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SUSTAINABLE DEVELOPMENT OF WATER RESOURCES, WATER SUPPLY AND ENVIRONMENTAL SANITATION

**A Quest for Effective Water Governance:
Look Who's Leading the WPI**

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Several developing countries are currently planning or implementing water sector reforms. Ensuring the sustainability of these processes requires taking into account also the complex institutional structure surrounding water services, consisting of the various organizations with their roles and responsibilities, as well as legislation related both directly and indirectly to water services. The effectiveness of a country's water governance structure is reflected in the water poverty index formulated by the World Water Council and the UK's Centre for Ecology and Hydrology. According to the index, Finland is the richest of 147 countries in terms of water resources, access, capacity, use and environmental sustainability. Therefore, those responsible for restructuring water resources and water services management in developing countries might find it useful to study Finland's water governance and business models. Even though the institutional arrangements would not be identically replicable, they present an example of an enabling environment for successful water governance.

Introduction

ACCORDING to World Water Development Report 2, the insufficiency of water is primarily due to problems in water governance: mismanagement, lack of institutions, bureaucratic inertia, and shortage of investments in both human and physical capital (UN, 2006). In order to overcome these and other water supply and sanitation related challenges, several developing countries are currently implementing or planning water sector reforms. These processes are increasingly considering not only technical and infrastructure issues but also governance and management issues such as multi-stakeholder participation, demand management measures, decentralization.

An important prerequisite for sustainable, functioning water governance is to create an institutional structure, consisting of the various organizations with their roles and responsibilities as well as legislation related both directly and indirectly to water resources and water services. As designing an effective institutional framework is a complex task, those responsible for restructuring the water sector in developing countries might find it useful to become familiar with some approved practices of other countries. This paper presents the institutional arrangements related to the water sector in Finland, a country with a long history of effective water governance. The aim of the paper is to identify factors required for creating an enabling environment for successful water governance, while remembering the fact that water services in particular depend to a large extent on local conditions.

Finland is the easternmost of the Nordic countries (Figure 1). The border countries are Norway, Sweden and Russia. By area Finland is the 7th largest country in Europe covering

338,145 km², out of which about 10 percent (32,000 km²) is water, 69 percent forest and 8 percent cultivated land. The population of Finland was 5,255,580 at the end of 2005, and the population density was thus 16 persons/km². Of the population, 65 percent live in towns or urban areas and 35 percent in rural areas. About 1 million people live in the Helsinki Metropolitan area.



Figure 1. Map of Finland

According to the Water Poverty Index (WPI), Finland is the highest-ranking country with a WPI of 77.9 points. The main components of the WPI are based on five different measures: resources, access, capacity, use and environmental impact. The WPI assigns a value of 20 points as the best score for each of its five categories, so a country that completely meets the criteria in all five categories would have a score of 100. Finland scored as follows: resources 12.2; access 20.0; capacity 18.0; use 10.6; and environmental impact 17.1 (Lawrence, Meigh and Sullivan 2002).

Socio-economic aspects

In 2005, the Gross Domestic Product (GDP) of Finland was EUR 29,612 per capita at market price, and the total GDP was EUR 155.3 billion. Finland has a highly industrialized, largely free-market economy, with per capita output roughly that of the UK, France, Germany, and Italy.

The Global Competitiveness Report 2005-2006 ranks Finland as the most competitive economy in the world. According to the Chief Economist and Director of the Global Competitiveness Network, Finland has an institutional environment that is among the finest in the world: the business community operates in a climate of respect for the law, unusually low levels of corruption, and openness and transparency. In all Nordic countries, successive governments have managed to create a climate of transparency and honesty in public management that greatly contributes to business confidence. Integrity and efficiency in the use of public resources results in adequate funds for investing in education, public health, and state-of-the-art infrastructure, all of which contribute to boosting productivity. The Public Institutions Index 2005 ranked Finland fifth out of the 117 sample countries, and according to the Technology Index 2005, Finland was ranked second (World Economic Forum 2006).

One explanation for the high competitiveness ranking is a well-functioning and effective system of social protection, which is one of the cornerstones of social capital. Social spending in Finland as a proportion of GDP is average in relation to other EU countries. If purchasing power adjustments are made, however, social spending in Finland is among the lowest of the EU countries. In 2002 it stood at 26 percent of GDP, or EUR 36.5 billion.

The constitution safeguards economic, social and educational basic rights for all people living in Finland. These basic rights are guaranteed by the state and the municipal authorities. From the standpoint of social policy, the right to comprehensive social protection is one of the key fundamental rights. Social protection is made up of preventive social and health policy, social welfare and health services, as well as sickness, unemployment, old age and other benefits. The Finnish social protection system is structured in line with the principles of the Nordic welfare model (Ministry of Social Affairs and Health 2003).

The annual Transparency International (TI) Corruption Perceptions Index 2005 charts the levels of corruption in 158 countries (Transparency International 2005). The TI

Corruption Perceptions Index (CPI) ranks countries in terms of the degree to which corruption is perceived to exist among public officials and politicians. The CPI ranked Finland as the second least corrupted country in 2005 with a score of 9.6.

Water resources and use

In Finland, there are 74 main river basins larger than 200 km² and 187,888 lakes. Renewable fresh water resources are estimated at 21,268 m³/capita, whereas the threshold for water poverty has been set at 1,700 m³/capita. The total water use for various purposes is only 2.2 percent of the total renewable water resources. The average discharge of the rivers is 3,300 m³/s. About 75 percent of this flows into the Baltic Sea, 15 percent into Lake Ladoga, and 10 percent into the Arctic Sea.

In 1998, the share of the industrial water consumption was 85 percent out of the total water consumption in Finland. The share of the domestic consumption was 12 percent and that of agricultural use only 3 percent. The industrial water consumption was about 7,400 billion m³ in 1999, out of which about 6,000 billion m³ was used as cooling water, mainly in electricity and heat production.

Since the beginning of the 1990s, the total water abstraction for domestic use has been quite constant even though the number of inhabitants served by water undertakings has continued to increase. The peak of specific water consumption (335 l/c/d) was observed in 1972. In 2001, the specific water consumption was 240 l/c/d. Over the last fifteen years, the general water consumption, including leakages, has accounted for 15 percent of the total consumption.

Transboundary water resources management

Finland has agreements with Sweden, Norway and Russia to ensure proper management of transboundary waters. Mechanisms for handling the issues related to the use and protection of border waters are considered important. The cooperation concerning the regulation of Lake Inari and the river Paatsjoki was initiated with the Soviet Union 40 years ago. Nowadays cooperation continues with Russia, with Norway as the third partner. Discharges from Lake Saimaa through the river Vuoksi have been discussed and compensations negotiated in the Finnish Russian Border Waters Commission since 1964.

The agreement with Sweden concerning the border river Tornionjoki is very detailed having 103 articles divided into 10 sections. The bilateral Finnish Norwegian Commission in the Tenjoki river area functions as a discussion forum and both countries are obliged to keep the Commission informed about activities and permit applications within its area (Ministry of the Environment 1999a).

Water pollution

Agricultural activities are presently the highest single source

of nutrients to surface waters. The primary problem caused by these discharges is eutrophication of surface waters. Groundwater pollution caused by nitrate leaching from fields is a local problem. Fish farming is the third largest point source of nutrients after forest industry and communities.

The pulp and paper industry is clearly the most prevalent water polluting industrial sector in Finland. Looking at the change of the total discharges from the industry (Figure 2), it can be noted that the development has been remarkable – since 1970 the production has more than doubled, while the total loadings to receiving waters have reduced to less than one twentieth. Thus the load per one ton produced has reduced to just two per cent compared with that in 1970.

Integrated water resources planning

Integrated water resources management plans covering the whole of Finland were drafted as long ago as the 1970s and the early 1980s. The aim of these plans was to create medium-term and long-term guidelines for regional water management, and to provide a knowledge base for decision-making by different interest groups. Regional water resources development plans were drafted by regional water and environment centres in cooperation with other stakeholders in the late 1980s and early 1990s. Many regional water protection plans have additionally been drawn up to improve water quality and usability.

The EU Water Framework Directive provides a useful instrument for integrated water resources management in river basins. Water resources protection in Finland is based on long-term goals and proactive strategies. Three national water protection programs have been issued since the early 1970s. Furthermore, Finnish municipalities must nowadays prepare development plans for water services (Ministry of the Environment 2005).

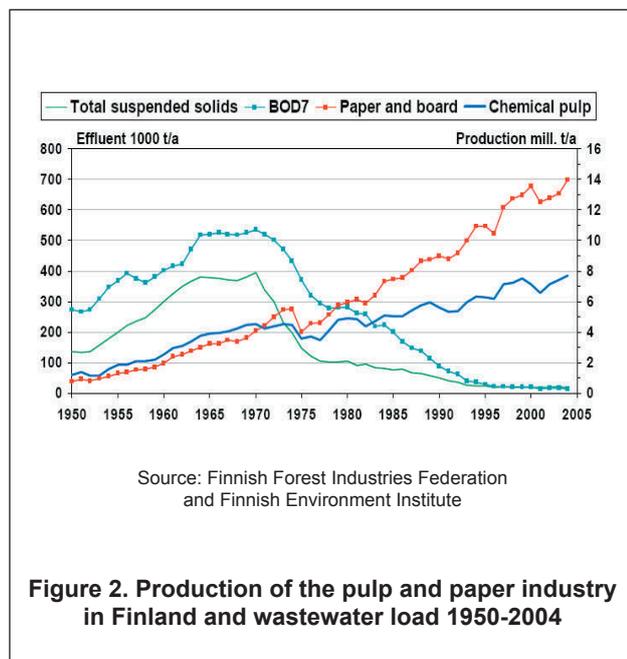


Figure 2. Production of the pulp and paper industry in Finland and wastewater load 1950-2004

Water and sewerage services

The first urban and rural water supply systems in Finland started their operation in the 1870s. Due to long distances in sparsely populated areas and the abundance of water, the percentage of public water services coverage is rather low compared to many other European countries. In 2001, about 90 percent (4.6 million people) of the population were connected to the public water distribution network. The others receive their drinking water mainly from private wells. Municipal water undertakings supply over 90 percent of the total amount of water, and about 60 percent of the water distributed is groundwater or artificial groundwater and the rest is surface water. (Finnish Environment Institute 2002a and b; FIWA 2002).

Public sewerage undertakings served about 4.2 million people in 2001, which accounted for 81 percent of the total population. Practically all wastewaters receive at least secondary treatment. The average removal rates of BOD7 and phosphorus are about 94%. At present, a septic tank alone does not meet the requirements set for the wastewater treatment in rural areas, but more advanced methods such as soil absorption systems, package wastewater treatment plants and holding tanks are becoming common. (Finnish Environment Institute 2002a and b; FIWA 2002).

The owner of a water and sewerage undertaking can choose freely how the ownership and the management of the operations will be organized, i.e. basically, the owners as well as the operators can be municipalities/municipal organizations, private associations, public utility companies, and privately or publicly or jointly owned joint stock companies. In practice, Finnish water and sewerage undertakings can be classified into three main categories based on their organizational and functional model:

1. Small private water associations (partnerships, water cooperatives) serving countryside communities and sparsely populated areas within municipalities.
2. Municipal undertakings (utility companies, joint stock companies) serving urban and rural centres.
3. Supramunicipal (intermunicipal and regional) undertakings (associations of municipalities, joint stock companies).

In 2001, the total number of the two first categories including those serving more than ten people was slightly over 2,000. There were about 1,400 associations and the number has increased in dispersed rural areas during recent years. The number of municipal water undertakings was about 500, slightly over the total number of municipalities (446 in the year 2001). In 1993, there were about 20 supramunicipal water or sewerage systems, and their number had increased to 30 by 2001. The small water associations, mainly cooperatives, usually provide water supply services, whereas sewerage services are provided by municipal undertakings. (Muukkonen et al., 2003)

Finland has long and extensive experience in public-private cooperation in the water supply and sewerage sector.

Outsourcing of services – especially non-core services – of public water undertakings in Finland is very extensive. Outsourced services can form as much as 60-80 percent of the undertaking's turnover (cash flow) in many public undertakings. Outsourcing is based on the competitive bidding. Nearly 100 percent of the expenditure with regard to capital investment projects is going to the private companies based on competitive bidding.

The new Water Services Act of 2001 allows municipalities to delegate water service production also to private operators. Yet, these are still scarce in the Finnish water market.

Legal framework of the water and sewerage services

Finnish regulations and laws related to water and sewerage services can be categorized into four main groups: water services legislation, health protection legislation, water and environmental protection legislation, and other related legislation. Table 1 summarizes the current national and European Union legislation (modified and updated from Vehmaskoski et al. 2002 by Pietilä et al. 2006).

The Water Services Act contains provisions on the development of the water services as well as the organization of water services and rates. A key principle of the Act is that the water and wastewater user charges would cover all the investments and operating costs of an undertaking. Yet, the subsidies for water services from the municipality, the State and the EU are still possible. The Act also stipulates that the charges may include "a reasonable rate of return." The properties located within the operating area of a water and sewerage undertakings should, as a rule, be connected to its networks. This guarantees the economic viability of the water and sewerage undertaking.

The municipality has to draft the water services development plans in cooperation with the water and sewerage undertakings within its territory, and with the neighbouring municipalities. The municipality has also to participate in the regional water services planning (Ministry of Agriculture and Forestry 2001 and 2002). Furthermore, the municipalities are responsible for organizing the water and sewerage services in their jurisdiction when these are required for health reasons or for environmental protection or for a relatively large number of inhabitants. The municipal council makes decisions concerning the general bases for charges for municipal and other services (Association of Finnish Local and Regional Authorities 2004; Finlex 2006).

The municipality approves the water services area of a water and sewerage undertaking (WSU). If the services area is extended to two or several municipalities, each municipality approves the respective water services area. Within the approved water services area, the WSU is responsible for the collection and conveyance of storm water and drainage water from the foundations of buildings.

The Water Act stipulates i.a. the conditions for the termination of a connection contract and the discontinuation of

water services. Municipalities also issue the environmental permits which are not under the jurisdiction of the Regional Environment Centre or the Environmental Permit Authority; monitor the state of the environment and control activities affecting the environment.

The Water Act aims to control the strict altering and damming of water bodies. Any activities likely to damage water bodies are subject to permit. Applications for permits are processed individually and permits are granted on terms laid down separately case by case. The Water Act is currently being amended (Ministry of Justice 2000).

The Health Protection Act (Finlex 2006) includes provisions on the quality of domestic water and its monitoring as well as several provisions on water and sewerage undertakings. In 2000, a new Act on the quality standards and inspection of domestic (drinking) water was brought into force by the Ministry of Social Affairs and Health, based on EU directive 98/83/EU.

Table 1. Key legislation governing water services in Finland

Field of application	Law / Act
Water Services	Water Services Act
	Act and Decree on Assistance for the Community Water Supply Measures
	EU Urban Wastewater Treatment Directive
Health Protection	Health Protection Act
	Decree of the Ministry of Social Affairs and Health Relating to the Quality and Monitoring of Water Intended for Human Consumption
	EU Drinking Water Directive
Water and Environment Protection and Land Use	Water Act
	Government Decree on Treating Domestic Wastewater in Areas outside Sewer Networks
	Environmental Protection Act
	Environmental Protection Decree
	Act on Environmental Permit Authorities
	Land Use and Building Act
	Act on Environmental Impact Assessment
	Decree on Environmental Impact Assessment
	EU Water Framework Directive
	EU Directive on Integrated Pollution Prevention and Control (IPPC)
EU Urban Wastewater Treatment Directive	
Others	Local Government Act
	Consumer Protection Act
	Competition Restriction Act
	Public Procurement Act
	EU Directives on public procurement
	Cooperatives Act

Administrative structure

The Finnish authorities that have responsibilities in the water supply and sewerage services (water services) sector can be classified as central, regional and local authorities. Figure 3 illustrates the current administrative framework in Finland.

Water resources management at the central (state) level is the responsibility of the Ministry of Agriculture and Forestry (MAF) and the Ministry of the Environment (MOE). These ministries are in charge of water and environmental policy and strategy development, and legislation. Under these ministries the Finnish Environment Institute (FEI) operates as a national advisory body.

Other national level key authorities are the Ministry of Social Affairs and Health (MOSAH) and the Ministry of Trade and Industry (MTI). MOSAH gives the guidelines for drinking water quality, and MTI through the Finnish

Competition Authority currently regulates the economic activities and competition in the water and sewerage services sector.

At the regional level, water and sewerage undertakings are regulated and monitored by the Regional Environment Centres (13), which also are responsible for regional planning, monitoring and guidance in water issues within their area. The Regional Environment Centres also oversee the implementation of the national policy and strategy in water services sector. The responsibilities of the REC cover water and sewerage services, flood prevention, drainage and irrigation, restoration of watercourses used for timber-floating, multipurpose regulation of river systems, environmental permits of regional significance, permit holders' obligations, maintenance of hydraulic structures, dam safety, combating sudden flood and ice jams, ditching procedures, investment activities for integrated water resources management and other water resources management issues (Ministry of Agriculture and Forestry 2003).

At the local level, the municipalities (431 as of January 1, 2006) are responsible for the provision, i.e. overall development and organizing of water and sewerage services in their jurisdiction in accordance with the Water Services Act. The water and sewerage undertakings are responsible for construction, and operations and maintenance of the water services infrastructure.

The water and sewerage undertakings are monitored and controlled by the municipal health protection and environment protection authorities, and by the regional environment centre (Vehmaskoski et al., 2002).

The State Provincial Office (6) is the state's general administrative authority. It also monitors and evaluates how well municipalities perform their duties also in the execution of the environmental health affairs. In addition, they supervise, inspect and grant certain permits (State Provincial Offices of Finland 2003).

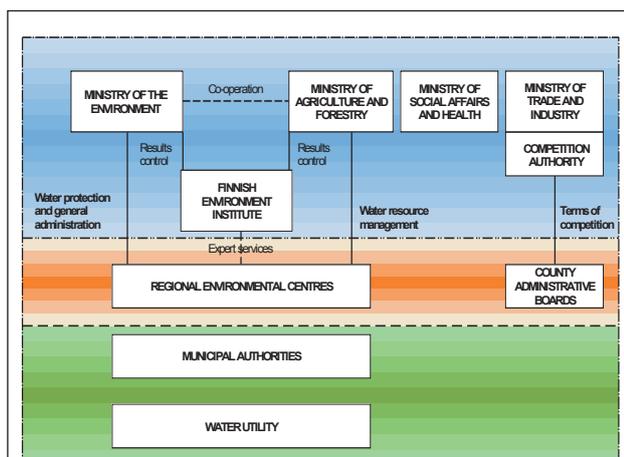
The Finnish Regional Council (19) functions as a federation of municipalities in regional development policy and land use planning. A statutory duty of the federation of municipalities is to supervise preparation, updating and development of the regional land use plan which guides municipal and other land use planning. (Regional Councils in Finland 2003).

The duty of the Employment and Economic Development Centre (15) is to influence and participate in regional development in general. The rural development program also considers water supply and sewerage matters. Furthermore, the Centre advises on issues concerning water rights, appropriations for fisheries, regional planning and the management of watercourses (Employment and Economic Development Centre 2004).

The Finnish Competition Authority (FCA) operates under the Ministry of Trade and Industry. Its objective is to protect sound and effective economic competition and to increase economic efficiency by promoting competition and abolishing competition restraints (Finnish Competition Authority 2004).

The Consumer Agency and Consumer Ombudsman function in the administrative sector of the Ministry of Trade and Industry. The Director General of the Consumer Agency serves as the Consumer Ombudsman. She/he monitors compliance with legislation concerning the protection of consumers' rights. The Consumer Ombudsman controls the compliance with the law of the general supply conditions for water services in respect of consumer protection (Consumer Agency and Consumer Ombudsman 2004).

The Environmental Permit Authority (3) is an independent authority that decides on environmental permits for activities having major environmental impacts, taking place under the Water Act and the Environmental Protection Act or having been initiated or promoted by a regional environment centre. The environmental permit authorities will also deal with most water pollution compensation claims. They also hold the power of decision over environmental permits for key enterprises (Ministry of Agriculture and Forestry 2003).



Source: Modified from Vehmaskoski et al. 2002

Figure 3. The central, regional and local level water administration in Finland

The jurisdiction of the Vaasa Administrative Court also covers the appeals concerning the decisions of the Environmental Permit Authorities, the Regional Environment Centres, and the municipal environmental protection authorities, which are in accordance with the Water Act and with the Environmental Protection Act. The jurisdiction is nationwide, but excludes the Province of Åland (Vaasa Administrative Court 2004).

The Supreme Administrative Court is the highest court of appeal in all environmental cases to which decisions of lower courts and certain administrative authorities can be appealed. Besides taxation, other large groups of issues are building and planning, the environment and water, transportation and roadways, municipal law and social welfare law. (Supreme Administrative Court 2004).

The other key actors in the water services policy making are the Finnish Water and Waste Water Works Association (FIWA) and the Association of Finnish Local and Regional Authorities (AFLRA). The main duties of FIWA are i.a. to promote the common interests of its members, and to prepare technical and administrative guidelines for its members' use. (FIWA 2003). The Association of Finnish Local and Regional Authorities consists of all urban and rural municipalities (431) and the regional councils (19) in Finland. The Association's goal is to create preconditions for basic municipal services, functioning democracy and a good living environment for the inhabitants. (Association of Finnish Local and Regional Authorities 2004).

Other relevant actors are i.a. universities, polytechnics, VTT Technical Research Centre of Finland, the Academy of Finland, the Finnish Funding Agency for Technology and Innovation, the National Emergency Supply Agency, the National Public Health Institute, and the Regional Rescue Departments.

Policy and strategy framework

The Water Resources Management Strategy (WRMS) aims at implementing the 1997 Strategy for the Sustainable Use of Renewable Natural Resources in Finland. The WRMS was approved in 1999, and it guides the management of water resources in the administrative sector of the Ministry of Agriculture and Forestry. The WRMS covers the water services of the municipalities and the use and management of water courses (Ministry of Agriculture and Forestry 2000). The WRMS stipulates the key actions, the vision and objectives to be reached by the year 2010. The overall objective of the WRMS is that the use of water resources is socially, economically and ecologically sustainable. The WRMS was updated in 2005 (Ministry of Agriculture and Forestry 2005).

Finland's third program of targets for water protection (Council of State 19.3.1998) set out the relevant guidelines for planners, policy-makers and those monitoring water protection schemes up to 2005. The program stipulated that the Ministry of the Environment together with the representatives of various sectors must prepare a program of action, incorporating the details of jointly agreed measures

and action to be taken on water protection in general and on specific pollutants, in order to meet the targets set (Ministry of the Environment 1999b).

Discussion

The overall societal and economic development has contributed to the evolution of water resources and services governance and management in Finland since the late 1800s. The present state of water governance in Finland meets the Guiding Principle No. 2 of the Dublin Statement on Water and Sustainable Development (1992), which stipulates that decisions should be made at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects. Finnish water governance is also built on the principle of subsidiarity, which states that matters ought to be handled by the lowest competent authority, and that a central authority should have a subsidiary function, performing only those tasks which cannot be performed effectively at a more immediate or local level. This also is presently a fundamental principle of European Union law.

The Finnish national level policies and legislation related to water services are aimed at safeguarding the well-functioning water and sewerage undertakings, and at improving the institutional framework and preconditions for their operations. The water services are considered commodities beneficial to the public or common interest, and therefore their availability must be guaranteed in all circumstances by legislation. The goal is that the water services availability and quality, or the reasonability and equitability of customer charges would not depend on the ownership and management model of the water and sewerage undertakings.

The formulation of the Finnish national policies and legislation are based on the EU policy and strategy and the aforesaid goal. Therefore, they form a so-called "enabling institutional framework". Also all ownership and organizational business models for the management of the water and sewerage undertakings are considered equal. The legislation defines the responsibilities of the municipalities, water and sewerage undertakings, regulatory (control) authorities and the property owners and occupants, but does not stipulate the ownership or organizational model of the water and sewerage undertakings. The water and sewerage undertakings and utilities are not public authorities, but (public) service producers, whose operations and charges have to be based on the Water Services Act and other relevant legislation.

In Finland, customer orientation has been a basic tenet of the public management reform throughout the 1980s and 1990s. This line has been followed in many projects designed to improve service capacity and the services themselves (OECD 2001a). Each resident of a municipality has the right to take the initiative in municipal affairs. The Local Government Act obliges the municipal councils to make sure that the municipal inhabitants have real participation and influence possibilities in the managing of a municipality's affairs (OECD 2001b).

Water charges in Finland are in general reasonable, and form only a small portion of the overall living costs. No actual “social tariffs” are used in Finland in the sense of progressive or increasing-block rates for domestic use. Basically, all domestic and industrial customers of a certain undertaking pay an equal volumetric charge per m³ of water used, independent of the quantity. Block rates for commercial and industrial customers are rarely used.

In general, technical and environmental regulation is currently adequate, but economic regulation may need strengthening due to the apparent unwillingness of the Competition Authority to act fully in accordance with the regulations. Currently, the Authority manages price regulation on the basis of customer complaints. Yet, if public-private partnerships will increase or private operators start getting considerably more operational management contracts, and the capacity and competencies of Competition Authority would be found inadequate, there might be a need to establish a specific regulatory agency for water services, similar to the one in the energy sector.

In the past, more economic regulation would have been required in water services to make the rate of return on capital of the largest water undertakings more reasonable. The new water services legislation in its part will address this issue.

Public water undertakings in Finland do not have major problems with obtaining financing. Income financing is stable and undertakings can get loans with reasonable terms. The cost of investment financing is determined by the nature of operations, not whether the borrower is the municipality or the water undertaking, which could get the loan directly. In practice, municipalities can get loans on slightly better terms and lower interest rates than private enterprises.

Yet, the Finnish municipalities are constantly looking for alternatives in order to safeguard viable water services for the citizens in the future. Currently, many municipalities are comparing and considering different forms of cooperation between the water services undertakings, and even greater involvement of private sector in operational management.

Concluding remarks

The economic and societal development in Finland supports sustainable water governance and provision of services, and vice versa. Finland has a decentralized control, supervision and regulatory system for water resources and services management. Legislation sets service requirements for, among others, drinking water quality, wastewater effluent quality and pricing. Compliance with legislation is monitored and regulated by various authorities (health, environmental protection, environmental and water permit, consumer protection, competition) at appropriate levels. The roles and responsibilities of these authorities are stipulated in the legislation.

The system of autonomous and incorporated municipal water services utilities has worked well in Finland. Outsourcing of various non-core services to the private sector based

on competitive bidding supports the concept of a functioning market economy. Finland’s promising experiences from various business models for supramunicipal co-operation between the water utilities could also be explored more with a view to their applicability elsewhere.

The Finnish experiences show that the quest for meeting the future water challenges requires effective governance based on the continuous development of appropriate policies and strategies, legal framework, enforcement, capable organizations at all levels, and trained professionals even in the post-modern information society. Water governance in Finland provides a useful example for those confronted with the task of restructuring the water sector in developing countries.

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