia and Georgia controlled by them.

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23 OECD (2011) Guidance for using contracts based on performance indicators between municipalities and water companies. EECCA practices and main findings.
24 Ibid.
3.4. Major conclusions to be derived by the Republic of Buryatia from international practices of tariff setting

Historically, the structure of the utility sector activity in Russia is not directly correlated to major models implemented in developed countries. As of 2012, only one third of all WSS systems in Russia (and they provide for 26.1% of useful water supply) were managed by private operators. Fixed assets of WSS enterprises are mainly owned by the state or municipalities. Tariffs in Russia are regulated, and federal authorities play significant role in relevant decision-making: they impose limits on the rate of tariff growth. The WSS sector in Russia is loss-making (according to the summarized data of official statistics)\textsuperscript{25}.

In this context, any recommendations for direct replication of any model for WSS structuring would be unadvisable and politically unfeasible. Nevertheless, international practices of managing tariffs and centralized water supply systems enable to formulate a number of conclusions highly relevant for improving the management of the WSS sector and irrigation systems in Buryatia.

1. The scope of financing WSS and irrigation systems should fully cover the cost of operation and timely renovation of the systems (expenditures for rehabilitation of fixed assets to compensate for their depreciation). Financing could be assured both with the help of tariff revenues and payment for connection, and with the help of shared financing from budgets.

2. The system of tariffs should create incentives for all consumer categories encouraging them to save water resources. However, while encouraging economic use of water, the interests of service suppliers should also be taken into account.

3. The most efficient way to balance interests in the area of WSS and irrigation is to use two-part tariffs including a “fixed” payment and a “variable” component. The advantage of such tariffs is that incentives for economic use of water are created. Simultaneously, limits on possible reduction of tariff revenues of suppliers are imposed, which reduction could otherwise exceed the reduction of costs due to decreased water release or volume of waste water removed (in other words, correctly estimated two-part tariffs can assure the reduction of suppliers’ revenues in proportion to the reduction of their variable costs).

4. The absence of payments for water as a resource in the irrigation area undoubtedly is at odds with best international practices. In addition to the lack of incentives for implementation of more efficient agricultural technologies and introduction of less water-intensive cultures with high added value, control over irrigation volumes is also discouraged. At the same time, “excessive” consumption of irrigation water may have rather grave environmental and economic consequences, for example, swamp formation or soil salinization with gradual deterioration of land plots and their withdrawal from agricultural production. Such examples are abundant in the EECCA region, especially in the countries of Central Asia.

\textsuperscript{25} Sivaev S., Pertsov L., Rodionov A. (2014) «Public service provision at the local level in Russia: development stages and current situation, Fund «The Institute for Urban Economics». 
4. Instruments for protection of bio-diversity and support for environment-oriented types of activity

The major problem of the RB and of natural resource exploitation in the BNA in general is that this region obtains too little economic benefits from the unique natural lake – Lake Baikal and inadequately uses it as a development resource.

Based on the findings of the 1st Interim Report, we can conclude that capitalization of the BNA is a key factor for assuring the balance between two goals – conservation of natural resources of the Baikal ecosystem and achievement of sustainable economic development of Buryatia. At present, the level of fiscal capacity of the RB is not sufficient for full-scale financing required for renewal of fixed assets in the water sector and implementation of appropriate number of water protection and other environmental measures. At the same time, enhancement of fiscal capacity is hindered by environmental restrictions, among other things. The BNA has a great potential for capitalization, but to meet this goal it is necessary to adapt international practices in this area, in particular, the practice of application of instruments for protection of bio-diversity and the practice of supporting environment-oriented types of activity. These are the practices of many developed and developing countries.

Recommendations of the OECD Council on application of economic instruments to promote protection and sustainable use of bio-diversity are the key OECD document regulating issues related to protected territories, natural and cultural heritage. The document is the methodological framework for development and application of instruments for protection and sustainable use of bio-diversity. The most important instruments used in international practices are pooled together in Table 4.1, with focus on administrative, economic and other (primarily, information) instruments.

Table 4.1 – Policy instruments in the area of protection and sustainable use of bio-diversity

<table>
<thead>
<tr>
<th>Administrative instruments</th>
<th>Economic instruments</th>
<th>Information and other instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restrictions and/or bans on the use of resources (e.g. on trading, wild fauna and flora species included in the Convention on International Trade in Endangered Species of Wild Fauna and Flora)</td>
<td>• Taxes and charges (e.g. on water abstraction, use of pesticides and fertilizers); • Payments (e.g. for the use of natural resources, access to national parks, license for fishing and hunting • Subsidies</td>
<td>Eco-labelling and certification</td>
</tr>
<tr>
<td>Permits and quotas (e.g. for fishing and forest harvesting)</td>
<td>Traded permits and quotas (creating the market of rights)</td>
<td>Voluntary agreements, for example between the private sector and the government</td>
</tr>
<tr>
<td>Regulation of economic activities based on standards (e.g. with regard to the size of nets used by commercial fisheries)</td>
<td>Payments for ecosystem services</td>
<td>Corporate environmental accountability</td>
</tr>
</tbody>
</table>

Recommendation of the OECD Council on Water Management Policies and Instruments [C(78)4/FINAL].
### Administrative instruments

- Restrictions and/or bans on the access (e.g. to protected areas and buffer zones)

### Economic instruments

- Responsibility instruments:
  - Penalty fees
  - Compensation for undermining bio-diversity

### Information and other instruments

- “Green” public procurements

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**Source:** OECD (2012) *A Framework for Financing of Water Resources Management; OECD (2012). Refocusing Economic and Other Monetary Instruments for Greater Environmental Impact: How to unblock reform in Eastern Europe, Caucasus and Central Asia*

Most of the instruments mentioned in the Table are reviewed in other sections of the present Report. Hereafter we focus on issues related to development of ecosystem services and support for environment-oriented types of activity.

### Payments for ecosystem services

There are different approaches to the payments for ecosystem services definition in international practice. In this project payments for ecosystem services are understood as compensation by consumers of ecosystem services (consumers of such services derive benefits from ecosystems) to persons or public law entities that own (control) ecosystem resources. Formally, payments for ecosystem services are payments under an agreement between the seller and buyer of a clearly defined service relating to the ecosystem. In this line, payments for ecosystem services is a particular case of support for environment-oriented types of activity.

Introduction of payments for ecosystem services means creation of a market of services, which were not priced in the past, i.e. were free-of-charge services, although the recipient of such services enjoys certain economic benefits, or these services are of aesthetic and cultural value. Payments for ecosystem services may play the role of incentives for quality improvement of ecosystems through enhancement of management. They can also facilitate the tackling of problems of distribution through compensation (at least, partial) to the owners of resources (authorities that manage resources) for undermining the productivity of resources. From the angle of economic theory, collection of payments for ecosystem services assures monetization of the resource rent and/or attainment of external effects, i.e. contributes to the achievement of efficient (well-balanced) use of the resource.

The most popular ecosystem services related to water resources management are as follows:

- Supply of assured quality water (e.g. water users in the lower reaches of river and/or the state pay to those who use or own land plots in the upper reaches of river for environmental methods of conducting economic activity);
- Protection of bio-diversity (support for specially protected natural areas, for environmentally sustainable forms of economic activity, etc.);
- Preservation of aesthetic value of landscapes (payments to administrations of protected areas for access to territories with aesthetically attractive natural landscapes or biodiversity);
- Carbon-dioxide absorption (organizations emitting significant volumes of green-house gases into atmosphere pay for forest planting or other measures aimed at forest protection).

Box 4.1 provides some examples of ecosystem services.

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Examples of ecosystem services

1. One of the first successful examples of using payments for ecosystem services is that of Vittel drinking water producers (France). In the 1980s, a lot of fertilizers and pesticides used by French farmers could be found in water sources used for production of drinking water. The quality of water was compromised, and Vittel company had to start encouraging farmers to opt for environment-friendly practices of agricultural production. Payments for ecosystem services were structured either as direct payments or as technical support to farmers in exchange for signing contracts with obligations to improve the methods of agricultural production (to cut the use of agrochemicals, plant forests, etc.). Payments are made during 7 years, because it is expected that within this period the changes in the agricultural practices become sustainable. As of mid-2000s, an annual average payment to farmers was at 230 USD per 1 hectare of land.

2. A successful example of ecosystem services implemented within the framework of public policy is the Programme of payments for ecosystem services in Costa-Rica. The authorities there ruled to create a financial mechanism for compensating the owners of forests for implementation of environmental measures on their land. The mechanism is regulated by the Forest Code of Costa-Rica, which contains a detailed list of ecosystem services and measures to be supported. Distribution of payments is implemented through an ad hoc targeted environmental fund – National Fund for financing forests. A well-developed procedure for monitoring the programme efficiency and effectiveness is in place.

3. The El Oro province of Ecuador has been implementing a project on payment collection for ecosystem services to finance the protection of the quality of water in the basin of river Río Arenillas. The consumer of services is the power dam of the HES, productivity of which suffered through an increase of mud content in the river water, sedimentation and clogging of HTS. Research revealed the cause of the increased concentration of solid sedimentation – the soil erosion due to intense deforestation in the upper reaches of the river. Therefore, the funds obtained with the help of this mechanism are used to implement forest rehabilitation measures. The average amount of payments is 32.4 USD per one hectare per year. Payments are collected and re-distributed by regional and local authorities in accordance with the Water Code of Ecuador.

Support for environment-oriented types of activity

Support for environment-oriented types of activity (ecopreneurship) plays a special role in natural resources’ protection. Such support is effectively a public policy aimed at facilitation of activities that favorably affect the environment, as well as promotion of environmentally neutral activities replacing environmentally hazardous activities.

The most common types of environment-oriented activity are as follows:

1. Production of machinery, equipment and devices that contribute to reduction of environment pollution (treatment systems, sorbents, monitoring and control devices).
2. Resource saving, recycling of wastes and alternate energy.
3. Production of environmentally clean food (without pesticides, herbicides, synthetic fertilizers and growth stimulants).
5. Environmental audit and consulting.

A vital aspect of environment-oriented activities is their indirect (usually, non-monetary) favorable impact on the economy and/or regional ecosystem. In the context of conservation of natural resources, the most important benefit is the replacement of environmentally-harmful production (technologically outdated industry, mining, forest harvesting, hunting, etc.) with environmentally neutral production. Other major indirect benefits are environmental education.
and enhancement of the cultural level of population, development of remote districts, etc. A typical example of support for environment-oriented types of activity is the use of the Bavarian Forest National Park (Germany). Its territory amounts to 24,250 hectares, and the part is owned by the federal land of Bavaria. The National Park borders with the natural park, the land of which is mainly privately-owned. These two parks form a bio-sphere reserve. 2 million persons visit the National Part every year, and almost 400 thousand of them use the services provided by the Park’s information centre. Visits to the Park are free-if-charge, and its revenues are generated by the sale of the information centre services and related services to tourists. As estimated by experts, budget revenues of the federal land of Bavaria related to the flow of tourists are almost 10 times higher than the losses of Bavaria’s budget resulting from the change in the Park’s status (from that of a “forest” to the “environment area”). Around 60-70% of the Park’s budget funds are allocated to support the tourism infrastructure and environmental education.

Prospects for implementation of ecosystem services and support for environment-oriented types of activity in the RB

At present, provision of eco-system services and support for environment-oriented types of activity in the RB is very limited. This activity is almost entirely limited to the use of specially protected natural areas. In the past, there were some attempts made to collect payments for visiting individual recreation objects, which payments were then channeled to protection of natural areas. However, today such initiatives are either purely local or non-existent at all. In the light of truly unique natural conditions in the region of Lake Baikal, this sphere of activity may be significantly scaled-up. As regards ecosystem services provision in the BNA, there is an obvious potential for development of tourism there. The first step in the direction of development of this type of ecosystem services may be mobilization of funds through introduction of a “resort fee” charged to each visitor for 24 hours of stay in the protected natural area. This fee not only existed in Soviet times and was applied in Buryatia in the past, but is also a common practiced in many countries of Europe and the world. This fee may be supplemented with a payment by tourists visiting specially protected areas using automobiles.

In this context, the initiative to create a tourism-recreation zone “Baikal’skaya Gavan” in Pribaikalski district of Buryatia, as well as a number of regional recreation zones deserves an outright support. At the same time, we should remember that tourism development can be assured not only with the capacity of a relevant territory, but also through the integrity of the tourism product, wide range of services, appropriate transportation infrastructure (the absence of the latter two frequently impedes the full-scale use of the territory’s capacity). In this respect the case of Lake Sevan in Armenia – the largest lake in the Caucasus and one of major alpine lakes in the world is very revealing. Attempts at tourism development in the national park “Sevan” have been made by the authorities of Armenia for nearly 20 years. So far the stream of tourists has not been big enough, and the ecosystem of the lake has been deteriorating.

A potentially efficient environment-oriented activity is the sale of the Baikal bottled water. The market of bottled water in Russia is highly competitive, which necessitates a special analysis of the issue of required volumes and optimal forms of support for this activity, which is already implemented by individual businessmen.

The RB has a big potential for scaling-up the use of economic instruments for protecting ecosystems and bio-diversity, as well as for support to ecosystem services and environment-oriented activities. As regards the use of price and tariff instruments, we recommend to increase and streamline payments for the use of natural resources, in particular, the entrance fee for

visitors to specially protected natural areas; and introduce compensations for undermining biodiversity. In addition, the RB may benefit from introduction of such an instrument as trading permits and quotas (creating markets of rights to fish, pollute environment, etc.), provided that their scope is not critical for Lake Baikal and ecosystems of the RB.

As regards the use of information instruments, there is a potential in the area of eco-labelling products and goods manufactured in the BNA – in the environmentally clean zone. Another promising measure in the RB is implementation of voluntary agreements in environmental protection area based on voluntary compensation schemes. Such agreements can be concluded by private producers and the government of the RB.

By far and large, as evidences from international practices of application of instruments for protection of bio-diversity and support for environment-oriented activities, the critically important factor for the success of these instruments in the BNA is the comprehensive assessment of the natural capital of this unique ecosystem. This assessment will be fundamental for cost evaluation of the set of potential ecosystem services. Such cost evaluation can be made with the help of relatively inexpensive indirect methods (see Annex A).
5. Instruments for protection of water resources and ecosystems: taxes and pollution charges, water resources-related risk management

5.1. Pollution taxes and charges for negative impact

Approaches to using this instrument

Pollution taxes and charges for negative impact on water resources are commonly applied in the process of WRM both in developed and developing countries. The key specificity of this instrument is that it can both reduce the level of pollution of water resources and generate funds for financing relevant areas. In the event of targeted use of revenues from taxation (payments), traditional lines for using these funds is the financing of water protection measures and compensations to public structures for their expenditures on waste water treatment and water resources protection. This type of instruments is particularly convenient for exercising control over a limited number of point sources of pollution.

According to the WRM theory, the rate of taxes or payments for discharge of pollutants should reflect the marginal costs related to pollution (see section 1 of the present Report). In this context, payments remitted to the budget (i.e. for public use) compensate for the negative external effects of pollution – for the negative impact on water resources, which affects both the society as a whole and water users on the specific territory. As we mentioned above, this approach is rarely fully implemented in practice, but it is a good benchmark for WRM.

Strong polluters’ opposition frequently poses problems for tax (charges) collection. Usually, the major polluters of water resources are industrial enterprises, which suffer extra financial burden when taxes (charges) are collected. Large enterprises are frequently capable of opposing the implementation of this instrument. In some cases, the instrument may also cause a protest of environmental interest groups, since it enables enterprises to flexibly approach the issue of paying taxes and charges (“streamlining taxes”).

The administration of taxes (charges) with regard to negative impact on environment is rather complicated. Full-scale implementation of taxes (charges) implies that a system for monitoring the volume of discharges of various substances over the reporting period, as well as a relevant controlling system should be in place. The system of should be developed with due account for the fact that, as a rule, rates of taxes (charges) are differentiated by various parameters. Moreover, this type of taxes necessitates an appropriate level of law enforcement and fulfillment of environmental requirements.

International practices of using taxes (charges) for discharge of pollutants seriously vary. In general, this economic instrument demonstrated its usefulness both as a regulatory instrument and as a mechanism for mobilizing additional revenues.

At the same time, there were some cases in the history of application of this instrument, when taxes and charges were established at unreasonably low levels, which ruled out the possibility of assuring an appropriate reduction of pollution or earning any meaningful revenues. In addition, as practices have proved, when possible environmental damage from a certain activity is potentially catastrophic, it is necessary to impose an outright ban on such activity rather than collect fees for discharge of pollutants or charges for other negative impacts on the environment.

European countries are most experienced in applying taxes and charges for discharge of

pollutant substances. In a number of countries (Germany, Netherlands, France), this instrument has already been applied over several decades. Prevalence of this economic instrument can be explained by the fact that it directly reflects one of major principles of European legislation in the area of environmental protection – the “polluter pays” principle 32.

European practices of collecting charges for discharge of pollutants revealed that this instrument is applied primarily to earn revenues, and the task of fighting pollution is only second-important (the regulatory impact of the instrument in the latter case is limited)33. Based on the research outputs, revenues from application of this type of instruments in France, Germany and UK in the 1990s – early 2000s covered only 50% of the estimated social damage from pollution.

When rates are low, control over pollution may be assured only if tax instruments and charges are applied in combination with direct instructions in the area of waste water treatment. Therefore, in most EU countries, economic instruments for controlling pollution are applied in combination with administrative instruments. Thus, in France, a set of measures is applied, which includes charges for pollution, a set of incentive subsidies and standards established at the level of river basins, regions and municipalities. An important component of the system for fighting water objects’ pollution in this country is the establishment of contractual relationships between the state and industrial producers, which envisage a set of requirements with regard to environmental protection34.

Mechanisms for collection of taxes (charges) for pollution and for the use of obtained revenues seriously differ from country to country. Table 5.1 contains data about taxes and charges for polluting water objects in a number of OECD countries, and Figure 5.1 shows the rates of taxes and charges in individual EECCA countries. The rates of taxes (charges) for pollution of water resources in many countries depend on the composition and amount of discharged pollutant substances and these rates can be increased many fold, if the established limits for discharges are exceeded (in the latter case taxes and charges are viewed as payments for failure to meet standards).

Table 5.1 – Taxes and charges for pollution of water objects in individual OECD countries

<table>
<thead>
<tr>
<th>Country (region), year</th>
<th>Computation base</th>
<th>Rate per unit</th>
<th>Object of taxation</th>
<th>Areas for using the obtained revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium (Flanders), 1999</td>
<td>Unit and composition of pollution</td>
<td>24.29 euros per pollution unit</td>
<td>Direct and indirect discharges</td>
<td>General environmental policy</td>
</tr>
<tr>
<td>Czech Republic, 2010</td>
<td>Composition of pollution</td>
<td>Varies</td>
<td></td>
<td>Public environmental fund</td>
</tr>
<tr>
<td>Denmark, 2009</td>
<td>Composition of pollution</td>
<td>1.48 euros/kg of biochemical oxygen demand (BOD), 2.69 euros/kg of nitrogen, euros/kg of phosphorus</td>
<td>Direct discharges</td>
<td>Overall budget, and partially – independent Water Fund (used to protect ground water)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country (region), year</th>
<th>Computation base</th>
<th>Rate per unit</th>
<th>Object of taxation</th>
<th>Areas for using the obtained revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia, 2009</td>
<td>Composition of pollution</td>
<td>Varies</td>
<td>Direct and indirect discharges</td>
<td>Environmental measures</td>
</tr>
<tr>
<td>France (Seine-Normandy), 2009</td>
<td>Composition of pollution and user type</td>
<td>35.79 euros per pollution unit</td>
<td>Direct discharges</td>
<td>WRM in the river basin (treatment, security, research, management), international projects</td>
</tr>
<tr>
<td>Germany, 2010</td>
<td>Unit and composition of pollution</td>
<td>Varies, starting from 37 euros per pollution unit</td>
<td>Direct and indirect discharges</td>
<td>Treatment of communal wastes, programmes related to water quality</td>
</tr>
<tr>
<td>Hungary, 2009</td>
<td>Composition of pollution</td>
<td>Varies</td>
<td>Direct discharges</td>
<td>Overall budget, and partially – targeted financing</td>
</tr>
<tr>
<td>Netherlands, 2009</td>
<td>Unit and composition of pollution</td>
<td>Varies</td>
<td>Direct discharges</td>
<td>Financing activities of WSS systems</td>
</tr>
<tr>
<td>Romania, 2009</td>
<td>Composition of pollution</td>
<td>Varies</td>
<td>Direct discharges</td>
<td>Public budget, Water Fund targeted financing</td>
</tr>
</tbody>
</table>


**Figure 5.1 – The base rates for discharges of nitrates in some EECCA countries, 2012, Euros per tonne**


In countries with developed WRM system taxes (charges) for pollution and administrative instruments for water quality management are applied separately – with regard to enterprises that
directly dump pollutants into water bodies and enterprises that discharge wastes in centralized sanitation systems. For example, such approach is regulated in detail by the US legislation.\(^\text{35}\)

**Recoverable charges for emissions (RCE)**

Recoverable charges for emissions (RCE) are a special mechanism within the framework of collection of taxes (charges) for pollution. RCE envisages lump sum refund of payment to the polluter. Within the system of recoverable charges, a group of similar type polluters is identified. These polluters “compete” for the achievement of the lowest level of emissions (discharges)\(^\text{36}\) per unit of produce. Enterprises within this group that have an average (for this group) volume of emissions (discharges) get compensations equal to the payments for emissions (discharges) they make (or partial compensation equal to a fixed share of payments made). Enterprises with indicators worse than the average level make payment for their emissions (discharges) without getting any compensation. Meanwhile, enterprises with environmental performance indicators better than averages get compensations exceeding their payment level (or partial compensation, the share of which is higher than that of average enterprises).

Benefits of this scheme are in the possibility of encouraging enterprises to reduce the level of emissions (discharges) without a significant increase in their expenditures. This mechanism can be more easily implemented politically than traditional taxes (charges) for pollution. However, its obvious drawback is the reduction of the public sector’s revenues.

Sweden pioneered the implementation of this scheme, and initially applied it with regard to incinerator plants. Since 1992, RCE have been applied in Sweden to regulate emissions of nitrogen oxides. The scheme is applied to all major incinerator plants that generate at least 50 Gigawatts of useful energy per year.

The payment amount is 5 USD per one kg of nitrogen oxides, and almost all revenues (80 million USD per year) are compensated for to enterprises in proportion to generated energy with due account for specific emissions. Administrative costs of the scheme implementation are minimal (0.2–0.3% of revenues). This scheme proved its efficiency with regard to reducing emissions and turned out to be acceptable for industrial enterprises. In addition to Sweden, the scheme is widely used in a number of other countries, for example, in Columbia and China.

The possibility of applying this instrument in Russia (in particular, with regard to discharges of pollutants into water bodies) should be considered.

**Examples of application of taxes (charges) for pollution**

The Netherlands is one of the most successful examples of regulatory effects of taxes (charges) for pollution of water objects in Europe and in the world in general. Rates of payment for discharge of BOD and heavy metals were established in the Netherlands at much higher level than in other EU countries (see Table 5.1). Econometric analysis implemented by some researchers revealed that payments for discharge of pollutants rather than treatment standards (that are also applied in the Netherlands) resulted in significant improvement of the quality of water resources in the country. According to such estimates, during 1976-1996, discharges of pollutants into water objects dropped by 70%. Moreover, this instrument motivated the country to beef up investments in the sanitation sector.\(^\text{37}\)

As regards developing countries, the instrument was successfully applied in Columbia. In the first half of the 1990s, the country had to face rapid pollution of rivers and growth of water

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\(^{36}\) Application of recoverable charges for emissions is practiced mainly with regard to pollution of atmosphere. However, this mechanism can be applied to any type of pollution.

transmitted infection. To address these problems, a system of payments was developed and implemented to control discharges of BOD and total suspended solids. Minimal rates of payment were established for the period preceding the attainment of the target 50% reduction of pollution. The rates were differentiated by regions, but at the same time, a minimal national rate was established.

The basin of river Rio Negro was selected as a pilot region for the project. Within the first six months of the programme implementation, they managed to reduce discharges of BOD by 28%, primarily through reduction of discharges by industrial enterprises. Revenues from the application of the approved scheme for collecting charges for pollution were used by environmental structures to develop capacity in the area of waste water treatment in municipalities of this region38.

Soon after the launch of this programme, there was a conflict between industrial and environmental structures caused by the tax rate. The conflict was successfully settled through refund of 30% of obtained revenues to industrial enterprises under the RCE scheme. This resulted in significant growth of environmental investments and reduction of the level of BOD discharges. Subsequently, this scheme was successfully disseminated in the remaining 33 regions of Columbia.

As the result of application of taxes (charges) for pollution in 1995-2003, they managed to almost halve discharges of pollutants into water objects in the basin of Rio Negro. Major factors contributing to such a success were as follows: serious attitude of the authorities to the establishment of a system of pollution monitoring and controlling implementation of standards, and greater focus on the dialogue between the authorities and industrial enterprises39.

China is considered to be an example of unsuccessful application of taxes (charges) for pollution. Payments for discharge of pollutants were established in the 1990s, but were actually collected only in cases when the level of pollution exceeded the approved standard level (very low, according to international practices), and the rates of taxes (charges) were low. Accordingly, the instrument could not seriously affect either the volume of discharges or the financial support to environmental measures40.

5.2. Instruments for controlling and reducing diffuse pollution

As international practices revealed, one of the most complicated objects for regulation is non-point source of pollution, or diffuse pollution (DP) – pollution generated by numerous dispersed sources. An example of DP is pollution related to activities of agro-industries. This sector is difficult to regulate because it is both difficult and costly to control numerous pollution sources, while the share of each source in the overall pollution is small.

Practices of DP regulation show that an efficient DP management is possible if administrative instruments are used in combination with economic ones, whereas application of economic instruments alone usually fails to produce the necessary effect.

This combination is in place, for example, in the Netherlands and Denmark: both of these countries achieve serious success in DP reduction in agriculture. Figure 5.2 shows changes in the specific levels of phosphate pollution from agricultural sources (point and diffuse sources) in the Netherlands and Denmark compared to the UK and USA.

40 Ibid.
The set of applied instruments in the Netherlands included:

- Quotas for livestock per one unit of the grazing area;
- High payment rates for above-standard pollution (with regard to biogenic matter);
- Gradually tightened standards, which include restrictions on volumes (maximum daily load) and maximum allowable concentration of discharges;
- Market of rights to discharges enabling to efficiently distribute the total biogenic burden between producers.  

Denmark developed quotas for use of nitrogen fertilizers differentiated by environmental indicators. If such quotas are exceeded, penalty fees surge. As regards dispersal of non-point sources of pollution in agriculture, the types and methods of land use can be considered a determinant factor. Denmark started to apply subsidies to maintain wetlands in proper condition and to use the former agricultural land for forestation. In addition, they used indirect taxes for pollution, including the tax on phosphorus contained in cattle fodder and tax on pesticides. Simultaneously with introduction of the tax on use of pesticides, a strict legislative ban was imposed on using highly toxic products.

**Figure 5.2 – Dynamics of phosphorus balance in the Netherlands, Denmark, UK and USA in 1985–2004, kg per one hectare of agricultural land**

![Graph showing phosphorus balance dynamics](image)

Source: Instrument mixes addressing non-point sources of water pollution, OECD, 2007

### 5.3. Trade in permits/pollution quotas

**Scheme of trade in permits and examples of its application**

Trade in pollution quotas/permits is based on creation of the market of rights to pollution. This

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42 Ibid.
market promotes the situation when reduction of pollution occurs at the expense of the enterprises, whose expenditures on reduction of an additional unit of discharges turn out to be the smallest. As in case of water markets, markets of trade in permits/quotas for discharges are regulated by ad hoc legislation establishing ownership rights to these permits, mechanism of trade, and defining concrete structures responsible for the management and monitoring of the trade in permits.

There is a wealth of international practices in the area of trade in pollution permits/quotas. Major versions of the market for trade in pollution permits are based on the initial distribution of permits/quotas for discharges. Such a permit may be issued to all polluters on common grounds (for similar volumes of pollution or with due account for technologies applied by the enterprise), with observance of the “old-timers’ right”, or through auction sales. The advantage of the scheme of trade in permits for discharges (if compared to the tax/charges for pollution) is that this scheme enables to better protect the rights to economic activity and does not eliminate the rights that existed prior to introduction of such regulation.

USA and Australia are most experienced in the area of trading in permits for discharges, whereas practices of application of charges for pollution are more popular in Europe. USA has a range of schemes of trade in such permits, which are currently applied. The schemes are primarily targeted at certain types of pollutants (BOD, chemical oxygen consumption, nitrogen, phosphorus, etc.) dumped in certain water bodies. The authority responsible for regulation of application of such schemes is the US Agency for Environmental Protection, and most frequently they are implemented at the state level.

An example of successful trade in permits for discharges is the scheme of trade in permits for discharges of nutrient substances (phosphorus and nitrogen) in the area of Lake Dillon, State of Colorado. This Lake has high recreation value and is also used as the major source for drinking water supply to the city of Denver. In this sense, the situation in this region has many similarities with that in Buryatia with its uniquely valuable Lake Baikal.

Problems of pollution with nutrient substances in this region are caused by discharges of pollutants from point sources into the lake (16 municipal treatment structures and an industrial enterprise), as well as from non-point sources of pollution (storm water drainage from neighboring cities). The scheme functions as follows:

First of all, the Committee for water quality identified a group of enterprises that are the major point sources of pollution and formulated the goal with regard to the burden of pollution inside this group. Then it defined the rights to annual discharges from each of the sources within the group based on historic data on discharges. The rights are traded within a particular group, as well as between point and non-point sources of pollution.

Trade in rights between point and non-point sources is based on the “two-to-one” approach, i.e. non-point sources should reduce emission/discharges by twice as big amount as point sources.

This scheme of trade in permits is based on the assumption that average expenditures on reduction of one unit of pollution for non-point sources amount to 119 USD, whereas for point sources they are estimated at 860 USD.

Implementation of the programme for Lake Dillon under this scheme resulted in the assured high quality of water against the backcloth of relatively low expenditures on reduction of discharges. When the scheme was just launched, there were some doubts about the possibility of its efficient administration (in particular, with regard to exchanging the rights to diffuse and point pollution). However, today such administration is in place: discharges are monitored, details about works executed are documented, and information about monitoring and controlling the observance of rights is recorded – all of the aforesaid is done with regard to each transaction.

A less successful example is the scheme applied to organic substances discharged into river
**Fox, State of Wisconsin.** This scheme was one of the first of its kind and was launched in 1981. It was intended to facilitate the State of Wisconsin with reducing pollution at minimal cost. The legal framework for the scheme was the Federal Clean Water Act\(^{43}\). Department for natural resources of the State of Wisconsin administers and supervises the implementation of the scheme. The rights to discharge pollutants are defined with regard to discharge BOD and are distributed between several point sources of pollution (mainly, paper factories and treatment structures).

Trade between sources of pollution is permitted in cases when the following requirements are met:
- Only a new or expanding enterprise unable assure that discharge standards are met can be a buyer;
- The proof should be provided by the buyer that he needs to have the level of pollution of the water body increased;
- The enterprise activity term is more than one year.

The foregoing requirements resulted in limiting the number of potential buyers. At the same time supply was also limited: there were only 5 pulp-and-paper mills and 2 municipal treatment structures in the district. In addition, enterprises found several alternative ways to meet the requirements that were not anticipated at the initial project stage, and the State government imposed restrictions on the rights of enterprises to re-sell permits. As the result, the level of pollution of river Fox has changed but slightly.

### 5.4. Potential for adaptation of international practices by the RB

We can state that taxes (charges) for pollution of water bodies are widely applied in many countries. The degree of success of application of this instrument from the angle of its regulatory effects and financial support to water protection measures differs. As revealed by international practices, rates of taxes (charges) should encourage polluters to reduce discharges. Rates should not be too high. Otherwise, they will be back-breaking for polluters and will not lead to the improvement of the current situation. Instead, they may spark opposition from payers (primarily, industrial enterprises). Based on the practices of a number of countries, for example, Columbia, the best incentive effect may be achieved through development and adoption of target indicators and plans for gradual reduction of pollution, as well as through differentiation of rates of charges for pollution by types of objects and pollutants. In addition, the most efficient rates are the ones established with due account for enterprises’ technological and investment potential.

In this connection, the use of the uniform additional factor of 2 in computations of charges for negative impact on the environment across the whole of the BNA (which implies one and the same level of impact in different environmental zones of the BNA) invites some doubts. In our opinion, the application of the uniform coefficient is incorrect and it is advisable to establish differentiated multiplying factors depending on the importance of the territory determined through environmental zoning. Such practices existed in the past, and we deem it feasible to revive them.

Efficiency of charges for negative impact on water objects can be improved through approval of the list of **best available technologies**, their implementation and use by different enterprises in Buryatia. This would enable to gradually achieve the established standards for the impact on the environment and reduce volumes of discharges at lower cost. In some cases, the use of best available technologies may assure additional revenues for enterprises through reduction of specific costs and/or through additional volumes of production from the same volume of raw materials. Table 5.2 shows several options for production of leather from salted hides: traditional

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\(^{43}\) Clean Water Act, 1972.
Russian, standard EU and best available technologies. We can see that the best available technology is not only the most environment-friendly, but also the most economically efficient one.

Table 5.2 – Individual indicators for various technologies of leather production from salted hides (per 1 ton)

<table>
<thead>
<tr>
<th>Technology</th>
<th>Finished product, kg</th>
<th>Water consumption, cubic meters</th>
<th>Energy consumption, Gigajoules</th>
<th>BOD, COD, kg</th>
<th>Solid wastes, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russian</td>
<td>126</td>
<td>62</td>
<td>17</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>Standard EU</td>
<td>200-240</td>
<td>40-50</td>
<td>15-20</td>
<td>70/170</td>
<td>600</td>
</tr>
<tr>
<td>Best available</td>
<td>250</td>
<td>15</td>
<td>10</td>
<td>40/100</td>
<td></td>
</tr>
</tbody>
</table>

Source: data provided by the OECD representatives during implementation of the project

The scheme of RCE also warrants attention, because this type of economic instruments may also turn out to be more profitable for the RB industrial enterprises, because many enterprises and organizations in the Republic lack financial resources necessary for transition to less polluting and more resource-saving technologies. However, the decision on feasibility of application of the RCE scheme is made on the basis of analysis of pollution structure: this instrument can be successfully applied if the number of polluters is big enough and if they have real opportunities for reducing discharges into water bodies.

**Potential for the trade in permits in the RB**

In general, the trade in permits for discharge is a universal and flexible instrument. Its outright advantage is the possibility of reducing the level of environmental pollution at minimal costs for the society. In addition, such schemes are more “loyal” to polluters than administrative bans and standards, and therefore – more attractive for industries.

As regards the shortages of this type of instruments, they are as follows:

- Relatively complicated administration;
- Markets of rights should be large enough and have sufficient number of players;
- Potential for trade in permits depends on how much expenditures on pollution reduction differ from participant to participant;
- Participants may halt trading through collusion.

In general, the flexibility of the mechanism of trade in permits (quotas) for discharges, possibilities for combining it with other economic and administrative mechanisms for WRM assure a significant potential for application of this instrument in the RB. In the light of specificities of Russian practices for regulation of natural resource exploitation and natural resources’ protection, the foregoing mechanism’s sphere of application is limited: the enterprises that systematically meet the limits established for discharges can be granted a permit for a fee-based transfer of the right to underused volumes of discharges of relevant pollutants to third parties. At the initial stage, the instrument may be used only with regard to individual types of pollutants (BOD, total and ammonia nitrogen, phosphorus, fats and oil products, heavy metals, etc.) and individual water objects (e.g. the basin of river Selenga).

5.5. Alternative instruments for controlling pollution of water resources

**Taxation of individual types of products**

Taxation of individual types of products that may significantly pollute water resources is a widespread mechanism for regulation of discharges. A typical example of this mechanism is
taxation of pesticides, herbicides, synthetic mineral fertilizers and other products that are potentially dangerous from the point of view of water resources pollution.

Practices of application of this group of instruments are rather successful. Thus, introduction of taxes on pesticides in some European countries (Hungary, Denmark, Netherlands, France, etc.) enabled to significantly cut their use (e.g. by more than 30% in Denmark). A substantial reduction of some environment-unfriendly substances’ use is achieved, as a rule, through various combinations of economic and administrative instruments.

As regards agrochemicals, the degree of their harmful impact on the environment depends not only on the concentration of active ingredients, but also on the number and quantity of substances used. Therefore, in Denmark the tax on agrochemicals is computed on the basis of retail prices, and the rate of taxes on herbicides and fungicides may vary. In France, the rate of taxes on pesticides depends on their “class” and toxicity and may exceed 10 euros per kg. The use of all revenues from this tax in France is targeted: they are spent on protection and sustainable use of water resources in a relevant water basin.

Taxes on environment-unfriendly or polluting types of products in the RB (e.g. the higher rate of excise or sales tax, if the latter is introduced) may be used both with regard to pesticides/herbicides and consumer goods that are potential pollutants of water resources (e.g. engine oil and synthetic detergents) – especially so if they do have environmentally safe analogues.

**Liability rules**

**Strict liability rules** are an instrument for protection and sustainable use of water resources used by some countries. They envisage an outright obligation to fully compensate the third parties for the cost of treatment and other damages suffered through the activity of an enterprise or company. These rules are usually applied when handling hazardous wastes and in accidents (oil spills, etc.)

The best known scheme of this type is the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) issued by the US Agency for Environmental Protection (US EPA) in 1980. This document identifies a list of chemicals and envisages that companies polluting the environment with chemical substances included in the list shall bear responsibility for pollution and should fully compensate the third parties for the cost of treatment and other expenditures. The US EPA is not obliged to prove that the company is guilty even if the latter has not committed an act of negligence or had no criminal intent.

These principles are applied at the level of US states to address local environmental problems that are not covered by federal jurisdiction.

There are mixed estimates of the success of this approach. Thus, some researchers pointed out that application of the “strict liability” legislation is caused by the growth of cases of chemical spills, included in the CERCLA list. According to some experts, the CERCLA programme has removed incentives for companies to act with necessary caution, since standards of such “caution” do not correlate with the potential liability. It was also found out that when the strict liability rules are applied, the scale and frequency of spills of pollutant substances from the list is higher among small-size companies possessing insignificant assets. This is indicative of behavioral response to the scheme of strict liability: small-size organizations with total assets smaller than potential damages start specializing in such hazardous types of activity


**Information disclosure**

Since the 1990s, requirements and standards for Information Disclosure (ID) related to discharges (emissions) and observance of standards in the area of environmental pollution have been more and more widely used around the world. Requirements to ID are an administrative instrument aimed at promulgation of environmental and other information on performance indicators of controlled entities (enterprises-polluters), so that this information is reviewed and studied by public. Thus, an interaction is established between enterprises-polluters and their personnel, other enterprises, community, consumer groups and financial markets.

This instrument enables to attract public opinion to acute issues, is fully transparent and does not imply significant costs. In this context, requirements to information disclosure are especially attractive for developing countries where the European practices cannot be directly replicated. In addition, the process of collecting data and information within the ID schemes may strengthen the local capacity for successful implementation of future regulatory policies.

One of the best known schemes for ID is the Toxic Emissions Register issued by the US EPA. The Register is intended to inform community about potential hazards of accidents involving chemicals and assure public response preparedness. The current legislation requires that the US EPA and all states should every year collect data on emissions and relocation of certain chemicals by industrial enterprises and inform general public within the framework of the Toxic Emissions Register. These data are disseminated in several ways, including their placement on the website of the US EPA. Such activities and data have not only a stimulating effect, but also serve as indicators of environmental progress.

An example of successful ID in developing countries is the Indonesia’s Program for Pollution Control, Evaluation, and Rating (PROPER), which has been implemented since 1995. In the past, environmental regulation in Indonesia was technically and politically weak resulting in deterioration of environment, which became of major problems facing the country. The National Agency for Environmental Protection developed and approved a scheme for ID in the area of pollution, as well as key financial indicators for companies-polluters. All enterprises were rated with the help of eco-labelling with assignment of relevant color marks to each group of enterprises (see Table 5.3).

**Table 5.3 – System for rating performance indicators under PROPER**

<table>
<thead>
<tr>
<th>Rating (rank, mark)</th>
<th>Technical requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold</td>
<td>International level treatment technology; minimization of wastes and pollution</td>
</tr>
<tr>
<td>Green</td>
<td>Above standards envisaged by environmental requirements</td>
</tr>
<tr>
<td>Blue</td>
<td>At the level of standards envisaged by environmental requirements</td>
</tr>
<tr>
<td>Red</td>
<td>Below the level of standards envisaged by environmental requirements</td>
</tr>
<tr>
<td>Black</td>
<td>Serious damage to environment; no pollution control in place</td>
</tr>
</tbody>
</table>


As of the moment of introduction of the system of labelling there were no companies in the country that got the “gold” mark; 5 organizations were rated as “green”, 61 – as “blue”, 115 – as “red” and 6 – as “black”. Over the first 6 months of the program implementation, discharges by 187 companies-program participants shrank by 43%, and their ratings have significantly improved. In due time, new enterprises were invited to the program.

The PROPER system was universally recognized as successful both in terms of environmental results and strengthening the capacity of the Agency for Environmental Protection, and with regard to creating an atmosphere of trust between this structure and the country’s industries. The
mechanism applied within the system produces an impact on:

- Media and reputation: companies’ managers get the sense of civil liability;
- Consumers of products manufactured by companies-polluters: reputation influences their decisions on purchasing;
- Investors: investor behavior acquires an “ethical” component, or they become concerned about consumer response and future liability;
- Population: reputation of companies-polluters is gradually ruined.

**Key success factors** for the scheme application were as follows: integrity of the program and absence of corruption in the regulatory authority; unequivocally interpreted system of criteria; high level of political support for the scheme and efficient public awareness campaign with information disclosure.

The scheme of ID in Indonesia ceased to be in force because of the coup d’état in the late 1990s. Nevertheless, similar schemes sprang to life in many countries of the region – in Thailand, Philippines, China, etc., and later on – in a number of developed countries.

**The Baikal natural area (BNA)** with its unique ecosystem and specific regulation of natural resource exploitation could become a pilot territory in Russia with regard to adoption of requirements to environmental information disclosure. When establishing requirements to disclosure of environmental information, it is advisable to take into account the practices of the utility sector of Russia in the area of ID standards application. It should be noted, that requirements to environmental information disclosure and eco-labelling of organizations-polluters have virtually no negative effects.

**Waste management and recycling of reusable material resources**

An important component of environmental activities in developed countries is waste management, in particular, encouragement of sustainable use of reusable material resources. This activity directly affects the water sector, since effluents from landfills is a major source of pollution for water resources. Facilitation of reuse of products, recycling of wastes and proper handling of other wastes is currently a policy commitment reflected in a number of programme documents of the OECD countries. Programme OECD and EU documents in the area of waste handling identify the following objectives 46:

- Reduce wastes generation;
- Reuse wastes, e.g. reusable glass and plastic containers/packaging and reusable materials generated in the process of recycling valuable fractions of production and consumption wastes – glass, plastic, metals, paper and cardboard;
- Streamline transportation and treatment of wastes;
- Promote rehabilitation of polluted environment.

The level of recycling certain types of materials in developed countries is rather high. Thus, in some European countries, the level of paper recycling exceeds 40% and glass recycling – 30% of its total production (Germany, Netherlands, Switzerland). An incentive policy includes promotion of implementation of new organizational and technological processes (in some cases – direct arrangements for waste collection), use of administrative and economic incentives for reuse and recycling of wastes, environmental advocacy.

An example of successful practices of reuse of resources to substantially reduce the environmental burden on the water sector is the system of collection of used machine oils in Canada. Within the framework of the programme on reuse of lubricants, the sellers of lubricants are obliged to accept machine oil used by consumers (up to 10 liters per day per person). Acceptance of used lubricants (by the seller himself, or by a special unit located at a distance of

maximum 5 km from the place of sale of lubricants. The programme was launched in 1996, and in the first year of its implementation 492 thousand liters of used machine oil were accepted. Later on, this figure continued to grow. Similar practices were in place in the Soviet Union, where motor transport services had to collect and hand over used lubricants to a relevant organization, if they wanted to get new oil.

The main methods for disposal of used machine oil are as follows:

- Oil burning with generation of heat and electric power;
- Regeneration to obtain new machine oil and other lubricants.

When selecting an appropriate option for disposal it is necessary to take into account environmental specificities of each option (see Box 5.1). It is also necessary to remember that implementation of both options implies that an efficient system for collection and recycling of used oils is in place. An important component of this system is the assurance of serious economic incentives for potential participants of the recycling programme.

**Box 5.1**

**Lubricants: disposal or reuse?**

In general, from the environmental protection angle, the reuse of lubricants is more preferable than their burning. Based on research outputs, we know that the energy intensity of reuse exceeds that of burning lubricants by 8%. Reuse of lubricants contributes to reduction of emissions into atmosphere. Heavy metals contained in oil (zinc, lead, cadmium and chromium) in the process of recycling end up in new chemical compounds, for example, in asphalt where they solidify and have practically no harmful effects for the environment.

In the event of burning used oils with generation of heat and electric power, hazardous elements end up in the atmosphere or in filters of pollution control equipment.


**5.6. Risks related to water resources and risk management methods**

**Types of risks and approaches to risk management**

Two major groups of risks related to water resources are usually identified in international practices:

- Risks for water resources (their quantity and quality) and relevant ecosystems, as well as for bio-diversity;
- Risks of the negative impact of water-related hazards (high water, flood, wind setup, mud-flow, etc.).

Management of the foregoing risks assures the safety of water resources and population residing near water objects. In the broader sense, WRM reviewed in the present report envisages risk management as well. In the narrow sense, risk management is defined as purposeful development of mechanisms for monitoring, evaluation, prevention of relevant risks, minimization of damage from relevant events, as well as response to risk-induced events.

An example of system-based approach to water risk management is the experience of the US

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Environmental Protection Agency (US EPA) in the area of handling pollutants in water supply systems, which are dangerous for public health and environment. The EPA develops methodology and instruments for monitoring, treatment, protection and rehabilitation of damaged waterways and water infrastructure. The EPA implements measures aimed at identification or risk factors, minimization of chances for onset of risks and potential implications of risks related to shortage of water, as well as water-related risks of undermining bio-diversity.

Within the framework of this system, special attention is paid to risks relating to emergency situations in systems of drinking water supply. Such risks may damage health. The EPA monitors such risks to obtain the information it needs to manage these risks in accordance with the US legislation. In particular, it regularly monitors the following:

- Handling pollutants in drinking water supply systems;
- Condition and rehabilitation of water objects exposed to negative impact;
- Technical assistance to the water sector necessitated by water transmitted diseases, quality of water resources, etc.;
- Methods and technologies for water resources’ protection and assurance of safe supply of drinking water.

It should be noted that risk management measures may also have economic consequences. For example, hedging instruments and government policies against the uncertainty availability of water can reduce the uncertainty in agricultural profitability. Therefore these instruments promote economic sustainability of agricultural producers. Such effects should be taken into account when implementing of relevant sectoral policies.

**Risks of the negative impact of water-related hazards**

Prevention of the negative impact of water-related hazards is a stand-alone aspect of WRM. Water-related natural disasters are a separate group of natural calamities. Major types of such disasters are as follows: flood, mud-flow, landslide, storm, wind setup, heat and cold waves, drought and water-transmitted diseases. As estimated by the UNO, every year several hundred natural disasters occur around the world, which affect dozens of millions of people.  

The negative impact of water-related hazards may include:

- Threat to public health and life as the result of direct impact of water, as well as epidemics caused by water-transmitted diseases;
- Damage to the environment, including devastation of habitat and threat to ecosystems;
- Property damage;
- Destruction of the recreation potential of water resources or water-related aesthetical values.

The logic of managing risks of the negative impact of water-related hazards is similar to the logic of management of all types of water-related risks. UK is an example of comprehensive approach to this issue. This country has identified the following stages for identification and management of risks of the negative impact of water-related hazards:

Risk identification includes:

1) Identification of territories within the risk zone, as well as identification of the level of risk of flooding or high water caused by inundation, sea wave run-up or other water-related hazards;
2) Development of the Flood Risk Appraisals or strategic assessment of the risk of flooding (as an independent assessment procedure) – both the Appraisals and assessment serve the

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purpose of evaluating the sustainability and designing relevant action plans.

Risk management measures include:

1) Identification of the approach enabling to reduce, to the fullest extent possible, the risk of adverse effects for people and their property, and to assure the residual risk management;

2) Implementation of actions that directly reduce risks or encourage people to reduce potential implications of risks, including the following actions:
   - Land protection via construction activity in flood-prone areas (construction of flood-control structures, diversion of flood-water, etc.);
   - Reduction of flood risks in new construction sites via planning, designing and installing sustainable drainage systems;
   - Use of opportunities provided by the new construction activity to eliminate the reasons for and reduction of the consequences of floods (e.g., construction of protective barriers and structures as integral elements of multi-purpose construction sites; creation of functional flood plains).

UK established requirements to risk assessment for making decisions on construction (Box 5.2). Implementation of these requirements is formalized in ad hoc regulatory acts.

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**Box 5.2**

**Requirements to water-related risk assessment for construction activity in the UK**

- monitor the risk of floods caused by construction, as well as the risk of damage to construction proper from floods;
- prepare expert opinions with regard to risk assessment at the stage of construction planning and object positioning;
- make quantitative assessment of potential damage from floods and high water as the result of implementation or non-implementation of measures aimed at reduction of the probability of onset of risks (reduction of damage) within the framework of construction activities;
- use historic data on cases of the negative impact of water-related hazards at the construction site in the past.


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**Water-related risk management principles**

Drawing on the practices of developed countries, we can identify the following common approaches to water-related risk management:

1. Risk management activity should be comprehensive in nature (in particular, some countries approve programmes and strategies for comprehensive risk management).
2. Risk management is based on systematic and scientifically substantiated monitoring and assessment of risks and potential damage in case of their onset.
3. Measures aimed at prevention of risk onset and mitigation of their consequences should include incentives for reduction of chances for risk onset and for minimization of damage.

Comprehensive management for risks of the negative impact of water-related hazards and climate change risks is often used in European countries. In the course of Lake Baikal protection, this experience can be used in relation to risk management of fluctuations of the lake level.

In forming the risk management system minimizing of risk level at any price cannot be considered to be best practice (and can rarely be achieved as well). Targeted management of risk level (i.e.

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49 [http://www.theseusproject.eu/](http://www.theseusproject.eu/)
the definition of an acceptable level of risk, which is aimed during policy implementation) is more appropriate.

Water-related risk management is implemented not only by public authorities, but also by commercial organizations. In the latter case, water-related risk management is an integral part of the general model for the organization’s economic activity.\(^{50}\)

As regards water-related risk management, the *OECD Council’s Recommendation on Critical Risks Management*, adopted on May 6, 2014 is extremely useful.

**Insurance against risks of the negative impact of water-related hazards**

The obvious economic instrument for managing risks of the negative impact of water-related hazards, as well as any other risks, is insurance. However, based on international practices, we can say that opportunities for commercial insurance against risks of natural disasters are limited. Such risks, including the risk of floods and high water, are characterized by low probability of their onset and grave consequences. The insurance procedure faces an acute problem of “bad” selection (when the insurance programme admits persons at the highest risk and expels those who are at less risk because of too big insurance premium). In addition, such risks can hardly be diversified in terms of geographical location, because territories suffer different level floods and mud-flows. All of the aforesaid imposes limitations on the traditional (for the insurance sector) simulation of losses and computation of an appropriate insurance premium.

Accordingly, a major part of insurance against such risks around the world is implemented by the public sector based on social reasons rather than business considerations. An example of an insurance programme implemented by the public sector is the US National insurance programme against floods. The programme is controlled by the Federal Agency for Emergencies Management, which cooperates with more than 80 operators of the programme (private insurance companies).

To get an insurance against floods, a household or private business entity should undergo a special assessment and express their readiness to meet the established rules for reduction of flood risks. Premium rates are established at the national level and depend on a concrete insurance agent. If buildings are located in the zone of high risk of floods, meeting the rules for reduction of risks implies substantial expenditures for the owners of such buildings.

The practices of insurance against such risks reveal how difficult it is to efficiently structure this system. Insurance against damage from floods and mud-flows, as a rule, is implemented with due account for both economic and social factors. In addition, the insurance system should take into account different probability of the negative impact of water-related hazards and the insured party’s activities aimed at reduction of risks of floods and mud-flows, as well as damages from the onset of these risks. This experience has to be considered by the RB, if a decision on implementation of the insurance system is made. This decision should be based on the analysis of statistics of floods and mud-flows and on developed procedures for encouragement of risk reduction. A transition period of several years is necessary for implementation of the analysis and development of procedures.

As revealed by international practices, it is advisable to supplement the public insurance against the risk of the negative impact of water-related hazards with an outright ban on new housing construction and construction of economic facilities in the zones of especially high risk. This is important, because the cost of land in such territories is usually much lower and there is a serious economic motivation to construct in these particular zones, despite the fact this will increase budget expenditures on compensations to victims of mud-flows, landslides, major floods and other manifestations of the negative impact of water-related hazards.

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\(^{50}\) Ernst and Young (2013) *Water Resources at the Corporate Level. Moving from a risk-based approach to active management*. 

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6. Forms and mechanisms of state support to the water sector

6.1. Role of public financing in international practices of WRM and approaches to finance allocation

There is a wide range of approaches to assuring appropriate financing for the water sector in international practices. Each country and region has its own approach to covering expenditures on water use and mobilizing financial resources. The role of State support plays a crucial role in the functioning and development of all components of the water sector. In most countries, the state

1) bears the major burden of expenditures related to creation of HTS and assurance of their functioning;
2) plays an active role in mobilizing investments in WSS objects and waste water treatment (current operational and managerial costs, as well as a major part of capital costs are covered with the help of tariff revenues);
3) provides core financing for water-related environmental measures.

The scale of state participation in the sources of financing for the water sector differs and depends on the component of the water sector, approaches to WRM applied in the country and the level of socio-economic development of the country. In general, both in developed and developing countries up to 70% of investments in the water sector are the public sector funding. In developed countries, the share of public funds is, on the average, lower, although there are some exceptions.

Such big role of public sources and state support in the water sector financing is explained by the fact that the major part of the water infrastructure around the world is in public ownership, and most of environmental activities (including water-related activities) are also implemented by the public sector.

Security, including water security, is an important public value, and the state bears key responsibility for assuring it. Therefore, regardless of the scale of participation of private operators, the state is always the guarantor of provision of WSS services, water infrastructure services based on HTS, implementation of environmental measures and actions aimed at prevention and minimization of damage from the negative impact of water-related hazards (mud-flows, landslides, floods).

Situation in the WSS sector is less homogeneous. There are different models for organizing the WSS sector: in some countries private operators play the major role in utility services provision (including services related to water use). However, even in many developed countries with market economy fixed WSS assets are in state and municipal ownership. Thus, WSS systems in Austria, Belgium, Bulgaria, Greece, Norway, Portugal, Sweden and Switzerland, as well as in some other countries are mainly municipally owned. Only 11% of the US population gets water supply services from private companies. Approximately 15% of US citizens obtain water from their own wells, whereas others receive drinking water from public sector networks, including those belonging to ad hoc cooperatives.

Regardless of who owns fixed WSS assets, financial support to WSS in the world is mainly rendered in accordance with the principle of full recovery (compensation) of funds – expenditures incurred at all stages of the “water cycle”. The obligatory minimum is the recovery

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51 For the purposes of the present Report the state support for the water sector is defined as support rendered by all levels of public authorities, including municipalities, of relevant countries.

of direct costs (operational, capital and managerial), whereas compensation for the alternative cost of the resource and external costs is a good practice, which has not yet become a global standard. However, even in case of projects envisaging full recovery of funds, the public sector most frequently participates in mobilizing funds for investing in WSS objects. As revealed by international practices, even in developed countries mobilization of funds for the water sector on purely market terms (without state participation) may unreasonably increase the project costs and in some cases make the project implementation impossible.\footnote{OECD (2012) \textit{A Framework for Financing of Water Resources Management}, Paris.}

OECD publications identify financing sources – the so-called “3T” (tariffs, taxes and transfers) within the framework of the financial aspect of WRM. 3T are used both directly and to support other instruments, including repayment financing – mobilization of credit resources of commercial banks, issue of bonds and other securities. Indirect use of tariffs, taxes and transfers is mostly common for developed countries. Forms of implementation of these instruments vary and include grants, soft loans (at the rate lower than the market rate), tax exemptions, tax benefits and accelerated depreciation of fixed assets for computation of the tax base.

As a rule, legislation in developed countries imposes limitations on state support to economic activities to prevent restraint of competition. Such limitations may extend to water infrastructure exploited with the help of payments made by water users.

Thus, according to articles 87 and 107 of the European Union Treaty, generally, state support to individual projects or manufacturers of goods is forbidden in EU member-states. However, this provision envisages certain exceptions. For example, it is allowed to

- Support individual consumers due to their social status;
- Support individual types of economic activity or regions, when such support does not seriously affect the overall market environment;
- Participate in the liquidation of damage inflicted as the result of natural disasters or other emergency situations;
- Facilitate implementation of most important projects of national or European importance.

State support to environmental projects and activities is also permitted, for example, in the process of adjustment to future (introduced) standards, encouragement of energy saving and use of renewable energy sources, relocation of hazardous industries. A good example of such environment-oriented support in the EU is subsidies encouraging rehabilitation of forests, creation and maintenance of wetlands.

In most countries, revenues from target taxes and charges are the most important source of financing for the water sector. In the EU and OECD countries, charges for water abstraction and water pollution, payments for traded permits (for abstraction of certain volumes of water, for discharge of certain pollutants, etc.) are the most important economic instruments used to finance the sector. France is a good example of application of such economic instruments. Its approach to the issue is summarized in Box 6.1.

### Box 6.1 Support to WSS systems in France

In France, support to WSS systems is based on the system of transfers. These transfers assure the equalizing of levels of tariff affordability between urban and rural municipalities, as well as between large and small settlements. In addition, the obtained funds are used to attain environmental goals set at the level of river basins.

The source of funding for these transfers is the target tax collected at the level of river basins. The tax is included in the tariffs of end-users of WSS services, and then WSS organizations remit the collected

Target taxes and charges are frequently accumulated in ad hoc funds. The most prominent example of such funds is the Delta Fund in the Netherlands – the county where more than half of the territory is below the sea level, and where a full-scale support to the HTS system is one of key national priorities. The assets of the Fund are used for construction, improvement, management and maintenance of water infrastructure, primarily – dams. The Fund’s Action Plan up to 2020 envisages execution of works worth minimum 1 billion euros per year. Substantial experience of establishment of ad hoc funds for tackling tasks of even lesser scale has been accumulated around the world (see sections 2 and 5 of the Report).

When using economic instruments for WRM, developed countries aspire to balance the regulatory effects of instruments and revenues from their application in such a way as to meet certain environmental and economic indicators. For example, the target volume of revenues from a certain payment is frequently determined on the basis of the funds required for the achievement of a certain level of water treatment. The amount of necessary expenditures depends on the volume of discharged polluted water, and this volume, in its turn, depends on the amount of payments established by the authorities.

### 6.2. Examples of instruments of state support to the water sector

Examples of various mechanisms of state support are given below. These mechanisms may be shaped as: a one-off programme with a limited validity term and an ad hoc targeted revolving fund with unlimited validity term; soft loans from ad hoc targeted funds and subsidizing interest rates under loans extended by commercial banks; and institutional (non-financial) support to the sector. They can be replenished with the example mentioned above – establishment of targeted basin funds in France – “water solidarity” funds.

#### 6.2.1. Development of the system of support to the water sector in Austria

The government of Austria draws up the general framework requirements to the water sector activities and bears major responsibility for assuring the safety of HTS. The area of joint responsibility of the central government and governments of lands (regions) is the implementation of water-related measures (assurance of water resources’ use in agriculture, flood control, implementation of major WSS projects, etc.). Municipalities bear main responsibility for organizing communal WSS in Austria.

Over recent decades, the system of state support to the water sector in Austria has undergone substantial changes.

The major support to the water sector, in particular, to WSS systems is rendered at the national level. In 1959–1993, the main mechanism of such support was the Fund for water resources management, which was responsible for allocation of national grants and soft loans. The Fund’s capital was formed with the help of budget funds. In 1984, the Environmental Fund was established, which subsidized projects on protection of atmosphere, projects in renewable sources of energy, as well as projects aimed at handling hazardous wastes. In 1987, the foregoing Funds were united.

Until 1993, the Fund for water resources management issued soft loans to finance investments in the water sector, because at that time the sector lacked private investment capital. Soft loans had very low interest rates (1–3%) and a long loan repayment period. However, the terms of support
were changing as time went by and in accordance with the type of infrastructure projects. By the moment of termination of the Fund’s operations:

- loans to the local water supply networks were originated at a fixed interest rate (3%), their term of repayment was 30 years, and a loan could account for almost 55% of total investment expenditures;
- loans for waste water treatment stations were issued at a fixed interest rate (1%), their term of repayment was 50 years, and a loan could account for almost 90% of total investment expenditures.

In addition to soft loans, the Fund allocated some of its assets in the form of grants, according to state policy priorities. Until the 1970s, grants were focused on the development of network economies of large cities. Since the 1970s, the policy of supporting tourism gained momentum across the country, and the major attention was focused on financing measures aimed at cleaning up lakes in the districts attractive for tourists.

In 1993, the Fund stopped accepting applications for financing, but even today it continues to finance investments under applications approved before 1993. After 1993, the then existing state system of subsidies was restructured and oriented at allocation of annual subsidies for payment of interest under loans directly from the budget. This reform enabled applicants to independently select a source of financing. One of the main reasons for changing the system of support was an increased affordability of long-term loans issued by commercial banks to finance capital investments and environmental measures in the WSS sector.

In addition to annual grants, there was introduced yet another scheme – lump sum financial support enabling the applicants who offer the most economically feasible projects to expect an extra financial assistance. This scheme is competition-based and encourages local self-governance bodies and WSS organizations to propose the most efficient solutions. It is also an incentive for inter-municipal cooperation based on inter-municipal associations, because the scaling up of projects results in the increase of the share of co-financing by the national government.\textsuperscript{54}

Before 2001, when an applicant received lump sum assistance he had to assure that the financial model of his project met certain indicators. Since 2001, this requirement was cancelled, and when applicants submitted their applications they started to independently assess the terms of loan mobilization and the acceptable ratio of their own funds and borrowings.

Austrian practices of supporting investments in the water sector are considered very successful. During 1959–2007, almost 40 billion euros were invested in the WSS sector development in Austria. The coverage and quality of WSS services in this country is high even by the standards of developed countries. In addition to the national system of support for investments, similar regional schemes continue to be implemented in Austria.

As in case of the RF, state support in Austria is provided if a feasibility study is prepared for the project. However, requirements to this substantiating document in Austria are higher than in Russia. For example, in Austria it should include a comparative analysis of different investment options accounting for anticipated expenditures on exploitation, investment recover and re-investment during the period of 50 years. If this approach were applied in Russia, it could improve the quality of decision-making. However, such requirements can be established only at the federal level.

\textsuperscript{54} OECD (2009) \textit{Toward overcoming the negative impact of decentralization in the water supply and sanitation sector. Review of several countries’ practices}, Paris.
6.2.2. Support to the WSS sector from state revolving funds in USA

The WSS system in USA is structured in such a way that most citizens are serviced by the public sector enterprises. The WSS sector is regulated jointly by the federal government and state governments.

At the federal level, the issues related to the quality of drinking water and discharges of waste water are within the competence of the US EPA. The latter has been implementing a large-scale programme on support to the WSS sector from state revolving funds (SRF)\(^{55}\). SRF are structures that issue soft loans for investing in WSS infrastructure and controlling non-point source pollution (diffuse pollution) and implementation of projects on protection of river mouths. Support for the development of “green” water infrastructure is provided separately. The funds report to the US EPA and state governments. At present, two state revolving funds are active – the Clean Water State Revolving Fund (established in 1987 within the framework of the Clean Water Act) and the Drinking Water State Revolving Fund\(^{56}\), which was established in accordance with the Safe Drinking Water Act\(^{57}\). The operations of these Funds are geared to particular regions, i.e. the funding allocated from the budget of a particular state is to be spent only in this state.

Schemes and conditions for support of the SRF’s projects differ, but there are some common principles, such as:

1. The SRF funding is allocated in the form of soft loans and credits to implement a list of projects approved by ad hoc collegiate bodies. The money can also be used to buy out municipal debts resulting from borrowings for infrastructure development. These are long-term loans/credits (up to 20 years).
2. The rules for support provision prohibit the issue of soft loans and other forms of support to the enterprises that violate the Clean Air Act and Clean Water Act. Applicants may get additional funding (up to 15%) if their projects include the component of “green” technologies accounting for 30% of the total project value.
3. Gratuitous and non-repayable spending of the SRF’s funding at the project start is prohibited. At the same time, participants can get subsidies in the form of partial writing off the debt under the loan. To get such a subsidy, the applicant should be included in the Plan for special use as a subject in crisis, or within an ad hoc “green” project.

SRF accumulate the capital necessary for their activities using federal transfers and contributions from state budgets (for each dollar contributed by the federal government, states should contribute 20 cents). Additional capitalization of the funds can be implemented through the sale of the rights to claim and issue of common bonds\(^{58}\).

During 1987–2007, the total budget revenues of the funds amounted to almost 65 billion USD (obviously, the foregoing SRF are only one part of the state system for the water sector support). This funding was used to finance projects via issue of 20,711 loans and credits. In general, the SRF’s activities are considered adequate to the tasks facing them.

The major advantage of the US mechanism of support is its flexibility. Within the framework of a single instrument the authorities managed to simultaneously provide for the following: allocation of substantial financial assistance, project competition, and encouragement of environmental measures. At the same time, the mechanism accounts for objective differences in the fiscal capacity of territories (through the mechanism of partial writing off the debt).

\(^{55}\) State Revolving Fund. \\
\(^{56}\) Clean Water State Revolving Fund, Drinking Water State Revolving Fund. \\
\(^{57}\) Clean Water Act, 1972; Water Quality Act, 1987. \\
\(^{58}\) US EPA (2014) *Utilizing SRF Funding for Green Infrastructure Projects.*
At the stage of making decisions on the areas for spending the funding, the instrument enables the commission representing a relevant state to independently select projects. This is the major difference from the system of federal transfers granted to constituent subjects of the RF, when the latter’s funds cannot be spent for the purposes other than those envisaged by federal documents well in advance.

6.2.3. Sweden: an example of institutional (non-financial) support to WSS organizations

In Sweden, all issues related to WSS, including the management of the collection and removal of storm waters, are within the competence of local authorities. Most WSS enterprises belong to municipalities and are operated by them. Each municipality independently addressing water pricing issues and determines the level of payments for WSS services.

Tariff revenues and payments for connection assure the financing for 99% of capital and operational costs of enterprises. The remaining 1% is covered by allocations from a special municipal tax imposed on visitors to the country.

Hence, the WSS sector can be considered sustainable. At the same time, the Swedish government prohibits to use the profits generated by the WSS sector in other sectors.

Approximately 40% of the sector’s budget comes from the water supply and is spent therein, and 60% – in the sanitation and waste water treatment area. Capital costs across the WSS sector account for 26% of the total budget of relevant organizations.

Swedish public authorities practically do not allocate direct subsidies to WSS enterprises. At the same time, they have created a well-developed system of non-financial support to the sector. In 1962, the country’s municipalities established the Swedish WSS Association to address technical, administrative and economic issues, as well as to represent the interests of municipalities at negotiations with central authorities and various organizations. The Association’s functions include the following:

1) Experience sharing, development and dissemination of recommendations and guidelines, organizing seminars and training courses for the members of the Association;
2) Initiating and financing research and development in the WSS area;
3) Collection and assessment of statistical data.

Today, all 290 Swedish municipalities have joined the Association. Its activity is financed through membership fees paid by municipalities and included in tariffs for services. The amount of fees depends on the size of municipalities.

The Association promotes the sharing and dissemination of technologies and efficient managerial solutions in the WSS sector, advocates the sector’s interests, provides analytical support for the sector activities. Thus, the Swedish public authorities have created an efficient system of institutional support to the sector. The costs of the Associations’ activities are covered by consumers, but the overall effects from its operations exceed the costs because the Association assures that the most efficient solutions are approved and technologies are shared.

6.3. Prospects for application of international practices of state support in the RB

Direct state support

Schemes of support to the water sector applied in developed countries are versatile, but there are some common features, such as:

1. **Focus on economic mechanisms and competition encouragement.** The EU and OECD countries rely on the principle of cost recovery (this, primarily, applies to the WSS sector). If possible and acceptable, economic mechanisms of support are prioritized: soft loans and credits, guarantees backing loans mobilized from commercial banks, and tax mechanisms. Soft loans and credits extended for the purposes of investing are widely used. Competitive selection of projects-potential support recipients is a rather frequently made.

2. **Flexibility.** In most cases, decisions on state support are made by ad hoc committees and commissions. Their activity, as well as the range of possible parameters for support, is governed by regulatory acts. However, in general, the degree of independence of such commissions with regard to decision-making is much higher than in Russia. This difference is particularly big when the source of financing for various measures is the national budget. In Russia, the list of financed objects and measures is usually approved by federal documents on the basis of proposals submitted by the regions. Meanwhile, in developed countries, in most cases regions themselves determine their first priority needs, even if the federal budget funds are to be spent. As a rule, regions are entitled to independently adjust the previously approved plans and even the launched projects on transfers (while reporting to the national government is still in place).

3. **Prevalence of target funds** accumulating proceeds from collection of taxes and charges related to water use. These funds may be either budget or off-budget. Comparison of systems of state support to the water sector in the EU/OECD countries and Russia reveals serious differences in approaches. Support to the water sector in Russia is based on direct budget funding in accordance with the usual procedure (revenues and expenditures related to water use are completely isolated from each other). The major part of funding for the water sector of the RB comes from the federal budget and is based on thoroughly regulated and rigid mechanism of allocation of subsidies and subventions.

When assessing the potential for development of the system of state support in the RB in accordance with best international practices, it is necessary to take into account the following considerations:

*First of all, enhancement of the Russian system of state support implies the necessity of reconciliation of and changes to the legislation, primarily, at the federal level.*

*Secondly, complete revision of current approaches to the tariff policy is an obligatory condition for strengthening the support to WSS systems and treatment structures.*

WSS tariffs established in the RB are reduced, first of all, through underestimation of the present value of fixed assets in the tariff. Artificial constraints on tariff growth make it extremely difficult (and frequently absolutely impossible) to adopt successful practices of support based on soft loans. This is explained by the fact that if it is impossible to fully include the investment surcharge in tariffs, investments can be provided only from the budget and mainly on non-repayable basis, rather than in the form of loans and credits.

Having compared concrete approaches to and instruments of support with the conditions, in which the water sector is functioning in the RB, we concluded that there is future for implementation of the following mechanisms:

First of all, the mechanism of soft loans for water-related projects and budget guarantees for such projects seems to be very promising. This mechanism makes it possible to mitigate a very acute (for the present-day Russia) **problem of low affordability of long-term debt finance.** If relevant federal decisions are made, all of the above-mentioned aspects of application of this mechanism may be adopted in Russia. In particular, special attention may be paid to adoption of the US practice of relaxing requirements to municipalities and other borrowers that find it

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61 See the 1st Interim Report under the present project.
difficult to repay their debts within the fixed term. Obviously, the practice of special support to “green” project components is highly relevant for the RB. This support is provided on competitive basis within the framework of the project as a whole.

Naturally, there is future for the adoption of the practice of establishing target funds for the support of the water sector and environmental measures. However, simple replication of foreign practices in this case is impossible because of the budget legislation of Russia based on the principle of cash unity. Accumulation of funds can take place with regard to a concrete list of sources withdrawn from the general norms of budget legislation.

Development of inter-municipal cooperation in providing state support to the WSS sector of Buryatia could play an important role. Stronger inter-municipal relations could enhance attractiveness of WSS service provision to residents of rural municipalities for the private sector through enlargement of serviced areas. In this respect, the practice of incorporating incentives for inter-municipal cooperation in the system of support, as well as institutional schemes of support (examples of which can be found in Austria and Sweden respectively) could be useful.

Reforming counter-productive subsidies in the water sector

Attempts to do away with counter-productive subsidies are a separate component of international practices aimed at improving the efficiency of state support for activities affecting the environment, including water resources.

The OECD defines an environmentally-harmful subsidy (EHS) as “a result of a government action that confers an advantage on consumers or producers, in order to supplement their income or lower their costs, but in doing so, discriminates against sound environmental policies. All other things being equal, the EHS increases the level of waste, pollution and natural resource exploitation to those connected”<sup>63</sup>. Typical examples of environmentally-harmful subsidies are subsidies for:

- Excessive use of irrigation water from irrigation systems resulting in marsh formation and soil salination;
- Agricultural producers without imposing any limitations on methods of production; it results in unreasonable use of pesticides and agrochemicals;
- Industrial producers, whose discharges and emissions do not meet national standards;
- Automobile producers and road transport companies; it results in the growth of emissions from mobile sources;
- Lumber industry; it results in higher rate of deforestation.

To date, a range of methods has been developed and tested internationally to identify and estimate the scale of use of environmentally-harmful subsidies. In particular, such estimates are based on the following methods<sup>64</sup>:

1) Direct assessment of the cost of the subsidy programme: direct costs and/or shortfall in revenues resulting from subsidies;
2) Measurement of the price gap (assessment of the subsidy’s impact on the price of the benefit);
3) Computation of effects from subsidies on the scope of production;
4) Determination of the difference between the factual price of the benefit and the cost estimated on the basis of marginal social costs (see section 1 of the present report).

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<sup>62</sup> On the use of the term “subsidy” in international practices see section 5 of the 1<sup>st</sup> (Interim) Report under the present Project.


Obviously some part of subsidies is inseparable from support to economic activity and cannot be immediately liquidated. However, in developed countries, campaign against environmentally-harmful subsidies is a purposeful policy. There were some examples of such campaign as early as in the 1960-1970s, when some environmentally-harmful subsidies were annulled. Since the 1990s, the fight against EHS became system-based and is waged primarily by supra-national structures (OECD, UNO, etc.), as well as by non-government organizations. Significant experience has been accumulated in gradual annulment of subsidies so as to minimize the negative impact on the supported sectors of economy.\textsuperscript{65}

Ad hoc methodology for assessment of subsidies influencing water resources and water sector by the criteria of their environmental, social, financial and economic effects was developed and successfully tested by the OECD.\textsuperscript{66} Rapid analysis of such subsidies in the RB aimed at identification of counter-productive (including environmentally-harmful) subsidies was made in the 1st Interim Report under the present project. It enabled to identify a number of counter-productive subsidies.

International practices evidenced that, as regards some subsidies, determination of concrete actions and deadlines for their implementation implies the necessity of ad hoc economic-mathematical simulations – and this is beyond the framework of the present project.

Nevertheless, gradual steps toward annulment of EHS should be made. For example, without any doubt it is necessary to annul subsidies shaped as “absence of payment for water as a resource” in irrigation and “absence of taxation” of potential sources of diffuse pollution, as well as some other subsidies in the RB. Framework guidelines with regard to counter-productive subsidies in the water sector in the RB will be formulated at the final stage of the project.

An ad hoc research is required for drawing up more detailed recommendations, including recommendations with regard to the subsidy reform timeline and cost parameters. Such research should include quantitative assessment of the degree of negative impact of relevant subsidies on the environment, their social and financial-economic effects, as well as identification of the reform methods and timeline acceptable for households and economy.

\textsuperscript{65} Ibid.

Conclusions

1. Instruments for WRM applied in international practices are very versatile. Common for WRM in developed countries is the comprehensive approach and combination of different types of instruments. Cross-cutting WRM envisages systematic approach to selection of instruments to regulate water use at all stages of the “water cycle”, and due account for the interaction of these instruments. The main types of instruments are economic instruments (aimed at creating positive and negative incentives) and administrative instruments (directive regulation). Information and other instruments play an auxiliary role. The trend of the last couple of decades in the OECD and EU countries is the scaling up of economic instruments’ application. At the same time, the replacement of administrative instruments with economic ones is acceptable only in cases when the potential damage to water resources and environment in general is localized, insignificant and not critical. If the possible damage is unacceptably big, administrative methods are applied.

2. WRM is an integral part of national systems of socio-economic development management. This determinates the importance of assessment of conformity of instruments used in the world with natural and institutional factors specific to the RB. In some cases, it may turn out absolutely impossible to introduce here (within a reasonable timeline and at a reasonable cost) an instrument that proved its efficiency in other countries. There are also cases when introduction of some instrument is possible and reasonable, but requires a transition period of several years to create proper conditions.

3. Water use (water abstraction) fee in the form of a water tax and water abstraction charges is collected practically in all developed countries. This instrument is applied to attain two goals: management of water use volumes and structure, and mobilization of funds (including funds for financing the WRM area). Buryatia waived the function of consumption regulation when collecting payments for water use, which is at odds with best international practices. The consequences of this approach are higher water consumption and abandonment of one of economic incentives for implementation of more efficient technologies. Based on international practices, we deem it feasible to strengthen the regulatory role of this instrument in Buryatia: to change the rate taking into account the scarcity of the resource and, possible, to establish correlation between the amount of payment and technology of use (for industrial consumers and WSS enterprises).

4. When designing tariffs for water within the WSS sector and for irrigation water, developed countries proceed from the necessity to meet target indicators with regard to volumes and structure of water consumption, and in addition address the task of balancing the amount of consumers’ expenditures on water and financial sustainability of service suppliers. EU directives for determining tariffs recommend to keep in mind the principle of full recovery of all operational and capital costs in the WSS sector. However, this approach is not always implemented. In cases when the recovery of all costs with the help of tariffs for services is impossible or unreasonable (e.g. due to limited financial affordability of services for households), the difference between the expenditures of service suppliers and revenues (tariff revenues and payment for connection) should be compensated for from the budget.

5. An efficient instrument for balancing the interests of consumers and suppliers of WSS services is two-part tariffs that include a “fixed” payment and a “variable” component. Correctly defined two-part tariffs encourage consumers to save water, and, on the other hand, assure economic sustainability of suppliers. However, regulating bodies should especially consider the issue of increasing the efficiency of the fixed costs of WSS companies. If this is not done, two-part tariffs can conserve inefficient fixed costs via fixed component of tariffs (for example, conserving excess capacities, which is particularly relevant in the post-Soviet countries).
Two-part tariffs can be recommended to the RB both for use in the WSS sector, and with regard to water supply in irrigation systems. As it has already been mentioned in the 1st Interim Report under the present project, the first step toward improvement of tariff policy in the region should be the establishment of economically reasonable tariffs (that assure the recovery of operational and capital costs), or introduction of compensations because of the difference between the factual and economically reasonable tariffs. In addition, the role of local self-governance bodies in the process of designing WSS tariffs in the RB is too small comparing with international practices.

6. The absence of payment for water as a resource in irrigation in the RB is definitely at odds with best international practices. It is recommended that at the first stage the main objective should be the introduction of payment as such and assurance of proper payment collection. However, attempts to improve the system of payments for water abstracted for economic activities should focus on optimization of rates. In the process of such optimization, it is necessary to assure a balance between the level of revenues and affordability of water for various types of consumers.

7. Taxes and charges for the negative impact (pollution) of water-related hazards are widely applied in most countries. This group of instruments most vividly illustrates the following principle: application of economic instruments is reasonable in cases when the potential damage is not critical. As evidences from international practices, rates of taxes (charges) should encourage polluters to reduce the rate of discharges. Maximum effect is achieved in cases when the rates are substantial, but not too burdensome for polluters, taking into account their financial status. The recommended approach for the development of the system of charges for pollution in Buryatia is its differentiation by territories and establishment of ever tightening standards based on existing production technologies (the approval of the list of best available technologies). It is also advisable to use simulations to justify the introduction of the scheme of recoverable charges for emissions and optimal parameters of such charges.

8. The mechanism of trade in permits for discharge of pollutants into water objects is an efficient scheme for managing the volume of pollution. However, this scheme is not applied in the present-day Russia. Therefore, a transition period will be necessary for the introduction of this scheme. At the first stage, this practice may be used with regard to a limited range of water objects and pollutant substances.

9. The mechanism for regulating diffuse pollution of water resources, which is widely (and, as a rule, successfully) applied around the world, is the tax on individual products. In the RB this tax may be used, for example, with regard to pesticides and herbicides, as well as consumer goods that are potential pollutants of water resources and water-related ecosystems.

10. Over the last couple of decades, in most developed countries, encouragement of reuse of products, recycling of wastes and appropriate handling of other wastes became a consistent state policy. This policy is applied both to ordinary wastes (solid domestic waste and other types of waste) and to individual types of pollutant products (used machine oils, etc.). The analysis implemented within the framework of the 1st Interim Report revealed that it is necessary to adjust this practice to the needs of the RB.

11. As regards innovative instruments for reduction of water resources’ pollution, we recommend to focus on the requirements to and standards for disclosure of information related to discharges (emissions) and observance of environment pollution standards. Practices of application of this instrument in developing and developed countries show that it has a serious potential for reduction of pollution at low cost. This mechanism is also useful in the context of advocacy of environmentally-friendly behavior. In this respect, the BNA with its special status and regulation of natural resource exploitation could become a pilot territory in the Russian Federation.
12. Capitalization of the BNA is the key component for assuring a balance between conservation of natural resources of the ecosystem of Baikal and achievement of sustainable economic development of Buryatia. To make capitalization successful, international practices should be adopted, primarily in the area of application of instruments for protection of bio-diversity (ecosystem services, etc.) and in the area of support for environment-oriented types of activity.

13. In the context of capitalization of the BNA, the initiative aimed at creating a special economic area – a tourism-recreation zone “Baikalskaya Gavan” and regional recreation zones should be supported. A potentially efficient environment-oriented activity is the sale of the Baikal bottled water. Eco-labelling of products and goods manufactured in the BNA (an ecologically clean zone) also has a great potential. As regards the list of ecosystem services provided around the world, it is recommended to focus on increasing and streamlining the amount of payments for the use of natural resources (in particular, payments for visiting specially protected natural areas, reimbursements and compensations for undermining biodiversity). Creation of markets of rights to fishing, pollution, etc. can prove to be useful for Buryatia.

14. Successful management of water-related risks envisages establishment of monitoring systems and implementation of measures aimed at reduction of probability of onset of such risks and ensuing damage. Relevant data should be comprehensive, and measures aimed at risk prevention and control should include both direct administrative requirements and incentives. A promising instrument for controlling the risks of the negative impact of water-related hazards in the RB is the development of the practice of life and property insurance. At the same time, international practices of such risk insurance demonstrate that the system of insurance should be developed with due account for the activities of insured parties aimed at reduction of risks of floods and mud-flows (and damages from onset of such risks). Such system should take into account social criteria and its development should be initiated by the regional public authorities. Most likely, a transition period will be necessary for implementation of the insurance system.

15. Today, the potential for application of best international practices of state support to the water sector in the RB is limited by resolutions issued by federal authorities. The best practices of developed and developing countries evidence that the most promising approaches to support for the water sectors are the enhancement of affordability of long-term debt finance and partial accumulation of revenues related to water resources and environment in ad hoc (target) funds. From the point of view of structuring the system of support, it is advisable to strengthen the role of regional authorities of the RB and local self-governance bodies in the decision-making, as well as to encourage inter-municipal cooperation.

16. Attempts to do away with counter-productive (EHS) subsidies are a separate component of international practices aimed at improving the efficiency of state activities in the area of natural resource management, including WRM. In the 1990s the policy in this area became system-based, and today ad hoc mathematical methods are applied for identification of such subsidies and assessment of their impact. As revealed by practices, immediate annulment of most subsidies is too complicated both economically and socially. As a rule, such annulment should be staged. The rapid analysis implemented in the 1st Interim Report revealed a number of counter-productive subsidies in the RB. We recommend that an ad hoc research should be conducted to identify the full list of EHS in Buryatia, assess the degree of their impact, develop a “road map” (an action plan) for reforming these subsidies.
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Annexes

Annex A. Indirect environmental assessment within the framework of the water-related policy

Cost estimate of natural resources and benefits of their use is an important aspect of the cost-benefit analysis and decision-making in the area of WRM.

Indirect environmental assessment is used in cases when the available data are not sufficient, time is running out, and the cost of direct assessment is too high. Benefit transfer methodology and hedonic analysis are indirect assessment methods widely applied around the world.

Benefit transfer methodology

The transfer of existing benefit estimates is the method used for assessment of changes in the quality of natural (including water) resources. It has gained popularity in recent years, because frequently there is a shortage of both means and time for implementation of initial (direct) assessment of each policy measure.

This method envisages that values obtained at the location and at the time of implementation of initial assessment of a certain effect shall be transferred to the currently reviewed situation. The method is applied as follows:

1. Natural parameters of an environmental benefit or service are estimated, with regard to which pecuniary valuation should be made.
2. Analysis of possible approaches to benefit transfer is made with due account for economic specificities of territories and ecosystems, and an initial estimate is selected for transfer. Major approaches in this case are unit transfer (transfer of value adjusted to the scale) and function transfer (transfer of factors conditioning the value, and obtaining the result on the basis of their new values).
3. Specificities of the territory and ecosystem, with regard to which the transfer is made, are formalized.
4. Data obtained at the location of initial research are selected and analyzed.
5. The estimate from the location of the initial research is transferred to the location where a similar policy measure will be applied, in accordance with the selected approach to transfer and with due account for parameters of the initial and the currently reviewed situation.
6. General benefits and costs of application of the selected policy measure are computed, and possible margin of error of the transfer is estimated.

A good example of application of this method is the transfer of benefit estimates for assessment of the fight against environmental pollution from industrial sources in the Asopos river basin in Greece. Within the framework of the research, the value of clean water was estimated on the basis of such criterion as people’s readiness to pay for the ecosystem improvement (the unit of measurement used was the marginal annual payment by one household).

When selecting the initial situation for the transfer, it was decided that the initial assessment should have been made with regard to the object with properties similar to those of Asopos river.

and geographically as close to Asopos river as possible. Therefore, only objects polluted by industrial sources on the territory of Europe and Mediterranean region were reviewed. The main selection criteria were the quality of water (the level of pollution), comparability of factors and sources of pollution and population using water from polluted sources.

Based on the review of a number of research papers, the basin of Guadalquivir river (Spain)\(^70\) was selected as the most appropriate object for the transfer of benefit estimates. The basin of Guadalquivir is located in the Mediterranean region and has similar climate. Moreover, research was implemented there under the EU Water Framework Directive using similar legislative framework with application of the same approaches as in the Asopos river basin. The main pollution sources were industrial discharges, just like in case of river Asopos.

The assessment was made with an adjustment to the difference in peoples’ income and in the cost of money during different periods of time (based on the consumer price index), and to a number of other parameters.

The obtained estimate of the transfer of the value of environmental improvements in the river basin varied from “bad” to “very good” and amounted to 116.94 euros of annual payment by one household. The estimate of the transfer of possible payment for environmental improvements in wetlands amounted to 14.45 euros. These are quantitative estimates of the value of the appropriate quality water for population.

\textit{Hedonic analysis}

The hedonic analysis method is based on the assumption that real property prices depend on the environmental attractiveness of territories and natural risk factors (in particular, the risk of floods and mud-flows). Within the framework of this approach, the difference in the cost of objects which are comparable in all respects, except for their environmental attractiveness and environmental risks, is the pecuniary valuation of relevant attractiveness and risks.

For example, the cost of agricultural land under otherwise equal conditions depends on affordability and quality of water resources, as well as on the security of the territory with regard to the negative impact of water-related hazards.

The major premises for the application of this method are: existence of the real property market where demand and supply are formed on the basis of the utility value of realty objects for their users.

An example of application of this method is the estimate of value of ground water in the water-bearing horizon of Kition in Cyprus.

Land plots in the Kition district located near the sea may be used either for agricultural or tourism purposes. The productivity of this land depends on the quality (degree of salination) of ground water. The location that close to the sea is a negative factor for agricultural use of land because of high salination of water-bearing horizons, but the very same location is a positive factor if the designation of this land is changed from agricultural to tourism development.

To identify the value of ground water in this district, the market of land plots was reviewed. The data about the cost of land were used to determine the level of influence of the quality of ground water on consumers’ willingness to buy the land, i.e. the value of ground water was identified. Water salination level (which is higher, if the land plot is located closer to the sea) is the ground water quality factor that can be quantitatively assessed.

The research revealed that an increase in the water salination level enhances the value of the land plot if it is to be used for tourism rather than for agricultural purposes. As we move closer to the sea, the probability of using land for more profitable tourism-related needs is growing.

Annex B. Description of WSS tariffs in the OECD countries

Table B.1 – Structure of tariffs for drinking water supplied to households in the OECD countries, 2008

<table>
<thead>
<tr>
<th>Country</th>
<th>Payment for connection</th>
<th>Fixed tariff</th>
<th>Tariff types</th>
<th>Markup block</th>
<th>Fixed component’s base</th>
</tr>
</thead>
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<td></td>
<td></td>
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<td>Without fixed payment + fixed payment + minimal rate + fixed payment</td>
<td></td>
</tr>
<tr>
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<td>x</td>
<td>O</td>
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<tr>
<td>Austria</td>
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<td>O</td>
<td>data not available</td>
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<td></td>
<td></td>
<td></td>
<td>data not available</td>
</tr>
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<td></td>
<td>x</td>
<td></td>
<td>data not available</td>
</tr>
<tr>
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<td>x</td>
<td>x</td>
<td>x</td>
</tr>
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<td></td>
<td></td>
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</tr>
<tr>
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<td></td>
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</tr>
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<td>data not available</td>
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<td>x</td>
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<td></td>
</tr>
<tr>
<td>Japan</td>
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<td></td>
<td>x</td>
<td>data not available</td>
<td></td>
</tr>
<tr>
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<td></td>
<td>x</td>
<td>data not available</td>
<td></td>
</tr>
<tr>
<td>Luxemburg</td>
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<td></td>
<td>x</td>
<td>data not available</td>
<td></td>
</tr>
<tr>
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<td></td>
<td>o</td>
<td>data not available</td>
<td></td>
</tr>
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<td>o</td>
<td>o</td>
<td>data not available</td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
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<td>o</td>
<td></td>
<td>data not available</td>
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Notes: Yes: 1; No: 0; Fixed payment: x; o; o
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<th>Country</th>
<th>Payment for connection</th>
<th>Fixed tariff</th>
<th>Constant volumetric</th>
<th>Markup block</th>
<th>Fixed component’s base</th>
</tr>
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<td></td>
<td></td>
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<td>+ fixed payment</td>
<td>+ minimal rate + fixed payment</td>
</tr>
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<td>available</td>
<td>o</td>
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</tr>
<tr>
<td>Poland</td>
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<td>o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
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<td>data not available</td>
<td>o</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovakia</td>
<td>data not available</td>
<td>o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
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<td>x</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Sweden</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Switzerland</td>
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<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Turkey</td>
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<td>o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern England and Wales</td>
<td>yes</td>
<td>x</td>
<td></td>
<td></td>
<td>real property cost rectangular</td>
</tr>
<tr>
<td>Ireland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Scotland</td>
<td>data not available</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA</td>
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<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
</tbody>
</table>

x – OECD data, o – Global Water Intelligence data
Source: OECD (2010) *Pricing in the area of water resources management, water supply and sanitation*
Table B.2 – Structure of sanitation tariffs for households in some OECD countries, 2008

<table>
<thead>
<tr>
<th>Country</th>
<th>Payment for connection</th>
<th>Charged in the same way as for water supply</th>
<th>Structure of sanitation tariff matches the structure of water supply tariff</th>
<th>Payments for sanitation separated from payments for waste water treatment</th>
<th>Procedure for determination of payments for sanitation and waste water treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>uniform tariff (different for sanitation and waste water treatment), based on the volume of water consumption</td>
</tr>
<tr>
<td>Flanders</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>water consumption</td>
</tr>
<tr>
<td>Brussels</td>
<td>yes</td>
<td>data not available</td>
<td>no</td>
<td>yes</td>
<td>fixed and volumetric rates (based on the factual cost of WSS)</td>
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<tr>
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<td>data not available</td>
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<td></td>
</tr>
<tr>
<td>Canada</td>
<td>yes</td>
<td>data not available</td>
<td>data not available</td>
<td>data not available</td>
<td></td>
</tr>
<tr>
<td>Czech Republic</td>
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<td>no/yes</td>
<td>yes (fixed tariff)</td>
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<td>water consumption, plus profit and taxes</td>
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<td>Denmark</td>
<td>yes/yes</td>
<td>no/yes</td>
<td>no (fixed tariff)</td>
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<td>Finland</td>
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<td>water consumption</td>
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<td>France</td>
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<td>data not available</td>
<td>yes (constant volumetric + fixed payment)</td>
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<tr>
<td>Hungary</td>
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<td>no</td>
<td>yes (constant volumetric without fixed payment)</td>
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<td></td>
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<td>Italy</td>
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<td>water consumption</td>
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<td>data not available</td>
<td>no</td>
<td>data not available</td>
<td></td>
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<tr>
<td>Mexico</td>
<td>yes</td>
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<td>data not available</td>
<td>data not available</td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
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<td>data not available</td>
<td>no</td>
<td>yes</td>
<td>based on water consumption, determined as a percent of the water tariff</td>
</tr>
<tr>
<td>Spain</td>
<td>data not available</td>
<td>data not available</td>
<td>yes (markup block + fixed payment, markup block + minimal rate + fixed payment)</td>
<td>yes</td>
<td>based on water consumption, determined as a percent of the water tariff</td>
</tr>
<tr>
<td>Sweden</td>
<td>yes</td>
<td>no</td>
<td>yes (fixed tariff, constant volumetric without fixed payment, constant volumetric + fixed payment, constant volumetric + minimal rate + fixed payment)</td>
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<td>the same amount as for water</td>
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<tr>
<td>Country</td>
<td>Payment for connection</td>
<td>Structure of sanitation tariff matches the structure of water supply tariff</td>
<td>Payments for sanitation separated from payments for waste water treatment</td>
<td>Procedure for determination of payments for sanitation and waste water treatment</td>
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<td>--------------</td>
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<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>sanitation: payment for connection + fixed payment waste water treatment: volumetric payments</td>
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</tr>
<tr>
<td>Northern Ireland</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>total cost of sanitation estimated in accordance with generated waste water (95% of consumed water)</td>
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<tr>
<td>Scotland</td>
<td>yes</td>
<td>yes (fixed tariff)</td>
<td>yes</td>
<td>is not measured, is paid for depending on the housing category determined in accordance with municipal criteria for real property assessment</td>
<td></td>
</tr>
</tbody>
</table>

Source: OECD (2010) *Pricing in the area of water resources management, water supply and sanitation*
### Table B.3 – Structure of tariffs for WSS services provided to industrial consumers by the public (municipal) sector in the OECD countries, 2008

<table>
<thead>
<tr>
<th>Country</th>
<th>Charging payments for connection</th>
<th>Fixed component’s base</th>
<th>Fixed tariff</th>
<th>Constant volumetric</th>
<th>Markup block</th>
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<th>Full cost recovery</th>
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<td></td>
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</table>

* Fixed component: it is applied to industrial consumers, whose water consumption is not metered; based on the business value and approximate volumes of used water/generated waste water

Source: OECD (2010) *Pricing in the area of water resources management, water supply and sanitation*
### Table B.4 – Structure of tariffs for sanitation and waste water treatment services for industrial consumers in the OECD countries, 2008

<table>
<thead>
<tr>
<th>Country</th>
<th>Payments for sanitation separated from payments for waste water treatment</th>
<th>Structure of sanitation tariff matches the structure of water supply tariff</th>
<th>Procedure for determination of payments for sanitation and waste water treatment</th>
<th>Use of special tariffs</th>
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<td>yes</td>
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<td>waste water treatment: fixed rate for one unit of pollution</td>
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<td>based on water consumption</td>
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</tbody>
</table>

Source: OECD (2010) *Pricing in the area of water resources management, water supply and sanitation*