

Opportunities for Change in the Water Supply System of Chişinău, Moldova

A case study on actor behavior for sustainable water supply system management in a transition economy

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Mulțumesc.

Abstract

Partially due to years of poor water management practices in Moldova, water resources are increasingly becoming a concern. This situation is intensified by the pollution of water bodies that could be used for drinking water supply. An improvement of the water supply system in Moldova's capital city Chisinau would result in an upgrading of water quality and hence increased health and living conditions in the country. Moldova is a transition economy with limited financial resources and deteriorating water supply infrastructure as well as inefficient service. The water supply system reflects the continued transition state of the country it has been in since its independence. The focus of this study is on the actor behavior within the water supply system of Chisinau, which is analyzed with the thinking of systems approach. Within the malfunctioning water supply system problems are disclosed due to actor behavior, which are identified using Donatella Meadows' system problems and malfunctions. System dysfunctions are reinforced by actor behavior such as corruption and an ideological divide in the country, which further embeds political instability and a Moldovan identity crisis. This underlying problem overshadows every other malfunction, which is not currently being managed sufficiently. It additionally diverts from the overall goal of the system, which could be more aligned towards sustainable water management and qualitative drinking water access. This problem is not case specific for Chisinau's water supply system, or even to the state of Moldova alone. Rather, this is a worldwide problem, and especially important to countries in transitional phases. Nevertheless, the identified problems of the system can serve as a guiding tool for practical mediation towards solving dysfunctions of the system.

Keywords: systems approach, water management and policy, Moldova, transition economy, water supply system

Executive Summary

Water is a resource that needs to be well managed worldwide. Partially due to years of poor water management practices in Moldova, water resources are increasingly becoming a concern. Decreasing amounts and polluted drinking water sources have an effect on health and living conditions of the Moldovan population. In combination with other factors such as the economic decline and political instability of the country, insufficient water management could be taken as an indirect cause for continued migration, due to decreased health and living conditions.

In order to address the above stated problems, the following research question is used to guide this study: How can the system's approach assist to identify dysfunctions in the water supply system of Chisinau and use those as opportunities for change? The main question is supported by the two following sub-questions: 1) Which are the problems of Chisinau's water supply system that can be classified using Donatella Meadow's system approach of 'opportunities and traps'? and 2) How can the involved actors operating in the water supply system intervene into the system to support change?

Sources are triangulated to reflect upon the problems governing Chisinau's water supply system from as many angles as possible. The literature review is therefore based on reports by the international community, due to a lack of existing and insufficient range of choice as well as objective academic publications on Moldova's water sector. Hence, main findings are based on primary sources via a site visit to Chisinau and personal communication with the different actors involved in water supply system.

To answer the main research questions, the systems approach is used in order to provide a framework and develop a methodology model to direct and set boundaries to the study. The methodology model is applied on the problem analysis and discussion of possible ways to intervene into the identified system's dysfunctions by the author. The systems approach is adapted and made applicable to Chisinau's water supply system in order to study the complex system and make it comprehensible, thereby diminishing obscured answers to the problems identified.

The model is based on Meadows, with the analysis following identified problems of 'Traps and Opportunities' listed in 'Thinking in Systems' by Donatella Meadows. These identified problems within Chisinau's water supply system include: 'Policy Resistance', 'Tragedy of the Commons', 'Shifting the Burden to the Intervenor', 'Rule Beating' and 'Seeking the Wrong Goal'. Resulting from the system's dysfunction analysis, an answer to the first sub-research question is provided. The dysfunctions identified within Meadow's problem definition are applied to the water supply system of Chisinau and analyzed in regard to the systems approach. By applying the systems approach as an analytical framework to the study and constructing a methodology model based on Meadows system approach, adjusted to the situation in Chisinau, the overall research question of how the systems approach could be of use can be answered.

The main findings of the dysfunction analysis and resulting recommendations provide an answer to the second sub-research question and are as follows:

First of all, the overall *goal or strategy* for the water supply system needs to be well defined. Overlapping strategies with multiple goals to be met create confusion and are unnecessary, thereby weakening actors productiveness and capacity. Sustainable management of drinking water sources and water supply and sanitation systems could start with a well-established

policy and physical infrastructure framework to guide actor behavior and provide a goal to strive towards.

Second, the *rules* of the system include a policy reform to construct a framework in which involved actors can operate in the water supply system. This includes well-defined, country specific adjusted, as well as achievable rules that can serve as a guiding tool for actors.

Third, *actor responsibilities and tasks* between the different players need to be clarified. Clearly assigned tasks, responsibilities and no overlapping competences reduce confusion of all actors involved in the system, thereby aligning expert capacity for sufficiently.

Fourth, *information feedback* needs to flow undisturbed and be available to all actors involved in the water supply system in order for actors to correct behavior and apply the information feedback at the appropriate level and time in the system.

Fifth, *dependency* is reduced by self-organization, giving the Moldovan people the power to add change to their own situation. Moldova should not depend on donor organizations to solve the problems within the water sector or other problems the country encounters.

Finally, Moldova should make *use of what is available* within the country, as well as neighboring countries. Moldova should make use of its bilingualism and learnings from its neighboring countries, such as Romania, which as a EU country already has the necessary legislation and strategies in place. Any exiting national legislation and strategies should be revised and do not need to be reinvented. Placing capacity and experts at places where they are necessary and not let the political ideology divide take over. Politicians as well as the Moldovan population and any other actors need to stay focused on the problem that needs to be solved.

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Abbreviations

ACA	Apa-Canal Association
ACC	S.A. Apa-Canal Chisinau
ADA	Austrian Development Agency
AGRM	Agency for Geology and Mineral Resources of the Republic of Moldova
ANRE	National Agency for Energetic Regulation
Apa Canal	Moldovan: Water Utility
CIS	Commonwealth of Independent States
DANCEE	Danish Cooperation for Environment in Eastern Europe
DANIDA	Danish International Development Agency
DEPA	Danish Environmental Protection Agency
DFID	UK Department for International Development
DG	Directorate General (European Commission)
EBRD	European Bank for Regional Development
EC	European Commission
EECCA	Easter Europe, Caucasus and Central Asia
ENP	European Neighborhood Policy
EU	European Union
EUWI	European Water Initiative
GIZ	German Technical Cooperation
GNI	Gross National Income
GWP	Global Water Partnership
HR	Hygenic Regulation
IBNET	International Benchmarking Network for Water and Sanitation Utilities
ICPDR	Danube River Protection Convention
JICA	Japan Development Cooperation
kW	KiloWatt
MAC	Maximum Allowable Concentrations
MCA	Millenium Challenge Account
MCC	Millenium Challenge Cooperation
MDG	Millenium Development Goal
MDL	Moldovan Lei (currency)
NFRD	National Fund for Regional Development
NIS	Newly Independent States
NGO	Non-Governmental Organization
OECD	Organization for Economic Co-operation and Development
POPs	Persistent Organic Pollutants
PPP	Public Private Partnership
RPSW	Rules for Protection of Surface Waters

SDC	Swiss Agency for Development and Cooperation
TDS	Total Dissolved Solids
TICA	Turkish International Cooperaton and Development Agency
UNDP	United Nations Development Program
UNECE	United Nations Economic Commission for Europe
USSR	Union of Soviet Socialist Republics
WB	World Bank
WFD	Water Framework Directive
WHO	World Health Organization
WMO	World Meteorological Organization
WSS	Water Supply and Sanitation
WTO	World Trade Organization

1 Introduction

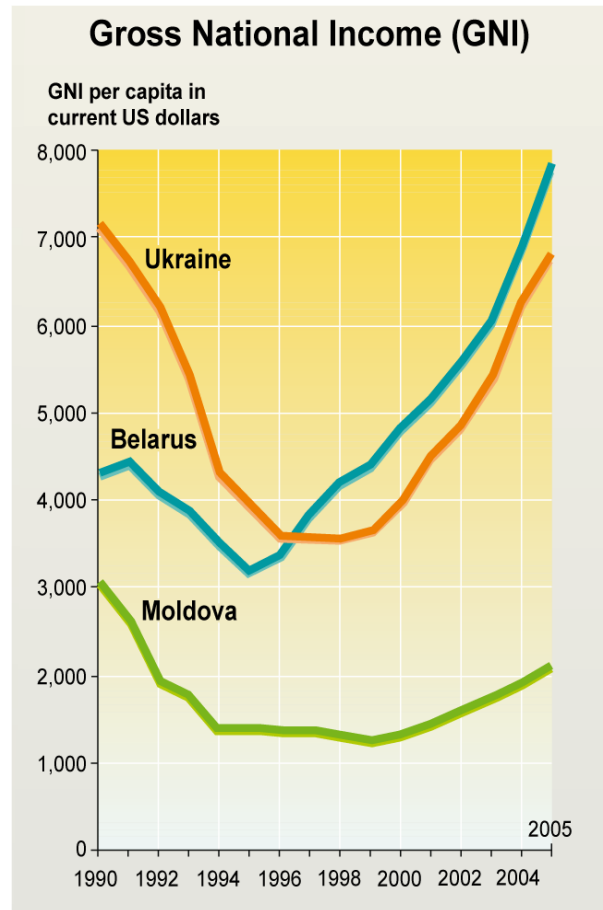
1.1 Background

Although the EU is considered to have abundant access to clean water, sufficient management of water resources is becoming increasingly important for future security. With scarcity problems already occurring in southern member states and neighboring countries, the EU could begin to see a domino effect coming from these countries. This also includes policy dialogue with the EU’s direct neighbors, such as the Republic of Moldova, which shares borders with Romania and the Ukraine.

The Republic of Moldova, referred to as Moldova in this study, has been independent since the dissolution of the Soviet Union in 1991 and once belonged to greater Romania. It has a bilingual population that speaks both Romanian and Russian. The bilingualism unfortunately resembles a split society of the pro-Russian and the pro-Romanian population, which is clearly shown in the conflict with its breakaway province Transnistria. Although the economic situation has improved in Moldova in the past years, the collapse of the Soviet Union brought along decreasing economic activity, due to Moldova’s small economy that was abruptly cut off from the Russian market. The separation of the Russian-speaking province Transnistria from the Republic twenty years ago not only led to political instability but also weakened the economy further as most of Moldova’s industry was located in that particular region. Recognizably Moldova has fertile soil due to which it once prospered during the Soviet era and has not been able to fully exploit this opportunity since its independence. Nevertheless, the most important sector in the country remains to be agriculture. Additionally, the country loses many of their young, educated citizens and experts to a more prosperous life in the European Union.

Moldova has experienced a number of governmental changes in the past twenty years, which includes a drastic change from the Party of Communists coalition to the Alliance for European Integration party coalition in 2009. This change led to social upheavals and revolts, splitting the country further into two camps. The international community classifies the current political situation of Moldova as unstable (European Commission).

The figure on the right (Figure 1-1) visualizes the economic situation of Moldova in comparison to neighboring Eastern European non-EU countries,



UNEP/GRID-Arendal, May 2007.

Note: Purchasing Power Parity method.

Source: World Bank. Development Indicators database (www.worldbank.org).

Figure 1-1 Gross National Income

Source: (Novikov 2007)

Belarus and Ukraine. It also illustrates the drastic economic decline since the dissolution of the Soviet Union. The unstable political condition in combination with a high corruption rate and governmental interference in the country does not assist the economic situation, as this discourages financial direct investments and especially international investors. In addition, the country does not make use of its bilingualism advantage, thereby not acknowledging the benefit that comes with biliguality. The present political power is forming the Moldovan identity more towards the Romanian language and culture identity, thereby suppressing Russian. Moldova is a multiethnic state that could make use of its multi-ethnicity and bilingualism, but needs to acknowledge its advantage and adopt leadership that takes on this integration project of combining Russian and Romanian roots. The ideological crisis is reflected in the political instability and insufficient political leading capacity, thereby shadowing over any other problem and issue the country could concentrate on (Schieder 2011). Besides building political capacity, including good governance and reforms, the country also is in need for social and human development, especially in the areas of health and labor market reforms (EC ; European Commission 2004). This is reflected in the conditions of many sectors within the country, especially in Moldova's water supply and sanitation sector.

1.2 Problem Definition

Water is fundamental for human life and health, its importance and security issues that come with scarcity lies at hand and does not need to be further established here. Well-managed water includes sufficient governance of water resources, from water supply and sanitation to wastewater management. It is indispensable for human well being to have access to safe drinking water. Without safe drinking water, not only health is directly affected, but also the agricultural industry, which constitutes an important export factor for the country. In order to export agricultural products to the EU, Moldova's agricultural industry needs to comply to WTO and EU norms in regard to food and water borne diseases (World Bank 2005).

The water supply and sanitation systems in many former Soviet countries are falling apart, as infrastructure and services are deteriorating, mainly due to stalling of infrastructure investments and insufficient maintenance. Although the social benefits of access to safe water supply and sanitation exceeds the provision of them by a factor of 13 (OECD 2007). Hence, many Eastern European countries are in a similar situation as Moldova (OECD 2007). Since Moldova is not the only eastern European transition economy in the battle for better water supply quality conditions.

In order for Moldova to overcome its socio-economic problems, it could set sustainable water management as one of its national priorities. Without safe drinking water, the country cannot make use of its fertile land and climate within its biggest industrial sector agriculture. Safe access to drinking water is still not the case for most Moldovan citizens, especially in rural areas. The rural areas suffer the most, as the rural population remains mostly disconnected to the central supply and sewage systems, which is paid for by their health. Due to agricultural run-offs, insufficient storage of fertilizers and pesticides, oil industry and lead contamination as well as remaining pollution incidents from Soviet times and insufficient sewage systems many water bodies' quality is affected. These include surface waters but also shallow ground water and sometimes even ground water as deep as 60 meters that are contaminated. Due to low incomes, even if wells are tested and declared to be unusable, the rural population has no choice but to continue using contaminated water, as their financial situation does not allow them to purchase bottled water. Figure 1-2 provides an overview of the water resource situation of Moldova, including polluted sources as well as water scarce areas of the country. The map also shows the regions of obsolete storage areas from past Soviet era, which have been abandoned without being taken care of. Additionally environmental impacts, such as

pollution and drought areas, as well as regions declared as natural habitats are visualized on the map.

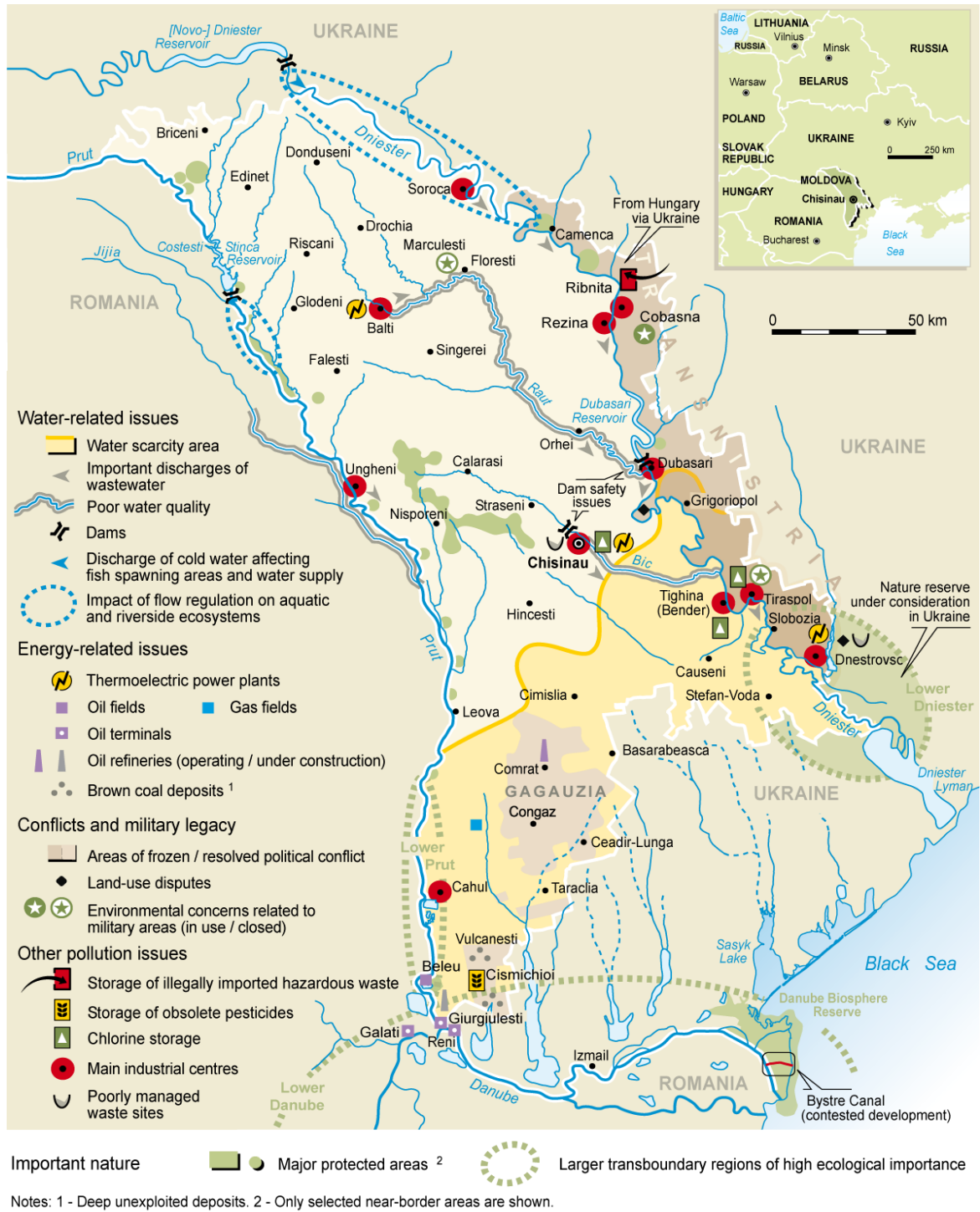


Figure 1-2 Environment and security issues in Moldova

Source: (Novikov 2007)

The urban situation of the population is much better, however the water sources stay the same and many people in the cities remain disconnected to the central water distributor. Moreover, due to the economic situation of many people, water thefts can occur. The water availability and quality in Chişinău is one of the better situations in the country, however quality and

access implications remain. As the tap water is not advisable to be used for drinking and often households are cut off from water for several hours. In addition, the infrastructure of the water supply is inherited from the Soviet era and hence outdated and inadequate for today's needs, from the piping system to the plants.

1.3 Research Objective and Question

The research objective of the study is to analyze the water supply situation of Chisinau within the 'thinking in systems' framework, thereby applying the systems approach to the study's analysis and resulting findings. The objective includes highlighting the faulty areas and malfunctions of the system in light of actor behavior. Problem areas are identified and analyzed and could be confronted by the system's actors and approached in order to improve the system's functions.

In light of the above-mentioned objective of the study, this paper is focused on the following Research Question:

How can the system's approach assist to identify dysfunctions in the water supply system of Chisinau and use those as opportunities for change?

In order to provide an answer to the above leading research question, the following sub-questions are used to guide the research within the methodology model applied to the specific case of Chisinau.

1. Which are the problems of Chisinau's water supply system that can be classified using Donatella Meadow's system approach of 'opportunities and traps'¹?
2. How can the involved actors operating in the water supply system intervene into the system to support change?

1.4 Scope and Limitations

While observing water systems within the thinking in systems approach², one would assume to include the entire water system from its source, transport and supply to wastewater treatment and also impacts resulting from agriculture and industry on water resources as well as end-customer behavior and educational measures. The author has acknowledged the fact that a water system incorporates more aspects than merely water supply and reaches far beyond the country's boundaries. An all-encompassing study would be interesting to conduct especially for a small country like Moldova. Nevertheless, such an all-encompassing study would be outside the scope of this research project and the given time limitations. However the author acknowledges that there is more to water systems, besides the actors involved in the water supply system. Hence, this paper focuses on the water supply service of the Republic of Moldova's capital, Chisinau and the actors active within the system. This paper does not take a look at the complete water system, nor at the entire country. Although the water systems of other Moldovan cities and in particular rural Moldova are interesting and worth to explore, the access to valuable information is even more limited than for a case study on the capital city Chisinau. Hence this paper focuses on the capital city and its supply of water, due to simplification of access to actors and information.

¹ Opportunities and traps has been coined by Donatella Meadows and is referred to within the problem analysis, the term as

² The systems approach is used as the methodology framework in this study and will be further explained and defined in the methodology Chapter 2

Although the focus on the water supply system of the Capital City makes access to information better than in the rural parts of the country, useful academic studies are scarce. The available academic studies on the country’s water sector had to be considered with caution, as the information displayed in these studies was often outdated and sometimes subjective. Thus even though a focus on the part of the country with most access to information has been chosen, academic literature sources remain limited. Therefore, much information has been gathered first hand from interview sources and personal communication as well as on site visits. Due to the given timeframe for the thesis project resulted in limited time available for the on site visit and hence also for personal interviews in Chisinau was limited. Some actors to be interviewed were unavailable during the time of the on site visit, some of them were interviewed through follow up telephone interviews and e-mail communication. However some were unavailable during the site visit, refused non-face to face interviews or an interview at all. Furthermore, telephone interviews were only possible with those actors able to communicate in English. Language was another barrier for the interviews, as many actors do not speak English and the author does not speak any Romanian or Russian, hence a translator was needed for the interviews. Governmental actors, water utility employees and actors of the international community were generally accessible, non-governmental actors and representatives of the civil society were however less accessible³.

This study uses references stating the Moldovan Lei and also US Dollars. In order to enhance the text flow and to clarify the understanding of the different rates referred to, please see the exchange rate Table 1-1 from September 7th, 2011, below.

Table 1-1 MDL Exchange Rate

0 : 27	 USD	 EUR	 GBP	 JPY	 CAD	 AUD	 CHF	 CNY
	1 MDL = 0.08790	0.06256	0.05504	6.79596	0.08694	0.08297	0.07541	0.56180
	Inverse: 11.3765	15.9856	18.1678	0.14715	11.5021	12.0522	13.2603	1.77999

Source: (xe 2011)

Further research on other Moldovan cities and especially the rural part of the country and its water supply and wastewater treatment would be very interesting, since not much has been done in these areas yet. This includes the involvement of the agricultural sector as well as transboundary water issues. Moreover a more in depth stakeholder analysis, including a longer field research period and thus more time for interviews and first hand experience on local projects in cooperation with international donors would also be more than helpful for a complete assessment of Moldova’s water sector.

1.5 Outline and intended audience

After providing the reader with the context and problems in terms of water resources available in the Republic of Moldova and explaining the methodology used to conduct the study in Chapter 2, this paper will provide a descriptive overview of Chisinau’s water supply system and the local utility in Chapter 3. The legislative status quo and policy outlook is outlined in Chapter 4. Chapter 5 provides an overview on the involved actors in Chisinau’s water supply system, followed by an analysis of these actors in Chapter 6. Afterwards reflections on the analysis and findings of how to intervene in the system are discussed in Chapter 7. The Conclusion of the study follows in Chapter 8. The Appendix of the study provides the

³ The involved actors will be discussed in detail in Chapter 5 of this study.

Questionnaire to the interviewees, as well as a list of the contacted actors, a summary on water related legislation, as well as a time plan for the implementation of further EU water related Directives and a photo gallery of the author's site visit to the inner city water treatment plant of the utility S.A. Apa-Canal Chisinau.

This study is first and foremost done to fulfill the thesis requirements of the Masters Program Environmental Management and Policy at the IIIEE at Lund University and the author's fellow classmates. Secondly, this study is aimed at the actors involved in Moldova's water management sector. Especially those Moldovans that are interested in pushing their country forward and making Moldova a living space with qualitative water resources and thus better living conditions for its citizens. This study is also intended at the international community active in transition economies, developing countries and the water sector in general. This study would however also be interesting for anybody interested in countries in transition and in particular water management work.

2 Methodology

2.1 Analytical Framework

The systems approach is used as the theoretical framework to guide and direct this study. Definitions and concepts are taken from ‘Thinking in System’s’ by Donatella Meadows (Meadows 2008). Meadows defines a system to be “more than the sum of its parts and operates its interconnections through the flow of information”. The system’s function or purpose is the most crucial part within the system and the structure of the system is its source of behavior, which is revealed by a series of events over time. By viewing the world as a system, within paradigms, it becomes comprehensible and its borders are defined. “Paradigms are the source of systems. From paradigms and from shared social agreements about the nature of reality, come systems goals and information flows, feedbacks, stocks, flows, and everything else about systems” (Meadows 2008). Everything can be viewed as a system, which makes the interconnection of things easier to understand. In a practical context, this means that the systems approach helps with identifying malfunctions of a system and provides opportunities to intervene into the system and hence the possibility to change it. The definition of systems thinking given by Konkarikoski provides a more practical and easier to understand approach: “Systems Thinking has been defined as an approach to problem solving, by viewing ‘problems’ as parts of an overall system, rather than reacting to specific part, outcomes or events and potentially contributing to further development of unintended consequences. Systems thinking is not one thing but a set of habits or practices within a framework that is based on the belief that the component parts of a system can best be understood in the context of relationships with each other and with other systems, rather than in isolation” (Konkarikoski and et al. 2010).

A system can be influenced by many factors, however most changes are only viewed after a certain time and not directly (Meadows 2008). Hence feedback loops occurring within systems cannot change a system’s behavior or direction immediately, but only future behavior. Often it is hard to predict future behavior and hence, future action needs to be taken into account before one intervenes in the system.

The author used the system’s approach theory, as outlined by Meadows, to develop a systems model, which is practical and applicable to the Moldovan case of water supply. The system model aids to put the research and study of the complex water supply and sanitation system into a comprehensible format and give it a structure that would make it possible to apply the different ‘traps and opportunities’⁴ or archetypal problems and ‘intervention points’⁵, as defined by Meadows. These among others include the following: ‘Policy Resistance’, ‘The Tragedy of the Commons’, ‘Drift to Low Performance’, ‘Escalation’, ‘Success to the Successful’, ‘Shifting the Burden to the Intervenor’, ‘Rule Beating’, and ‘Seeking the Wrong Goal’ (Meadows 2008). Since water supply and sanitation system are complex structures that would need to incorporate many more aspects than reflected upon in this study, the model was used to draw a boundary around the case and for the analysis in this study to simplify the situation and contribute to the understanding of it. This approach makes the analysis less complicated and helps to diminish the possibility of too complex and obscured answers. The

⁴ Archetypal problems cause destruction, which is often blamed on particular actors or events, whereas it is actually a consequence of the system’s structure. „Blaming, disciplining, firing, twisting policy levers harder, hoping for more favorable sequences of driving events, tinkering at the margins-these standards will not fix structural problems“, this is why Meadow’s refers to them as ‘traps’, which however can be used as opportunities as well (Meadows, 2008).

⁵ Intervention points or Leverage points into a system are places in a system where small change could lead to a large shift in behavior (Meadows, 2008).

author used Meadows guiding principle of systems thinking of ‘stepping outside the limited information’ in order to decrease a too narrow and subjective scope on the topic, as “from a wider perspective, information flows, goals, incentives, and disincentives can be restructured so that separate, bounded, rational actions do add up to results that everyone desires” (Meadows 2008).

2.2 Methodology Model

The figure below (Figure 2-1) visualizes the methodology used, including the set boundary of the study within the systems approach and reviewed literature. The systems approach theory is used to frame the study, hence symbolized in the figure by the outer layer in grey. The scope of the study encircles the source triangulation in order to direct the research. The data collected from literature review as well as from the interviews is analyzed and presented within the scope of water supply service in Chisinau, Moldova, which is a transition economy in regard to the policy agenda of the water sector and involved actors. The blue circle in the Figure 2-1 below presents the scope. The data collection triangulation will be further and in more detail explained in the following section (2.3 Data Collection). The analysis is directed by the analytical framework, which is presented by the grey pentagon of the theoretical model in the graphic below. The corners of the polygon present the author’s identified system ‘traps or opportunities’, as defined by Meadows. These ‘traps or opportunities’ reflect the problematic within the water supply system in Chisinau that have been identified after the on-site research and the following literature review and analysis of the interviewed actors. The pentagon presents the dysfunctions of the water supply system, as five ‘traps or opportunities’. The corners are a reflection of the disruptive nature of the functions of the system and constitute the cornerstones of the analysis of this study, by intervening into the system and correcting the system’s behavior, the problems can be used as ‘opportunities’ to initiate change within the system.

The graphical illustration highlights the irregularities and unevenness of the system’s function, hence the pentagon and not a circle. A circle, presenting an even flow of feedback loops and around a well-defined goal, could visualize a functioning system in comparison to the present model.

The Traps and Opportunities discussed in this study are the following: ‘Tragedy of the Commons’, ‘Rule Beating’, ‘Seeking the Wrong Goal’, ‘Shifting the Burden to the Intervenor’ and ‘Policy Resistance’. After assessing collected data, these have been identified to be dysfunctions within Chisinau’s water supply system and are hence taken as cornerstones for the system analysis. Other Traps and Opportunities include ‘Drift to Low Performance’, ‘Escalation’ and ‘Success to the Successful’, these have been considered to be less relevant to Chisinau’s case, but would be worth exploring for further research.

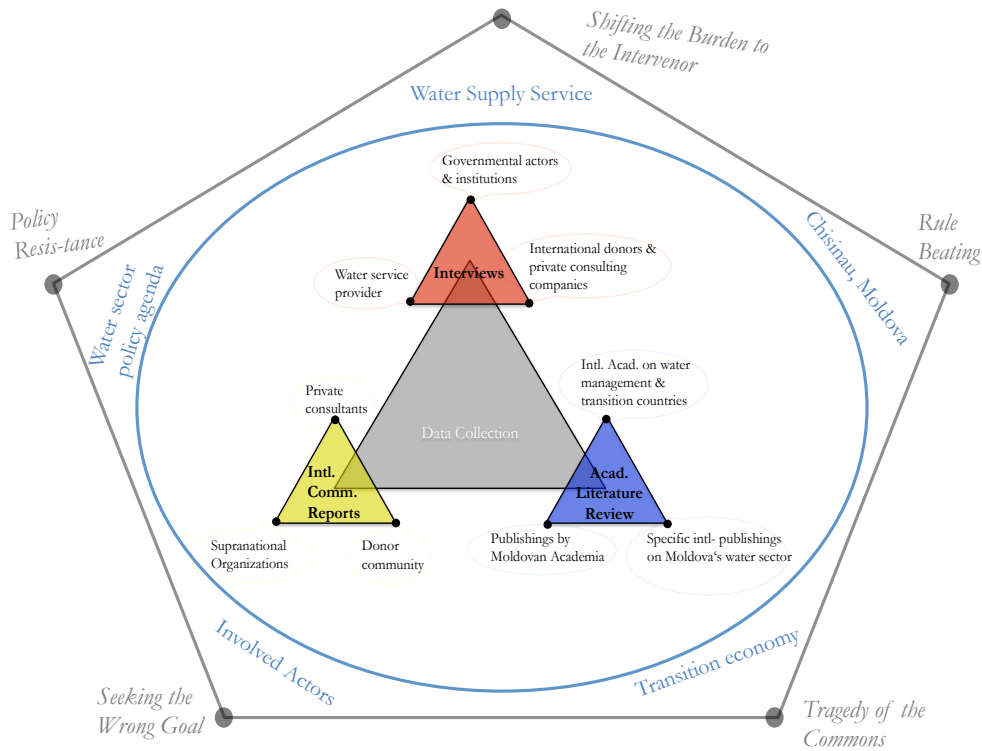


Figure 2-1 Schematic presentation of the analytical framework developed for this study

Source: Author

The pentagon’s corners of ‘traps’ and possible ‘opportunities’ are briefly defined below:

‘*Shifting the Burden to the Intervenor*’ distracts of the “harder and long-term task of solving the real problem” (Meadows 2008). Problem symptoms are disguised by fixing problems on the surface, but the underlying problem is not solved and can even get in the way of solving the actual problem. “The system deteriorates; more and more of the solution is then required. The system will become more and more dependent on the intervention and less and less able to maintain its own desired state” (Meadows 2008).

‘*Policy Resistance*’ – term fixes that fail, despite of policy fixes to change or improve system errors, and the system seems stuck and resistant in its behavior. “Policy resistance comes from the bounded rationalities of the actors in a system, each with his or her own goals. Each actor monitors the state of the system with regard (to a variable important to themselves) and compares (the variable) with his or her goals.” Thus leading to a discrepancy, with each actor doing something to correct the situation and working hard to achieve their goals (Meadows 2008).

‘*Seeking the Wrong Goal*’- the direction set for the system becomes distracted. “One of the most powerful ways to influence the behavior of a system is through its purpose or goal” (Meadows 2008). Without the right goal, the system is directed into the wrong track and might produce a result that is not intended or wanted (Meadows 2008).

‘*Rule Beating*’ concerns the right flow of information via feedback loops through the rules that govern a system. It appears that rules are being follow, but evasive action is being taken mostly of the lower levels in hierarchy to “get around the intent of a system’s rules”, which can often be ill-defined, over-rigid or damaging (Meadows 2008).

'*Tragedy of the Commons*' points at the resource, which eventually becomes limited. It is coined as "the escalation of an erodible environment, an overexploitation of a renewable resource". Hence making the renewable resource, un-renewable and unavailable to everyone (Meadows 2008). Garrett Hardin has coined the concept in 1968, drawing the example of many different herd owners grazing on public land and thereby exploiting the resource, as nobody feels responsible for the public resource.

This study focuses on a combination of these corners, with an analysis on the different actors involved in Chisinau's water supply system. The analysis Chapter (Chapter 6) will provide a more detailed explanation on the dysfunctions as well as the 'opportunities and traps' mentioned above. Chapter 7 will discuss the findings and possible recommendations in reflection to the analyzed dysfunctions.

2.3 Data Collection

In order to gain a complete overview on the topic of water management and the water situation in general in Moldova, data was collected from as many angles and different sources and actors as possible. The apelemoldovei.org website proved to be a good basis in order to gain an overview on the water situation, as well as the water policy sector in Moldova. Other sources included the water website by the European Commission of the DG Environment, which points to all water related EU Directives and Strategies.

Secondary literature review proved to be difficult, as sources were scarce in terms of academic publications, especially from international academics. Most literature sources reviewed include reports by the international community. These include international donors, as well as organizations such as the OECD, EBRD, World Bank and the EU. Since academic papers were scarce, however few publications on the water sector in Moldova are available from the Academy of Science and other Moldovan Academia, these were taken into account to complement information.

In order to answer the research question, primary sources were necessary in form of a site visit to Chisinau and personal interviews with the involved actors of the water supply system and water sector in Moldova. These interviews constitute primarily to the entire study and especially to the actor analysis. The primary sources consist of personal interviews with local actors in Chisinau, as well as skype and telephone interviews with international actors. Other primary sources include site visits to the utility, treatment plant and several Ministries. The detailed interview design will be described in section 2.3.2 Interview Design.

The Literature Triangle below provides an overview on how the information for this study has been collected, in order to gain a complete view of Chisinau's water supply system service and the involved actors.

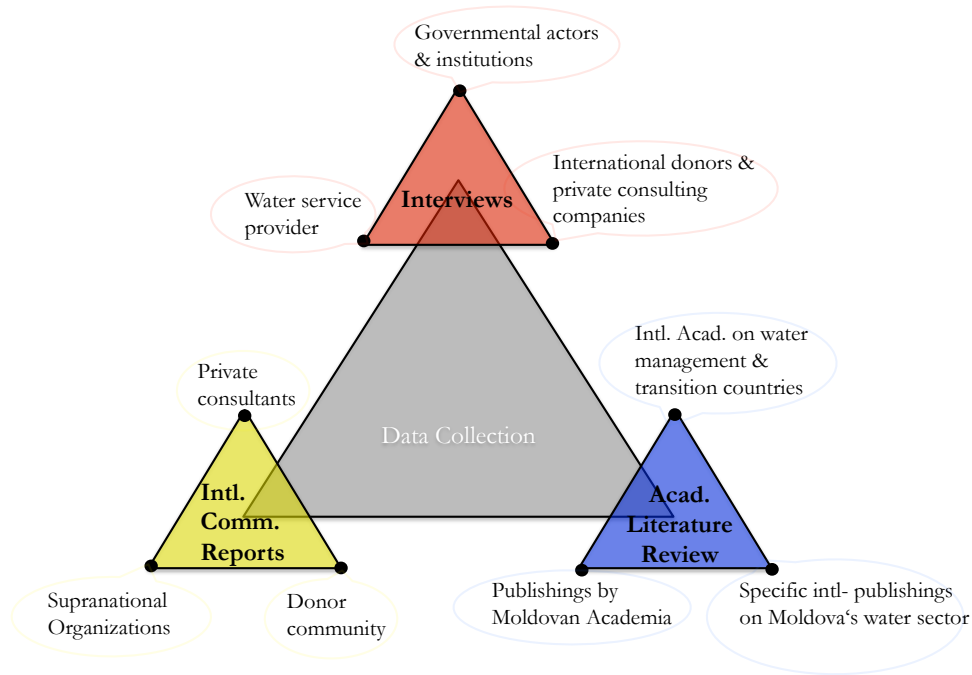


Figure 2-2 Data Collection Triangulation

Source: Author

2.3.1 Literature Review

The literature gathered and reviewed has been primarily based on reports by the international community, as secondary literature on Moldova’s water sector from reliable academic sources was limited. Nevertheless general academic publications on water management and policy frameworks have been used to acquire a basic understanding of how the policy framework and actor interaction works within the water sector in other countries. A list of these publications is given at the end of this section. In order to gain more specific informational insight into Moldova’s situation, the author based her literature review on reports by the international community, publications on Moldova’s water sector and reports by the Moldovan government, including strategies and other legislative documents. Furthermore, web databases from the European Union in regard to water relevant policies and water quality standards have been reviewed, as well as World Bank and the European Bank for Regional Development (EBRD) sector analysis. Other web databases include OECD and EU Water Initiative (EUWI) funded water specific information by the water department of the Moldovan Ministry of Environment.

The literature review based on reports by the international community, publications by the government of Moldova and web data bases by the EU and OECD were used to construct the descriptive parts of this study on the background material concerning the country’s water sector. However, as Moldova specific academic secondary sources were mostly lacking or not reliable, most information that has led to the analysis and findings of this study has been gathered through personal communication with the involved actors and some selected domestic academic sources of interviewed actors. The reliability of most domestic academics has been found to be questionable after triangulating the given sources, this was later confirmed by several sources and personal experience. This particular actor aspect is later incorporated in the discussion and in the analysis of this study. Hence most information in this study constitute from primary sources as well as impressions and observations by the author. In order to keep an objective mind while analyzing the findings and observations, the

author triangulated these observations with the reviewed literature and reflections with international donor actors.

In order to gain an overview on water management, water supply systems, transboundary water management in general, as well as specifically towards countries in transition, the following academic literature has been reviewed, however not directly cited. Nevertheless they added to the author's background understanding of the system.

- General literature reviewed regarding water management and investments: Bruch (2009), Pahl-Wostl (2008), (2008), Lankford (2008), Marinoni, Higgins et al. (2008), Mukhtarov (2008), McDaniels (1999), Wietske Medema (2008);
- Water Policy: Pahl-Wostl (2009);
- International treaties and transboundary water management: Bogdanovik (2011), Gerlak (2004), Hildering (2004), Kliota (2001);
- Europe and water scarcity: EEA (2009), Gregorič & Sušnik (2010);
- Water protection and monitoring: Epting, Regli et al. (2008);
- Water utilities and service: Blokland (2010);
- Modelling of resource management: Brugnach & Pahl-Wostl (2008);
- Eastern Europe and states in transition: Lešnodorska (2011), Romanciuc, Gladchi et al. (2009), Pahl-Wostl, Mötgen et al. (2008), Trumbull (2009);
- Water supply and sanitation specifically on Moldova: Hugosson & Larnhold (Mars 2010), Melian, Myrlian et al. (1999), Sirodov (2010).

2.3.2 Interview Design

Different actors related to water management, in particular in transition economies were contacted by e-mail in order to collect as much published information as possible prior to the on-site research and personal interviews in Chisinau. These resulted in skype interviews before the visit to Chisinau. Local actors in Chisinau were contacted prior the field research in order to set up a meeting schedule and also to provide the actors with an outline of the intended area of discussion. This included a questionnaire, which can be found in the Appendix I and the following outline of core questions:

- Responsibilities and power distribution (including overlapping areas of responsibility for different departments and ministries)
- Where is change needed in the legislative framework to ensure a sustainable or sufficiently working water supply system? What change is needed?
- Barriers related to different actors (individuals and institutional)
- Who needs to initiate change/ or should act on change? What can be gained or lost from action? What would be reasons not to act on behalf of improved water quality and environment protection?

The questionnaire was used as a guide during the interviews to direct the question flow and also to keep on track. Phrasing of the questions, as well as which questions were asked to the different actors, including the sequence of the questions varied with every interview. All questions were open-ended and did not presume answers or did not direct the interviewee to a certain answer.

The questionnaire was sent to all actors prior the meeting in order to give the interviewee time to prepare and also to save time during the interview. This could have provided some complications in regard to the possibility that some actors could have prepared themselves too thoroughly so far as to not answer questions spontaneously and hence not honestly. Also some actors could have been inflexible as to dully sticking to every single question during the interview. Furthermore, a throughout and long questionnaire could also appear intimidating. These conditions have been acknowledged and taken into account by the author and hence merely send the questionnaire only a day before the meeting with a note of caution that the questionnaire merely serves the purpose of directing the topic and is to be used as a guiding tool for the author. This method proved to be effective as most actors merely glanced over the questionnaire, but still had some answers prepared.

Since some actors were not available or not based in Chisinau, some interviews were done via skype or telephone and e-mail correspondence. This was primarily done with actors of the international community and private consulting companies, as these interviews did not need the help of a translator. Hence personal on-site interviews were concentrated on local actors in Chisinau. However, some follow-up consultation with local actors was done in retrospect.

In order to counteract biased opinionated or even false information from interviewees, the author tried to interview as many different actors as possible and triangulate the given information with reports of the international community. Further consultation and follow-up telephone and skype interviews were done to confirm the information given by the on-site interviewees.

3 Description of the Physical Water System in Moldova

3.1 Available Water Resources

Water resources available in Moldova include ground water reserves and surface waters. The most important water basins for Moldova are the Prut, Dniester or Nistru and Danube basin, from which main surface water sources are extracted.

3.1.1 Surface Water Sources

Surface water resources in Moldova include mostly the two major rivers, Dniester or Nistru and Prut. The Dniester or Nistru basin covers about 67% of Moldova's land surface and is regulated by two basins, the Dniestrovsky in southwestern Ukraine, and the Dubasari in Moldova (OECD/EUWI 2011). The Prut River also rises in the Ukraine and forms the border to Romania and ends in the Danube. Both rivers water quality have increased with the dissolution of the Soviet Union and the slowing of economic activity and although the water quality is relatively stable, the water quality deteriorates downstream due to discharges from industries and households. Nevertheless, sufficient transboundary water management is still needed between the Ukraine, Moldova and the breakaway province Transnistria. All internal rivers in Moldova are small in comparison to the two transboundary ones as well as seasonal, hence they have a tendency of being dry during the summer months. Furthermore, most of the internal rivers are highly polluted and contain too high amounts of minerals and are therefore unsuitable for drinking water sources (OECD/EUWI 2011). Other surface waters include artificial and natural lakes and ponds, with a tendency of high salinity and mineralization, which often leads to eutrophication and are thus also not suitable as a source for drinking water. Hence Moldovans are restricted to the two main rivers as a main source of drinking water from surface water sources, this particularly accounts to the citizens of Chisinau, as the water utility of Chisinau extracts its water from the Dniester or Nistru River.

3.1.2 Ground Water Sources and Aquifers

Especially shallow groundwater sources, but also some deeper sources are contaminated in Moldova. Nitrate is one of the biggest problems within ensuring drinking water supply as it is an agricultural fertilizer and can turn into nitrite in the human body. High dosages of nitrate can lead to dyspnea in children and carcinogenic illnesses for adults (Samwel). The maximum level for Nitrate set under the Nitrate Directive as well as the Groundwater Directive for the European Union is 25 mg (European Union 2010; European Commission DG Environment 2011). Additionally Fluoride and TDS exceed levels set by the WHO, which often reach 8-10 mg/l opposed to the set limit of 1.5 mg/l (J. Fawell 2001). The high Fluoride and total dissolved solids (TDS) levels are mostly due to the geological nature of the rocks, but nevertheless pose a threat to health and are unfortunately difficult to remove. According to Apele Moldovei and the Water Department of the Ministry of Environment of Moldova, the lower Baden Sarmat aquifer, which is the largest formation in the country, is widely exploited and natural recharge is limited (OECD/EUWI 2011). Additionally, the use of aquifers includes the problem of high investment costs due to depth, low yields, high pumping costs, treatment requirements and the need to reduce over extraction as this would eventually lead to overexploitation. Hence, most villages in the rural parts of Moldova are supplied with shallow groundwater sources via local wells. However the yield of these sources is limited due to high evaporation and low precipitation, especially in the summer months. According to a study by the World Bank, water quality of more than 90% of the wells has one or more chemical constituent that exceeds national drinking water standards these included "hardness (90%), total dissolved solids (65%), Nitrates (55%), Sulfates (55%), Selenium (40%), Fluoride (15%) and Chloride (10%). Over 80% of the wells had positive and high concentration E. Coli

counts. Investigations indicated a strong relationship between groundwater quality and agricultural activities. High TDS, nitrates sulfates, chlorides and bacteria levels being manifestly higher in residential areas. On the other hand, the impact of agricultural land-use was less pronounced, and there also appeared to be no extensive contamination from pesticides.” (OECD/EUWI 2011).

According to the Water Department of the Ministry of Environment, information of groundwater quality available in Moldova is not complete, but has a high probability to be polluted (OECD/EUWI 2011). The Moldovan state lacks sources to investigate all water bodies and assess their quality, thus most sources have not been assessed. Hence, data information and statistics on the country’s water quality is limited to the few studies conducted by the international community and some done by the national Moldovan government. The limited available data, which is often incomplete, is however used to assess most water bodies across the entire country. Therefore water statistics and data needs to be considered with precaution to its overall reliability.

3.2 Water Supply and Sanitation System

The efficiency of the water supply and sanitation system in Moldova, specifically Chisinau, is be assessed via the following points in this study:

According to customer trends: 1) connection rates of customers to the central distributor, in order to assess how many people are actually connected to the central grid; 2) general consumption level of customers, to analyze consumption trends in relation to capacity, service and tariffs. The infrastructure: 3) interruptions of supply, in order to assess the service quality as well as infrastructure quality; 4) water quality and ways of treatment, to evaluate the quality of the water source; and 5) metering at the pumping stations and the amount of electricity used for these pumps, to assess the efficiency of the pumping system, as well as the quantity of water flow and therefore also losses within the system; and additionally on site sanitation and wastewater connection rates that need to be taken into account to analyze the entire system, which however is outside the scope of this study and hence not addressed in this Chapter.

3.2.1 Customer Trends

Customer trends of Chisinau’s water supplier can be assessed by their connection rates to the central supplier as well as their consumption rates. The connection rate of the population of Chisinau is displayed in percentage towards the relation of population numbers in the graph below (Figure 3-1). In general it can be assumed that the connection rate to the centralized water system is not a problem in the urban parts of the country, but more in the rural parts. However, by displaying the general trend of connection rates towards the system in Chisinau, customer behavior trends can be evaluated in regard to willingness and ability to be connected to a central water supplier. Furthermore, the service of the utility can be reflected in terms of infrastructure capacity reaching every customer. According to International Benchmarking Network for Water and Sanitation Utilities (IBNET), “the population of Chisinau’s water service area has been relatively flat over the past 15 years. After increasing marginally in 2002–03, the population dropped to 700,000 before rising again to its current figure of 750,000. Over the same period, the population served by the water company has increased from 550,000 to more than 650,000.” (Caroline van den Berg and Alexander Danilenko 2011). The figure below visualizes the connection rate of Chisinau’s population to the central supplier. As can be seen on the graphic, the trend of connection rates follows the increase or decrease of the population. According to other figures assessed by the author of the latest OECD project, a decreasing connection trend particularly occurred in 2003, this is also indicated within the

graphic (Figure 3-1) and can be explained by a drop of population, suggesting high migration at the time. 2003 was a year marked by spiraling inflation rates, assuming a reason to high migration of the Moldovan population.

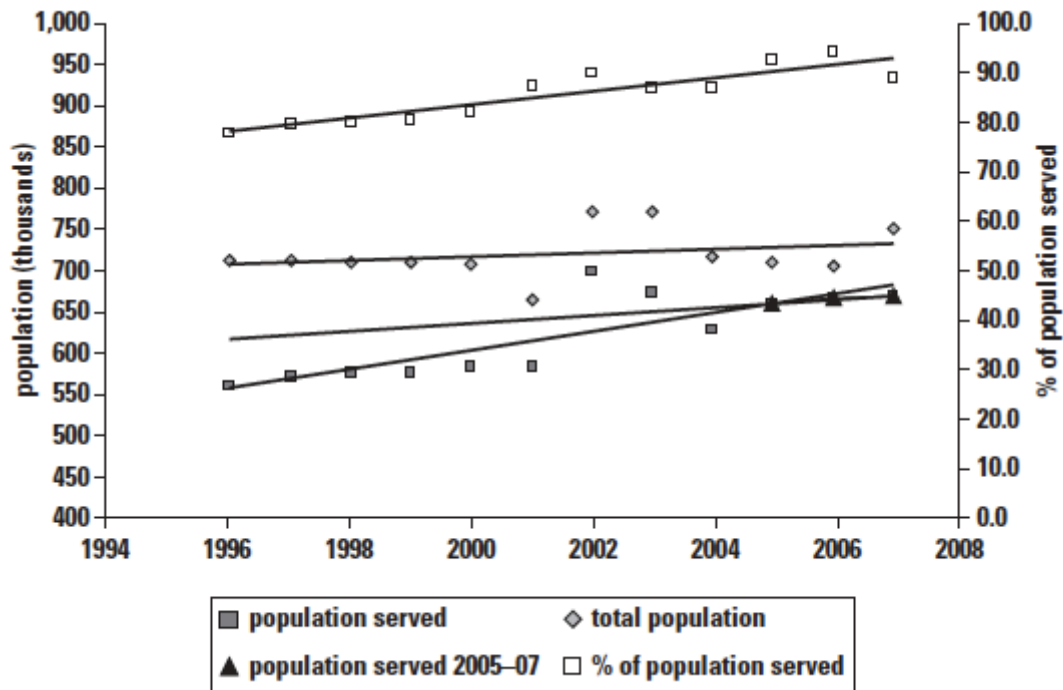


Figure 3-1 Trends in Population and Population Receiving Water Supply Services, Chisinau Water, 1994–2008

Source: (Caroline van den Berg and Alexander Danilenko 2011)

General consumption trends by citizens as well as industry have decreased in Moldova since the dissolution of the Soviet Union, which is coupled to the decline of the country’s economic activity. This can be seen in the following figure on water consumption (Figure 3-2). It is quite evident that industrial activity has slowed and thus also decreased the total consumption of water. In terms of residential consumption, according to the Apele Moldovei Agency⁶, consumption is increasingly influenced by irregularity of supply and the introduction of a metering system in the past years (OECD/EUWI 2011). “Domestic consumption forms the main component of demand in all sizes of towns. Industrial consumption of water has decreased significantly over the last twenty years, this is partly due to the adjustment to the post-soviet economic situation, but also partly due to the very high tariffs applied to industrial consumer.” (OECD/EUWI 2011). It can however also be assumed that a drop of population, as evidently seen in the previous Figure (3-1) on the connection rates is in direct relation to the consumption patterns, in addition on a rise in tariffs for residential as well as industrial consumers. Furthermore, as can be seen in Figure 3-2 below, the total production of water exceeds the total consumption of water. This indicates high water losses due to the deteriorating infrastructure in addition to possible pipe taps done by water thieves. Water theft

⁶ The Apele Moldovei Agency is one of the main actors within the water supply system of the country as is hence described in more detail in Chapter 5 and analyzed in Chapter 6 of this study.

has been mentioned during the personal interviews to increase with tariffs due to the economic situation of many citizens in Chisinau (Shumilo 2011).

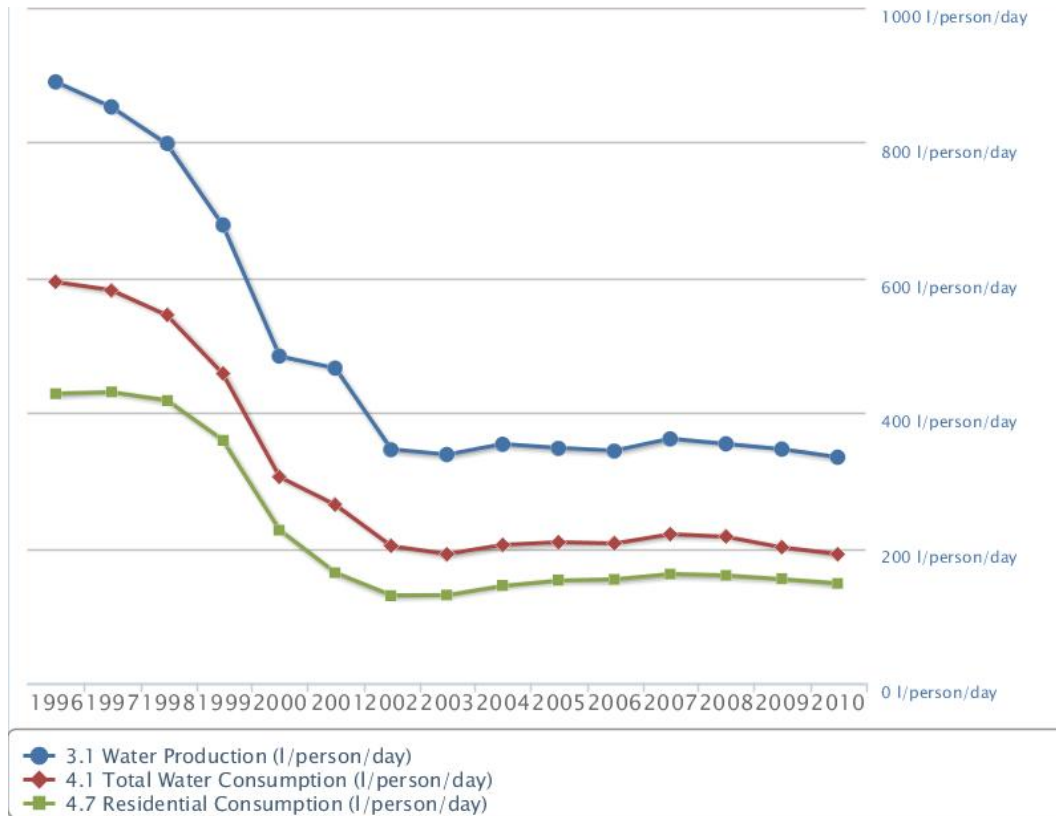


Figure 3-2 Water Consumption in relation to Water Production in Chişinău

Source: (Author based on data from IBNET 2011)

The reduction in consumption levels has consequences in terms of water sales and thus reduced capacity for improving the infrastructure for utilities. Especially since the water utility capacity was constructed for generous demand assumptions, hence the low consumption has resulted in low utilization of the entire system and therefore also high unit operating costs (OECD/EUWI 2011). It can be assumed that there is an overproduction of water for Chişinău, thus infrastructure treatment plants are more than adequate. According to IBNET, “demand should be the driver of any utility’s program. Effective demand from current and future customers is the primary determinant of how much service to provide and when, where, and at what level. Utilities should carry out comprehensive demand analysis, including demographic analysis, water-use patterns, demand management, and wastewater demand.” (Caroline van den Berg and Alexander Danilenko 2011). Thus production needs to be tied directly to consumption patterns and trends, including future assessment of Chişinău’s population behavior.

3.2.2 Infrastructure

The infrastructure of the water supply system is assessed by the following three points in this study: 3) interruptions of supply, in order to assess the service quality as well as infrastructure quality; 4) water quality and ways of treatment, to evaluate the quality of the water source; 5) metering at the pumping stations and the amount of electricity used for these pumps, to assess the efficiency of the pumping system, as well as the quantity of water flow and therefore also losses within the system.

Water quality of the larger cities, including Chisinau, is ensured by the full treatment including coagulation, settlement, filtration and disinfection, as the water is retrieved from the Dniester or Nistru River. The infrastructure capacity, especially the treatment facilities exceed demand, as they have been built in order to meet higher demand levels, constituting from estimates in the 1970s (Vladimir 2011). Additionally, the infrastructure is deteriorating, as most of the electrical and mechanical parts are of poor condition. However, not merely the mechanical and electrical parts of the system are deteriorating, but the entire infrastructure is of poor condition. This is surprising, as the infrastructure is only about 30 years old, which is by far a young age compared to most western European piping infrastructure systems, which have a tendency of being more than a 100 years old. Nevertheless, electrical components, such as the pumping system stemming from Soviet times are considered to be old and unreliable by today’s standards, as they have been made of poor material and by unqualified work force (ibid.). Including the fact that maintenance of the entire infrastructure system has been rather low and close to no investments into refurbishment measures the entire system has deteriorated to an extend of severe unreliability of losses and pipe breaks. The fluctuation of pipe breaks is visualized in Figure 3-3. According to the Apele Moldovei Agency, “without rehabilitation these plants will quickly cease to be operational”, however this is very costly and exceeds the budget of Chisinau’s Apa Canal as well as the municipality by far. The illustrated frequency of pipe bursts in comparison to Western Europe (at 0.2 bursts per km a year) is 40 times higher in Moldova (OECD/EUWI 2011; Daniel Wiltschnigg and Team March 2010).

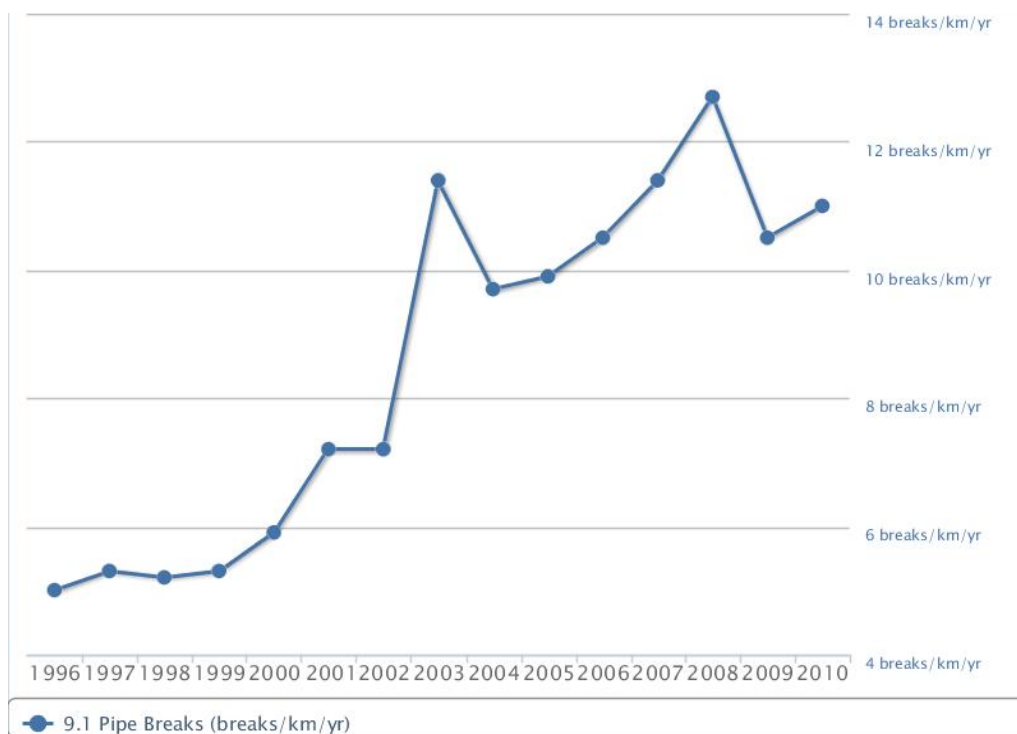


Figure 3-3 Pipe breaks in Chisinau

Source: (Author based on data from IBNET 2011)

Losses in general account up to 38% in Chisinau, in Western Europe, 20% is accounted to be a loss that is still economic (Lahlou 2001). As losses in Chisinau are above 20%, they are considered to be uneconomic. In addition to the uneconomic losses, rising energy costs, scarcity and pollution are other factors that need to be taken into consideration for a water supplier to stay economical. According to the OECD, “losses, as they increase over 30% have an increasing impact on the cost of running the network in terms of energy charges and effort

in repairs and maintenance. Losses over 50% represent systems that are highly inefficient and, unless these are due to exceptionally high levels of commercial losses, are vulnerable to pollution.” (Daniel Wiltschnigg and Team March 2010).

3.3 Chisinau’s Water Supply System

The S.A. Apa-Canal Chisinau (ACC) is a joint stock company owned by the municipality of Chisinau with a capital share of 553.7 mio lei⁷. The budget of the utility consists of water bills paid by the end consumer and an annual budget by the municipality of 45 mio lei to be invested into infrastructure (Mazurean 2011). The Apa-Canal provides water to more than 650 thousand customers with a current daily supply of 220.000m³ drinking water. The water treatment plants however have been built for a larger supply demand and could provide 384.500m³ (Vavelschi). The overcapacity of the treatment plant is reflected in electricity consumption of the pumps, which amounts to about 6000 kW per day for the inner city treatment plant (Vladimir 2011). A fact sheet of the S.A. Apa-Canal is given in the table below (Table 3-1). The figure provides an overview of Chisinau’s water supply system and the water supplier ACC from 1996 until 2010. Unfortunately no data was available dating back into the Soviet era, which would have been interesting to compare to today’s figures. The data has been taken from IBNET, which has been provided with the data by the water utility itself.

Table 3-1 Performance Overview S.A. Apa-Canal Chisinau

Indicator	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Water Coverage (%)	78	80	81	81	82	88	90	87	87	93	95	89	95	91	91
Water Production (l/person/day)	890	853	799	678	484	466	345	338	353	347	343	361	354	346	334
Total Water Consumption (l/person/day)	594	581	545	458	305	264	203	190	204	208	207	220	217	201	190
Pipe Breaks (breaks/km/yr)	5	5.3	5.2	5.3	5.9	7.2	7.2	11.4	9.7	9.9	10.5	11.4	12.7	10.5	11
Operational Cost W&WW (US\$/m³ water sold)	0.14	0.16	0.19	0.14	0.2	0.36	0.34	0.45	0.37	0.38	0.41	0.56	0.72	0.7	0.76
Average Revenue W&WW (US\$/m³ water sold)	0.18	0.26	0.23	0.18	0.31	0.39	0.39	0.41	0.46	0.43	0.41	0.54	0.77	0.78	0.95
Average revenue - water only (US\$/m³ water sold)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.3	0.34	0.32	0.32	0.34	0.52	0.54	0.66
Operating Cost Coverage (ratio)	1.23	1.59	1.22	1.25	1.58	1.09	1.16	0.9	1.27	1.13	1	0.97	1.08	1.11	1.26

Source: (Author based on data from IBNET 2011)

As can be seen in the data from the table, water consumption in Chisinau has decreased, whereas operational costs have increased. However, revenue for the Apa-Canal, hence price for water per m³ has increased steadily and has continuously been adapted to operational costs. Nevertheless, not until 2010 was the real price reached with the cost collected from the end-consumer. During the personal interviews with the main actors involved in Chisinau’s water supply system, the real price versus the price paid by the end-consumers was pointed out as one of the main problems of the system. The discrepancy of the real cost leads to a declining water supply service, as decreasing investment and maintenance causes spiraling deterioration of the system. Water prices are generally a political issue, especially in a country with socio-economic problems and a high percentage of the population living below the

⁷ Please see Table 1-1 on Exchange Rates for the Moldovan Lei (MDL)

poverty rate it also becomes an ethical problem. Nonetheless, without the right budget, the utility is not able to maintain the service with a further deteriorating infrastructure and hence unsustainable as well as qualitative low supply of water. Which becomes a dilemma with a high percentage of end-consumers that are unable to cover their water bills.

3.3.1 Water Tariff and Operation Costs

The Apa-Canals are authorized to set the tariffs according to a principle of full cost recovery, but are not entitled to subsidies from the public budgets. Hence all costs must be covered through the revenues. The tariffs have had to be approved by the municipal consilium, since 2004 the energy regulation agency (ANRE) sets the tariffs in coordination with the municipal consilium. Although international agreements have priority over national tariff setting rules and calculation methodology of the tariffs, there are nevertheless ways by the municipal consilium to influence the set tariffs according to the utility's head of economic analysis and prices (Trifan Braila 2011). The ACC is currently in a loan contract with the EBRD, set targets by the EBRD have however not been reached as can be seen in the figure below (Figure 3-4). The figure also provides a more detailed overview of the evolvement of costs and water rates in Chisinau (Figure 3-4).

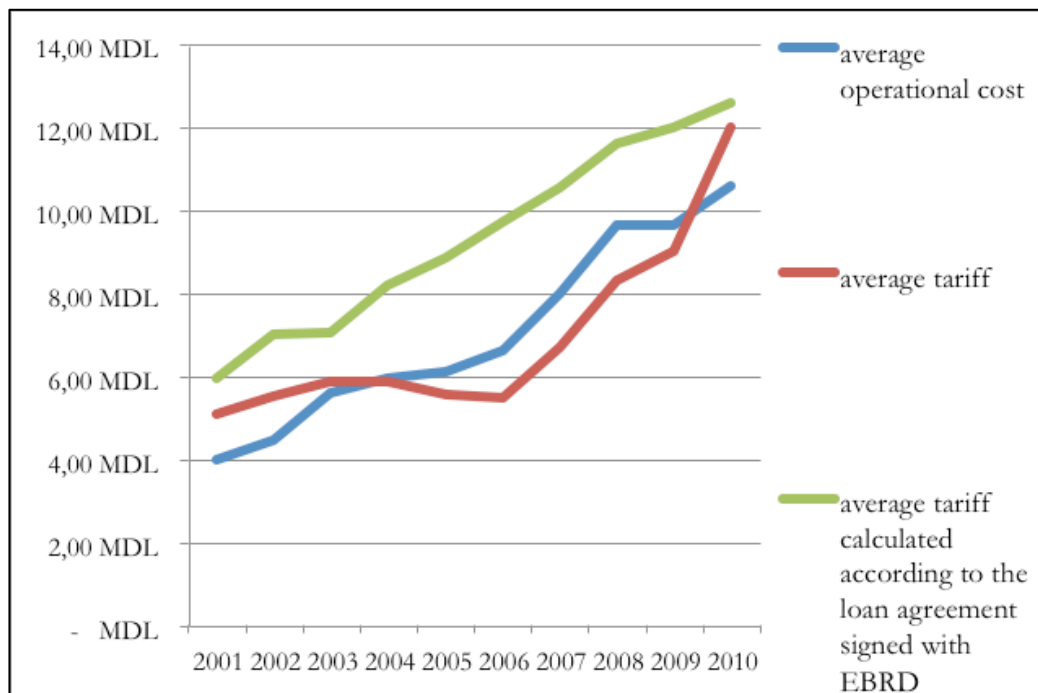


Figure 3-4 Rates and Costs water supply and sanitation service provided by Apa-Canal Chisinau⁸

Source: (Trifan Braila 2011)

As can be seen in the figure, from 2004 until 2009, the average operating costs were higher than the tariff for water per cubic meter. The green line presents the tariff rate suggested by the European Bank for Regional Development (EBRD) on the basis of a loan agreement. However, as the setting of tariffs, is not only an economic decision taken by the water utility, but mainly a political one by the municipality, the tariffs have not been set according to the suggestions by the EBRD (Trifan Braila 2011). “In reality, concerns over affordability and the

⁸ The Figure has been translated from Romanian to English by the author using Google translate. The author does not take any responsibility for translation mistakes.

public's right to access to water overrule the right of water utilities to charge on a full cost recovery basis. This is the major reason for the lack of revenue to cover maintenance costs. Occurring deficits are normally covered by taking on of debt through postponing payments to suppliers of electricity and chemicals and of salaries" (Danish Environmental Protection Agency DEPA, Danish Cooperation for Environment in Eastern Europe DANCEE et al. 2000). The loan agreement of the EBRD with the ACC is coupled with the price and tariff setting up until 2014, which have been based on tariffs set in 1997 and the currency fluctuations as well as exchange rates. However, since the tariffs have not been set according to the costs until 2009, the average operation costs have been higher than the tariffs, which resulted in a lost benefit of 1.200 million lei⁹ (Trifan Braila 2011). The deficit due to too low tariffs, according to the utility is reflected in their incapability of investments into the system's infrastructure. Although incentives for investments are given by the national bank, as 10-12% are refunded if a loan is taken for investments (ibid.) and investment are supposed to be covered by the municipal budget.

3.3.2 Technical Aspects of the Water Supply System

The city of Chisinau retrieves its water supply from the River Dniester or Nistru, as well as two small groundwater wells (which cover 2.5% of the total water resource usage) in the City itself. One part of the water is pumped to an on site treatment plant before it reaches the households, whereas another part of the river water is pumped to a treatment plant within the city's borders (photographs of the on site visit to the City treatment plant can be viewed in Appendix IV).

The water pumped to the city treatment plant has to travel 16 km and is then treated in facilities built between 1957 and 1981. Before the water is pumped into the piping system of the treatment plant, the piping system is chlorinated beforehand, and then the water is chlorinated for preliminary disinfection. The water is further treated via coagulation with the agents: aluminum sulfate, poly-aluminum chloride and cationic polymer and then pumped into sedimentation tanks (Vavelschi). After settlement, the water is filtered through 20 different sized filters, with filter media of sand and activated carbon and zeolite (ibid.). After filtration, the water is pumped into 17 different sedimentation tanks and disinfected with chlorine again before the water is stored for supply (see Appendix IV). The main treatment methods for the ACC is the chlorine treatment and sedimentation process (Vladimir 2011).

The schematic water supply system in Chisinau is divided into different areas and zones, connected by hubs and pumping stations, in order to manage spillages, pipe leaks and breaks (Shumilo 2011). The piping infrastructure amounts to 1650 km, consisting of different materials, including some with asbestos and lead, which have been in use for more than 40 years (Mazurean 2011). Twenty km of the entire piping infrastructure has been refurbished so far, which is done due to state enforcement. However, according to the technical department of the ACC, catching up with the water price and tariffs has been too slow and too low to cover all costs, which makes it impossible to refurbish the piping infrastructure according to the plan set by the government, which would be 100 km per year. Unfortunately, the slower the refurbishment process, the further the infrastructure deteriorates and the harder and more costly the refurbishments will be (ibid.). Most losses occur within the city infrastructure, in numerical terms, losses amounted to 39% within the water distribution in 2010. In order to monitor losses, the water is metered at every pumping station. Leakages or pipe bursts and also losses due to illegal water withdrawal are mainly detected via the monitoring of the electricity consumption of the pumps, as with pressure drop, an electricity increase occurs

⁹ Please see Table 1-1 on Exchange Rates for the Moldovan Lei (MDL)

(Shumilo 2011). For more detail on the infrastructure, as well as consumer behavior, see the previous Section 3.2. Water Supply and Sanitation System.

In comparison with other former Soviet countries, the relationship between the municipality and the water utility is very similar, due to most countries having inherited Soviet centralized structures and built capacities in the 1970s. Generally, water utilities are owned by the municipalities, hence tariff setting is done in consultation with the local government. The centralized water supply structure and long state owned tradition makes it harder for these countries to take upon a more liberalized and competitive approach. Moldova currently has some regional development projects in the northern rural areas on public private partnerships, however these are still pilot projects. According to the Department of Regional Development Institutions Relations of the Ministry of Regional Development and Construction, public private partnerships are viewed also as a possible option for Chisinau in the future (Cecan 2011).

4 Description of Moldova's Water Management Policy

The policies discussed in this Chapter are water supply related policies relevant for the scope of this study, hence not all water relevant policies are considered

4.1 Current Legislative Condition

Moldova's national laws and policies are influenced not only by domestic factors, but also the direction of the current political party in power. Besides the two international conventions, the Helsinki Convention on Watercourses and International Lakes of 1992 and the Danube River Protection Convention of 1994, national water related laws are also influenced by EU Directives and Strategies as part of the European Neighborhood Policy (ENP). Most of the water related EU law has not been transposed and implemented yet; hence EU policies will be discussed in the next section on the legislative outlook (section 4.2).

Since both of Moldova's main rivers, Prut and Nistru or Dniester are transboundary rivers, it is important for the country to engage in transboundary policy and pollution protection as well as resource preservation measures with its neighboring countries sharing the same water resources. Moldova signed the UNECE Water Convention in 1994 and ratified it in February 2007 (UNECE 1992). The same accounts for being part of the Danube River Protection Convention (ICPDR 2011). Especially, since the water source for Chişinău is taken from the Dniester or Nistru River, which is a transboundary water body and can be affected by pollution and drought problems. Especially when it comes to preventative strategies towards the effects of climate change, the region is increasingly prone to droughts and flood catastrophes, thus further collaboration between the countries is needed (Sirodoev 2011).

This Chapter provides a review and comparison to the EU Water Framework Directive on the most relevant policies for water supply. The current water related domestic policies are listed in the Box below (Figure 4-1) and a summary of them is given in Appendix II.

- The WSS Strategy (Gov. Dec. nr. 662 from 13.07.2007)²
- Water code (Parl. Code nr. 1532 from 22.06.1993)
- Law on water protection zones along rivers and water basins, (Law nr. 440 from 27.04.1995)
- Law on potable water (Law nr. 272 from 10.02.1999)
- Law on Public Services of Communal Management (Law nr. 1402 from 24.10.2002)
- Law on local public finances (Law nr. 397 from 16.10.2003)
- Law on regional development (Law nr. 438 from 28.12.2006)
- National policy concept on water resources (Parl. Dec. nr. 325 from 18.07.2003)
- The Regulation of "Apa-Canal" Association (Gov. Dec. nr. 500 from 10.09.1991)
- The State Cadastre Regulation on Waters (Gov. Dec. nr. 626 from 18.08.1994)
- The methodology of appreciation, approval and application of tariffs for services on water supply, sewage and water treatment – ANRE (Gov. Dec. nr. 164 from 29.11.2004)
- Regulation concerning the conditions of residual water evacuation in the natural reservoir (Gov. Dec. nr. 1141 from 10.10.2008)

Figure 4-1 Current Water related Policies

Source: (Daniel Wiltschnigg and Team March 2010)

Most important to note here is that water supply related laws and drinking water standards are still existent from the Soviet era and Moldova is currently still in the process of redefining these laws. In general, surface water quality standards in Moldova are defined according to three uses (Paul Buijs and Carmen Toader 2007):

- water abstraction for drinking and domestic needs of population and food industry;
- different varieties of recreation activities (socio-cultural use) and for irrigation of crops, which are consumed without thermal pre-treatment;
- commercial fishery and fish farming, including protection of any aquatic organisms.

The actual surface water quality standards are specified in:

- the Rules for Protection of Surface Waters (RPSW) of 1991 (adopted by the State Committee for Environmental Protection of USSR) and the
- Hygienic Regulation (HR) No. 06.6.3.23 of 3 July 1997 “Protection of Water Bodies against Pollution” issued by the Ministry of Health of the Republic of Moldova (Paul Buijs and Carmen Toader 2007)

However, as most legislation is still in the process of being redefined, many policies are currently not valid. It is to be assumed that the Rules for Protection on Surface Waters stemming from the Soviet regime will be reassessed (Paul Buijs and Carmen Toader 2007), the Hygienic Rule in particular is to be assessed with the implementation of following EU Directives in the future, for more detail please see Appendix III. It is notable that the HR is in fact by far more detailed and stricter than the Directive 75/440 EC on drinking water quality, for instance the range of regulated parameters is much larger in the HR 1997 (255 parameters compared to 75/440 EC with only 46). These parameters however are hard to meet and the reality of monitored parameters is relatively small due to sporadic and ineffective enforcement of law. Whereas some other laws are too general and hence provide no direction on enforcement.

Concluding from the policies reviewed, in comparison to relevant EU legislation, Moldovan standards as constituted in national legislation are more stringent on surface water quality for water bodies to be used for abstraction of drinking water, protection and breeding of freshwater fish and for recreation. Thereby leaving the impression that standards in Moldova are stricter. Interestingly the fishing surface water policy is much more stringent than the drinking surface water policy. Nonetheless, the maximum allowable concentrations (MACs) of parameters for fishery waters are relatively comparable to the WFD defined priorities (Paul Buijs and Carmen Toader 2007). As most surface waters used for drinking water extraction are also used for fishing, the fishing surface water standards indirectly also apply to the drinking water. In regard to the WFD, it needs to be considered that EU legislation is always set out to be the lowest common denominator between the member states and hence only serves a guiding purpose of reaching the lowest level but is set out for member states to achieve higher standards. Thus the WFD defined ‘good status’ goals in water quality for its member states by 2015 is lacking in the Moldovan context. Moreover, according to a study by the OECD, “Compared to the large number of regulated parameters, the number of actually monitored parameters is rather small. Notably, the toxic pollutants are poorly covered in the current monitoring programs. In addition, the main central laboratories are not always able to analyze monitored micro-pollutants at concentration levels corresponding to the MACs.” (Paul Buijs and Carmen Toader 2007).

Another relevant domestic law concerning water supply, as the utilities are all state owned

enterprises in hand of local governments, is the Law on local public administration (Law nr. 436 from 28.12.2006). As stated by Article 3, “Local public administration authorities benefit from decisional, organizational management and financial autonomy and have the right of own initiative concerning the administration of local public issues. The control over local public authorities is made by the government through its specialized central public institutions.” (Daniel Wiltschnigg and Team March 2010). Concluding from this article, the municipality or local government is the main responsible governmental actor in relation to the water utility and has the authority on any changes. Hence the national government is disconnected to any management responsibilities of the utility.

Besides national laws on how surface drinking water and the relationship between the utilities and the local government is managed, the country sets out strategies on achieving certain set goals for improvements. Moldova’s national strategies on water quality and water resources management, include the following:

- Concept on national policy on water resources adopted by the Parliament Decision No. 325 of 18 July 2003, Monitorul Oficial No. 191 of 05 September 2003.
- Scheme for the protection of settlements against floods in Moldova adopted by the Governmental Decision No. 1030 of 13 October 2000, Monitorul Oficial No. 133-136 of 26 October 2000.
- Water supply and sanitation program for the settlements of the Republic of Moldova until 2015 adopted by the Governmental Decision No. 1406 of 30 December 2005, Monitorul Oficial No. 1-4 of 06 January 2006.
- Water Supply and Sanitation Strategy adopted by the Governmental Decision No. 662 of 13 June 2007, Monitorul Oficial No. 86-89 of 22 June 2007. (Breda Howard and Ludmila Gofman 2010).

The water supply and sanitation strategy is particularly interesting, as it outlines “urgent rehabilitation, technical renewal, and development of municipal water supply and sewerage systems towards meeting the targets of the Millennium Development Goals 2015” (OECD/EUWI 2011). The Strategy is broken down into two timeframe goals, ranging from medium-term objectives (2008-2012) and long-term objectives (2012-2020). However, after a review of the OECD and EUWI, the strategy has been coined to be overambitious as it sets unrealistic goals, as well as being contradictive to the Millennium Development Goals and the Regional Development Strategy (Daniel Wiltschnigg and Team March 2010). This statement on set goals of the country is congruent with the above review on the water quality legislation. Although the strategies of the country set targets to be met, they are often unrealistic and contradictive, moreover, many strategies seem to exist for the same purpose.

Concluding on the current legislation, policies and strategies in place on water supply, the country could work on its practicability of them, including making them more concise for actors to work with them, especially in terms of goals to be met. Moreover, laws need to be set out to be economically feasible. These aspects will be analyzed in more detail in Chapter 6 of this study. Furthermore, convergence with EU legislation would be in the country’s interest and will be discussed in the next section of this Chapter.

4.2 Legislative Outlook

Water is a vital element and thus one of the cornerstones of environmental protection within the European Union. Therefore several directives and other legislation has been passed on the supranational level in order to ensure transboundary cooperation on sustainable water

management (European Commission DG Environment). The table below (Table 4-1) provides an overview of EU legislation and platforms the Republic of Moldova acquires to comply to and is keen on implementing into its national law (Enderlein 2008), (2008). The table visualizes an overview of water related EU legislation to be transposed and implemented into Moldova's national law.

To ensure qualitative drinking water supply specific Directives from Table 4-1 below are particularly relevant for Moldova to be implemented into a well-established framework set by the Water Framework Directive. The WFD is of particular importance to the water sector in Moldova, as it could serve as a legal basis for further more detailed water relevant policies (European Commission DG Environment 2011). The Water Quality and Resource Management Directive 98/83 EC on the quality of water intended for human consumption to be transposed by 2012 is to establish drinking water standards (European Commission DG Environment 2011). In the process, the 1999 Moldovan national law on drinking water will be revised in order to be compatible with the outlined targets of the Directive (Breda Howard and Ludmila Gofman 2010). Since Chisinau receives its drinking water supply from the surface water body the Dniester or Nistru River, the implementation of the Directive 2006/7 EC on the surface water protection for drinking and food industry water supply is significant, which is to be transposed by 2013 and provides a direction for revision of the Hygienic Regulation of 1997. This draft regulation on surface water protection could define specific use-based requirements for surface water quantity and insurance against pollution. The surface water law could be done in combination with Directive 2008/105 EC on environmental standards, thereby providing a list of hazardous substances to be used for setting maximum limits for drinking water supply, together with the Nitrate Directive 91/676 EC for agricultural nitrate run off. Indirectly relevant are the Directives on groundwater sources (European Commission DG Environment 2011), floods (European Commission DG Environment 2011) and scarcity and droughts (European Commission DG Environment 2011), which are stated in the Table (Table 4-1) below.

EU direct budget support for water supply and sanitation is to be implemented by 2012. The direct budget support is supposed to support legislation harmonization and thereby making use of the existing systems in the country and strengthen capacity (World Bank 2006). The direct budget support amounts up to € 50 million for the water supply and sanitation sector (Hirbu).

Table 4-1 Timetable for EU legislation to be transposed and implemented

Timetable of EU legislation to be transposed and implemented	
2011	Water Framework Directive 2000/60/EC establishing a framework for Community action in the field of water policy as amended by Decision No 2455/2001/EC
2012	Water quality and resource management Directive 98/83/EC on quality of water intended for human consumption to be regularly monitored in order to protect the health of its citizens as amended by Regulation (EC) 1882/2003
	Water quality and resources management Directive 91/271/EEC on urban waste water treatment as amended by Directive 98/15/EC and Regulation (EC) 1882/2003
	Water quality and resources management Directive 91/676/EC concerning the protection of waters against pollution caused by nitrates from agricultural sources as amended by Regulation (EC) 1882/2003.
2013	Water Quality and resource management Directive 2006/7/EC concerning the quality of bathing water
	Water quality and resources management Directive 2006/118/EC on the protection of groundwater against pollution and deterioration
	Water Quality and resource management Directive 2008/105/EC on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC16
2016 and onwards	Water quality and resources management Directive 2007/60/EC on the assessment and management of flood risks

Source: (Breda Howard and Ludmila Gofman 2010)

A more detailed outline of the Directives relevant to the water supply system and implementation time plan as well as necessary legislative measures to be done can be found in Appendix III.

In order to implement the Water Framework Directive (WFD), a revised version of the ‘Water Law’ draft has been worked on in collaboration with the policy dialogue of the Millennium Challenge Account (MCA) and other international donor organizations. The water law is to be approved by the Parliament in the coming months. The water law is supposed to become the legal basis for following water policies in all areas, as well as transposition of more specified water related EU Directives, as the table above indicates. The water law has been in progress since its initiation in 1993 and has so far not been put forward or approved by the parliament. One of the reasons according to Budenesteanu is that the law has been criticized to be too complicated, as it was formulated by water specialists and not by lawyers (Sergiu Budesteanu and MCA 2011). Reasoning from this standpoint, the MCA in collaboration with other donors provided support in the formulation of the law (Sergiu Budesteanu and MCA 2011). The draft is however criticized to not be fully compliant with the WFD, which is explained by Sergiu Budesteanu of Millennium Challenge Account to be due to the reason of trying to push the law though the parliament to create a legal basis first. Afterwards the missing parts can be used for secondary legislation (Sergiu Budesteanu and MCA 2011). According to Constantin

Mihailescu, former Minister of Environment and current water and sanitation expert at the Austrian Development Agency, the water law should at least comply with the key requirements of the WFD and needs to be more harmonized, which in its current draft is not the case (Mihailescu 2011). As pointed out by Mihailescu, the water law needs to be a clear policy, guiding Moldova’s next policy implementation steps (ibid.). A flawed incomplete legal basis however cannot serve as a guiding tool.

The following table by Howard and Gofman summarizes the Water Framework Directive’s compatibility requirements to be adjusted of Moldova’s national laws. Please refer to the table for further details (Table 4-2), other water related Directives to be implemented as listed in Table 4-1 can be found in Appendix III.

Table 4-2 Water Framework Directive Compatibility Status

<p>EU legislation</p>	<p>Directive 2000/60/EC establishing a framework for Community action in the field of water policy as amended by Decision No 2455/2001/EC</p> <p>The following provisions shall be applicable:</p> <ul style="list-style-type: none"> • adoption of national legislation and designation of competent authority/ies • identification of river basin districts and establishment of administrative arrangements for international rivers, lakes and coastal waters (Art. 3) • analysis of the characteristics of river basin districts (Art. 5) • establishment of programs for monitoring water quality (Art. 8) • preparation of river basin management plans, consultations with the public and publication of these plans (Art. 13 and 14)
<p>Legal transposition degree of Republic of Moldova National laws / by-laws / drafts (covering the area of the relevant EU act)</p>	<p>NOT COMPATIBLE WITH REQUIRED EU STANDARDS</p> <p>The current legal framework for water policy is established by:</p> <ul style="list-style-type: none"> • Water Code No. 1532 of 22 June 1993, Subsoil Code No.3 of 02 February 2009 • Law on environmental protection No.1515 of 16 June 1993 • Law on natural resources No. 1102 of 03.06.1997 • Law on fund of state protected natural areas No. 1538 of 25 February 1998 • Law on protection zones and belts of waters, rivers and lakes No. 440 of 27 April 1995 • Law on Animal Kingdom No. 439 of 27 April 1995 • Law on Fish Fund, Fishing and Fishery No. 149 of 08 June 2006 • Law on real estate No.1543 of 25 February 1998 • Governmental Decision on approval of the Regulations on State Water Cadastre No. 626 of 18 August 1994 • Governmental Decision No.72 of 25 January 2000 on Regulations on involvement of public in elaboration and adoption of environmental decisions • Order on integrated environmental monitoring system No. 20 of 10 November 1998 adopted by the Ministry for Environment Regulation • Rules on surface water protection of 01.03.1991, adopted by the State Committee of Nature Protection of URRSS • Hygienic Regulation “Protection of water bodies against pollution” no. 06.6.3.23 of 3 July 1997 etc. <p>The compatibility assessment undertaken under the Environmental Collaboration for the Black Sea TACIS Project concluded that the current legislation is not compatible with EU requirements.</p> <p>The CLA Compatibility Declaration for the draft EPL dated 15.07.2010 states that the draft is partially compatible with the Directive’s requirements.</p>

	<p>A draft Law on water is being prepared, which incorporates the provisions on river basin districts, establishment of administrative arrangements for international waters, analysis of river basin district characteristics, establishment of water quality monitoring programs, river basin management programs as well as their consultation with public and publication.</p> <p>The CLA Compatibility Declaration for the draft Water Law dated 11.08.2010 states that the draft legal act is partially compatible with the Directive's requirements.</p> <p>About twenty subsequent regulations have to be developed to ensure the draft law implementation. The draft law was submitted to the CLA at the end of July 2010.</p> <p>Several draft regulations under the draft Law on water are already developed:</p> <ul style="list-style-type: none"> • The draft Regulations on identification, delimitation and classification of water bodies establishes the requirements for the identification, delimitation and classification of water bodies. • The draft Regulations on the development and approval of the management program and action plan contains detailed requirements for RBMP preparation procedure and RBMP's content are provided. • The draft Regulations on the procedures for the development and updating of water resources monitoring programs focuses on procedural aspects and establishes a minimum content of the water resources monitoring program. <p>Draft Regulations on basin district committees describes the procedure of a committee establishment as well as its composition and competences.</p>
<p>Necessary legislative measures</p>	<p>Development of necessary legislative measures compliant with Directive 2001/81/EC</p> <p>The draft Water law is planned to be adopted in 2011. It incorporates provisions of the mentioned articles. However, a range of subsequent regulations shall be developed after the law adoption to fully transpose the mentioned articles of the directive until 2012. See the information in the column 2.</p>
<p>Time table</p> <p>2010-2015</p>	<p>2011</p>
<p>Comments and recommendations for future steps in order to achieve full approximation</p>	<p>The development of framework legislation including legislation compliant with Directive 2006/60/EC is a priority in the period 2011-2015.</p> <p>This Directive is regarded as the most challenging in the full range of EU legislation. It also requires investment funding to achieve compliance. A planned approach should be developed to meet the aim of this Directive including key tasks for, planning, administrative arrangements, regulation, monitoring, consultation and reporting.</p> <p>A large number of other legal instruments are linked to Directive 2006/60/EC, and should be borne in mind during the implementation of this directive. These include all water sector directives (including the various daughter directives establishing limit values and quality objectives further to Directive 2006/11/EC — see Annex IX to the directive), as well as a number of the EU Directives detailed in this publication.</p> <p>Particularly relevant issues in these directives concern their impact upon the development of programs of measures within the river basin plans of the Water Framework Directive. The directive aims to complement a number of international conventions to which Moldova is a party and attention should be paid to these when considering transposition and implementation plans.</p>

Source: (Breda Howard and Ludmila Gofman 2010) and (European Commission DG Environment 2011)

Other strategies influenced by international agreements are the goals set for the Millennium Development Goal (MDG). The MDG include targets set in the water sector, for instance improved access to water until 2015. Access to water is also one of the targets set in the national water supply and sanitation strategy mentioned previously in this Chapter, however the targets set are contradictive and sometimes overlap each other in more than one strategy (Daniel Wiltschnigg and Team March 2010). This implies that the goals set in various strategies are for one not consistent and contradicting, hence confusing for any actor working with these targets and for the other cannot be taken as a serious objective, as they seem to merely serve as a space filler or a random number, however without any meaning behind the target. In a wider context, the fact that more than one strategy exists in outlining the set targets, as well as overlapping or contradictive targets, reflects the political situation of the country in terms of fragmented political leadership and responsibilities. The split situation of the Republic also in social terms, is clearly visible in the political instability and confused condition of the country. The political condition of the water sector is however merely a fragment of the situation of the country and will be further analyzed in the following Chapters of this study.

5 Overview on the main actors involved in the water sector

The identified main actors involved in the water sector and in particular in Chisinau's water supply system range from national government ministries to local government, the utility itself to external actors such as donors, private enterprises and other international organizations as well as NGOs, academia and the end-consumer. This Chapter provides an overview of the named actors and discusses their responsibilities and relation to one another.

5.1 National Government

The ministries currently directly or indirectly responsible and in charge of the water sector are the Ministry of Environment, the Ministry of Regional Development and Construction, the Ministry of Health, Agriculture, Finance and the Ministry of Economy. Names and responsibilities of the ministries, including staffing and budget have changed over the past 20 years repeatedly. Due to a political shift in 2009 and new as well as renamed ministries with newly assigned tasks, confusion in terms of responsibilities and power distribution is existent. Furthermore, the political instability of the country is reflected in the hesitant behavior of politicians and civil servants, which in turn does not help stabilizing the country.

The Ministry of Environment as well as the Ministry of Regional Development and Construction can be seen to be currently holding the main responsibilities for the water sector.

5.1.1 Ministry of Environment

The water sector is presently under the Ministry of Environment with all water related issues assigned to the Ministry. The Ministry has a new specified water department since May 2010 and is in charge of water related policy development and implementation (Tronza 2011). The department's task includes ensuring compliance with water management policies and national strategy plans by harmonizing the different policies, including EU Directives. It also takes part in the development of strategies and national water management plans in an advisory position (Water Department 2011). Furthermore, the water department collaborates with the central government in order to develop and promote local programs and national plans. Another task includes the coordination of activities to attract foreign investment and external assistance.

Furthermore, the Apele Moldovei Agency, the State Inspectorate, the State Hydrometeorologic Service and the Agency of Geology and Mineral Resources, which are related to the water sector, are under the umbrella of the Ministry of Environment.

The Apele Moldovei Agency is a subdivision of the Ministry of Environment since 2009 and currently the water designated agency in charge of harmonizing the Water Framework Directive and water law draft. It first and foremost carries the responsibility of implementing legislation and has an operative control (Bujac 2011). Before 2009, the Agency belonged to the Ministry of Agriculture and was an independent Agency before. It does not receive its budget directly from the Ministry of Environment, but nevertheless from the state budget in combination with customer fees. Water utilities as well as other water users have to report to the Apele Moldovei Agency, which in turn has to report back to the Ministry of Environment and the Ministry of Economy (ibid.). It works together with the State Inspectorate and State Hydrometeorologic Service (Apele Moldovei 2011).

The State Inspectorate's main tasks are to regulate and authorize the use of natural resources and ensure compliance with environmental legislation uniform throughout the country. It was established within a previous form of the Ministry of Environment in 1990, however now it is

an autonomous institution under the current Ministry of Environment. Its activities, along with the exercise of state control and supervision of environmental compliance, include the licensing activities and limits to the use of natural resources, recovery of material, damage to the environment, pollution and irrational use of natural resources or illegal, including suspension of economic activities (State Inspectorate 2011).

The Hydrometeorological Service promotes the state policy in hydrometeorology, environmental quality monitoring and state control on hydro meteorological observations in Moldova, as well as weather forecasting, meteorological, climatic, hydrological, and environmental pollution levels (State Hydrometeorological Service 2011). In particular monitoring of surface waters, including its quantity flows and water quality, thereby taking climatic changes and drought outlooks into account (Dr. Ilie Boian and Elina Pleșca 2011). Supervision and control is carried out according to a plan approved by the Ministry of Environment, under which the Hydrometeorological Service is headed. The Hydrometeorological Service works in close collaboration with the World Meteorological Organization (WMO), of which Moldova has been a member since 1994 and other international conventions (*ibid.*).

The Geology and Mineral Resource Agency (AGRM) is responsible for the protection and rational use and development of underground and raw materials of Moldova (Geology and Mineral Resource Agency 2011). In the case of water sources, it is responsible for underground water sources (Dr. Ilie Boian and Elina Pleșca 2011). Headed by the Ministry of Environment, it has control over compliance with requirements of standards, as well as creating an information system (*ibid.*). The AGRM is only briefly mentioned in the context of this study, as it does not concern surface water bodies and hence is not directly relevant for the study of Chisinau's water supply system, as the surface river body Dniester or Nistru mainly supplies the city.

The interplay between the subdivisions and the Ministry of Environment is regulated by the Regulation on Water State Cadastre, outlined in Figure 5-1 below and is further elaborated in Appendix II on national legislation. The mentioned tariff methodology is developed by the National Agency for Energetic Regulation (ANRE), which is elaborated according to the law on potable water, national accounting standards, public service of communal management and other normative acts. As the tariff setting lies within the local government responsibility, ANRE will be further elaborated in the following section (5.2 Local Government and Utility).

The Ministry has also been pushing for a well-established water policy framework, its elaboration and implementation. As mentioned in the previous section on the future legislative outlook (section 4.2), the water code of 1993 has been revised and adjusted towards the Water Framework Directive and is currently at the Parliament to be approved, which is expected to take place this fall. Furthermore, all funding and international projects need to go through the channel of the national government; hence the Ministry of Environment is in charge of distributing these to municipalities. This occurs in coordination with the Ministry of Regional Development and Construction. The National Environmental Fund of the Ministry of Environment allocated 94.5 million MDL¹⁰ to the water sector from 2006 till 2009 (OECD/EUWI 2011).

¹⁰ Please see Table 1-1 on Exchange Rates for the Moldovan Lei (MDL)

Regulation on Water State Cadastre (Gov. Dec. nr. 626 from 18.08.1994)

The evidence (supervision) of state waters usage is performed according to a unique system by the State Hydrometeorology Service (SHS) together with Geological and Mineral Resources Agency (GMRA). Both institutions are subordinated to the Ministry of Environment. “Apele-Moldovei” Agency together with the Ministry of Environment establishes the list of consumers to be taken under supervision. SHS takes the supervision of surface waters and GMRA covers the supervision of underground waters. “Apele-Moldovei” Agency according to its functions perform the operational control of primary evidence for the captured and evacuated waters; the existence of necessary equipment for counting and controlling of water quality standards at the water providers and consumers. The accumulate information is presented by the Agency the Statistical Department, Ministry of Economy. The organization, generalization and maintenance of Water State Cadastre is performed by the Ministry of Environment (performing state policy), GMRA (evidence / control of underground waters), SHS (evidence / control of surface waters), “Apele-Moldovei” Agency (water usage, surface and underground). In accordance to its own competence each institution elaborates norms, standards and procedures of evidence and control. The methodology of determining, approving and applying of tariffs for services on water supply, sewage and water treatment – ANRE (Gov. Dec. nr. 164 from 29.11.2004) The methodology of appreciation and application of tariff for WSS services is elaborated by ANRE and approved by the Government of Moldova. This methodology is elaborated in accordance with Law nr. 1402 on communal public services, Law nr. 272 on potable waters, national accounting standards and other normative acts of the Republic of Moldova. The costs included in the calculation of tariffs for water supply, sewage and water treatment are consistent with the National Accounting Standard 3 (composition of enterprise costs and expenditures)

Figure 5-1 Regulation on Water State Cadastre (Gov. Dec. nr. 626 from 19.08.1994)

Source: (Daniel Wiltschnigg and Team March 2010)

5.1.2 Ministry of Regional Development and Construction

The Ministry of Regional Development and Construction until recently has had the responsibility and coordination concerning state owned enterprises in its repertoire, which was inherited from the governmental structure of the Soviet era (Socol 2011). However, the structure and tasks of the Ministry, including its name has changed and its responsibilities appear diffuse, even after consulting civil servants within the Ministry. Its main responsibility in regards to the water sector is however of operational nature, including the maintenance of water systems (ibid.), which at the same time is also the responsibility of the water utility itself. The Department of Regional Development and Institution Relations however has clearly assigned tasks in regard to regional development. Moldova is divided into 3 Agencies (North, Center and South) of which the 2009 created Department coordinates the development of institutions in order to ensure the sustainability of projects (Cecan 2011). Currently 5 of the 21 accepted projects of the Department are on water management. The Water Department works closely together with local governments, citizens and also the international donor community, and reports to a Consilium consisting of the Ministry of Environment, Economy, Regional Development and Construction, Transportation, Agriculture and Finance. The Consilium also decides on the distribution of the Regional Development Fund, which consists of at least 1% of state budget of the given year (ibid.).

5.1.3 Other Ministries

The Ministry of Health and the Ministry of Agriculture are directly involved, as water quality is a national health concern and also has an effect of the food quality of agricultural goods

produced in Moldova. The Ministry of Finance and the Ministry of Economy are indirectly involved, as the Ministry of Finance determines the budget aligned to the water sector. Whereas the Ministry of Economy together with the Ministry of Agriculture needs to be involved in the water sector concerning the country's biggest industry agriculture.

Furthermore, in 2009 the Commission on WSS management was established, in order to identify the use of water resources and also the development of WSS systems, this includes action plans and harmonization of EU Directives (see Appendix II and III).

5.1.4 National Government Overview

The Graphic below visualizes the interplay of the different national governmental bodies and their departments as well as subdivisions related to the water sector as described in the sections above.

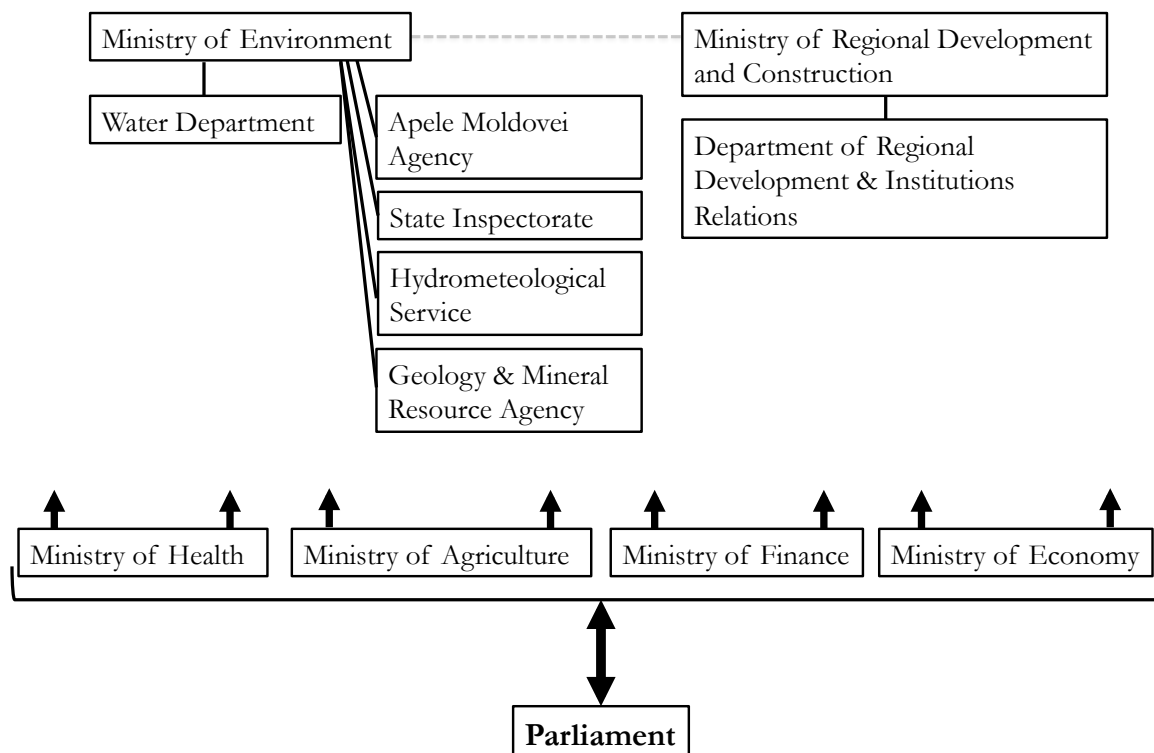


Figure 5-2 Actors: National Government Interaction

Source: Author

Thereby the relationship of the ministries and water relevant agencies and departments are displayed. The Ministry of Environment and its relative good communication and cooperation link to the Ministry of Regional Development and Construction is presented by the direct link in the graphic. Furthermore the departments and agencies under the Ministries are shown, including their connection to their particular Ministry. These are the main national governmental actors in the water sector. However, these Ministries are influenced by the agendas and strategies of the Ministries of Health, Agriculture, Finance and Economy. An interaction or communication link between these Ministries and the two mainly active Ministries is however almost non-existent. Hence they are merely displayed as influencing, but not active actors in the graphic. Furthermore, the Ministries actions and also the outcomes of their legislative work is influenced by the behavior and approval of the Parliament. The approval of the legislation worked on by the Ministries is one of the crucial points within the

system, as this process is highly politicized and often diverted from the actual problem at hand.

5.2 Local Government and Water Utility

“The responsibility for organization and functioning of the water and sanitation infrastructure is decentralized to the local governments” (Daniel Wiltschnigg and Team March 2010). The relationship between the municipality and the water utility is established in the Law on Public Services of Communal Management, which institutes the organization of public services (see Appendix II). The water utility S.A. Apa-Canal Chisinau is a state owned Joint Stock Company and hence it belongs to the municipality of Chisinau. The utility operates mainly autonomous with a large amount of staff. Article 13 of the above named Regulation sets the settlement of tariffs. Proposals for tariff increases, as well as investment plans, including all major repairs need to be approved by the municipality, tariff setting is supposed to be calculated via the ANRE methodology. This is mainly due to the fact that major investments concerning the infrastructure of the utilities are paid through the municipal budget or other municipal sources. Moreover, “local public administration have their own exclusive competence to initialize, organize, coordinate, monitor and functioning of communal public services” (Article 14) and as Article 16 states, “The management, monitoring and control of communal public service are the responsibility of central and local public authorities” (Daniel Wiltschnigg and Team March 2010). Whereas the utility needs to cover its operational costs through the income paid by the end-consumers. The municipality also decides on subsidies for the part of the population that is not able to pay their water bills and also whether the subsidy will be included in the tariff and hence subtracted from the profit for the utility or if the subsidy will be paid from municipal budget.

As Moldova has a fast changing political environment, so does the legal framework, in which water utilities have to operate and function. This situation can lead to unclear rules and responsibilities, and makes the every day management of the utilities more complicated (Danish Environmental Protection Agency DEPA, Danish Cooperation for Environment in Eastern Europe DANCEE et al. 2000). Utilities are required to report and coordinate not only with the local government, but also with the national government. Monitoring numbers on leakages, spills and pipe breaks as well as any water related data to quality and quantity is required to be reported to the Apele Moldovei Agency (Bujac 2011).

The non-profit association of Apa Canals represents the utilities before the national government and lobbies for their sake. This association will be further discussed in the following NGO section.

The relationship between the water utility, municipality, association and the national government is visualized in the Figure 5-3 below.

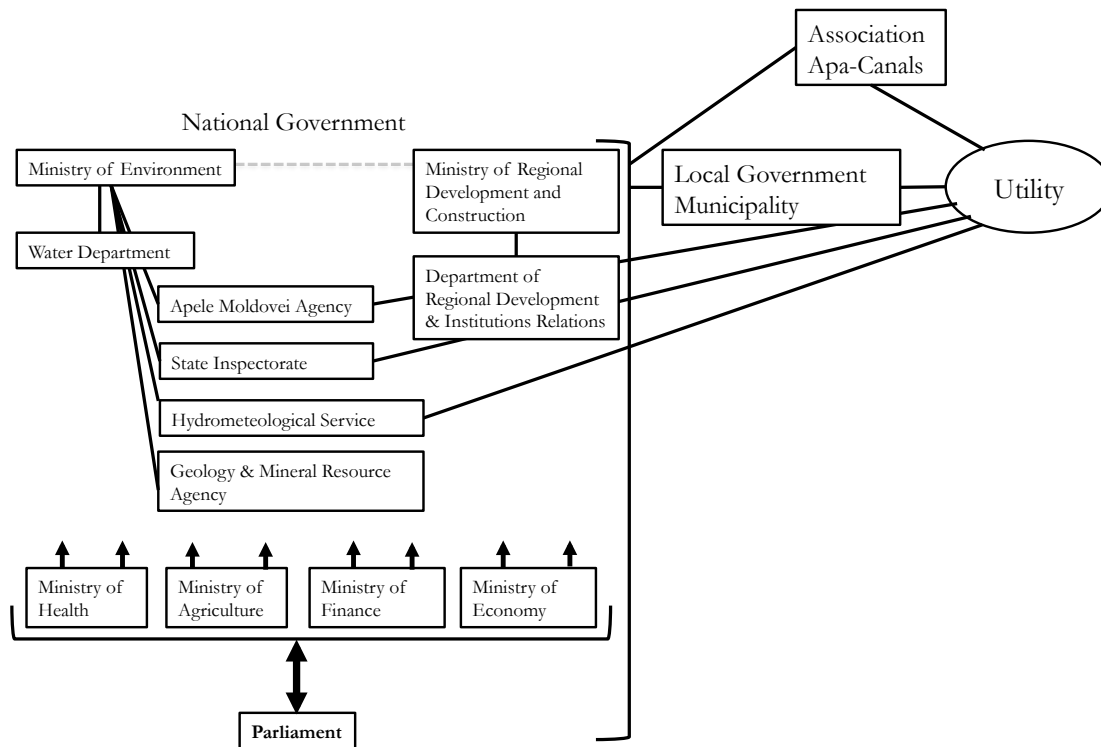


Figure 5-3 Actors: Municipality & Utility interaction with National Government

Source: Author

The Graphic displays the direct link between the municipality and the utility, which is represented by the Association in front of the national government. However there is also a direct link between the utility and the state sub-organizations, as those need to be provided with data from the utility and also gain access to information on water standards.

5.3 Civil Society

Moldovan citizens living in Chisinau as well as industry based in Chisinau, hence the end-consumers are the ones who are directly affected by the current water system and any changes taking place. This includes change for a better service through refurbishment of infrastructure, but also changes concerning water tariffs and prices. Hence end-consumers will eventually be faced with a completely deteriorated or an improved water supply service that is more reliable and provides better quality water, however they also have to pay more for the service.

As the water utility in Chisinau is currently in debt and operating on an increasingly deteriorating infrastructure, increased water prices will not lead to better service immediately, but expectedly in the long-term. This is due to delayed feedback-loops, the company needs to charge higher water prices in order to invest into its infrastructure and fill the debt hole, hence a delay of results will appear. This factor needs to be publicized and educated about, when involving the end-consumer as an active as well as politically mature citizen.

5.3.1 Non-Governmental Organizations (NGOs)

NGOs are meant to be one possible alternative for citizen involvement and representation in the water sector, as they are commonly referred to in most parts of the world. Domestic NGOs in Moldova however are rather particular. They are not laid out to function in the way as most Western citizens are used to classify a NGO. According to the UN, NGOs are defined as the following,

“A non-governmental organization (NGO) is any non-profit, voluntary citizens’ group, which is organized on a local, national or international level. Task-oriented and driven by people with a common interest, NGOs perform a variety of service and humanitarian functions, bring citizen concerns to Governments, advocate and monitor policies and encourage political participation through provision of information. Some are organized around specific issues, such as human rights, environment or health. They provide analysis and expertise, serve as early warning mechanisms and help monitor and implement international agreements.” (United Nations 2004).

Domestic NGOs in Moldova have been initiated after the dissolution of the Soviet Union and increased involvement of the international community. From the on site visit to Chisinau, the author gathered that these NGOs were founded after learning that the willingness to provide funding to NGOs by the international community is most often substantially higher than asking for funding as a governmental organization. Often these NGOs are run by retired politicians and mainly serve the purpose of attracting funds.

One of these NGOs involved in the water sector is the Apa-Canal Association¹¹. It is stated to be a non-profit organization, initiated in 2000 and carries the responsibility of lobbying for water utilities on the national government level. Most utilities are a member of this Association and are provided with general assistance in terms of information exchange regarding the operation of water utilities. The association’s tasks are established in the Regulation of “Apa-Canal” Association (Gov. Dec. nr. 500 from 10.09.1991), which states the following (see Figure 5-4):

ACA is voluntary non-commercial association providing WSS services through its members, established with the purpose to create favorable conditions to realize and protect production, technical and scientific, social interests and other communal interest of its members. ACA represent the interest of its members to the central public institutions, local public administration and Government. ACA has a juridical person status, dispose its own accounting balance, banc account, seal and may sign contracts on association’s name.

In the Regulation, paragraph II, it is described the specific objectives and tasks of ACA:

- assisting the WSS enterprises in getting new technologies, technical-scientific support,
- exchange of experience between different WSS enterprises, organization of meetings,
- conferences, training courses, etc.,
- promoting of editorial and advertising activities,
- protection of rights and interest vis-à-vis central public institutions, local public administration and Government,
- accumulation of information and database from the WSS sector.

Figure 5-4 Regulation of Apa-Canal Association

Source: (Daniel Wiltschnigg and Team March 2010)

¹¹ The Apa-Canal Association refused to be interviewed by the author, in order to provide its side of information and perspective on the water supply situation in Chisinau. The author has to assume that the Association falls into the schema of most operating NGOs in Moldova. Due to the lack of communication, the author cannot assess the credibility of the Association and hence assumes that the Association nevertheless fullfills is stated responsibilities in terms of representing utilities and exchanging information.

No domestic NGO, as defined in the classical sense by the UN, representing the end-consumer has been identified by the author, hence is assumed that such an NGO does not exist in this context in Moldova. However this could be also be due to web absence and low priority or even being unknown by any of the interviewed actors. The author had to rely on the Internet and the interviewed actors on information on NGOs.

5.3.2 Academia

The Academy of Science in Chisinau has had a few academic publications on water management issues in Moldova, these include studies on water management specifically in Moldova (Opopol 2006), studies on Moldova's surface waters (Sirodoev 2010) and groundwater and drinking water supplies (Melian, Myrlian et al. 1999). Besides the named studies, most publications have however only been available in Romanian or Russian. Unavailability of sources in English and the experience about the academic work in qualitative terms led the author to disregard any publications not published in English. General quality of the sources has been assessed through the available sources in English and partially Google translated paragraphs of sources in Romanian and Russian.

There is no direct collaboration between academics and the national government or its institutions. Nevertheless, some academics are involved and are considered as experts, the academic community is however very small and underpaid (Sirodoev 2011). These circumstances do not draw experts into the academic field in Moldova, which explains a lack of experts and also qualified experts as well as a high migration rate of qualified personnel. Hence reserved behavior of the governmental as well as any other actor side appears to be justified.

The Global Water Partnership (GWP) is an internationally active NGO (GWP 2011) operating in Moldova in compliance with the Academy of Science. However, currently unrelated to the case of Chisinau's water supply system, as the GWP focuses on rural WSS and water basin projects, in particular the Danube River Basin (Drumea 2011). According to Drumea, the GWP works closely with local government on different projects, however finds the national government not as easy to access (ibid.). Although the GWP is unrelated to the case of this study, it is nevertheless worth mentioning that international NGOs seem to be active in Moldova in cooperation with local academia.

Chisinau holds many more academic institutions, however only the Academy of Science has been taken into account in this study, as the author did not come across any academic publications from other institutions.

5.4 External Influences

5.4.1 International Community

The International Community is relatively present and important to the water sector in Moldova, as these institutions provide the country not only with financial funding, but also with technical and structural support. The Donors, in particular the Austrian Development Agency, are active in mapping out ways for the country to achieve better functioning water supply and sanitation systems, especially in the rural areas of the country. Other activities include policy dialogue and providing a guide towards better legislation and governmental functioning. This is evident in the water law draft, which has been supported actively by the international community.

A direct link between the international community and domestic actors is however mainly among national governmental actors, which facilitate communication. Moreover, in the case of utilities, the municipality has the responsibility to maintain a relationship with the international organization. Nevertheless, the EBRD has had a direct link to the S.A. Apa-Canal Chisinau, through its funding and providing a guideline to overcome discrepancies between income and operational costs. Normally, these agreements have priority over domestic laws and guidelines.

However, the involvement of the international community is meant to be start up help, in order to support Moldova's water sector and towards a self-sustaining system without the need for international donor help (UIPAAC 2011). Below, a list of international organizations and institutions involved in Moldova's water sector is provided.

Bilateral international institutions involved in the water sector in Moldova, include the following directly active organizations:

- Austrian Development Agency (ADA)
- Swiss Agency for Development and Cooperation (SDC)
- Millennium Challenge Corporation (MCC) and the Millennium Challenge Account (MCA)
- Czech International Development Cooperation
- Recently also the German GIZ

Indirectly active Donors:

- Turkish International Cooperation and Development Agency (TICA)
- Japan International Cooperation Agency (JICA)
- Kuwait Fund for Arab Economic Development
- And until recently also the Danish International Development Agency (DANIDA) and the UK Department for International Development DFID

Multilateral and international institutions include the following:

- European Bank for Reconstruction and Development (EBRD)
- European Commission of the European Union (EU)
- European Union Water Initiative (EUWI)
- Organization for Economic Cooperation and Development (OECD)
- United Nations Development Programme (UNDP)
- World Bank (WB)

This list also includes the International Conventions UNECE Convention on the Protection and use of transboundary watercourses and International Lakes and the International Commission for the Protection of the Danube River.

5.4.2 Private Sector

Most international donors cooperate with the private sector for different projects. Those usually include private companies from their home country and include consultants as well as technology suppliers. The interconnection with the entire water sector is however solely based

on the contract with the donors. Although some consulting companies might take on a leading role in providing stakeholders with information and workshops for some projects, this mainly happens due to the donors. As the water utilities in Moldova are all still state owned there is basically no domestic private sector involvement. However this is possibly going to change with future private public partnership (PPP) implementation plans. As the pilot project on PPP has just been initiated in the North of the country, results need to be assessed in a few years and if it is possible to apply PPPs to the case in Chisinau. However, according to the Law on Public Services of Communal Management, the central public administration has the responsibility to partnership promotion, hence public private partnerships between the municipalities and private investors or service provision (Daniel Wiltschnigg and Team March 2010).

5.5 Overview on the discussed Actors

The Graphic below (Figure 5-5) provides a complete overview of the actors involved in Chisinau’s water supply system. From the actor interaction within the national government, between the utility and the municipality, as well as governmental organizations and external influences on the water sector from Chisinau’s citizens as well as the international community and private companies.

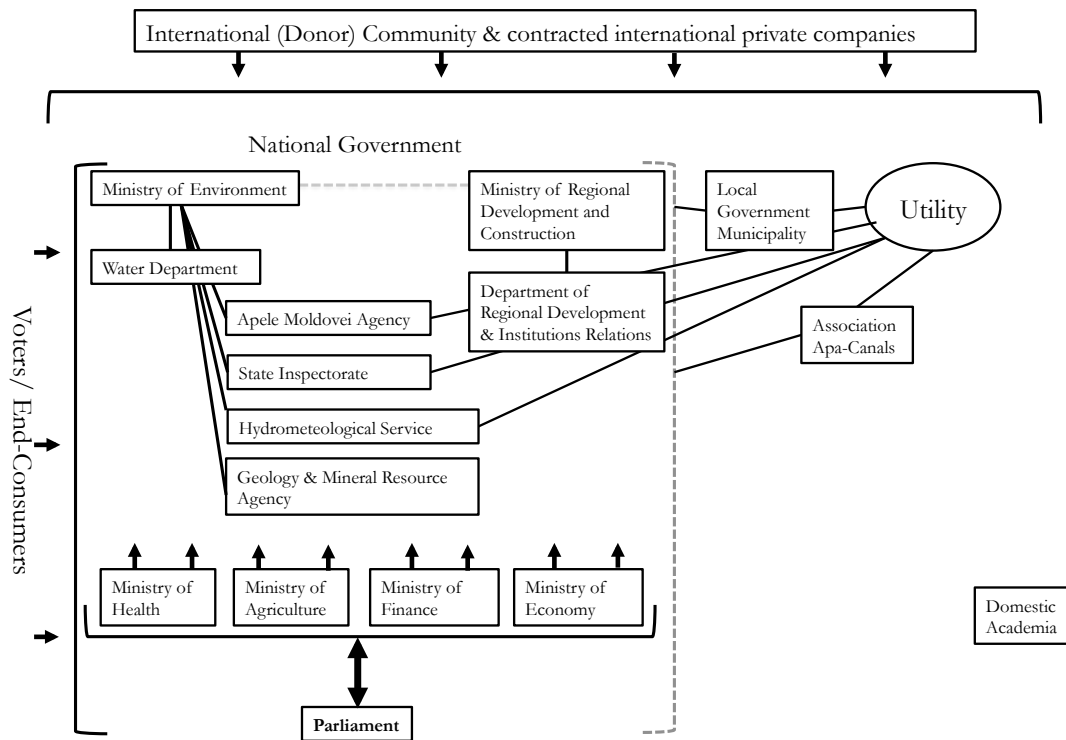


Figure 5-5 Actor Overview involved in Chisinau’s water supply system

Source: Author

This Graphic is a recap of the entire Chapter, presenting all actors involved in the water sector. In addition to the national government and utility-municipality interplay, external influencing actors have been added in form of the Moldovan population as end-consumers and voter, which have an influence on the legislation by their voting and consumption behavior. The external forces on the system by the international community, including private company actors, display external influence into the system. The Domestic Academia has been placed slightly outside the system, as it does not gain much recognition and does not take on a big influencing role on the water supply system.

6 Analysis of actors involved in the water supply system in Chişinău

In order to answer the research questions and thus approach the problems governing the water supply system in a holistic way, the analysis is based on the systems approach by Meadows. Thereby replies of interviewed actors, observations gathered during the on site visit to Chişinău, as well as the literature reviewed is framed within the systems model to point out functions of the system due to interconnections of actor behavior and responses. For the reader to understand the analysis it is important to be familiar with the functions of a system and what influences it. These are described in the Methodology Recap section below.

6.1 Methodology Recap

According to Meadows, a system is made up of interlocking stocks, which determine the inflow and outflow of the given material going into the system. Stocks are the foundation of the system. The least obvious but most important and crucial determinant of a system's behavior is the Purpose, also referred to as Goal. Stocks are constrained by feedback loops, which are lead by the purpose of a system. The structures of these determinants define hidden behavior of a system and functions through information provided by feedback loops. The loops are mechanisms that are consistent in their behavior and pattern over time. Information feedback loops can come in form of a reinforcing feedback loop or a balancing one (Meadows 2008).

Reinforcing feedback loops are self enhancing, enabling the stock to reinforce or reproduce itself. Reinforcing feedback loops can be a virtuous or a vicious circle, as they can cause to exponential growth or runaway collapse. Whichever direction of change is imposed on the system is enhance by this loop. Balancing feedback loops have a regulating mechanism and are goal seeking. Hence they need a defined goal. They are also the source of stability and resistance to change within a system. It functions by bringing the discrepancy to zero, thereby not taking the direction of discrepancy into account (Meadows 2008).

Information coming into the system can only affect future behavior of the system, as responses to information are always with at least a slight delay. Information reaching the system can arrive too late, at the wrong place, unclear or incomplete, therefore the action it is supposed to trigger can be too weak, delayed or also resource constrained and ineffective. As results are shown with delay, intervention at the right time is crucial. A dominant feedback loop also has a dominating effect on the behavior of the system (Meadows 2008). If these facts about information flows are not considered, this can lead to system dysfunctions.

The dysfunctions resulting from misinterpretation of information flows, not viewing the entire system from a holistic point of view, misleading goals or any other reasons have been pointed out as problems or 'corners of opportunities for change' in the methodology Chapter of this study. These opportunities, coined by Meadows, are transposed into the main cornerstones in which actor feedback and literature review has been analyzed. The following construct of the analysis hence follows the pointed out 'opportunities or traps' identified as problems within the system in the methodological framework Chapter of this study (Chapter 2). These problems include:

The problem of ‘tragedy of the commons¹²’, which is not specific to the case of Moldova alone, but also in a global context. Nevertheless, needs to be addressed within the analysis of malfunctions governing the water supply system in Chisinau, as it is one interconnected part of the problem as a whole. The following problems are more specific towards the problems of the water supply system in Chisinau: ‘shifting burden to intervenor’, ‘policy resistance’, ‘seeking wrong goal’ and ‘rule beating’. The system’s problems described and analyzed are affected and mainly created by actor behavior, but can also be intervened by these particular actors or a fraction of them. Actors can use the problems outlined in this Chapter as an opportunity within the system to push for change.

These mentioned actors and their responsibilities have been described in the previous Chapter (Chapter 5- Overview on the main actors involved in the water supply sector). In order to visualize their interaction and see their relationship with each other, see the actor map below.

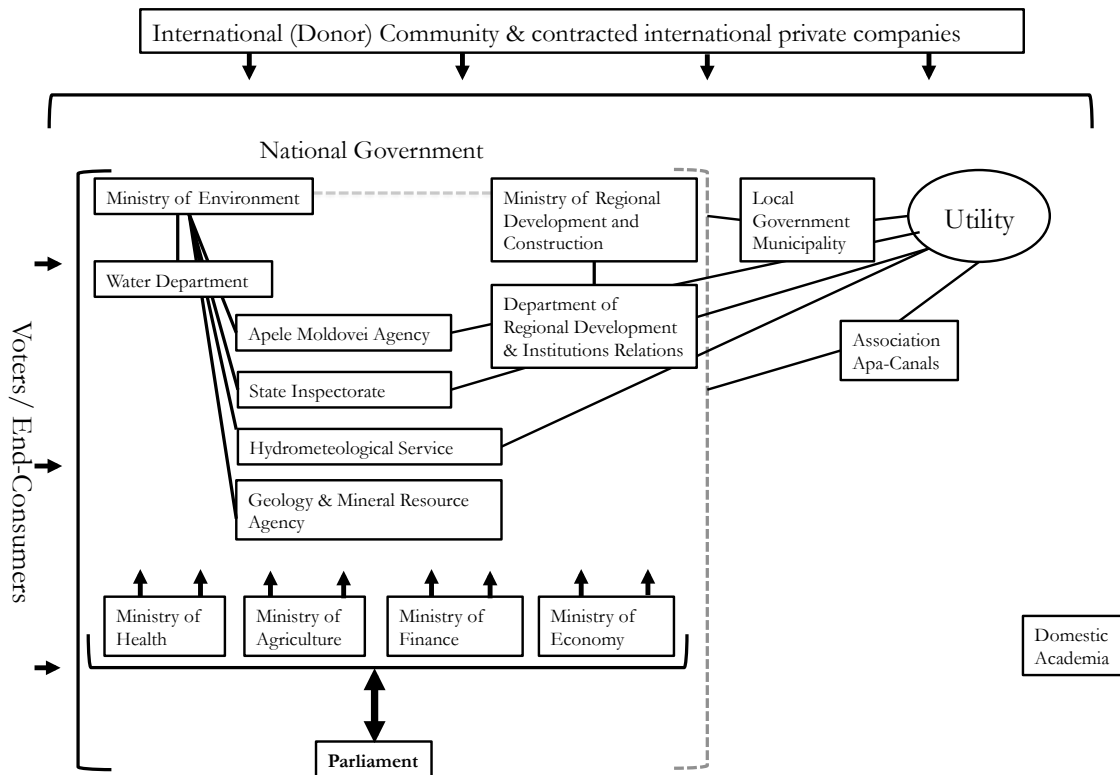


Figure 6-1 Actor Overview involved in Chisinau’s water supply system

Source: Author

¹² The commons according to Hardin are public goods that are accessible by all. Since the resource is not owned by anyone, it is not regulated and every user of the good is keen of maximizing his or her profit. Hardin exemplifies the tragedy of the commons with the herdsmen and grazing cows on public land, thereby exploiting the resource with an increase of cows, as none of the herdsmen has an incentive to decrease his or her numbers of cows. The same example can be applied to overfishing of the oceans, as well as water resources.

In order to compile the necessary information of relationships and interactions as well as power distributions and responsibilities of the different actors involved, the author conducted on site interviews and has been in touch with the following: Ministry of Environment and relevant departments, Ministry of Regional Development and Construction and relevant departments, Apele Moldovei Agency, State Hydrometeorologic Service, Municipality of Chisinau, S.A. Apa-Canal Chisinau, Academy of Science, Millennium Challenge Account, Global Water Partnership, EU Delegation to Moldova, OECD, Austrian Development Agency, Swiss Agency for Development and Cooperation, UK Department for International Development, UNECE, UNDP, SST Consult and Aequilibrium Consult. The complete list of interviewed actors can be found in Appendix I.

Unfortunately some actors were not available or refused to be interviewed, who would have been valuable to talk to, these include: the Ministries of Health, Agriculture, Finance and Economy, individual Parliamentarians, a representative of the State Inspectorate, and finally the Association Apa-Canal. All named organizations have been contacted repeatedly and sent requests for interviews or written statements, however the author never received a usable answer or no answer at all.

6.2 'tragedy of commons'

The 'tragedy of the commons' addresses a commonly shared resource, first coined by Garrett Hardin in 1968, referring to individual users who increase their use of the resource and thereby possibly overexploiting it and driving a renewable resource into a non-renewable one. This problem arises from the involved actors having no incentive to limit their usage of the resource, which is related to delayed feedback information (Meadows 2008). This turns into a tragedy of the commons as everyone uses the resource, thereby exploiting it to an extent that nobody can use it anymore in the future, however in the present none of the users have an incentive to reduce their usage of the particular resource. According to Hardin this is a problem that can be solved by privatization, thereby providing an incentive to the owner in form of a future use of the resource (Hardin 1968). Water resources in Moldova are owned and managed by the national government, however the many resource users from utilities to direct extraction by industry and private households require sufficient national management. Nevertheless an incentive for sustainable resource management either seems to be lacking or the monitoring and thereby enforcement power is not as existent in the country as it would be necessary. This includes sufficient regulatory tools as well as educational campaigns.

The tragedy of commons effects in Chisinau, as well as entire Moldova are in terms of health problems and accessibility to drinking water, which has an impact on living standards. This could have a direct effect on possible future migration behavior of the Moldovan population. With a decrease in health and hence living standards, it is most likely that Moldovans will further continue to seek their opportunities elsewhere. Another direct impact could be on the quality of agricultural products grown in Moldova, as agriculture is a water intensive industry and dependent on sufficient water quality, especially in terms of possible export products. Therefore, the available amount and quality of water is in direct relation to the economic stability and population of the country. With an increase in water quality and sustainable management of the resource, the country could have the possibility to make use of the fertile soil and grow to an agricultural export nation.

As the river Dniester or Nistru is a transboundary water source, international cooperation with other countries sharing the source is necessary. An international agreement, the Helsinki Convention on Watercourses and International Lakes of 1992 is already in place. However international agreements are indicators of the rule of the play and rarely on the priority list of national governments, which is most likely to be no different in the case of Moldova. As

sustainable water management is increasingly becoming eminent and the Dniester or Nistru River is a transboundary water source, international cooperation on shared water resources should become one of the country's priorities. The main Moldovan actors in this case would be the national government, more specifically the Ministry of Environment. Since water resources fall within the responsibilities of the Ministry, it is their area to incorporate international agreements and water resource issues into national laws. Moreover the State Hydrometeorological Service, as responsible for surface waters, is involved in this process. From personal interviews with the State Hydrometeorological Service, the author recollected that the agency is far more advanced in its action and thinking towards sustainable surface water resource management than the Ministry of Environment (Dr. Ilie Boian and Elina Pleșca 2011). Due to the agency's direct link with international organizations such as collaboration with EU organs and the World Meteorological Organization increased external pressure has been exerted on the agency. Nevertheless a discrepancy in the belief of abundant water resource seems to be apparent. Whether water as a resource is on the verge of over extraction and Moldova will face future water catastrophes in terms of shortages or droughts varied with the interviewed actors. Whereby the effects and current state of water resources and its health effects on the population was fully acknowledged by the State Hydrometeorological Service and Apele Moldovei Agency interview partners, the interviewed NGO representative of Global Water Partnership and Academy of Science employee recognizes the "doubtful water quality", however believes illnesses not to be the result of the polluted water, in particular POPs¹³ but rather the living style of the people (Drumea 2011).

However also the water utility and therefore the municipality of Chisinau need to be involved, as they are a main extracting actor and hold the responsibility to deliver drinking water to the citizens of Chisinau. Furthermore, the matter at hand also needs to be a concern of the Ministry of Health in terms of drinking water implications on the health of the population and the Ministry of Economy and Agriculture for the mentioned economic factors.

Other indirect actors include the international community, academia and possible NGOs. The international community plays a role of pushing the government into the right direction and aiding with support and guidance, in terms of technical and policy experts, and also placing funds or grants in the right place. This role can be supported by the inclusion of the academia and NGOs, thereby providing opportunities to show wider and more differentiated aspects in information flow towards the main actors in the national government. This would include an increased representation of the civil society, which is currently completely lacking within the information flows of the system due to the lack of NGOs existing that represent the end consumer and hence the citizens of Chisinau and not merely the water providers.

Therefore, this is not merely a task of the Ministry of Environment, but rather a task involving many actors that need to collaborate and cooperate in order to overcome the problem of tragedy of the commons and achieve a sustainable management of water resources.

The 'tragedy of the commons' is an overarching problem for the entire global water sector, not only in Chisinau or Moldova, but an increasingly serious problem for other parts of the world as well. Decreasing supply of fresh water sources is becoming an eminent problem that needs to be addressed. Although this is an issue that needs to be attended in a global context;

¹³ POPs, Persistent Organic Pollutants are an eminent problem for the water quality in Moldova. They are to be believed to be the source of severe health problems within rural population Mihailescu, C., M. Latif, et al. (2006). Moldova Water Quality Monitoring Program. U. AID. Chisinau.

POPs need to be mentioned at this point, however are not discussed in this study, as this problem would constitute an entire study for itself and exceed the scope of this paper.

it nevertheless has direct implications on Chisinau's water supply in terms of water quality and quantity available.

6.3 'shifting burden to intervenor'

This problem is also referred to as an addiction or dependency. A dependency or addiction to an external intervenor exists to solve problems within the system. According to Meadows, the intervention into the system is shallow, trying to fix it on the surface but not solving the underlying actual problem. A 'quick and dirty' solution to the symptom of the problem is found, thereby distracting from the harder to resolve and long-term task of solving the real problem (Meadows 2008).

This problem is evident in two forms for this case: 1) on the political level- a Moldovan dependency on the international community to apply fixes as well as quick legislative fixes, hence external actors carry the 'burden' of fixing the water supply and sanitation system 2) on the physical water supply system level- the utility applying quick fixes on the infrastructure of the system.

The latter, physical one is rather simple and easy to solve and understand. It does not constitute the main problem. The physical water supply system is in need for sufficient maintenance and infrastructure investments. The flow of the budget as well as profit stock is hindered. By maintaining water tariffs artificially low and thereby making it impossible for the utility to cover its operational costs, it has to fill the built up deficit before it is able to make profit and thereby filling its stock for it being able to cover maintenance costs. As infrastructure investments should be covered by the municipal budget, this aspect lies with the municipality to be covered. Hereby, a lack of medium to long-term budget planning is eminent, as budgets are set on a one-year basis in Moldova. Nevertheless, the result of saving maintenance costs and infrastructure investment is a destructive reinforcing feedback loop, which merely enhances the current status quo of the infrastructure. The more and more deteriorating infrastructure however becomes increasingly dependent on external intervention from international donors and is less able to maintain its own desired state.

The second not so easy to solve underlying problem concerns the fundamental problem of the current political climate conditions in Moldova. The political situation in Moldova is in an impasse. Political instability resembles a lack of leadership for the country, which is reflected on the economic condition and possibilities. This also includes investments, especially from external investors. Investments into an instable political climate are unlikely. The current instable condition, which increases fast change, leads to constant restructuring of Ministries, from budget and staffing to tasks and responsibilities. This condition creates confusion and discomfort. The situation also applies to the organizations currently belonging to the Ministry of Environment, as well as the creation of new departments within Ministries. Without clear assigned tasks and stability, no responsibility will be taken, no lead will be taken and no effort will be put in drafting useful legislation. If the entire political construct could change tomorrow, there is no sense for actors to put energy into anything today. Confusion about responsibilities and tasks is eminent within the Ministries as the author learned from the personal interviews. If political actors are confused, it is only obvious that the citizens are as well.

The inability of the Moldovan government to draft its own legislation in the water sector and dependency of external intervention into the drafting process is exemplified by the current water law draft. As mentioned in previous Chapters of this paper, the drafting process has been going on for several years without getting anywhere and being stuck within political ideological barriers. The water law has been revised with the help of several international

donor organizations and is expected to be passed by the Parliament this fall. Hereby visualizing the intervention inherent by the international organizations and the Moldovan need for external help and pressure. This state is widely recognized by the international community, as most projects are set out to be self-sustaining after a couple of years. Unfortunately, many projects cease in its existence if not maintained properly, which is mostly due to funds being used up for other donor-unintended purposes, as has been pointed out by international donors. According to local actors, the international community is only willing to invest into 'success stories', with which it is easier to brand oneself (Drumea 2011). Thereby pointing out projects by the World Bank that apparently failed after several years (ibid.). Resulting from the interviews, the author assumes that communication between local and international actors seems to be not as clear as it should be, since it is evident to the author that the projects that ceased to exist were set out to be self-sustaining after a few years, this indicator however did not reach other local non-governmental actors and left the impression of abandonment by the donor. Moreover, it is apparent that many local actors seem to assume a never-ending flow of grants available for Moldova from the donor community, as well as a certain responsibility to help the country. However concerning external financial assistance, "although investments are required, these problems will not be solved only by increasing the supply of financial resources from public budgets: such an approach would not be sustainable and would reinforce the inefficiency of existing arrangements" as in most former USSR countries only 30-40% of the resources needed are available to run the system properly, "external financial resources could only help to address a small fraction of the total needs" (UK Department for International Development 2000). Furthermore, it is questionable if financial resources arrive at their intended destination in a country with high corruption rates within the government as well as the society and industry. Hence it is reasonable that financial assistance only comes with precaution and a combination of control mechanisms. The same accounts towards external private investors.

However, the deepest underlying problem within the Moldovan political system, its society and all its malfunctions that are reflected in its economic stagnation, migrating citizens and also its water supply system is the ideological divide in the country. The identity split between the Romanian and the Russian, which is transferred into a communist political party and a pro-western alliance political party split. Opposing political parties are natural in any nation, however not in the form of completely dividing a nation's identity, suppressing valuable bilingualism and economic chances. The ideology issue spans itself like an umbrella over the actual issue at hand and diverts from the real problems that need to be addressed. It also diverts from the direction a government should take, a direction for the common good of its citizens.

6.4 'policy resistance'

As defined by Meadows, this problem often appears in a system that is in the state of an impasse, in which not much change takes place, although an effort to change is made by many actors involved in the system. Each actor monitors the system in regard to his or her own important valuable and compares to his or her personal goal within the system. If there is a discrepancy within the system, every actor does something to correct the situation. Hence, the goals of the system or subsystems are different or inconsistent; each actor within the system has his or her own goal (Meadows 2008). Everyone pulls the system into different directions, if one side gains an advantage, the other side increases its efforts to pull the system to the other side.

From the interviewed actors, the author gained the impression that there is a general willingness to change the current water supply system in Chisinau, however a leading responsibility and common goal seems to be lacking. For instance, this condition is reflected

in the redistribution of tasks and responsibilities, which has not only created confusion, but also resistance against change. This is an indication of actors not being happy with the instituted change or they are afraid of the change, which implies uncertainty about future conditions. Persons have a tendency of resisting change and preferring the past, where they knew what was going to happen or they got used to the system and learned how to work with it. From learnings after the personal interviews with some actors, this appears to be particularly the case for the shifts in responsibility redistribution of the current sub-divisions under the Ministry of Environment. As the responsibilities and tasks of these sub-divisions have changed quite frequently over the past two years, including their autonomous status and institution of a new department, the condition especially for the Apele Moldovei Agency has changed. As has been discussed in the previous Chapter on the different involved actors, the Apele Moldovei Agency was initially headed by the Ministry of Agriculture, shortly independent and now it is under the Ministry of Environment. After the personal interview, it became apparent that the interviewed representative preferred the independent status of the Agency as well as the past task distribution, which has been changed under the lead of Ministry of Environment (Bujac 2011). This became mostly apparent with indications towards the responsibilities and enforcement power given away to the State Inspectorate, as the Agency has no enforcement power over its implemented regulations, including no direct link to the State Inspectorate. Furthermore, the creation of the water department under the Ministry of Environment and the unclear difference between the Agency and the department creates continuous confusion over responsibilities as well as resentment from the 'longer established players' in the water supply sector. Moreover, according to the Agency's representative as well as the representative from the Ministry of Regional Development and Construction, an incentive to make the system work is lacking, because of fragmentation and no clear leadership that manages the entire system (Socol 2011). Furthermore, one non-governmental actor pointed out that "authorities were more sufficient, practical and worked faster until the collapse of the Soviet Union" (Drumea 2011). This statement indicates for one that the Soviet system in fact worked more efficiently than the current government and for another that not much belief into the current governmental system is existent, which also leads to the impression of reminiscing and ideologizing the past Soviet times by some Moldovans. This reveals a general anxiety of possible change and future situation for the country.

Furthermore, the problem is again a reflection of the underlying ideology problem discussed in the previous section 6.3 'shifting burden to the intervenor'. As the ideology umbrella leads to a divide in the country, which is carried by the political instability, the direction towards a common goal is diverted within the government and the water. Actors within the system seek their different goals, which they believe are the best to strive for. This occurs due to a lack of a clearly established common goal. Another result from the ideology divide is that laws initiated by the opposition are not considered to be of value, which leads to a revision of many laws and also discarding laws that could be of use. Hence a lot of time, energy and working capacity is wasted on reinvesting the wheel.

One example in the case of water legislation is again the impassable water law that has not been able to pass through the Parliament for the past couple of years, since it has been initiated in 1993. Thereby constituting the example of a national problem becoming a pure political discussion and not regarding the issue itself. This also accounts for many legislative proposals that have been worked out by the communist regime, however those are not accepted in the current political environment by the opposing party alliance. On the other side, barriers are created for making use of legislation examples available from neighboring countries. This is especially the case for EU legislation that has been translated into Romanian and transposed into Romanian law.

6.5 'seeking the wrong goal'

According to the systems approach by Meadows, the goal is the direction setter of the system, the definer of discrepancies that require action and the indicator of compliance, failure or success towards which a balancing loop strives (Meadows 2008). However, if a goal is defined inaccurately or incomplete, feedback loops will strive to the ill-defined goal, which brings unintended results. Systems work to produce results, not what is actually intended. Goals are measuring points towards which feedback loops strive, thereby taking upon corrective behavior.

The direction of the water supply system should take is distracted by other water unrelated matters, which get in the way of a well-defined goal or purpose of the particular system. This is mainly reflected in the political drive behind setting tariffs, which diverts from the goal of making the water supplier work more efficiently and become self-sustaining. This includes electoral changes and hence also staff changes, which need to be convinced for every new project as has been pointed out by the head of the regional development project department within the Regional Development and Construction Ministry (Cecan 2011). According to Igor Sirodoev of the Academy of Science, a framework is needed that allows for and promotes initiatives for change as well as supports persons who want change (Sirodoev 2011). Currently, no such framework exists, in particular political actors are working against each other or for the next election, instead of working for the country. Due to the fast changing political conditions and re-elections, politicians are kept from making unpopular decisions (ibid.) or currently refer to strategies done by the previous government as 'communist strategies' that are found to be inadequate (Mihailescu 2011). In combination of the rather fuzzy legal basis policy makers have to work with, a clear view is needed on who is responsible for which sector, including the capability of which legal area belongs to which Ministry (Socol 2011).

The fragmented leadership condition of the country's government also affects the direction of the country and the lack of a goal. If the water sector is not explicitly pointed out as being a priority of the Republic's policy agenda, no clear signal can be set. Not only to the involved actors and the own population but especially to the international community and private investors in terms of investments and project funding. If investors do not see a clear goal, the willingness to invest is most likely to be very low, which also makes the attraction for public private partnership (PPP) partners very hard. A clear concept and vision or a strategy is needed for the country (Mihailescu 2011). These include the already discussed ideology and political instability problem, which makes any long-term planning hard for all actors involved. Furthermore, the intended goal is not visible to the actors involved, which also explains the previously discussed problem of policy resistance where actors seek their own goals, but not a common goal and thereby pulling on multiple strings towards different directions of the system. As pointed out by Budenesteanu of the MCA, the biggest challenge of the water supply system is the political will to work beyond the mandate and in a long-term perspective, which also includes the behavioral aspect of not pointing their finger at other people not doing their job (Sergiu Budesteanu and MCA 2011). A lacking overarching goal of the government sprouts insecurity with the population, who "don't know what is happening currently, what will happen in the future, where everything is going, politically, socially and economically" (Tronza 2011).

However, if goals are existent, these need to be achievable. In the case of the water quality standards, the set goals are set higher than necessary. Thereby the standards are made impossible to be met and hence only produce other problems, such as 'rule beating', as discussed in the next section. Especially since the rule of a system determines the entire behavior of it, this is a crucial point to be set straight and clarify for all actors involved.

6.6 'rule beating'

This problem is rather straight forward and defined as the “evasive action to get around the intent of the system’s rules” and often produces the appearance of rules being followed (Meadows 2008). It is often a response of “lower levels in hierarchy to over rigid, unworkable and or ill-defined rules” (ibid.). This also accounts towards the flow of information between involved actors.

In the case of Chisinau’s water supply system, the flow of information within the system is distorted, as communication between actors is not at its best. This factor is enhanced by not clarifying the overarching goal of the system, as well as long-term assigned responsibilities and tasks, as the different actors constantly need to readjust to new conditions in an ever-changing political environment. Hence the shifting of responsibilities within the Ministries makes it not easy to keep up well flowing communication and hence artificially creates a communication barrier between the different actors involved in the system.

A legislative framework for water is existent in Moldova, but standards are set very high and hence almost unachievable. It needs to be reassessed how high water quality standards really need to be and how far these can be achieved. Not to lower the bar of a goal to be achieved, but to set the goal at a reasonable and economic efficient level. This will also create a much needed success story not only for the water sector, but also for the entire country. Thus actors are not ‘made’ to circumvent the rules, but have a better incentive to stick to them. This would possibly straighten out the current problem the Apele Moldovei Agency has with the Apa-Canals, as they are not providing the needed data they should provide. According to the interviewed representative from the Agency, the utilities “do not respect legislation” and do not provide the Agency with monitoring data (Bujac 2011), this also includes the non-cooperation in providing data from the break-away province Transnistria. However, from the non-governmental perspective, the national government seems to be in-accessible and living far from reality (Drumea 2011), resembling disturbance of information flow and feedback from non-governmental actors to the national government. This also includes any missing communication links between the different governmental actors, ministries, sub-agencies and the utility or their association. The disturbed flow of information can be taken as one of the main reasons of why the existing legal framework does not work properly and almost every actor involved treats and interprets the laws to their own understanding, which has been pointed out among others by Budenesteanu of the MCA (Sergiu Budesteanu and MCA 2011).

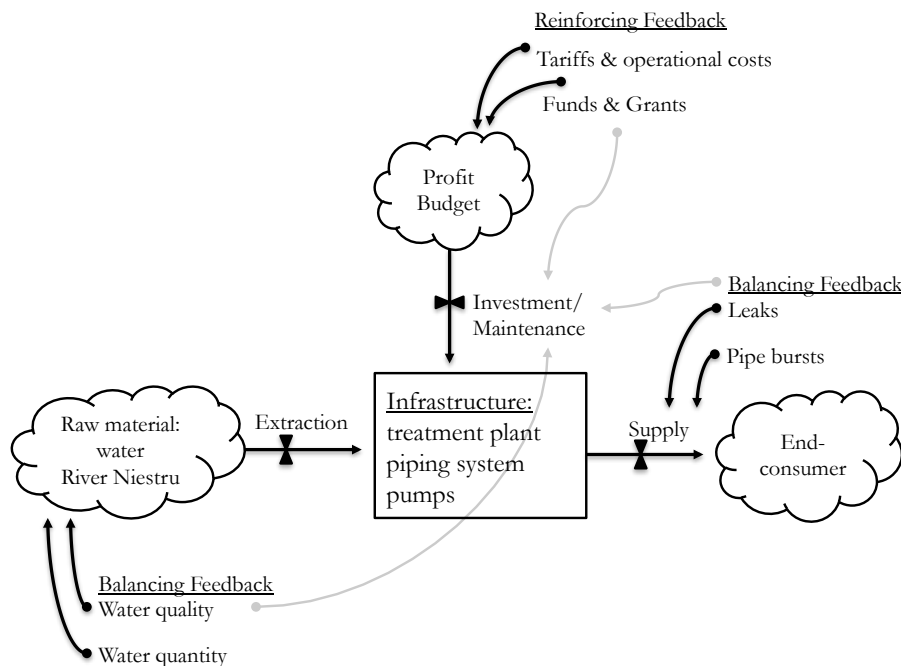
Another factor to be addressed within the range of this problem is corruption. The Republic of Moldova has an international reputation of being one of the most corrupt countries in Europe; hence the need to address the issue of corruption comes as no surprise. As a country that is interested in gaining access to the EU, it is within their interest and also set as one of the priorities by the European Neighborhood Policy (European Commission) and the specified Action Plan for Moldova (European Commission 2004), including the Partnership and Cooperation Agreement (European Community 28.11.1994) to overcome the corruption problem. In order to do so, the source of its existence needs to be analyzed first. This however is outside the scope of this paper; nevertheless some aspects can be pointed out by the author due to the outcomes and impressions gained from personal interviews on site in Chisinau. For one, corruption is a form of rule beating that has embedded itself within the entire system functioning in the country and highly diverts from any set goal as well as distorts information flows. Therefore, corruption is a problem that needs to take on priority in making any system functioning better within the Republic. As much willingness for change could be seen during the on site visit, change driven by a few actors can only work if the entire system is changed. Merely by replacing actors within a faulty system, does not make it work any better. According to interviewees, reasons that lead to corruption and invite this unwanted

behavior of actors is due to underpaid and under qualified staff, which is also related to the high migration rate and lack of experts. In many organizations, in combination with underpaid and unqualified staff, understaffed departments lead to high work amounts seeking for shortcuts to achieve results. Furthermore, enforcement capacity is lacking as a control mechanism. Thus, a sub-society within a subsystem has created itself, which is ruled by corruption that diverts from any goal set for the common good and distorts information flows for the system to function accurately.

6.7 Graphical Reflection of the System's Analysis

The following Graphic is based on Meadow's systems approach and hence the methodology model, which shows the structure of the water supply system of Chisinau. It visualizes the system structure in a simplified way, the clouds being the beginning and end of flows, hence the stock, which can be regulated by involved actors. The stock of the raw material, namely the water, is affected by quantity and quality flows. The stocks and the entire behavior of the system is influenced by feedback loops, here reinforcing feedback in the form of tariffs, operational costs, funds and grants, which enhance the direction the system takes. Whereas the balancing feedback in the form of leaks and pipe bursts, as well as water quality and quantity regulating the system, in the best case scenario towards an overarching well-defined goal. All feedback loops have an indirect influence on investment and maintenance of the infrastructure in the system. The infrastructure of the water supply system is the engine, without maintenance, it will fail to function and move into a deterioration spiral.

Figure 6-2 Chisinau's water supply system



Source: (Michel 2011)

As is clearly to be seen in the graphic, the information flows affect the whole operative behavior of the system and is thus one of the basic function mechanisms of the entire system. Without well functioning information flows, the systems functions become distorted as has been analyzed in the previous sections. Without clarified goals and directions the system should take, information feedback loops can provide false or delayed feedback, thereby directing the system into an unintended direction. An overarching goal and straightforward assigned tasks and responsibilities are necessary to guide actors' behavior in the system.

7 Discussion on using Problems as Opportunities for Change

7.1 Intervention into the System in reflection to the analyzed problems

In reflection to the analysis findings and the system ‘traps or opportunities’ identified by Meadows, several intervention points into the system to increase the function of the system will be discussed in this section. Meadows points out multiple ‘leverage points’ to intervene into a system, these are discussed here within the different problem areas of the water supply system. Within the analyzed problems, it has become apparent that a distinct and clear goal is lacking from the system, as well as well defined rules to guide the system and its actors. Thereby the situation is increased by faulty information flows between the actors. The reliance on external intervention into the system by the donor community to save the system from its malfunctions does not help Moldova to stand on its own feet.

7.1.1 Goal and Strategy

As the goal or strategy of a system is the guiding principle behind any system, it is the most important element of the system to be taken care of. The Goal set within a system determines the purpose of the system and thus also its function. According to Meadows, a well defined goal is one of the best and high ranking intervention points within a system to actually be able to change something (Meadows 2008). A system without a goal is confusing to any actors functioning in it and will never strive to its optimum or intended target. The reflection of the country’s condition, the missing perspective of the population is reflected in a smaller format in the water sector. The national government needs to align any existing goals with one overarching goal, taking into account sub-goals and also goals of the different actors involved, while moving the state of the system into a better direction. By setting a well-defined goal, any discrepancies in the system can be worked at much better than within a system that is lacking a strategy.

A well-defined goal that is achieved leads to success stories and therefore also increased confidence and will power to push change further. For instance by setting the goal of improved water quality by the State Hydrometeorological Service, it was possible to increase the quality of water in the last 5 years for the Dniester or Nistru River to pollution limit classes 3-4, meaning moderately polluted to polluted¹⁴ (Dr. Ilie Boian and Elina Pleşca 2011). This is still a questionable state, however in the Moldovan context a success story, which can be taken as an example for the water utility, municipality and national government in convergence with non-governmental actors to set a common goal within the water supply service that is to be achieved within a given timeframe. This also accounts to legislative goals of different water or development related strategies. A dispersion of legal strategies containing different goals creates additional confusion within the system. The water sector needs one guiding legal strategy within the framework of a water law as a legal basis with precise goals and rules. This will provide the possibility of cohesion within governmental actors and thereby communicate governmental coherence to the Moldovan citizens as well as international and private actors. In addition, it is necessary to make the importance of the water sector visible to external actors as well as its citizens by making it a national priority.

¹⁴ „The water quality in the Dniester or Nistru river remained at the II class level ‚moderate polluted’, with a slightly increase in 2006, namely the bacterioplanktonic pollution up to the intermediary III-IV class ‚moderate polluted- polluted’ and of the benthos -in the limits of the IV class - ‚polluted’“ Serciciul Hidrometeorologic de Stat (2010). Raport de Activitate. Chisinau, Ministerul Mediului.

7.1.2 Rules

For the water supply system to function best, the conditions for it need to be set. Technical and financial measures need accountability mechanisms to ensure earmarked funds are not misappropriated for other purposes. In order to achieve this, the legislative conditions and political framework set in the country need to be existent in order for directing funds and provide a framework for projects. “A new framework is needed to guide the reform of the urban water supply and sanitation sector. Such a framework is essential to stop the continued deterioration and eventual collapse of water sanitation services, with the serious consequences for the health of the population and their environments which this would entail.” (UK Department for International Development 2000). Previously launched projects by international donors at the local level have yielded valuable experience and should be continued. However, “it is questionable whether these initiatives can be widely replicated unless new policies are implemented establishing a sounder, more sustainable basis for sector reform” (UK Department for International Development 2000).

Policy reforms are no popular selling points to voters. Policy reforms and also dialogue and work done in this sector is intangible and doesn't show immediate or even medium-term results. Often only results will show in the long-term, if continuously worked towards. Moreover, results tend to become disconnected to early initiatives and previous work, persons or organizations that worked towards the particular goal. Many times those that have worked towards a policy reforms are not rewarded for their work or recognition. Someone often unrelated who happens to be in office at the moment will get the credit for the previous work. Policy reform is a necessary but ungrateful job, as any policy work in general. This also accounts to international donor organizations, projects that show tangible results and produce success stories within short time frames are favored over time consuming intangible policy work. The following recommendations of the OECD (Figure 7-1) on how to improve the water sector and initiate policy reform in a nutshell could be used as a guiding tool for policy reformers.

- Set consistent, stable objectives for the water supply and sanitation sector as part of city or regional master plans and with clear links to Integrated Water Resource Management plans;
- Elaborate realistic finance strategies to achieve these objectives;
- Translate these strategies into rolling, medium-term investment programmes, rather than the annual programmes that many municipalities currently follow, and
- Promote public participation in the development and implementation of these activities.

Figure 7-1 OECD Water Sector Reform Recommendations

Source: (OECD 2007)

As also stated by the OECD, any instituted rule needs to be reasonable. This includes giving up ineffective policies in order to save resources and energy for more constructive purpose (Meadows 2008) of initiating real change within the system. This is also a counteractive method described by Meadows in her intervention list to tackle policy resistance.

7.1.3 Actor Responsibilities

However, before any policy reform can take place, the entire water sector needs to be clarified on who as well as which organization or ministry holds which responsibility and what task. Especially of which ministry is responsible for which legislation areas. A clear assignment of tasks and responsibilities as well as power distributions is indispensable for the water sector to work properly or any other sector of the country.

The Ministry of Environment currently clearly holds the responsibilities for water resources and should continue keeping this duty. Throughout the research on the water sector and after several interviews it became apparent that the Ministry is also the center point of data and information flows concerning anything in the water sector (Dr. Ilie Boian and Elina Pleşca 2011), especially after the Apele Moldovei Agency has been placed under the heading of the Ministry. The Apele Molovei Agency is in direct relation with the water providers, which have to provide the Agency with any data flows and monitoring information. Here the distribution of tasks becomes diffuse, as the Agency is also responsible for legislation implementation, as is the new created Water Department within the Ministry of Environment. Furthermore, the State Hydrometeorological Service is responsible for surface waters and the Geological and Mineral Resource Agency for groundwater sources, with the water utilities being responsible for the management of the water they extract. As the water utility is a state owned enterprise and thus managed by the local government, hence the municipality of Chisinau, in the case of the S.A. Apa-Canal Chisinau, is responsible for the utility. The municipality however has no dedicated department for state owned enterprises, merely different vice-mayors are assigned with the responsibility. Furthermore, inherited from the Soviet era is a recognition of one Ministry being responsible for state owned enterprises, this ministry does not exist in the formerly know structure anymore, but has partially been reassigned to the Ministry of Regional Development and Construction according to the knowledge of some interviewed actors (Mihailescu 2011). While interviewing the Ministry of Regional Development and Construction it became apparent that this task has not been acknowledged to be a responsibility of their Ministry, but rather something that gets handed around between the Ministries and finally lands on the table of the Regional Development and Construction Ministry (Socol 2011). With Institutional changes, overlapping functions of different ministries create confusion between governmental officials and civil servants (Sergiu Budesteanu and MCA 2011). The responsibility for the utility and management of water therefore needs to be clarified on the national as well as local government levels.

As much international funding is dedicated to the water service and sanitation sector, as many different actors as possible want to be included in the system, this is also the case for the different ministries and other governmental organizations (Sergiu Budesteanu and MCA 2011). After analyzing the water supply system in Chisinau it became apparent that the Ministry of Environment could be the driver for change and also the leader in collaboration with the other ministries.

7.1.4 Information Feedback

Information feedback is important to take action for correction measures and influence future behavior of a system. It is what the actors within a system need to react upon and initiate changes in order to direct the system's progress towards a defined goal. However in order to be able to make use of information feedback, the system needs a well-defined goal to strive towards. Hence the goal and strategy setting is a pre-requisite for the information feedback invention to work well. Without undisturbed information flows a system is not able to reach its goal. Besides a well-defined overall goal, policies and other rules to work within the system need to be clear and comprehensible for all actors involved. Clearly defined goals and rules in

combination with an increase of communication and cooperation between actors enhances the possibility for information feedback and thus corrective measures.

In order to correct disturbed feedback loops within the system, it needs to be defined who does and who does not have access to information, as well as reconsider overall accessibility to information. Missing information is most often the most common cause of malfunctions within systems (Meadows 2008). Furthermore, a delay in feedback and reaction to information needs to be adjusted as to not overshoot or undershoot the goal of the system (ibid.). This includes balancing and reinforcing feedback loops. Balancing feedback loops can be numerous and serve a self correcting purpose within the system and can be used as a monitoring and signaling device to detect deviations from the set goal. One of these is a water tariff, reflecting full water costs. However visible effects are mostly only shown in the long-term and depend on all parameters to be taken into account. The same accounts to reinforcing loops, which enforce the direction of the current state the system is on. The current physical state of the water supply system is of low maintenance and a deteriorating infrastructure, which will continue to deteriorate if left in this condition. Therefore balancing measures need to be enacted to initiate a change within the system.

On an actor related note, information flows are also reflected in education. As has been pointed out to the author, Moldova is lacking trained specialist and also professionals, which is reflected in lacking professional staff to maintain a good functioning system (Mihailescu 2011). Hence the country is in need for more qualitative education. This however needs to be coupled to better working and living conditions for professionals to have a purpose to stay in the country and not migrate and seek possibilities elsewhere. Education is also pointed out by Meadows as a counter measure to tackle the 'tragedy of the commons' (Meadows, 2008).

7.1.5 Dependency

The problem of the 'burden of the intervenor' into the system is reflected to the country's artificial dependency on solving problems by external actors, favorably donors and other international community organizations. This dependency is tied towards an expectation of the international community having an obligation of solving the country's inherited problems. This is a common problem among aid organization and is outside the scope of this paper to be further discussed beside the fact that it needs to be mentioned in relation to the dependency of Moldova on external actors on solving their internal problems.

Nevertheless, the utilities' infrastructure all over the former Soviet Union has been centrally planned 40-50 years ago and hence also the water supply system. In the current transition period, which has been taken longer than anticipated for some former Soviet countries, it is very difficult to switch to a liberal economic approach (Sirodoev 2011). However this problem remains to be a common problem across the entire Soviet sector. Moldova is not alone with this problem. The figure below (Figure 7-2) provides an overview of the water supply and sanitation sector of Moldova in comparison with other former Soviet countries that are still in the transition process and have also so far not had any prospect of gaining EU accession.

As can be seen in the figure, Moldova is not at the lowest end with the water sector problem, however also not the most progressed. Especially, in comparison to its larger neighbors, Moldova is in a much better condition, due to its proximity to Romania and thus the EU. Hence, Moldova is in a much better condition than many of the other listed transition countries, but also has some neighbors it can make use of their learnings and experiences. The country needs to distance itself from the belief that it is the only country facing problems in transitioning towards a well functioning market economy and thereby placing itself on the lowest end of progress within Europe. A continued discussion of identified problems does not

solve any problems; more appropriate would be the incorporation of a solution-based approach into the governmental system. It is necessary for Moldovans to enhance their efforts in changing the situation of their country themselves. Empowering its own citizens and putting an increased effort into increasing expertise is essential for the country. Confidence in its own ability to achieve change needs to be built from within the country. Change should be driven from inside a system and not by external actors.

COUNTRY	Population, total	Urban Population	GNI per capital	Improved water source (% of population with access)	Connected to centralised water supply (% of population)		Improved sanitation facilities, urban (% of urban population with access)	Connected to centralised sewer (% of population)	Mortality rate, under-5	Average daily water supply, urban
	(millions)	(%)	(USD)	(%)	urban	rural	(%)	(%)	(per 1000 live births)	(Number of hours)
Armenia	3	67	950	96	68	32	92	67-89	33	7
Azerbaijan	8	52	820	73	95-83	11	77	78	91	8
Belarus	10	70	1 600	..	94	53	100	68	17	..
Georgia	5	57	770	96	95	35	76	60	45	18
Kazakhstan	15	56	1 780	87	93	26	86		73	23
Kyrgyz Republic	5	24	240	75		70	76		68	20
Moldova	4	42	590	86	73		92	56	32	10
Russian Federation	143	73	2 610	93	84		96	70	21	24
Tajikistan	6	28	210	71			58		95	14
Turkmenistan	5	45	1 120	77	80	28	71	61	102	..
Ukraine	48	68	970	100	83	26	98	53	20	19
Uzbekistan	26	37	420	73	65	64	89		69	..
World:										
Low income countries	2 311	31	440	61			75		123	..
Middle income	2 988	53	1 930	81			83		37	..
High income: OECD	915	78	29 360	..			99		7	..

Figure 7-2 Key EECCA country figures

Source: (OECD 2007)

According to Meadows intervention points, the intervenor into the system needs to restore and enhance the system’s own ability to solve its own problem and keep the system running, whereas the dependent should enhance the ability to build the system’s own capabilities back before removing the intervention (Meadows 2008). This should be done as soon as possible, as the longer the decoupling from the intervenor is delayed, the harder it will become.

7.1.6 Use what is available

Moldova is generally in a good position in comparison with other transition countries, as it has a bilingual population, and the country has access to Romania and Russian-speaking transition countries. Especially Romania is of an advantage here, due to its recent EU accession and mostly already transposed and implemented EU legislation. Historically Moldova was part of greater Romania and hence inherited cultural aspects of today’s Romania. Moreover, the province bordering Moldova on the Romanian side referred to Moldova province has the same climate, infrastructure, culture and historical conditions (Schieder, 2011). Therefore many legislative measures and water supply systems are similar and hence adaptable to Moldova. In particular the city of Iasi, in the Moldova province of Romania would be a suitable case to draw best practice examples from. Especially since Iasi roughly faces the same conditions and is of approximately the same size as Chisinau. Iasi would be worth a comparison for Chisinau, in particular since it is also a partner city of Chisinau.

Besides using learnings from its neighboring countries that have already gone through the process of building up their capacity in the water sector and transposed EU legislation, Moldova needs to acknowledge that not everything inherited from its past is bad or useless. Existing legislation might need to be revised and updated to today's standards, however coining legislation as a 'communist strategy' merely gives it a bad connotation and the issue becomes political and thus unrelated to the actual problem itself. The country needs to de-stigmatize Russian or Communist-made legislation or infrastructure, as well as recognize the difference between the former Soviet Union and today's Russia. This factor also plays a role in the identity split of the country. Not everything needs to be new, revisions and refurbishments are recommended, but it is unnecessary to reinvent the wheel. Not everything developed and initiated by former government coalitions is bad even if a different ideology was being followed, it is the problem and the population that matters. Hence it is pointless to use resources and experts on reinventing the wheel, when it would only be necessary to improve what is already available. The same accounts to experts in the country, improving education and strengthening experts' capacity would only be beneficial to the country.

7.2 Summary of the main Findings and Recommendations

This section provides a summary of the points above in the Chapter and recommendation on intervention measures into the system in a nutshell:

The overall *Goal and Strategy* for the water supply system needs to be well defined. Overlapping strategies with multiple goals to be met create confusion and are unnecessary. Reduced confusion of actors enhances productivity and capacity.

The *Rules* of the system include a policy reform to construct a framework in which involved actors can operate in the water supply system. This includes well-defined, country specific and adjusted, as well as achievable rules, which can serve as a guiding tool for actors.

Actor Responsibilities and Tasks between the different actors need to be clarified. This is particularly the case for the Ministries. Clearly assigned tasks, responsibilities and no overlapping competences reduce confusion of all actors involved in the system and also the handing over responsibilities to other actors.

Information Feedback needs to flow undisturbed and be available to all actors involved in the water supply system in order for actors to correct behavior and apply the information feedback at the appropriate level and time.

Dependency is reduced by self-organization, giving the Moldovan people the power to add change to their own situation. Moldova should not depend on donor organizations to solve the problems within the water sector or other problems the country encounters. The population needs to be given the possibility to empower itself. Change needs to come from inside the country and not by external pressure.

Use what is available within the country, as well as neighboring countries. Moldova should make use of its bilingual asset. The country can also take learnings from its neighboring countries, such as Romania, which as a EU member state already has the necessary legislation and strategies in place. Existing national legislation and strategies should be revised and not reinvented. Use capacity and experts at places where they are really needed and not let the political ideology divide take over. Politicians as well as the Moldovan population and any other actors need to stay focused on the problem that needs to be solved.

Public Private Partnerships (PPP) are another option improving the utilities conditions and a step in between a liberalized and a governmentally regulated water sector. However in order to run pilot tests of PPPs, investors and potential partners need to be attracted first. As it is exceptional for companies to invest into politically instable countries, the instability needs to be tackled as one of the main issues to be handled if PPPs are to be considered.

8 Conclusion

The importance of a well established legal as well as physical infrastructure and maintenance framework for water supply and sanitation system in Moldova and as reflected upon in this paper's case study of the capital city Chisinau, lies primarily within the possibility of improved life quality of the Moldovan population. Sustainable water management in regard to improved quality and well-managed water flows demands to become a priority goal of the Moldovan government first and foremost for increased health of the Moldovan population coupled with improved drinking water quality. Secondly, water abundance becomes increasingly important in light of rising water scarcity. Finally water serves as the basis of a functioning agricultural economy, including qualitative agricultural products with a potential for export and thereby a likely economic boost.

In this study, the water supply system of Chisinau has been analyzed according to the following research question: How can the system's approach assist to identify dysfunctions in the water supply system of Chisinau and use those as opportunities for change? The methodology model established in Chapter 2 and applied to the water supply system of Chisinau in the following Chapters can already answer this main question. The two following sub-questions have been used to guide the analysis and discussion within the methodology model: Which are the problems of Chisinau's water supply system that can be classified using Donatella Meadow's system approach of 'opportunities and traps'? And how can the involved actors operating in the water supply system intervene into the system to support change?

The following recap of the findings and recommendations of Chapters 6 and 7 provide an answer to the two sub-questions: An increased input of financial resources into the water supply system is not sustainable without a functioning legal basis and legislative framework to guide investments to the most appropriate areas. The legal framework is the first step, as a guide to provide direction for all actors involved in the water supply system. The provision of an overall goal for the system, as well as rules for actors, serve as a guide for behavior and change into the direction the system is headed. This includes clear assigned tasks and responsibilities between the different actors and diminishing the current overlap of competences, especially in the ministries.

Investments are however needed within the deteriorating infrastructure of the water supplier, including piping, pumps and treatments plants. As investments are supposed to be carried by the municipal budget, this issue becomes a governmental one and should not merely be a task of the water utility. The lacking maintenance of the entire system in order to keep it in a desired condition is responsibility of the utility and needs to be reassessed by the enterprise. Nevertheless, a legal framework for directing any investments into Chisinau's water supply infrastructure needs to be established first.

The following quote from Meadows describes the necessary attitude for Moldova's political actor, not only for the water sector, to turn the country around and give it a push to a better future. "Change comes first from stepping outside the limited information that can be seen from any single place in the system and getting an overview. From a wider perspective, information flows, goals, incentives, and disincentives can be restructured so that separate, bounded, rational actions do add up to results that everyone desires" (Meadows 2008). In other words, for change to take place, actors need to step outside limited information and view the entire system from more than one perspective within the system in order to gain an overview of the complete situation. From a wider perspective, information flows, goals, incentives as well as disincentives can be restructured into results everyone desires. Merely placing new actors into an old system will not improve the system's performance. The system

needs to be redesigned with improved information flows, incentives and disincentives, an overarching goal and constraints that have an effect on actors' behavior and action taken towards change. Without changing the system itself, not much will change, despite of outside forces pushing towards the change.

The framework of the water supply system, if legal or physical, needs to be flexible and support people who want to initiate change, thereby not creating artificial barriers. A rigid and manifested system as it is currently, not supporting changing mechanisms and creating insecurity sustains a corrupt functioning system's behavior. Fighting corruption is first and foremost a question of political will. By making the water supply and sanitation system one of the country's priorities and implementing clear and focused as well as strategies with realistic and reachable targets and indicators, system rules can be created not only to guide actors behavior but also demonstrating that water is of importance to the government and hence also the people of Moldova. Nevertheless, initiatives need to come from within the country itself and preferably at the local level, thereby decreasing dependency on the international community. This gives Moldova a possibility to empower its own people and thereby build capacity and knowledge with an improved and more aligned education system. Building capacity and creating one's own experts not only decreases dependency but also enhances confidence and a belief of possibilities, chances and capability within the Moldovan society.

Moldova's self display to foreigners often appears helpless and without much hope, the lacking confidence in its own population does not help this situation. The country needs a success story to build up confidence. However by relying on external actors, in particular on international donors, will not provide the much-needed encouragement. The country needs to learn how to initiate change and provide guidance for itself. It needs to acknowledge its potential, make use of what is available and not strive towards impossible goals. The agricultural potential of the country's fertile soil, combined with sustainable water usage could stipulate agricultural goods for export.

Making use of what is available also accounts to existing legislative instruments inherited from previous governments. The unique position of Moldova between Romania and Ukraine is an advantage for the country; not only because of its bilingualism but also of the learnings it can take from its bigger neighbors. This in particular accounts for Romania as a recent accession to the EU, the common language enables Moldova to cooperate further with its neighbor and use the already translated and country specific adjustments as well as experiences made with implementing EU legislation.

The underlying problem governing Moldova and making it impossible to solve any other problem remains to be the ideological divide of the Moldovan society, which is enhanced by the behavior of political actors. The identity problem between the Romanian and the Russian heritage of the country and currently not being able to combine these two needs to be solved for Moldova to be able to create a combined Moldovan identity. The Moldovan population needs to acknowledge its Romanian and Russian heritage and find a solution of combining these two. By coining legislation initiatives as 'communist strategies' and declaring them to be inadequate, while being led merely by ideology purposes increases the problem at hand. The politicians in office are to work for the country and its people, creating better living conditions and not initiate the most convenient policies merely to stay in office. This includes a policy reform in the water sector and many other sectors of the country and the initiation of unpopular policies as well as increased tariffs.

Further academic research supporting the water supply and sanitation sector of Moldova could be done on numerical flows of water within the water supply network in Chişinău. It

would be interesting to quantify the sustainability of the water management of the S.A. Apa-Canal Chisinau utility. Moreover, a comparative study on water supply and sanitation with the Romanian city Iasi or other Romanian cities as well as Ukrainian examples could be of interest and use for the country. Furthermore, a throughout water legislation review could also be helpful for the Moldovan actors on their path to re-establish their water sector.

Moreover, more in depth research on other Moldovan cities and especially the rural part of the country and its water supply and wastewater treatment would be highly interesting, since not much has been done in these areas yet. This includes the involvement of the agricultural sector as well as transboundary water issues. Also an in depth stakeholder analysis, including a longer field research period and thus more time for interviews and first hand experience on local projects in cooperation with international donors would also be more than helpful for a complete assessment of Moldova's water sector.

Additionally, this study has been conducted in light of the systems approach. The author concentrated on five Traps and Opportunities as defined by Meadows, for any further investigation within the systems approach other Traps and Opportunities besides the five explored in this study would be worth to be investigated. The systems approach has proven to be a suitable guiding tool as well as framework for the author. However, it would also be interesting to investigate the water sector of Moldova in light of the transition theory and not merely within the systems approach. Furthermore, it would be interesting to compare Moldova within the transition theory to other countries in transition.

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Appendix I- Questionnaire and Personal Communication

Survey on Water Supply Management in Chisinau, Moldova

Dear Madam or Sir,

I'm a researcher at Lund University in Sweden and am currently conducting a study on water supply management implications within a transition country context in the field of environmental management and policy, thus I chose Moldova as my case. I have a background in EU policy and law, therefore I'm focusing on water management legislation, less the technical aspects. Most of my preliminary literature research has been based on documentation and interviews to the donor community. However in order to gain a complete picture, it is important for my research to talk to local stakeholders, especially governmental actors and water suppliers.

Best regards and thank you for your time and help,

Lena Michel

My areas of interest, I would like to talk to you about, include:

- Responsibilities and power distribution (including overlapping areas of responsibility for different departments and ministries)
- Where is change needed in the legislative framework to ensure a sustainable or sufficiently working water supply system? What change is needed?
- Barriers related to different actors (individuals and institutional)
- Who needs to initiate change/ or should act on change?
- What can be gained or lost from action? What would be reasons not to act on behalf of improved water quality and environment protection?

Organization:

Department:

Name of Representative:

Position:

1. What is the role and responsibility of your department/ministry in regards to water management and ensuring sufficient water quality and protection?
2. What has been initiated from your department to reach sufficient water quality goals?
3. How is the status of interconnection and communication of the different Ministries involved in water management?
4. How is the interaction of non-governmental stakeholders aligned?
5. Does a platform exist for involved actors and stakeholders to exchange views/ideas/problems?
6. Current status towards the two relevant international Conventions (Danube River Protection and Helsinki Convention on Watercourses and International Lakes).
 - a. How seriously are they being taken into account during the policy process?
 - b. Any plans for other Conventions?
7. Current status of Moldova's EU legislation implementation:

Legislation	Description	Implementation Status in Moldova	Enforcement implications
Water Framework Directive (2000/ 60 EC)	Provides a framework for community action in the area of water policy		
Flood Risk Management (2007/60 EC)	Requires the assessment of flood risky water bodies by Member States		
Groundwater Directive (2006/118 EC)	Established underground water quality standards and limits pollutant inputs into groundwater		
Water scarcity and droughts [COM(2007)414]	Part of the EUs "Blue Print for Safeguarding European Waters"		
Drinking Water Directive (98/83 EC)	Sets quality standards for tap water and obliges Member States to regular monitoring in order to protect the health of EU citizens		
Urban Waste Water Directive (91/271 EEC)	Environmental protection from adverse effects from urban and industrial discharges		
Industrial Wastewater effluent (IPPC Directive 2008/1 EC)	Integrated pollution prevention and control		
Agricultural water pollution and Nitrates Directive (91/676 EEC)	Protection of waters against agricultural discharges		
Adaptation of water and environmental resources to global change- White Paper COM/2009/0147	Promotion to strategies for the resilience towards climate change including the improvement of management of water resources and ecosystems		
EU Water Initiative (EUWI)	Partnership approach towards water supply and sanitation		
Water Information System for Europe (WISE)	A partnership between the Commission's DG Environment, European Environment Agency, Joint Research Center and Eurostat		

8. If the legislation has been transposed, how successful has been its implementation status?
9. How difficult is it to enforce these laws? What is needed to make enforcement more successful?
10. How successful have been the national strategies and laws? What change is needed for them to work better?
11. Groundwater Protection and Property Rights:
 - a. What do property rights for areas of groundwater sources look like?

- b. Is there sufficient groundwater protection? Are these areas owned by the state or by private land-owners?
 - c. What incentives are given to land users to ensure proper groundwater protection?
12. What is the status-quo of Chisinau's water supply Quality?
- a. What improvements have occurred during the past few years? Did the quality improve?
 - b. What investments have been done?
13. Utilities:
- a. State owned? Any experience with privatized/ public-private ownership structures in the past? Ever considered? → private investors?
 - b. What does their budget structure look like? What are the utilities budgets aligned to? How much can they work with in terms of investments?
 - c. How much is annually invested into:
 - i. Infrastructure
 - ii. Water quality
 - iii. Maintenance
 - d. What incentives are given for long-term investments?
 - e. Is groundwater protection taken into account in terms of land protection investments or incentives?
14. Monitoring: who is responsible for the water quality from its way from the source into households?
15. Consumer Costs:
- a. how much does the average consumer pay per month?
 - b. What incentives are given to safe water?
 - c. Is there health education on water quality and safety of tap water?
 - d. Program for filters?
 - e. Low income household support?
 - f. What happens to households that don't pay their water bill?
16. What in your department's opinion needs to change in the water supply system for it to work better? In Legislative or Governance framework terms.
17. What and where are the flaws within the legislative framework for water supply? Legislative loopholes?
18. How is the interaction with the International Community?
19. How does the process work of getting a project in water supply and sanitation going with the lead of an international Donor? What can be done from the International Community to give your water supply system a boost in making it work better (other than financial support).

List of Personal Contacts

List of Personal Interviewees		
Date	Organization	Name
11.07.2011	Ministry of Regional Development and Construction Department of Regional Development Institutions Relations	Sergiu Cecan
11.07.2011	Ministry of Environment Vice Minister	Radion Bajureanu
11.07.2011	Ministry of Environment Water Department	Serafina Tronza
12.07.2011	Utility Apa Canal Chisinau Technical Department	Mihai Mazurean
13.07.2011	Apele Moldovei Agency	Victor Bujac
14.07.2011	Global Water Partnership/ Academy of Science	Dumitru Drumea
14.07.2011	Ministry of Regional Development and Construction	Iuri Socol
14.07.2011	Millenium Challenge Account	Sergiu Budenesteanu
14.07.2011	Austrian Development Agency Former Moldovan Minister of Environment	Constantin Mihailescu
15.07.2011	Austrian Development Agency Country Director	Michael Schieder
18.07.2011	State Hydrometeorological Service	Dr. Ilie Boian Elina Plesca
19.07.2011	Utility Apa Canal Chisinau Monitoring Department Tariff Department Treatment Plant	Irina Shumilo Trifan Braila Ceban Vladmir Mr. Mazurean
27.7.2011	Academy of Science	Igor Sirodoev
15.08.2011	EU Delegation to Moldova	Dagmar Kaljarikova
General Contact & Information provision		
	Utility Apa Canal Chisinau	Vitali Midari
	SST Consult	Rafal Stanek
	Aequilibrium Consult	Juerg Klarer
	OECD Consultant	Tatiana Ivanova
	DFID	Brian Penny
	Swiss Agency for Development Cooperation (SDC)	Viorica Cretu
	Municipality of Chisinau	Gabriela Ciurac

Appendix II- Summary of legal and regulatory framework of the WSS sector

Information according to Inception Report: Supporting the Development of an Investment/Action Plan to Help Implement the New Strategy of the Government of Moldova for Water Supply and Sanitation (OECD Contract No. M08/135) (Daniel Wiltschnigg and Team March 2010)

The main legal and regulatory framework governing the WSS sector relevant for this study is made up of the following legal acts:

- The WSS Strategy (Gov. Dec. nr. 662 from 13.07.2007)²
- Water code (Parl. Code nr. 1532 from 22.06.1993)
- Law on water protection zones along rivers and water basins, (Law nr. 440 from 27.04.1995)
- Law on potable water (Law nr. 272 from 10.02.1999)
- Law on Public Services of Communal Management (Law nr. 1402 from 24.10.2002)
- Law on local public finances (Law nr. 397 from 16.10.2003)
- Law on regional development (Law nr. 438 from 28.12.2006)
- National policy concept on water resources (Parl. Dec. nr. 325 from 18.07.2003)
- The Regulation of “Apa-Canal” Association (Gov. Dec. nr. 500 from 10.09.1991)
- The State Cadastre Regulation on Waters (Gov. Dec. nr. 626 from 18.08.1994)
- The methodology of appreciation, approval and application of tariffs for services on water supply, sewage and water treatment – ANRE (Gov. Dec. nr. 164 from 29.11.2004)
- Regulation concerning the conditions of residual water evacuation in the natural reservoir (Gov. Dec. nr. 1141 from 10.10.2008)

Water code (Parl. Code nr. 1532 from 22.06.1993)

currently revised and will soon contain the EU Water Framework Directive (WFD)

The Law on water code describes the main principles referring to public and private water property, the distinctions of water reservoirs, etc. It describes in general who performs the state administration and control of water usage and protection (Government, central and local specialized institutions). The law describes the principles of constructions and placement of entities in correlation with water protection principle. Part II of the Law refers to the usage of water and it provides that in order to ensure state security, population health, environment protection, and usage of aquatic resources, the usage of water could be partially limited or prohibited totally by Government, local public administrations, as a proposal from the central public institution responsible for the water sector. Further, the Law describes the possible ways of water usage for different purposes and its protection.

After the harmonization of the WFD, it is to serve as a legal basis to establish more precise regulations concerning water management

Law on water protection zones along rivers and water basins, (Law nr. 440 from 27.04.1995)

The legal framework of this law is protecting the water reservoirs and rivers from pollution,

mining, and rational use of territorial boundaries. The law is regulating the creation of water protection zones, river and water reservoirs shreds, the conditions for their usage and their protection.

Law on potable water (Law nr. 272 from 10.02.1999)

This Law regulates the relations within water supply sector and sets the norms referring to the insuring the physical and juridical persons with potable water, the absolutely functioning of water supply systems and water quality and the responsibility for the contraventions in this sector. In the Chapter concerning water supply management, the Law establishes that the water supply systems could be a property of the state, local public administration (incl. municipal), legal or physical persons. The main centralized water supply systems are the property of the state. It is possible to have also autonomous / non-centralized water supply systems. The centralized water supply systems cannot be privatized. The privatization of non-centralized water supply systems could be done through an individual projects (approach), approved by the Parliament as a proposal from the Government.

The water supply services are offered for a payment. The tariffs on potable water are calculated taking into consideration the principle of costs coverage.

Chapter III of the Law describes the norms (quality) of potable water. Chapter IV refers to the violation and responsibility issues. In the Chapter V concerning international agreements is set that international agreement prevails over national legislation.

Law on Public Services of Communal Management (Law nr. 1402 from 24.10.2002)

This Law establishes the framework regarding creation and organization of public services from the communal households in the administrative-territorial units, as well as monitoring and control over communal households' activity.

(Art. 10) The public communal services are provided by the specialized operators such as: municipal and individual enterprises, joint stock companies, limited liability companies and enterprises with other juridical forms of organizations. These entities could be a specialized compartment of the local public administration authority or economic agents regardless of their juridical form of organization.

Chapter II of the Law describes the attributions and responsibilities of public authorities in providing communal services. The central public administration (Government) executes its mandate to realize the general policy in the sector in accordance with principles:

- partnership promotion, joining the local public authorities with private entities (local or international) to finance or credit together the public communal services, as well as offering communal services,
- decentralization of communal public services to avoid monopoly conditions,
- establishing the base of legal framework concerning tariff promotion in regard to supplied communal services in conditions of natural monopoly and monitors the evolution of these.

(Art. 13) The settlement of tariffs for public communal services in general is a prerogative of the National Agency for Energetic Regulation (ANRE), as well as local public administration. ANREM elaborates and approves in accordance with Government the methodology of tariff calculation for the water supply, sewage and treatment of waste water services (WSS). ANRE approves in accordance with local public administration the tariffs for WSS services offered

centralized to the municipals or rayon based on methodology for tariff calculation.

(Art. 14) The local public administration have their own exclusive competence to initialize, organize, coordinate, monitor and control the functioning of communal public services, as well as creation and administration of public properties which belong to certain administrative territorial units (rayon). The local public administration can approve by themselves the decisions concerning

- rehabilitation programs, extension or modernization of their entities as well as implementation of know-how in accordance with the laws,
- coordination of project design and execution of works,
- creation of partnerships on public communal services to realize investments for common interests,
- concessionaire arrangements or privatization of public communal services, as well as goods of public properties
- elaboration and approval of local norms, as well as regulations for functioning of public communal agents in the rayon. A local public authority approves the taxes and tariffs for public communal services in accordance with ANRE approved methodology, except for the services of technological water supply.

Chapter III of the Law refers to the management of communal public services.

(Art. 16) The management, monitoring and control of communal public services are the responsibility of central and local public authorities.

(Art 17) The management of communal public services could be organized through:

- a. direct management
- b. indirect / concessionaire management

Direct management is realized through specialized departments / structures of the local public administration. Indirect / concessionaire management is performed on a contract base principle. For concessionaire management, the Government should elaborate and approve a Regulation. The communal public services under supervision of public authority administration could be privatized in accordance with current legal base. The entities of local entities are subordinated to local councils.

Law on local public finances (Law nr. 397 from 16.10.2003)

This Law identifies the structure of local public finances, the sources of revenues and correlation between different budget levels.

The local public finances are integral part of the national state budget and is divided as:

- the budgets of the autonomous territorial units (villages, towns) – the I-st level budgets,
- rayon's budget – the II-nd level budgets,
- municipal budgets (Chisinau, Balti) – municipal budgets.

The deficit of revenues during the budget year could not be compensated by the budget of another level. The surplus of revenues during the budget year remains at the same budget level and could be used for the next budget year. For budget leveraging the administrative territorial units are supported financially by the state budget. In this regard the state budget

makes financial arrangements (transfers) with the II-nd level budgets, or municipal budgets. The elaboration of local budgets is made independently by every executive authority. The I-st level budgets are elaborated individually by each territorial unit (village, town, commune) then it is coordinated, approved and integrated with the II-nd level budgets. The coordination of local public budgets with the state budget is made by the Ministry of Finance in correlation with the authorities responsible for the II-nd level budgets (rayon council) or municipal budgets.

Law on regional development (Law nr. 438 from 28.12.2006)

This Law defines six development regions, of which Chisinau municipality is one.

The regional development is promoted and coordinated at the national level by National Council for Coordination of Regional Development (National Council) and at the regional level by the Council for Regional Development (Regional Council). MCoRD, Regional Development Division holds the attributions of secretary for the National Council. The National Council promotes the regional development policy at the national level and Regional Council at the region level.

The main attributions assigned of the National Council are:

- approval of National Regional Development Strategy document,
- approval of criteria for evaluation and prioritization for regional and national development.
- approves the financial plan of the National Fund for Regional Development
- contributes to the attraction of extra funds (internal, external),
- assists in activities concerning regional, inter-rayon or trans-border cooperation.

The main attributions assigned of the Regional Council are:

- approves the regional development strategy and regional operational plan,
- approves and promotes regional development projects,
- monitors the expenses allocated from Regional Development Funds,
- evaluates the impact of implemented projects and programs and reached objectives on regional development.

(Art 6) Regional Development Fund represents at least 1% of state budget revenues and is approved through the State Budget Law. MoCRD is responsible for administration of this Fund. In the Fund could be attracted as well sources from international funds and public or private sectors. The elaboration and administration of the Fund is made through a regulation approved by the Government. The allocation of funds is made primarily to the less developed zones. The execution of financial operations concerning investment projects is rolled out by the regional development agencies through the State Treasury Territorial Units.

(Art. 8) The Regional Development Agency is an executive body, established in each development region that performs the coordination of implementation process, monitoring, provides methodological support and reports to the MoCRD on activities and results. The Agencies have the status of legal person and promote their activities under a regulation approved by the Government. Chapter III of Law describes the planning of regional development. National Regional Strategy is elaborated by MoCRD, coordinated with National Council and approved by the Government. The strategy should establish a plan for 3 year period and represent a synthesis of national / regional plans, strategies and programs. The programs and projects are identified by the agencies, local public administration, NGOs,

as well as legal and physical persons. The priority programs and projects defined in the National Regional Development Strategy should be approved by the National Council and finally these represent subjects to be financed from the National Regional Development Fund.

National policy concept on water resources (Parl. Dec. nr. 325 from 18.07.2003)

The national policy on water resources was adopted to promote a consistent policy on water resources management. The concept was adopted for the period 2003-2010 and is oriented for rational usage and conservation of water resources, improvement of water quality, satisfaction of population and national economy needs, rehabilitation of aquatic ecosystems. This concept was adopted because principles of water resources management do not contribute to the stable and sustainable socio-economic development of Moldova:

- i. the legal base on water resources is fragmented,
- ii. the application of legal and regulatory base is made by different public institutions and economic agents on ad-hoc principle.
- iii. institutional framework for water resources usage is inadequate,
- iv. many normative and regulatory standards are old and do not correspond to actual needs,
- v. the usage of border water resources depends on neighbor countries,
- vi. the water communal infrastructure do not correspond to the actual economic-financial possibilities of maintenance and exploitation.

The measures to overcome mentioned problems is described by this document on general aspects, like promotion of stable management of water resources at the state level, elaboration and improvement of legal mechanisms, principles of water management, promotion of national policy on water resources. In regard to pacification of communal WSS services is mentioned that the beneficiaries of projects (local public administration, “primaria”) determines by themselves the proportion of water usage and main components of infrastructure based on their economic-financial possibilities. The designer (planner) should assist the local public administration in elaboration of feasibility studies and technical proposals. Together with this procedure is necessary to estimate the ecological impact on environment for every technical possibility.

The Regulation of “Apa-Canal” Association (Gov. Dec. nr. 500 from 10.09.1991)

The “Apa-Canal” Association (ACA) was established according to the decision of General Meeting of water-sewage (“apa-canal”) enterprises on August 16, 2000. The Regulation of ACA was approved through the Government Decision nr. 500. ACA is voluntary non-commercial association providing WSS services through its members, established with the purpose to create favorable conditions to realize and protect production, technical and scientific, social interests and other communal interest of its members. ACA represent the interest of its members to the central public institutions, local public administration and Government. ACA has a juridical person status, dispose its own accounting balance, banc account, seal and may sign contracts on association’s name.

In the Regulation, paragraph II, it is described the specific objectives and tasks of ACA:

- assisting the WSS enterprises in getting new technologies, technical-scientific support,
- exchange of experience between different WSS enterprises, organization of meetings,
- conferences, training courses, etc.,

- promoting of editorial and advertising activities,
- protection of rights and interest vis-à-vis central public institutions, local public administration and Government,
- accumulation of information and database from the WSS sector.

Members of Association may become any economic agent, organization or juridical person that provides WSS services. The management of Association in hieratical order is performed by:

1. General Meeting (called at least one time per year),
2. Association Council,
3. Executive Division,
4. Revision Committee.

The Association Council is represented by the Head of Association and executive director of Association. The Executive Division of Association is performing the executive activity of the Association. Revision Committee is performing the economic-financial control of Association activity. The association fund consists of ACA member's contribution, donations, technical assistance, sponsorship and encashments that do not violate the law.

Approval of the Regulation on Water State Cadastre (Gov. Dec. nr. 626 from 18.08.1994)

The State Water Cadastre represents the aggregation of all official information concerning water resources supervised and controlled by state. The supervision of state water resources is made with the purpose:

- to maintain the usage of current and future water sources available for the population, regional development and distribution of labor force over country territory,
- to manage the measures of water protection and the efficiency of water supply,

The evidence (supervision) of state waters usage is performed according to a unique system by the State Hydrometeorology Service (SHS) together with Geological and Mineral Resources Agency (GMRA). Both institutions are subordinated to the Ministry of Environment. "Apele-Moldovei" Agency together with the Ministry of Environment establishes the list of consumers to be taken under supervision. SHS takes the supervision of surface waters and GMRA covers the supervision of underground waters. "Apele-Moldovei" Agency according to its functions perform the operational control of primary evidence for the captured and evacuated waters; the existence of necessary equipment for counting and controlling of water quality standards at the water providers and consumers. The accumulate information is presented by the Agency the Statistical Department, Ministry of Economy. The organization, generalization and maintenance of Water State Cadastre is performed by the Ministry of Environment (performing state policy), GMRA (evidence / control of underground waters), SHS (evidence / control of surface waters), "Apele-Moldovei" Agency (water usage, surface and underground). In accordance to its own competence each institution elaborates norms, standards and procedures of evidence and control. The methodology of determining, approving and applying of tariffs for services on water supply, sewage and water treatment – ANRE (Gov. Dec. nr. 164 from 29.11.2004) The methodology of appreciation and application of tariff for WSS services is elaborated by ANRE and approved by the Government of Moldova. This methodology is elaborated in accordance with Law nr. 1402 on communal public services, Law nr. 272 on potable waters, national

accounting standards and other normative acts of the Republic of Moldova. The costs included in the calculation of tariffs for water supply, sewage and water treatment are consistent with the National Accounting Standard 3 (composition of enterprise costs and expenditures):

- materials costs (CM),
- expenditures on salaries (CRM),
- indirect cost production (CIP),
- commercial costs / expenditures (CC),
- administrative expenditures (CGA),
- other operational expenditures (CO),
- exceptional losses (PE),

Thus the calculation formula is: $Ca = CM + CRM + CIP + CC + CGA + CO + PE$

Ca – the costs and expenditures of enterprises.

The determination of consumption and expenditures included in the calculation of tariffs for water supply, sewage and water treatment is appreciated by the enterprises taken into account:

- i. the volume of water necessary to be captured by the water supply sources, volume of water to be delivered to consumers, the volume of used water;
- ii. norms of water volumes used during the capture process, transportation, distribution, and treatment of wastewater;
- iii. norms of consumption for filtering materials, chemical reactive, fuel and energy during the production process;
- iv. invoices;
- v. amortization of fixed assets;
- vi. plans of reparation (utilizes and installations);
- vii. contracts signed with third parts on provided services, etc..

The consumption of materials for water supply is determined on base of volume of water necessary to be captured by the water supply networks and is determined according to formula:

$VAC = VAI + VP$, where:

VAC – the volume of water necessary to be captured by the water supply systems,

VAI - volume of water necessary to be delivered to the consumers, according to contracts,

VP – volume of water for technological needs and water losses in the water supply systems, determined by a methodological norm.

In the paragraph IV of the Regulation it is described the expenditures, which are not included in the tariff calculations:

- expenditures for construction and reconstruction, acquisition, modernization, realization of new objects, sections aggregates. All expenditures concerning capital expenditures are compensated by including in the tariff the amortization of realized (capitalized) fixed assets.
- expenditures necessary to eliminate the defects of project design works, construction

and montage, elimination of defects caused by the producers, suppliers or transport enterprises;

- expenditures for project design works and construction, acquisition of equipment, reconstruction and maintenance of living fund;
- expenditures qualifies as assistance to other WSS enterprises,
- non-productive expenditures, penalties and compensations,
- expenditures for works which are not related to WSS sector

Regulation concerning the conditions of residual water evacuation in the natural reservoir (Gov. Dec. nr. 1141 from 10.10.2008)

With purpose to conform the national quality norms on condition of residual water evacuation, the Government of Moldova approved a Regulation in this regard. The provisions of this Regulation is applied for the elaboration of project design documentation, authorization on water usage, extension and improvement of entities involved in the treatment of residual water, establishment of degree for preliminary evacuation of residual industrial waters that runs into residual water collectors or into the urban station for residual water treatment. The regulation describes the types of residual water and the conditions of residual water evacuation. The final context of Regulation it is presented in Annexes the specifications of residual water evacuation from the urban water treatment stations.

The establishment of Commission on WSS management (Gov. Order nr. 92 from 23.12.2009)

The Government Order was established by the Government Order to improve and monitor further the situation in the WSS sector, to perform rational use of aquatic recourses and to develop current WSS systems.

The WSS Commission is assigned:

- to perform a deep analysis of state aquatic recourses, to describe the situation of WSS and irrigation systems in localities and the current situation of investment projects financed by international donors.
- to elaborate an action plan for rational use of aquatic resources, development and management of WSS systems, to estimate the costs of WSS systems rehabilitation and harmonize all actions /measures with EU Directive 2008/32, EU Directive 2000/60.
- to update, based on new action plan, the previously adopted strategic documents.
- The Commission will present to the Government, until January 15, 2010 an action plan to initialize negotiations with external donors on financing the investment projects from the WSS sector. The WSS Commission will organize meetings as necessary, being called by the Chairman and Deputy Chairman.

Appendix III- EU Directive Implementation Timeline

Table 0-1 Implementation Timeline Directive 98/83/EC

EU legislation	Legal transposition degree of Republic of Moldova National laws / by-laws / drafts (covering the area of the relevant EU act)	Necessary legislative measures	Time table 2010-2015	Comments and recommendations for future steps in order to achieve full approximation
<p>Directive 98/83/EC on quality of water intended for human consumption as amended by Regulation (EC) 1882/2003</p> <p>The following provisions shall be applicable:</p> <ul style="list-style-type: none"> • adoption of national legislation and designation of competent authority/ies • establishment of standards for drinking water (Art. 4 and 5) • establishment of a monitoring system (Art. 6 and 7) • establishment of a mechanism to provide information to consumers (Art. 13) 	<p>PARTIALLY COMPATIBLE WITH REQUIRED EU STANDARDS</p> <p>The 1999 Law on drinking water No. 272 of 10 February 1999 is not compatible with the Directive requirements.</p> <p>The Governmental Decision on the establishment of automated information system "State register of natural mineral waters, drinking water and bottled soft drinks" No. 934 of 15 August 2007 incorporates the definitions, quality standards for the water intended for human consumption, points of quality compliance, monitoring sampling points requirements, information and reporting requirements, derogations, quality assurance of treatment, equipment and materials, information and reporting requirements set under the Directive 98/83/EC on quality of water intended for human consumption.</p> <p>The Governmental Decision sets the year 2015 as the deadline for compliance with the drinking water quality standards. However, a full compatibility assessment is needed.</p> <p>The EU Direct budget support for the water supply and sanitation sector planned to be implemented until 2012 shall provide support for the harmonization of sectoral legislation to EU Directive.</p>	<p>Development of necessary legislation measures in compliance with Directive 98/83/EC</p>	<p>2012</p>	<p>A planned approach should be developed to meet the aim of this Directive including key tasks for planning, administrative arrangements, regulation, reporting and public information.</p> <p>Given that the implementation of this directive will almost certainly involve some changes to previous drinking water regulations and standards, and a greater consideration of the integration of water services policy pursuant to the Water Framework Directive, it is important for all relevant stakeholders to be involved in the development and implementation of national legislation and regulations to implement this directive. These stakeholders include the Ministries of Health and Agriculture and Food in Moldova.</p> <p>Planning for this Directive should be coordinated with the Water Framework Directive particularly with regard to the river basin management system and the establishment, as necessary, of international river basin districts and relevant competent authorities in this regard.</p>

Source: (Breda Howard and Ludmila Gofman 2010).

Table 0-2 Implementation Timeline Directive 91/676/EC

EU legislation	Legal transposition degree of Republic of Moldova National laws / by-laws / drafts (covering the area of the relevant EU act)	Necessary legislative measures	Time table 2010-2015	Comments and recommendations for future steps in order to achieve full approximation
<p>Directive 91/676/EC concerning the protection of waters against pollution caused by nitrates from agricultural sources as amended by Regulation (EC) 1882/2003.</p> <p>The following provisions shall be applicable:</p> <ul style="list-style-type: none"> • adoption of national legislation and designation of competent authority/ies • Establishment of monitoring programs (Art. 6) • Identification of polluted waters or waters at risk and designation of nitrate vulnerable zones (Art. 3) • establishment of action plans and codes of good agricultural practices for nitrate vulnerable zones (Art. 4 and 5) 	<p>NOT COMPATIBLE WITH REQUIRED EU STANDARDS</p> <p>The relevant national legislation is as follows:</p> <ul style="list-style-type: none"> • Water Code No.1532 of 22 June 1993 • Law on environmental protection No.1515 of 16 June 1993 • Law on phytosanitary products and fertilizers No. 119 of 22.06.2004 • Law on Ecological Agrifood Products No. 115 of 09.06.2005 • Law on harmful substances and products regime No. 1236 of 03 July 1997 • Regulations on import, storage, marketing and use of phytosanitary products and fertilisers adopted by the Governmental Decision No. 1045 of 05 October 2005 • Governmental Decision on the establishment of automated information system "State register of natural mineral waters, drinking water and bottled soft drinks" No. 934 of 15 August 2007. <p>The draft Law on water incorporates provisions on monitoring program, nitrate vulnerable zones, action plans and good agricultural practices. Subsequent regulations have to be developed after the law adoption. The draft law underwent the endorsement by relevant public authorities.</p> <p>The Compatibility Declaration for the draft Water Law issued by CLA on 11.08.2010 states that some provisions of the draft law creates the framework for future development of specific bylaws covered by the Directive 91/676/EC</p>	<p>Following the adoption of the</p> <p>Water Law regulations concerning the protection of waters against pollution caused by nitrates from agricultural sources will be developed.</p> <p>New regulations should be compliant with Directive 91/676/EC</p>	<p>2012</p>	<p>Nitrates might become a significant problem for surface waters in Moldova along with agricultural development and extension / rehabilitation of irrigation systems.</p> <p>This Directive could be considered for transposition from 2016 onwards. Planning for the transposition and implementation of this Directive should be undertaken in close cooperation with the Ministry of Agriculture and Food Industry (MAFI) Moldova.</p>

Source: (Breda Howard and Ludmila Gofman 2010).

Table 0-3 Implementation Timeline Directive 2006/7/EC

EU legislation	Legal transposition degree of Republic of Moldova National laws / by-laws / drafts (covering the area of the relevant EU act)	Necessary legislative measures	Time table 2010-2015	Comments and recommendations for future steps in order to achieve full approximation
Directive 2006/7/EC concerning the quality of bathing water repealing Council Directive 76/160/EEC	<p>NOT COMPATIBLE WITH REQUIRED EU STANDARDS</p> <p>The 1997 Hygienic Regulation on protection of water bodies against pollution defines the surface water quality requirements for two types of water uses: the drinking water and food industry water supply as well as for bathing, sport, recreation, irrigation and within urban areas. The regulations include a list of 255 parameters for which sanitary MSCs are established.</p> <p>The Compatibility Declaration for the draft Water Law issued by CLA on 11.08.2010 states that some provisions of the draft law create the framework for future development of specific bylaws covered by the Directive 2006/7/EC.</p> <p>The draft Regulation on Surface Water Protection defines specific use-based requirements for surface water quality and ensures protection against pollution. The draft includes requirements for Escherichia coli and Intestinal enterococci.</p>	Development of necessary legislation measures in compliant with Directive 2006/7/ EC	2013	To ensure sufficient compliance and to maximize efficiency and the wise use of resources, Moldova should implement the Bathing Water Directive in conjunction with other related water legislation, e.g. the Waste Water Treatment Directive (91/271/EEC), the Nitrates from Agriculture Directive (91/676/EEC) and the Water Framework Directive (2000/60/EC). These Directives are covered in this publication.

Source: (Breda Howard and Ludmila Gofman 2010).

Table 0-4 Implementation Timeline Directive 2008/105/EC

EU legislation	Legal transposition degree of Republic of Moldova National laws / by-laws / drafts (covering the area of the relevant EU act)	Necessary legislative measures	Time table 2010-2015	Comments and recommendations for future steps in order to achieve full approximation
Directive 2008/105/EC on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC	<p>NOT COMPATIBLE WITH REQUIRED EU STANDARDS</p> <p>The relevant national legislation is as follows:</p> <ul style="list-style-type: none"> Water Code No.1532 of 22 June 1993 Rules for protection of surface waters adopted by the State Committee for Environmental Protection of USSR in 1991 Hygienic regulation on protection of water bodies against pollution Hygienic Regulation No. 06.6.3.23 of 3 July 1997 adopted by the Ministry of Health of the Republic of Moldova. <p>The draft Water states that the Government shall adopt the list of priority hazardous substances and hazardous. The draft Regulations on surface water protection sets the limits for the above-mentioned substances.</p> <p>The Compatibility Declaration for the draft Water Law issued by sCLA on 11.08.2010 states that some provisions of the draft law create the framework for future development of specific bylaws covered by the Directive 2008/105/EC.</p> <p>The list of substances and related surface water quality requirements are defined in the draft Regulations on Surface Water Protection.</p>	Development of necessary legislation measures in compliant with Directive 2008/105/EC	2013	<p>The transposition of the DIRECTIVE 2008/105/EC on environmental quality standards in the field of water policy is needed for the establishment of surface water bodies, surface water quality objectives under river district management program.</p> <p>To ensure sufficient compliance and to maximize efficiency and the wise use of resources, Moldova should implement the Directive with other related water legislation, e.g. the Waste Water Treatment Directive (91/271/EEC), the Nitrates from Agriculture Directive (91/676/EEC) and the Water Framework Directive (2000/60/EC). These Directives are covered in this publication.</p>

Source: (Breda Howard and Ludmila Gofman 2010).

Appendix IV- Photo Gallery of site visit to the in-town water supply treatment plant of S.A. Apa Canal Chisinau



Figure 0-1
Photograph:
S.A. Apa-
Canal Chisinau
Administration
building

Source: Author



Figure 0-2
Photograph:
Sedimentation
tanks

Source: Author



Figure 0-3 Photograph: Filter system

Source: Author



Figure 0-4 Photograph: Water Pipes from the treatment plant to the City

Source: Author