



The importance of economics and governance for the water sector in Kazakhstan, the issues and tools for better water management

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Abstract

Water is a scarce resource in the Central Asian region. We will look at the economic and governance aspects of water management. After reviewing the water situation in Kazakhstan and identifying some of the important issues in the water sector, the economic and financial tools to deal with these issues will be discussed. We will also look at governance structures that allow for more participation of different stakeholders and suggest measuring the performance of different approaches. Examples are given what this could mean for Kazakhstan, before drawing some conclusions about the usefulness of a more economic approach to water issues in Kazakhstan, paying attention also to governance of water works, which would involve also non-state actors.

Keywords: water economics, financial analysis, water governance, economic tools, water issues, Kazakhstan.

Paper type: Review paper

1. Introduction

The situation in the water sector in Kazakhstan is complex. ADB (2015:8) describes it as 'Kazakhstan is rich in everything but water'. In some places there is a lot of water, but these are not always the places where it is needed. There are not only water scarcity problems, the water may also not have the right quality, and no realistic price has been determined to assure efficient allocation of water over different users. Also little attention is paid to problems of governing water works and allocating resources efficiently between different possible options to solve the issue at stake.

In the past the emphasis in Kazakhstan was on technical solutions and little attention was paid to the governance structures of water works and how to recover the costs of the investments. Also environmental consequences played a limited role in the past, as has been illustrated by the water pollution due to intensive cotton cultivation and the effects of too much water being used for irrigation on the water level in Lake Aral. This example also points to the

international nature of the water problems in Kazakhstan. It shares, for example, the Irtysh River with China and Russia and it has signed an interstate agreement with these co-riparian states, known for pursuing their own interests. However, there are also problems with small trans-boundary rivers, such as the Isfara river, the Aspara river and the Ugam river (USAID 2012).

After a brief review of the water situation in Kazakhstan, we will deal with an approach to water management, which is based on public administration on the one hand and economics on the other (Van Dijk 2016). We suggest using economic and financial tools to look how other suggested technical and governance structures (allowing participation of more stakeholders), would perform. Such an approach would pay more attention to economic and financial issues and allow the people in charge to select the right solutions, not only from a technical point of view, but also in economic and governance terms.

2. The situation in Kazakhstan

Roughly over 1 billion people in this world live without safe water, while about 2 billion have no access to safe sanitation. This is due to a pervasive under-pricing and mismanagement of water and sanitation services. Also 10% of the world's food is grown with water from aquifers which are being depleted faster than the rate of recharge. To deal with these issues we need to invest in water and sanitation and improved water management.

Climate change will lead to more or less water and to greater volatility in rainfall in Kazakhstan (GEF 2013). Decreasing water consumption is typical for all regions of the country, especially in southern regions because of reduced areas under cultivation, liquidation of different kinds of services in the water sector and rises in the price for public utilities. These are challenges for the farmers (Li et al. 2012), who have to increase water efficiency. In the cities the risk of flooding increases and implies a challenge for the drainage system. The question is how to introduce sustainable urban storm water management. Sustainable urban drains (SUDs) are needed, but what is the size of drains and which other options are available? How should we deal with runoffs in a sustainable way and yet provide the level of services (and road security) required? The issue is how to determine to what extent different types of SUDs are appropriate for different road types in different cities (Butterworth et al. 2011).

Other relevant issues are dealing with waste water in the cities and with irrigation water in the rural areas. In the past the approach was very technical and did not look at water pricing and tariff fixing, but the results were often not sustainable. The Kazakh Ministry of agriculture, together with Asian Development Bank (ADB 2015) have published a report on Institutional Strengthening of the Committee for Water Resources to deal with these issues. The report notes that water tariffs are the key condition for efficient functioning of urban water supply and drainage systems. The tariffs are calculated in Kazakhstan by the operators (Vodokanals)

and need to be approved in first instance by the local executive administration. In a next step, the proposed tariffs need to be also approved by the regulator.

Increasing tariff blocks (ITB) is the dominant tariff system in the world, although they are not the tariff structure of choice in many developing countries. However, designing and enforcing cost-recovery mechanisms in the water sector is a complex process. It requires arrangements (technical, institutional, legal, and financial), including regulations and legislation and a good monitoring system. The challenge is to move to cost-recovery but at realistic pace. The experience in most countries is that the price paid for water is not in proportion with the costs. The urban middle class tends to pay too little for the water provided by the public authority, while the urban and rural poor often pay too much for water from private vendors. It is important to introduce ideas how to reach the poor, like introducing cross subsidies¹, promoting common taps, introduce the Life line concept (everybody gets a certain minimum quantity for free), or return 80 percent water bill of the poor (this is done in Chile).

Drinking water is a problem, not only for rural communities (GTZ 2010). Also in the cities people have to pay for drinking water. Tariffs have to be calculated according to a clearly defined method which is checked by the regulator. Tariffs for water services should influence the amount of water used (and wastewater produced) in the sense that consumers are stimulated to use less water, but they should also:

- Cover (at least) operation and maintenance costs and part of the investment costs;
- Be fair and equitable, and have particular regard to the needs of the poorer members of the community;
- Be easy to understand for the consumer;
- Be easy to administer and enforce.

In Kazakhstan the method is based on the “cost plus profit” principle. However, many Vodokanals are practically bankrupt and their facilities are in poor state, so financing of the sector obviously does not function:

1. The “cost plus” method does not give any incentives to the operators to improve operation efficiency;
2. Tariffs do not consider the fact that systems are highly depreciated and the correct value for depreciation would be to use the “replacement value”;
3. Maintenance costs are not considered sufficiently, they should be at least 1-2% for civil works and 3% for electro-mechanical works annually;
4. Tariffs need to consider the true physical losses of the system as well as the revenue collection ratio;
5. Vodokanals should have the possibility to work on multi-annual tariff regimes;
6. The regulator actually takes unofficially the social affordability criterion of tariffs into consideration, so the tariffs tend to be very low.

To conclude, these issues deserve serious attention and require learning from experiences elsewhere and implementing the ideas of Institutional Strengthening of the Committee for Water Resources (ADB 2015). First we will deal with the available economic and financial tools to better understand the dimensions of the issue and the cost of possible solutions. The basic principles of economic choice are comparing different alternatives.ⁱⁱ Investments require a comparison to determine which investments are more necessary or attractive because they are cheaper solutions for the issue at stake. This judgement can be based a priori judgement on the basis of the net present value (NPV) of an investment or its internal rate of return (IRR). Afterwards it is possible to make a ‘posterior’ judgement with criteria such as effectiveness, efficiency, impact and sustainability of a certain investment.

Water pricing is a challenge in the urban and rural areas, where different considerations play a role. In the urban areas tariffs usually concern the price of drinking water and in the rural areas the price of irrigation water. For the economist determining the tariff is easy, applying the marginal cost rule. However, in practice, a large number of other considerations need to be taken into account: the financial conditions of the buyers, the quality of the water, the quality of the service delivery, etc. The format for the analysis of different cases where tariffs are needed is to ask each time:

1. What was the issue?
2. Has this issue been studied already?
3. What are the technological options between which to choose to deal with the issue?
4. Which economic tools have been used to shed light on the decision problem?
5. What have these economic tools contributed to a better insight in the issue?
6. Which recommendations can be formulated to deal with the issue in a convincing way?

Table I gives an impression of different options to deal with urban and rural water management issues and Integrated Water Resource Management (IWRM) issues related to rain water runoff and sanitation.ⁱⁱⁱ These examples are analysed in more detail in Van Dijk (2016), using international experience, in particular China, Ghana and South Africa.

Table I. Examples of urban and rural water management issues and issues in urban sanitation.

Urban water management	Rural water management	Sanitation
Water demand management	The financial analysis of irrigation & rainwater harvesting systems	Separating grey & brown water, treating centralized/ decentralized waste water?
Drinking water options for the poor	Financial incentives for transitioning to rainwater	Sustainable urban drains

	harvesting	
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3. Economic and financial tools

Which financial and economic tools are available to analyse issues related to sustainable integrated in particular water resource management (IWRM).^{iv} Such tools are used to find out whether proposed solutions are economically viable compared to other systems and to assess the viability. The results of this analysis help decision makers to select the most suitable solutions. Van Dijk (2016) provides an analytical framework to look at IWRM issues in an integrated way and to link issues related to the water sector to different economic, management and financial tools. The main financial and economic issues in integrated water resource management (IWRM) will be listed, and they will be linked to the tools of management, economics and finance, which can be used to analyse a number of key technologies available for sustainable development of the water sector.^v The purposes of an economic analysis are three-fold:

1. To simplify the nature of the choice to a level that we can comprehend;
2. To enable us to understand the key elements of that choice;
3. To communicate that understanding to all stakeholders so as to form a framework in which they can debate, argue and negotiate their concerns.

Before dealing with the tools of economics we will first list the major types of issues in the water sector in table II.

Table II. Major issues in IWRM, a classification and some examples.

Type	Example
Technical issues	How to achieve aquifer refill in case of declining ground water levels
Governance issues	How to involve the major stakeholders in a governance structure of an important irrigation scheme
Economic and financial issues	How to cover the operation and maintenance cost of a drinking water project

The question should be asked: what are the major financial and economic issues in IWRM?

1. How to assess the cost and benefits of different options over a longer period of time?
2. How to compare the cost and benefits of different options?^{vi}
3. How to obtain finance for different proposed solutions?
4. How to recover the cost? (tariffs, betterment or property tax, connection fees, etc.)
5. What is the institutional framework necessary to achieve this?

6. What is the value of water or the environment?

All the major actors should be involved, the government, the private sector and the households and they create governance structures or institutions to take decisions. Institutional economics analyzes the role of such institutions and attaches an important role to the government in the functioning of the economy.^{vii} Institutions are rule-based and Green (2003: 46) points to the fact that they have geographical and functional boundaries. Examples are share cropping arrangements in Bangladesh or the functioning of water boards in Egypt. Table III shows that the role of institutions can be analysed at four different levels. The challenge is to assess the institutional effectiveness of different institutional arrangements.

Table III. Different layers analysed in institutional economics.

Level: four different layers	Purpose of each layer
1. Embeddedness: informal institutions, customs, traditions, norms and religion	Often non-calculative; spontaneous, based on social theories
2. Institutional environment: formal rules of the game, especially property (polity, judiciary, bureaucracy)	Get the institutional environment right; first order economizing (for example defining property rights)
3. Governance: the way the game is played, especially aligning governance structures with transactions	Get the governance structure right; second order economizing (designing institutional arrangements)
4. Resource allocation and employment (prices and quantities: incentive alignment)	Get the marginal conditions right; third order economizing, neo-classical theories

The idea of institutional economics is that institutions influence the resource allocation process, while neo-classical economists will say that the market does the job and solves all problems. Neo-classical economics likes to limit the role of the government, while in institutional economics there is an important role for the government in defining the rules of the game (legislation) and seeing to it that the rules are implemented. To present the tools for water management, we follow an approach developed in Managerial economics (Truett and Truett 1998)^{viii}:

- Identify the problem or decision to be made;
- State alternative solutions;
- Determine what data are relevant for the decision and analyse the data;
- Choose the best solution.

Different economic and financial tools can be used for IWRM. An example of this suggestion is given in table IV.

Table IV. Theories, methods and tools for urban water management.

Issue	Methods (more abstract)	Tools (more concrete)
Required water governance structure in a decentralized water or waste water system?	Action and strategic planning Economic and financial analysis (cost benefit analysis) of proposed structure	Integrated problem analysis Ways to organize the participation of stakeholders Environmental management tools
Increasing the water related productivity of industries or agriculture	Research methods Systematic monitoring and evaluation	Use of private finance for investments and using IT for constant monitoring Developing integrated solutions
Possibility of achieving a higher efficiency of utilities by using the New public management theory	Policy analysis Comparative analysis Planning of reforms Monitoring and evaluation	Institutional analysis Planning administrative reform Monitoring the results and using benchmarking systems

Source: Van Dijk (2006)

We suggest comparing the results of using different tools and to assess their contribution to a better understanding of the IWRM issues. Once we know the issue and have knowledge about the tools, we can think of combining the two. Table IV lists the most frequently used economic and financial methods and tools for urban water management, linked to an important issue. Sometimes it is difficult to say what is a method (a way of doing things) and what is a tool (an instrument helping to achieve the desired results).

However, there are more tools, in particular if related disciplines are taken into account. Figure 1 illustrates how different disciplines can contribute to understanding water related issues. The institutional context sets the conditions for successful IWRM. Economics can help because it can calculate the positive and negative effects for society as a whole. Management is important when ideas need to be implemented and day to day activities are important. The bottom line is the financial analysis, which calculates what it means for an investor or a household to adopt a certain technology. Sometimes the CBA and the financial analysis provide almost the same results. If the number of factors taken into account is limited and the deviation between the market price and the shadow price is small, the results of a cost benefit and a financial analysis come very close. This was the case of calculating the benefits of rainwater harvesting, while in the case of wastewater reuse the number of external effects of centralized systems was very high and hence, the difference with the outcome of the financial analysis can be substantial.

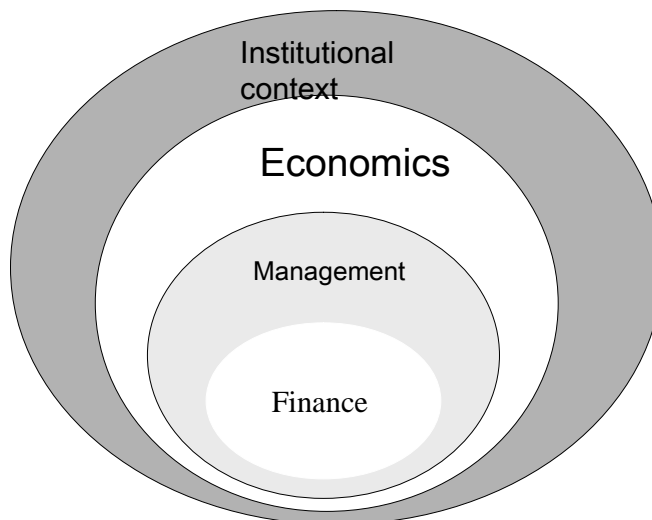


Figure 1. Different disciplines can contribute to understanding water related issues.

What are the most important tools for IWRM? Table V gives a list, relating the tools with different economic and management disciplines, ranging from using an institutional perspective to zooming in into the financial aspects. We have listed in box 1 a number of issues in water management and indicated that different economic tools may help to better understand these issues. In the Switch project (concerning the city of the future; Butterworth et al. 2011) different tools have been used for different issues to be solved with different degrees of success. However, later work will always build on the work of earlier research. There is no doubt that an analysis of economic, financial and institutional aspects of certain innovations in the water sector has added to our understanding of the issues. Table V shows what different disciplines can contribute to IWRM.

Table V. Contribution to IWRM from different disciplines.

From an institutional perspective	From regular economics
<ol style="list-style-type: none"> 1. Carry out an institutional analysis: which institutions can be found locally and how do they function? 2. It is important to achieve multi stakeholder involvement and popular participation; 3. Analyse the effectiveness & efficiency of institutions; 4. Suggest different institutional options to the stakeholders and decision makers. 	<ol style="list-style-type: none"> 1. Demand and supply curves to determine a price; 2. Cost benefit analysis (IRR or NPV); 3. Life cycle costing: whole life cycle cost & whole life maintenance cost; 4. Cost effectiveness, if no estimate of the benefits is possible; 5. Multi-criteria analysis; 6. Incorporate external effects in the price of a good or service;

	7. Policy impact analysis; 8. Environmental assessments.
From management 1. Action & strategic management; 2. Decision support models; 3. Planning techniques (scenarios); 4. Linear programming; 5. Business plans; 6. O&M, HRM & Financial management; 7. Sectoral, for example: urban management; 8. Transition management.	From finance 1. Financial analysis; 2. Financing options for projects; 3. Cost recovery options ^{ix} ; 4. Scoring and ranking alternatives; 5. Financial policies; 6. Effects of (dis) incentives, such as taxes & subsidies.

A combination of different economic and financial tools is necessary to analyse an issue and to come up with appropriate solutions. It is very common that a number of economic and financial methods are combined, for example to analyse cross cutting issues, such as the issue of scale, which turned up several times.

Table VI tries to link the relevant issues in IWRM to the most important tools from economics, management and finance. It shows that the real number of relevant issues is limited, just like the number of tools. It is important that technicians also have a feel which combination of economic tools to use to analyse an issue. Basically, we want them to select the proper tool from other disciplines to shed light on their technical options.

Table VI. Most important tools from economics for relevant issues in IWRM.

Relevant economic issues in IWRM	Most important tools from economics, management and finance
Developing a strategic vision of the city of the future, or how to deal with climate change in the rural areas	Action and strategic planning, integrated water resource planning, scenario exercise
Allocation problems	Allocation models
Making choices between different options	Decision support systems, for example for WDM or SUDs
Estimating future demand for water	Demand curves, scenarios and other planning tools
Comparing future cost and benefits	CBA, financial analysis, but also Cost effectiveness analysis, LCC &
Convincing actors to undertake certain actions	Incentives, subsidies, taxes on unattractive alternatives

Transitioning to a new situation	A combination of planning and incentives
Obtaining access to other sources of finance	Develop a business plan and do a solid financial analysis, including cost recovery options

4. Look at governance structures that allow for participation of more stakeholders

We will spend no attention to the institutional options for water pricing and cost recovery, but list the arguments to introduce cost recovery fees: to limit excess supply of public services, to control environmental hazards and to promote efficient use of national resources. However, there are two complications trying to determine the right cost recovery strategy:

1. Cost vary across space, time and consumer classes;
2. Investments are lumpy leading to indivisibilities (one moves from one treatment plant with a certain capacity to building a second when that capacity is no longer sufficient).

The following table shows the complexity and the different solutions that can be found, by trying to link them to some level of governance, the local or the national level. Secondly, it suggests considering partnerships between different organizations and finally, it increases the number of actors by adding other stakeholders, in particular the non-governmental organizations and community based organizations.

Table VII. Institutional solutions for water management.

National level organizations	Local level solutions
<ul style="list-style-type: none"> • National government ministry • National government agency • Autonomous water & sewerage company • Partnerships with lower levels of government or private parties • National and international non-governmental organizations 	<ul style="list-style-type: none"> • Integrated in local government • Local government agency • Semiautonomous water department • Autonomous agency • Partnerships with higher levels of government or private parties • Community based organizations and other stakeholders

5. Measuring the performance of these governance structures

An intervention in the water sector requires us to look at the demand side (who need this water), the expected output (what will they do with it), the involvement of the different stakeholders (owning the water or the necessary infrastructure), including the private sector and the sustainability of the intervention and its financing. Finally, we need to know that the proposed solution is effective (achieving its goals) and efficient (achieving it at minimum cost). This requires measuring the performance of a proposed solution and its governance

structure and comparing it to other countries, utilities or municipalities. This is called benchmarking in the water sector (Van Dijk and Blokland 2016).

6. Examples of economic tools which can be used to deal with water issues in Kazakhstan

In many cities there is not enough drinking water and instead of increasing the supply we could also focus on diminishing the demand for water. Water is demanded for different purposes, such as the industry, recreation, drinking water, navigation, irrigation and hydro power. Some of these uses are conflicting, some are complementary. The issue is how to reduce the consumption of water (demand management). The focus can be on the utility or on the consumers.

There are many different technological options to achieve demand management and the question is how to choose the most cost effective option. Urban water scarcity is a problem in many countries. Different technological options exist and different technological measures have been implemented in Chinese cities for preventing and solving the problem. Researchers studied separating grey and brown water and treating the grey water (grey water is waste water generated in households, excluding the water containing human excreta or urine, but including water from kitchens, bathrooms and washing rooms; Liang and Van Dijk 2010) on the spot (decentralized waste water treatment) and looked into the financial viability of rainwater harvesting (RWH, Liang and Van Dijk 2011, 2015). Table VIII gives a summary of six IWRM issues given in table I and lists the major economic tools to be used to shed light on the technological options listed in the last column.

Table VIII. Major issues in IWRM, technological option and the economic tool used.

IWRM issue	Major economic tool used	Technology
1. Reduce water consumption based on forecasting demand using models	Cost effectiveness of different reduction options expressed in cost and saved water	Water demand management (WDM)
2. Simplify sanitation allowing for decentralized treatment	CBA, an economic, social and environmental analysis of these options	Separating grey and brown water, or using eco sanitation
3. Introducing rainwater harvesting (RWH) to avoid using scarce ground water	Financial analysis to find out when this would be a viable option	RWH equipment at the household level
4. Transitioning: introducing changes to make rain water harvesting systems viable	Analysing price elasticity to determine how much tax or subsidy is necessary to make RWH financially viable	Transition management
5. Improved and more	Use Life cycle costing to	Bigger drains, which are

Sustainable urban drains (SUDs) in times of climate change	choose, because it is difficult to calculate the benefits	more sustainable
6. Sustainable drinking water options for the urban poor	Business plans to identify financing options and cost recovery systems for piped and non-piped drinking water systems	Different technologies are available, from digging wells, to buying water from utilities or private water vendors

The tools can also be used in combination. Questions to deal with are: are decentralized water treatment systems a good alternative to centralized system? Liang and Van Dijk (2010) did a comparative analysis between centralized and decentralized wastewater reuse systems in Beijing focusing on the financial and economic feasibility, including environmental and social effects. Scale plays a role just like the current financing practices in China. Subsidies for small scale decentralized waste water treatment systems are usually limited to the initial period of the project and the price of alternative sources of water tends to be lower than the cost of treating the grey water (Van Dijk and Liang 2017). The analysis indicates that decentralized wastewater reuse systems are economically feasible. It means the systems have positive effects on society. Thus, from the point of view of government or society, the decentralized wastewater reuse systems are worth to be promoted.

However, the decentralized wastewater reuse systems are not always financially feasible. The low rate charged for reclaimed water was the key reason in Beijing for the systems not being financially feasible and this may also be the case in Kazakhstan. From the project manager's perspective, the decentralized systems may not continue to operate in the long term if the financial problems are not solved. Thus solving the financial problems of decentralized wastewater reuse systems should be on the political agenda in the future (Angelakis et al. 2003). It would require subsidies unless realistic pricing policies for water are introduced.

The study in Beijing showed that the centralized wastewater reuse systems are not only financially feasible but also economically feasible. It implies the centralized wastewater reuse systems in Beijing have positive effects on society and these systems are feasible in the long run. From the perspective of financial feasibility, the centralized wastewater reuse systems are more competitive than the decentralized systems.

7. Involving the private sector to finance water infrastructure in Kazakhstan

Traditionally water and sanitation services are financed by the government in Kazakhstan. Many governments do not have the necessary funds. Hence they look for alternative sources of finance. In that case financial structuring, stakeholders' involvement, and risk management for water and sanitation projects is necessary. Financial structuring refers to the efforts to bring together different parties who can finance, govern, build and maintain the infrastructure.

For its success, stakeholders' involvement is crucial, because this determines whether all parties are involved and have a constructive role in the process. Finally, risk management is a necessary component of project management and also important for water and sanitation projects.

If no alternative sources of finance are tapped, we may see deficits in the budget of the utilities or the municipalities responsible for water supply. There are of course alternative ways of deficit financing, but they are not very attractive, namely through general fund financing, which means increasing tax revenues unrelated to the service. It is advised to use local and private finance mechanisms.

The goals of local finance mechanisms in the water sector are to ensure:

1. Sufficient revenue to deliver services in long-term;
2. Sufficient revenue to support improved quality of services;
3. Sufficient revenue to extend service coverage, particularly to low-income consumers;
4. Better use of scarce water resources and management of waste water disposal to conserve the natural environment.

We have learned a few lessons concerning private finance in the water sector, which are also relevant for Kazakhstan. One, it is important to promote flexible financial arrangements and the necessary organizational structures (management, service delivery, payment, etc.) and different service levels for consumers. Secondly, it is desirable to calculate an appropriate tariff and set up an equitable tariff and billing structure. As part of the design and implementation process, the authorities need to establish and promote sources of local finance to help users pay for improved levels of service. Finally, the Willingness and ability to pay for water services should be assessed, not assumed and subsidies can be used more effectively if used to increase access to water supply and sanitation - for example by subsidising connection fees. In reality there are only few choices to finance investments:

- Tariffs (consumers) or Taxes (tax payers), or through increasing public debt;
- Private sector involvement;
- Bilateral and multilateral aid, but only a *limited extent*.

However, it is also possible to blend different sources of finance: mix of, for example, donor and commercial finance. It is also possible to obtain guarantees for investment projects (for example MIGA). Finally, it is possible to apply other formulas, such as the creation of a special purpose vehicle (SPV) or a private public partnership (PPP).

PPPs are appropriate when public service providers have failed to provide consumers with adequate services, for example water supply and sanitation services. One solution for the inadequate water supply and sanitation services is to involve the private sector. Current estimates place the share of the world's population that is being serviced by private service

providers at no more than 3%-10%, of which the majority resides in high-income countries. Several gains can be obtained from partnering up with the private sector, such as experience (operational and managerial), access to international capital markets, new technology and more distance from the political sphere of influence. The use of PPP mechanisms is being promoted by large donor agencies such as the World Bank.

Different Public-Private Partnership (PPP) arrangements exist and all have different characteristics in the sense that they offer a combination of properties that can improve water and sanitation services, provided they operate in a suitable environment. This emphasizes the need to choose the right PPP arrangement as well as the creation of a suitable environment through contracts and if necessary the emergence of new institutions.

Another form of cooperation that is gaining ground is the Water Operator Partnership, a collaboration between public utilities. In this system, public utilities from developed countries support water operators in developing countries. Often they decide on one core activity within the utility and provide support in that field. An example is Vitens-Evides International, which is a cooperation between two large drinking water suppliers in the Netherlands. To contribute to the water Millennium Development Goals (MDG) they set up collaborations with water operators in developing countries and they focus on the human resource activities.

8. Conclusions

We suggested an economic approach to water issues taking into account governance issues. Van Dijk (2016) explains how water is priced through its value chain from raw water, through to bulk water and finally retail water tariffs. This involves tariff setting. Tariff elements are the Connection charge, the Fixed charge, the Volumetric charge, the Block charge and a Minimum charge.

Water issues have become more and more important in Kazakhstan, due to population growth and climate change. They require a multi-disciplinary approach, a combination of preparing technical options, analyzed with economic and financial tools in a positive regulatory environment. This means thinking in a more systematic way which issues can be tackled with which economic and financial instruments and look at the data requirement from the start. We tried to give an impression of the use of economics in water management in Kazakhstan and conclude that training water specialists in using economic and financial tools is important. The training should be part of a capacity building efforts, for example the way the OSCE and the German Kazakh University are dealing with water issues.^x

We emphasized the importance of the social, institutional and regulatory context in which IUWM is promoted. IWRM takes place in a certain governance context and that context needs to be taken into account. It was argued that institutional economics can help to analyse the functioning of this context and can show how institutional arrangements influence the allocation process.

A real challenge is to find alternative sources of finance for water related activities. It is important to make use of all possible sources of finance, both public and private. Furthermore it is necessary to create a framework where risks are properly allocated and bound by enforceable contracts.

The debate is not between Public or Private supply of water services, but about improving the performance of the water sector and achieving efficient quality service delivery to the poor at low cost. However, there is no magic solution! Cost recovery is critical and should be the basis of a sustainable tariff policy, although it has to be achieved at a realistic pace. Eventually, some targeted Subsidies is OK, for example for connections and for usage charges for the very poor.

The challenge is to mobilize balanced mix of public and private funding sources. Making use of public funds and subsidies in a more innovative way is necessary, powered by sustained cash flows from the project, instead of using taxes. Private funding should increasingly comprise local currency alternatives; make PPP contracts "pro-poor", with an appropriate allocation of risks. It is important to introduce partial risk and partial credit guarantees, to use IFC for structuring the water related investments and to look for guarantees and MIGA insurance instruments. In particular hybrid models mixing public and private finance and management options offer a pragmatic approach in an environment of increased perceived risks, given climate change technological developments.

9. Abbreviations used

CAREC Central Asia Regional Environment Centre

CBA Cost benefit analysis

GEF Global environmental facility

GTZ German Society for Technical Cooperation (Technische Zusammenarbeit)

HRM Human resource management

IFC International Finance Corporation

IRC International Resources Centre

ITB Increasing tariff blocks

IRR internal rate of return

IUWM Integrated urban water management

IWRM Integrated Water Resource Management

LCC Life cycle costing

MDG Millennium Development Goals

MIGA Multilateral Investment Guarantee Agreement

NPV Net present value

OSCE Organization for Security and Cooperation in Europe

O&M Operations & Maintenance

PPP Public-Private Partnership

RWH Rain water harvesting

SUD Sustainable Urban Drains

UNESCO-IHE United Nations Education & Science Organisation- Institute for Hydrological and Environmental Engineering

UNESCO-IHP International Hydrological Program

WDM Water Demand Management

10. References

- ADB and Ministry of Agriculture, 2015, Institutional strengthening of the Committee for water resources in Kazakhstan. TA № 4484 KAZ, the report available on internet under "Gorvodo kanal Kazakhstan".
- Angelakis, A. N., Bontoux, L. and Lazarova, V., 2003, Challenges and prospective for water recycling and reuse in EU countries. *Water Science and Technology*. Vol. 3, pp. 59-68.
- Butterworth, J., McIntyre, P. and da Silva Wells, C., (eds), 2011, SWITCH in the city, putting urban water management to the test. The Hague: IRC. Available at: www.switch.eu.
- GEF, 2013, Experience gained with the project of Kazakhstan community based climate change adaptation program. Almaty: global environmental facility.
- Green, C.H., 2003, Water economics, principles and practice. Chichester: Wiley.
- GTZ, 2012, CAREC programme - Clean drinking water for rural communities in Kazakhstan. Almaty: CAREC.
- Li, H., Gupta, J. and van Dijk, M.P., 2012, China's Governance Structure on Drought Disaster in Rural Areas. *Disaster Advances*. Vol. 5, No 4, pp. 733-738.
- Liang, X. and van Dijk, M.P., 2010, Financial and economic feasibility of decentralized waste water reuse systems in Beijing. *Water science and technology*. Vol. 61, No 8, pp. 1965-1974.
- Liang, Xiao and van Dijk, M. P., 2011, Optimal level of subsidy and groundwater charge to promote rainwater harvesting for irrigation in rural Beijing. *Water*.
- Liang, X. and van Dijk, M.P., 2015, The Factors in the Decision to Continue Rainwater Harvesting Systems in Beijing to achieve Sustainable Water Management. *Water*.
- Russell, B., 1954, Human society in ethics and politics, London: Allen and Unwin.
- Scott, R., 1995, Institutions and organisations. London: Sage.
- Truett, L.J. and Truett, D.B., 1998, Managerial economics, analysis, problems and cases. New York: South Western College.
- UNESCO-IHP, 2009, IWRM Guidelines at River basin level, art 1 Principles. Paris: UNESCO.
- USAID, 2012, Stakeholders' partnerships in collaborative policymaking: Fostering trans-boundary cooperation on small watersheds in Central Asia. Almaty: CAREC.
- Van Dijk, M.P., 2010, Financial and institutional analysis of Strategic options concerning water and sanitation for the Strategic plan for Accra. Delft: UNECSO IHE.

- Van Dijk, M.P., 2006, *Managing cities in developing countries, more urban management*. Cheltenham: Edward Elgar.
- Van Dijk, M.P., 2016, *The economics of the integrated water resource management*. Almaty: GKU, German Kazakh University, Manual, 52 pages.
- Van Dijk, M.P. and Blokland, M., (eds.), 2016, Benchmarking for the delivery of water and sanitation services to the urban poor. *International Journal of Water*. Vol. 10, No 2 and 3.
- Van Dijk, M.P. and Liang, X., 2017, Governance of urban eco- initiatives in Beijing in times of climate change. In Van Dijk et al. (eds, 2017), pp. 323-342.
- Van Dijk, M.P., Edelenbos, J. and van Rooijen, K., (eds.), 2017, *Urban governance in the realm of complexity*. Warwickshire: practical action. pp. 1-345.

Notes

i If utilized prudently targeted subsidies and long-term financing can contribute significantly towards expanding investments and improved service delivery.

ii Water is also an economic good according to the Dublin principles of the United Nations, which emphasize that water has a social and an economic role.

iii There exist of useful models for IWRM. However, in the context of developing countries models may quickly be too complicated. The data may not be available or no local expertise is available to update and run the model.

iv For IWRM guidelines, see UNESCO-IHP (2009).

v My preferred definition of economics is based on Russell (1954): “the use of reason linked to the choice of means to some end”.

vi It is important to be very precise about all possible costs and benefits of a certain scheme. It is not always easy to quantify these cost or benefits, but they should be listed. Sometimes alternatives for the CBA are available such as cost effectiveness methods and Lifelong costing, in particular when it is difficult to estimate all the future benefits.

vii Scott (1995) gives a definition of institutions as consisting of: “cognitive, normative, regulative structures that provide stability and meaning to social behaviour”.

viii Managerial economics is a tool for decision making with as basic concepts, supply and demand, markets which clear, resulting in a price and a quantity bought and sold.

ix Cost recovery means using economic or financial instruments to recover all costs associated with a water system, programme or service, to ensure its long-term sustainability.

x The OSCE office in Tajikistan in cooperation with the GKU organizes courses on water resources management.