



Transboundary Water Resources: Strategies for Regional Security and Ecological Stability

Edited by

Hartmut Vogtmann and
Nikolai Dobretsov

NATO Science Series

Transboundary Water Resources: Strategies for Regional Security and Ecological Stability

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Transboundary Water Resources: Strategies for Regional Security and Ecological Stability

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PREFACE

After the soviet era and since their independence the new Central Asian countries are rebuilding a system of water resources management: an important challenge for the development of the whole region. The NATO workshop held on 25-27 August 2003 by the Federal Agency for Nature Conservation, Germany and the Siberian Branch of the Russian Academy of Science, attended by experts from five Central Asian countries, Russia, six Western European countries, the US and the UNEP offered water engineers and nature scientists as well as economic and political scientists and practitioners from water administrations and international river commissions to meet in Novosibirsk and develop sustainable approaches in the management of Central Asian water resources.

This book presents important aspects of transboundary water resources, i.e. the global water crisis: problems and perspectives; regional experiences in solving water problems in Central Asia; problems and management of transboundary water resources; ecological and economic aspects of water management; scientific analysis and tools of water changes; strategic implications of water access arisen during the workshop.

A final recommendation in the area of equitable sharing of benefits, monitoring and data collection as well as proposals for Central Asia transboundary waters programme were set in the book as the main result of the meeting.

The editors.

ENVIRONMENTALLY SUSTAINABLE WATER USE FOR SUSTAINABLE DEVELOPMENT AND ENHANCING SECURITY IN CENTRAL ASIA

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ABSTRACT

This chapter outlines the relationship between environmentally sustainable water use, sustainable development and regional security in Central Asia. Environmentally sustainable freshwater use is argued to be an essential component of sustainable development, including poverty reduction. It is also argued to be important for reducing the potential for insecurity in Central Asia, in the context of transboundary waters in the region. The chapter sets out key elements for environmentally sustainable water use and successful transboundary waters management.

1. INTRODUCTION – THE GLOBAL SITUATION

Freshwater is a fundamental requirement for human survival and socio-economic development. Chapter 18 of Agenda 21 highlights the importance of water and indicates the way to a secure, sustainable water future. Its general objective is to ensure adequate supplies of water of good quality for the human population of the Earth, while also preserving the hydrological, biological and chemical functions of ecosystems and combating vectors of water-related diseases. Most importantly, however, Chapter 18 advocates that humans adapt their activities to live within the capacity limits of nature. That is, we must change the way we manage and use water to achieve the sustainable use of water. It is stressed that this is not primarily for the sake of the environment; rather it is to secure sustainable economic and social development for people, especially poor people.

Yet we are far from achieving the sustainable use of water and in many parts of the world, people are facing a water crisis. And, unlike the energy crisis, the water crisis is life threatening, and it is the most immediate and serious environmental, social and economic problem facing over a billion people in the world today.

The extent of the water crisis is indicated by the following examples (UNEP 1999; 2002):

- World-wide, about two thirds of the population in 2025 are likely to be subject to moderate to high levels of water stress
- About 20% of the world's population lacks access to safe drinking water and 50% lacks adequate sanitation.

- World-wide, three million people die every year from diarrhoeal diseases (such as cholera and dysentery) caused by contaminated water;
- Polluted water affects the health of 1.2 billion people every year, and contributes to the death of 15 million children under five every year.
- Vector-borne diseases, such as malaria, kill another 1.5 to 2.7 million people per year, with inadequate water management a key cause of such diseases.
- Increasing demands on available water supplies carry the potential for conflict over transboundary water resources.

At present levels of population and water demand, there is not enough clean water in large parts of the world. If water management remains as inadequate as it currently is, the present water crisis will become a catastrophe that will prevent the achievement of sustainable development in many parts of the world and cause the deaths of millions more people, mainly children. And while the crisis is not so life threatening in many parts of the world, water related economic costs and environmental degradation are also serious issues in many countries. Additionally, increased political tension as competition for water use intensifies in some water basins is more likely.

2. CONTRIBUTION OF THE ENVIRONMENTALLY SUSTAINABLE WATER USE TO SUSTAINABLE DEVELOPMENT

Water is a key element of sustainable development because it is an essential component of life and income generating activities. But for too long the environment has been seen as a competing user. A response to criticisms of environmentally unsustainable water use may be that there is no other choice but to use water in an environmentally unsustainable way. However, this view of the environment as a competitor misses the critical point that the environment is fundamental to sustainable development. That is, if water is used unsustainably over time less is available to meet the needs of people. More specifically, if water is used consistently at a faster rate than it is replenished and/or if it is polluted so its use is restricted, then there are direct economic and social costs. As the World Bank states "the environment [is] not just another consumptive user of water but the water resource itself and ... degrading the quantity and quality of water in rivers, lakes, wetlands and aquifers can inextricably alter the water resources system and its associated biota, affecting present and future generations." (World Bank, 1993). (The discussion above follows Smith et al 1998).

The sustainable use of water provides sustainable economic benefits - through good health and income generating activities, including food production. Conversely, unsustainable water use imposes costs through health problems and reduced production. While there is much focus on the costs of environmental protection, there is not enough focus on the costs of using environmental resources such as water unsustainably. This is partly

because these costs are often borne by those who have the least say - the poor.

Costs of environmentally unsustainable water use

Health Costs

The most obvious water-related cost is from the sickness and death some forms of pollution cause. The costs of sickness and death from water pollution are enormous, but because they are often borne by individuals with little or no market or political power, those in power and who manage water do not pay sufficient attention to these costs. Taking the figure quoted at the beginning of this paper of 1.2 billion people falling ill from contaminated water per year, if US\$5 is needed per person for medicines, that is equivalent to US \$ 6.0 billion per year in medical costs alone.

As the burden of such sickness and death falls on the poorer members of society, the cost as a proportion of their income is much higher than it would be in the developed world. If someone earns about a US\$1.00 a day, and it costs US\$5.00 to treat a water borne illness, a very heavy financial burden is imposed on that person.

Production and Income Costs

As indicated above, water generates benefits for humans. People use water to produce, for example, food, and generate revenue from sell what they produce. Thus, if water is used in an environmentally sustainable manner over time, the productive capacity of water resources is reduced and production and incomes decline.

The case of the Aral Sea basin is a well-known example of how environmentally unsustainable water use can have serious economic consequences. The environmentally unsustainable use of freshwater resources for agricultural irrigation in the Aral Sea basin has decreased lake water levels and quality severely. As a result, the fishing industry has collapsed. In addition, the inefficient use of irrigation water in this semi-arid region led to salinisation and a subsequent decrease in agricultural production. Serious human health problems have arisen with wind blown dust contaminated by agricultural chemical residues. (UNEP 1993; UNDP 1996).

Ecosystem costs

While pollution and excess water withdrawals cause serious damage to ecosystems in many parts of the world, which can be quantified in physical terms, it is much more difficult to calculate the monetary value of such damage. Declines in fish catches, for example, can be valued, as there is a direct link between ecosystems and human income. Less easily, health cost and productive impacts from pollution related illnesses can also be estimated. Biodiversity decline is far more difficult to value. Nevertheless, these impacts and cost occur, and sooner or later, reduce the goods and services that water provides to humans. Thus they must be included in a

comprehensive cost-benefit analysis. But unfortunately these impacts are not adequately considered in many cases.

Thus, using water unsustainably wastes water and wastes money, both of which are essential elements of sustainable development. To reiterate, environmentally sustainable water use is a vital component of sustainable economic and social development.

And it is important to stress that sustainable water and land use are closely connected. Land in water catchments must be managed sustainably to maintain and maximise the productivity of water. For example, unsustainable land use causes erosion that results in sediment run-off to water bodies and reduced water retention, increased flooding and lower reservoir storage, as well as decreasing soil fertility.

3. CONTRIBUTION OF ENVIRONMENTALLY SUSTAINABLE WATER USE TOWARDS POVERTY REDUCTION

Not only is environmentally sustainable water use a pillar of sustainable development, but also coupled with appropriate management regimes, it could and should be a vital contributor to poverty reduction.

As indicated above, health costs arising from diseases caused by polluted water impose costs the poor are least able to bear. In addition, excess withdrawals and pollution reduce the economic benefits from water use. Conversely, sustainable water use and sound management produce sustainable income from the goods and services requiring water – most obviously food. Improvements in water resources management, if targeted at the poor, can have a major impact on their lives by enabling them to increase productive activities that result in significant increases in income, thus reducing poverty.

In terms of water supply and sanitation, sound water utility management generates sustainable revenue flows which can then be used to improve supply to poor people and help all water users use water more efficiently through investment in appropriate end use technologies. Water utility management inefficiencies contribute directly to poverty - in many cities water losses are 40% or more of total water supply! Conversely, water utility efficiency improvements would contribute directly to improving the environmental sustainability of water use and reducing poverty, with improved services reducing illness and associated costs, and increasing the potential for increases in income.

4. CONTRIBUTION OF THE ENVIRONMENTALLY SUSTAINABLE WATER USE TOWARDS REGIONAL SECURITY IN CENTRAL ASIA.

Increasing competition over water resources in Central Asia could lead to increased political tension, due to, *inter alia*, disagreements over the allocation of water and the sharing of associated benefits between states.

Environmentally unsustainable water use increases the potential for tensions to develop, because unsustainable use reduces the quantity and/or quality of water resources and as a result reduces the actual or potential benefits generated. Thus states are faced with a declining resource, and if demand for water is constant or increasing, competition for this declining resource will increase, thereby raising the potential for disputes and increased tensions.

Environmentally sustainable water use over time maintains the quality and quantity of the water available and therefore the benefits that can be generated from the water resources in question. Therefore the potential for disputes is reduced if such water use is maintained, compared with using water unsustainably. The potential for disputes can be reduced if water management improves the environmental sustainability of water use and increases the potential benefits that can be generated.

A number of factors –political, geographical, economic, social and environmental – combine to determine the state of regional security and it is necessary to fully include the environmental dimension in regional security considerations.

Given the transboundary nature of water resources in Central Asia, it is important that a transboundary approach is taken to manage such waters, to maximise the benefits generated by the water resources and to share them equitably to, *inter alia*, reduce the potential for regional disputes.

In summary, environmentally sustainable water use managed on a transboundary basis is consistent with reducing the potential for regional insecurity. Below key elements for environmentally sustainable water management are set out, followed by a section on transboundary water management.

5. ACHIEVING ENVIRONMENTALLY SUSTAINABLE WATER USE: SOME KEY ELEMENTS.

The tools and techniques necessary for achieving environmentally sustainable water use have been agreed upon by the international community – as evidenced by the Chapter 18 of Agenda 21, (1992) the Bonn International Conference on Freshwater (2001) and the World Summit on Sustainable Development. (2002). The prime issue is to ensure the implementation of agreed targets using generally accepted and recognised techniques and tools.

It is also necessary to ensure the actions and policies in key water using sectors are consistent with environmentally sustainable water use. Thus, an intersectoral approach is needed.

Governance

Good governance is the most important prerequisite to solving freshwater problems. Governance includes policy, legal frameworks, management approaches, institutional structures and decision-making processes. Another essential requirement for good governance is the

political will to address the problems, including corruption and inefficiency.

This is widely recognised as the key reason why water is used in an environmentally unsustainable manner and why so many people lack access to clean water and waste treatment infrastructure. This recognition is long standing. For example, the Conference on Water Development in Less Developed Areas, held in Berlin in 1963, found that "the main problems in the field are not technical, but are of an organisational, administrative, political or managerial nature. Aid giving nations may be more helpful in solving these political problems than in providing either engineering or financial aid." (Howe, 1995).

Despite this recognition, attempts to address water management and policy issues have been grossly inadequate. The international community and national governments share responsibility for this. It is easier to provide money for infrastructure projects than train managers and reform water management agencies, which is probably partly why donors in the past have concentrated on such projects. To date the focus has been too much on engineering works - and many of these have failed to deliver anticipated benefits because the management frameworks in which they were planned and build were inadequate. Sound engineering works flow out of sound management and planning frameworks – that is, out of sound governance.

For example, around Lake Chad are hundreds of metres of unusable concrete irrigation channels and associated pumps. These are unusable because unsustainable water use from the lake has reduced water levels to below the level that can be reached by the pumps.

Below are some of the key elements needed for improving water governance.

Water Policy and Legal Frameworks

Water policies and law should:

- Have an overall objective of environmentally sustainable water use. Environmentally sustainable water use is the key to maximising, over time, the sustainable benefits from water resources.
- Incorporate this objective in policy detail so that it is operationally meaningful

It is not enough to have an overall policy objective of environmentally sustainable water use. The objective must be reflected in the operational clauses of water policy and law detail so that it results in the environmentally sustainable use of water resources

- Mandate the use of Integrated Water Resources Management (IWRM)

IWRM is the key tool to environmentally sustainable management of water and maximising the benefits of water resources use over time. (See below).

- Avoid fragmented water use & allocation decision-making and ensure there is inter-sectoral policy co-ordination

Co-ordinated decision-making on water use is vital for ensuring that water goes to the highest value uses, and thus generates the maximum benefits for people. It is necessary to ensure the actions and policies in key water using sectors are consistent with sustainable water use. Thus, an intersectoral approach is needed. For example, it does not make sense to invest significant capital in additional irrigation schemes when cheaper improvements in food storage to cut food spoilage would meet food needs. If agricultural policy and pricing encourage inefficient use of water, these should be addressed. As another example, industries should not be permitted to pollute water and profit from this, especially when the poor have to use the polluted water for their basic needs.

- Include enforceable incentives

Enforceable incentives – both economic and regulatory – are vital to ensuring water use is efficient and environmentally sustainable. Enforced regulations and fines applying to pollution plus economic incentives for efficient water use needed. (Meister, 1995).

- Adopt the subsidiarity principle

This is that water use decision-making should be devolved to the lowest government level consistent with internalising significant externalities. For example, management of a village water hole should be devolved to the village, within national policy and legal guidelines. And on the other end of the scale, management of a transboundary water resource should be conducted on an inter-governmental basis.

Appropriate Institutional Frameworks

Appropriate institutional structures and mandates are vital for good governance and integrated water resources management. Various models for appropriate water management institutions exist, and different models have been proven to work. Whatever the final design of water management institutions, there are certain goals and characteristics that they should aim for. From a 1995 UNEP workshop on economic principles from water management (Howe, 1995):

The institutional framework should ensure:

- Co-ordinated surface water and groundwater management;
- Co-ordinated water quantity and water quality management;
- The provision of incentives for greater economic and physical efficiencies in water use;
- Protection of in-stream flow values and other public values related to water systems.

This requires water management institutions that have the following characteristics (Howe, 1995):

- i. Capability of co-ordinating water plans and management procedures with other functional agencies. (E.g. agriculture, environment, economic planning, industry).

- ii. Capability of considering a wide range of alternative solutions to water problems, including non-structural measures and the use of economic instruments. (E.g. pricing, taxes, tradable permits, subsidies, etc.).
- iii. Separate planning and evaluation from construction and management functions. (I.e. Do not have dam building agencies responsible for watershed management.)
- iv. Have the multi-disciplinary expertise to carry out "multiple-objective planning and evaluation." (See Multi-objective planning below.)
- v. Observe the "subsidiarity principle" in assigning responsibilities to agencies at national, provincial and local levels. (IE assign responsibilities to the lowest level consist with the internalisation of important externalities.
- vi. Have the expertise to involve all "stakeholders" in planning operations from the beginning.
- vii. Build in a reward structure that will stimulate creativity and innovation.
- viii. Build in a reward structure that will stimulate learning through ex post analyses.

Multi-Objective Planning

Appropriate tools must also be used. A key tool for integrated, inter-sectoral approaches is multi-objective planning that bases catchment management decisions on an integrated assessment of environmental, economic and social factors. (Howe, 1995). As noted above, environmental degradation inevitably has economic and social consequences for human beings. In the case of catchment degradation, agriculture and energy production are reduced, which imposes direct economic costs. Contaminated water imposes harsh economic and social costs on people.

The elements of multi-objective planning are:

- i. Cost-benefit analysis from the national perspective
- ii. Cost-benefit analysis from the project or regional perspective
- iii. Environmental impact analysis
- iv. Social impact analysis (usually non-monetised.)

Cost-benefit analysis should include economic, social and environmental impacts. If it does not, then it will not include all the relevant impacts. Some impacts cannot be costed, but they should at least be identified. A diagram on how to integrate environmental, economic and

social assessment is in Annex1. "A narrow benefit-cost analysis would include only those factors outlined in double lines by extending the benefit-cost analysis, as indicated by the single lines, the whole array of effects on the natural system, the receptors, and the economy are incorporated." (Hufschmidt et al, 1983).

Including the poor in water use decisions.

An enhanced partnership between the poor majority, (who lack adequate access to water and sanitation), government and private sector partners is vital. Currently those who have access to water are far more prominent in decisions about water supply than those who do not have water. Thus, the interests of existing users predominate over the interests of the poor. No matter that the needs of the poor are desperate, it is too often the case than present users have more impact on water use investment and management decisions. Therefore it is important that those currently without adequate supplies of water are provided with formal and informal mechanisms so they have an active say in water policy and infrastructure decision-making.

Integrated Water Resources Management. (IWRM).

IWRM is the accepted key tool for successful water resources management. A core principle of IWRM is the environmentally sustainable use of water. Integration occurs at all levels and for all aspects. For example, IWRM includes integrated social, economic and environmental management, integrated sectoral management, plus integrated land- water management. It is strongly recommended that it is applied on a water catchment basis, as the water catchment is the natural management unit, encompassing all significant interactions in a water body.

There are a number of detailed guidelines on IWRM – for example, see the Global Water Partnership IWRM Toolbox (<http://www.gwpforum.org/servlet/PSP>).

Mobilising Financial Resources for water resources management and service provision.

Adequate financing is vital to achieve environmentally sustainable water management and to expand service provision, and good governance is vital to raising finance. But mobilising finance can be a highly sensitive issue, because it includes such issues as privatisation and water pricing. Finance mobilisation solutions that benefit developing countries in the long term, address the needs of the poor majority and that are consistent with the environmentally sustainable management of water are the aim.

There is no doubt that a significant increase in international funding for water sector reform and infrastructure is vital and urgent. Billions more are needed, but they must be spent wisely.

With regard to privatisation, the sale of water utilities and the contracting out of water revenue collection have advantages - such as service delivery improvements, improved revenue collection and financing

for expansion. But there are also disadvantages. If developing country utilities are sold in a poor management and financial state then the price gained is lower than if management was efficient and the financial situation good. In addition, the revenue stream to government or local authorities from water sales is reduced or lost. Privatised utilities require regulation, and in the developed world sophisticated regulatory authorities have been established to monitor privatised water utilities. However, most developing countries do not have the capacity to establish these.

A suggested approach is for the international community and governments to place far more emphasis on improving the management of developing country water utilities. Then improved revenue streams will be generated to finance service delivery and infrastructure improvements - and also to finance improvements to enhance the environmental sustainability of water supply and use. This could be achieved through donor funded management contracts where donors and private sector experts enhance the capacity of water utilities to manage themselves.

Water Pricing

Water pricing is a key tool for efficient management of water resources. Water sales are the most direct way of raising finance and appropriately applied, they also encourage improved efficiency in water use. There is no doubt that over time, water prices that reflect the true cost of water supply will result in more efficient use of water and more cost effective investment in water infrastructure. But the needs of the poor majority must be met at a price they can afford.

While some reject the use of pricing that reflects the cost of supply, consideration should be given to the costs of subsidising water to larger users. The opportunity cost to poor people is one cost - water used inefficiently by larger users and the funds used in infrastructure to supply such inefficient use could be used in supplying the needs of the poor. As it is, in many places the poor pay more per litre of water than the rich. For example, in Nairobi, water vendors in the slums often charge about 25 US cents per twenty litres. In contrast, in the better suburbs of Nairobi, water prices range from about 35 US cents to 70 US cents *per cubic metre* of water! And the costs the water for poorer people all too often include sickness.

Therefore it is not surprising that when the poor are asked, research suggests (Sivalingnam 1995, 1.) that they have a higher willingness-to-pay for clean, secure water supplies than richer people tend to assume. Moreover, in many cases, the cost of piped water is lower than the poor currently pay.

For larger users, the questions must be asked: If they are making money from selling goods why cannot they pay the true cost of water? What proportion of their production costs is comprised of water? Do they have options to improve the efficiency with which they use water, and thus reduce their costs if water prices rise? (Total cost equals price times

quantity - if the price goes up, but the quantity used goes down through more efficient use, total costs can remain relatively stable).

It is important to stress that the long-term costs of providing subsidies to the non-poor by failing to reflect the value of water in the price of water and waste disposal into water are very high and fall mainly on the poor. These costs are worth considering in some depth.

The costs of subsidies, explicit and hidden

Explicit Subsidies

Large explicit price subsidies are granted in many countries to large-scale water users, who pay significantly less than the cost of supplying water. When water is subsidised it tends to be wasted. For example, in large parts of Southern Africa, 80% of all water consumption is in agriculture - and about 65% of this is wasted! This part of the world is facing serious water shortages and such waste is increasingly costly. Thus water price subsidies impose a direct cost on other taxpayers and also an indirect cost through encouraging inefficient water use.

Explicit subsidies also have an opportunity cost. The funds used for subsidising water might be better used by society for other purposes, examples being to pay for water supply to other areas or for health clinics. Moreover, the inefficient use of irrigation water has major environmental impacts - including salinisation, which means agricultural production is severely reduced or even halted in some areas.

Although water subsidies may be justified in some situations, such as helping the poor access a basic level of supply, it is important that decision makers calculate all the significant costs and impacts of providing subsidies for water resources before a decision is made to apply them.

Subsidies in other sectors

Subsidies in other sectors can have the same impact as direct water price subsidies, creating incentives for unsustainable water use. Agricultural and energy subsidies encourage activities that result in inefficient water use and increased pollution. For example, production subsidies in agriculture encourage higher consumption of water, fertilisers and pesticides at a high cost to the taxpayer. This increases pressure on water resources and pollutes land and water. This in turn can increase demands for expenditure on remedial environmental protection and taxpayers are faced with a double bill as a result. (One for agricultural subsidies, another for action to clean up the environmental damage encouraged by agricultural subsidies).

Hidden subsidies

An example of a hidden subsidy is when people pollute water and do not pay. This transfers the costs of pollution to other users, and in some cases these costs are enormous. For example, in the case of pollution that results in illness and death or destroys fish stocks.

Sector Level Resource Misallocation Costs

These costs are rarely considered. Where unsustainable use of water occurs due to sector wide policy - such as agricultural subsidies and subsidies for irrigation projects and irrigation water - there can be a large-scale misallocation of resources. That is, a much higher level of investment in irrigation and irrigation-based activities occurs than would have been the case if full costs were paid for irrigation projects and water. This is a misallocation when funds invested in irrigation could have been used elsewhere in the economy for higher value uses - such as health clinics or growing different types of food or reforestation or in domestic or industrial uses. The large number of criticisms and negative evaluations of water projects suggests that billions of dollars have been wasted on large-scale water infrastructure projects.

However, the concerns about the impacts of water price increases are perfectly valid. Below is an approach designed to cater for such concerns.

Progressive Pricing - A practical approach that helps the poor and provides economic incentives for environmentally sustainable and economically efficient water use.

There are different models for pricing water – with examples including declining block tariffs, marginal cost pricing and progressive pricing. (Sivalingam, 1995; 2.). Progressive pricing is the preferred model from efficiency, equity and environmental sustainability grounds. It involves setting a price structure that charges more per unit the more water is used. A basic needs amount of water should be sold at a low price, subsidised if necessary, such that poor people can afford the minimum needed for a healthy existence. Increasing levels of consumption are charged for at progressively higher tariffs per unit sold. There is sound economic justification for such an approach. Supplying a basic amount of water to each person requires a lower level of investment in water infrastructure than does a higher level of supply to users. In addition, the public good benefits of water subsidies for the poor and likely to be high.

While existing large-scale users may protest that they cannot afford to pay unsubsidised prices for water, careful analysis may suggest this is not true over the long term. It is recommended that some of the higher revenue from water price increases be used to assist larger users to improve the efficiency with which they use water - for example through investment in more modern irrigation technologies. But this assistance may also be economically efficient, in that water saved through current users adopting more efficient technologies can be used elsewhere, and the water saved at lower cost than that of building a new reservoir.

In a more general sense, fixing leaks and largely eliminating water theft can have a dramatic impact on a water utilities cash-flow and reduce the prices that need to be charged to cover costs.