



Pekka E. Pietilä<sup>a</sup>, Tapio S. Katko<sup>a,b</sup>, Osmo T. Seppälä<sup>b</sup>

## UNIQUENESS OF WATER SERVICES

<sup>a</sup>Tampere University of Technology, Tampere, Finland

<sup>b</sup> Finnish Water and Waste Water Works Association

Correspondence address: Pekka E. Pietilä  
Tampere University of Technology  
PO Box 541, FI-33101 Tampere, FINLAND  
Tel. +358-40-198 1104  
Mob. +358-40-8323 112  
Fax +358-3-3115 2869  
Email: pekka.e.pietila@tut.fi

## **UNIQUENESS OF WATER SERVICES**

### **ABSTRACT**

Water services, both community water supply and sanitation, present several special characteristics compared to other commodities. This paper first discusses water as a basic need and a human right, an economic good, a public good, a non-substitutable good and a local resource. Then it presents a three-phase PESTEL (political, economic, socio-cultural, technical, environmental/ecological, and legal) analysis of Finnish water services by a group of experts. Water is an economic as well as a public good with a mixture of other features that vary by time and place.

### **VESIHUOLTOPALVELUIDEN ERITYISPIIRTEET**

### **TIIVISTELMÄ**

Yhdyskuntien vesihuoltopalveluilla vedenhankinnan ja jätevesihuollon kattavana on useita erityispiirteitä muihin palveluiden verrattuna. Tämä artikkeli arvioi ensiksi vettä perustarpeena ja ihmisoikeutena sekä julkisena ja ei-korvattana hyödykkeenä ja paikallisena resurssina. Sen jälkeen esitellään kolmivaiheinen PESTEL (poliittiset, ekonomiset, sosiaalis-kulttuurilliset, teknilliset, ekologiset ja lainsäädännölliset ulottuvuudet) analyysi, joka perustuu suomalaisten asiantuntijoiden arvioihin. Vesi on taloudellinen sekä julkinen hyödyke ja sillä on myös lukuisia muita piirteitä, jotka vaihtelevat ajan ja paikan suhteen.

## Introduction

The ultimate purpose of water services, including sanitation, has been debated over the last few years. On the one hand, water is a basic necessity for sustaining life and should thus be treated as a public resource or common good to ensure that everyone has access at least to a basic supply. On the other hand, a large part of mankind still lacks safe water and proper sanitation, and arguments have also been raised that water should be treated as a private commodity allowing the markets to find ways to fill the service gaps.

A frequently presented clearly false related argument is that water and sanitation services and infrastructure are similar to other infrastructure systems – such as electricity, energy, transport and telecommunications – and can thus be restructured along the same lines. Water supply and sanitation have special features which must be considered in all development and reform work. These features will be explored in this paper.

## Objectives and methods

This paper aims at highlighting the many dimensions of water and sanitation services – water services in brief – and analysing their major characteristics and dimensions. It is argued that during the last couple of decades the discussion has too often been dominated by the economic aspects emphasised by the neoclassical school of thought rather than by what institutional economics considers of vital importance. We do not wish to undermine the importance of sound financing as a basis of sustainable water services. Yet, one should not forget the numerous special characteristics of water and water services.

The first part of the paper is devoted to a literature review and the authors' findings from domestic and international water sector assignments over some 30 years. It summarises the critical factors for viable water services.

Based on that general overview, the various factors related to water services were classified under the PESTEL framework: political, economic, socio-cultural, technical, environmental/ecological, and legal dimensions. The latter part of the paper shows how a selected group of Finnish water services professionals assessed the importance of selected factors in the Finnish setting.

## Key characteristics of water services

### ***Water as a basic need and a human right***

Undoubtedly, there is no life without water, and all human activity depends on it. According to WHO [1], everyone is entitled to sufficient water for drinking, sanitation, cooking and personal hygiene. Yet, a large proportion of the world's population are not provided even that basic necessity. Over 1.1 billion people lack safe drinking water and some 2.5 billion are without basic sanitation [2]. Water scarcity – both qualitative and quantitative – is emerging as a major development challenge for many countries. The situation has ignited a number of social and political conflicts worldwide. [3, 4]

The concept of water as a human right emerged as a result of the undisputed fact that we humans cannot survive without water. In November 2002, the United Nations Committee on Economic, Social and Cultural Rights adopted a General Comment on the Right to Water [5] and provided an authoritative, but not legally binding, interpretation of the right to water under the International Covenant on Economic, Social and Cultural Rights. By 2005 the Covenant had already been ratified by 151 countries [6]. However, the Committee did not state that water should be free, but that it should be affordable. Later the OHCHR joined the discussion on equitable access to safe drinking water and sanitation [7]. Langford [8] presented a comprehensive summary of the development and the real meaning of the United Nation's concept of the right to water.

Perhaps the most common interpretation of the right to water is that people should have access to water services, not that they should be provided services free of charge, which is unrealistic. The experiences from the free water policies of many developing economies, especially in Africa, after their independence in the 1960s and '70s as well as the almost free water in the former Soviet Union clearly prove the correctness of that view. The Independent Expert on the issue of human rights obligations related to access to safe drinking water and sanitation, Ms. Catarina de Albuquerque, had this to say on the issue: *"Unfortunately, but unsurprisingly, those who suffer the most from lack of access to water and sanitation, are the poorest, the most marginalized and the most vulnerable"*. [9]

## ***Water as an economic good<sup>1</sup> [10]***

Water is used by a wide variety of users for various purposes, and the demand for water also varies. In the international context, the idea of water being an economic good was strongly promoted by the Dublin Principles [11] preceding the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992. Soon thereafter the international financial bodies started to promote privatisation of water services through concessions or long-term operational contracts according to the policies of the Washington Consensus – as it was claimed to be. The goals were ambitious and experiments were carried out particularly in Latin America, but also in Africa, transition economies and even North America.

This privatisation policy, however, proved less than successful as shown by international evaluations [12] and researchers [13]. There is also historical evidence that the policy has not worked in today's developed economies in the North either [14].

The need of considering economics in a wider institutional framework, instead of following neoclassical economic thinking, has been pointed out by several Nobel Laureates in Economics during the last two decades. They have emphasised that institutions do matter (Ostrom in 2009), and that neoclassical economics cannot adequately explain development (e.g. Krugman in 2008, Stiglitz in 2002, North in 1990). Using the soccer analogy, D.C. North [15] defined institutions as the “rules of the game” while organisations are the “players”. Institutional analysis has indeed proved to be very useful in understanding the social interaction between infrastructure and natural resources, as shown, for instance, by North (2005), Ostrom (1990), Ostrom et al. (1993) and Stiglitz (2006) [16].

Mehta [17] points out that market forces do not operate in a vacuum. Instead they are influenced by social practices, cultural norms, and local institutional settings. Willingness and ability to pay varies enormously between user groups. As a general principle, we can state that everybody should pay or otherwise contribute toward water supply – not necessarily at the same time, with same amount nor the same way. Water is a basic resource of industrial production, and thus industry considers paying for water the same as paying for other raw materials or factors of production. Households need a certain volume of water for their basic needs although the volume used depends highly on the ability to pay. Unfortunately many people in developing economies are so poor that their ability to pay for water is very limited. Interestingly, South Africa introduced a “free basic services” policy in 2000.

---

<sup>1</sup> In this paper, the term “goods” refers to both goods and services [10].

Farmers often use large volumes of water for irrigation, which in many countries is highly subsidized, but are unwilling to pay the full cost. Water use purposes vary a lot between countries and regions. For instance, in Finland industrial use is four times higher than residential use, while very little is used for irrigation. Nature also needs water, but how can “this cost” be taken into account? There is no single formula for setting a fair price on water and therefore, according to Savenije [18], it is a highly political question that requires formulating proper policies.

The role of water as a basic need, a merit good, and a social, economic, financial, and environmental resource makes its pricing exceptionally controversial because the flow of water through a basin involves many externalities, possible market failure, and high transaction costs. Rodriguez [19] softened the debate by suggesting that the management of water as an economic good does not, however, imply the total commodification of water.

Water prices and tariffs seem to be a never-ending subject of debate. Even today, they are a hotly contested issue, for example, in Finland. Raising of the price of water is still often opposed by decision makers who often argue that the price should be lower than that of neighbouring municipalities or other utilities, instead of considering actual needs and full cost recovery as required by the 2001 Water Services Act. One possible solution could be to give more autonomy to utilities.

### ***Water as a public good***

Economic textbooks define public goods as goods that are non-rival and non-excludable [20]. Also by definition, once a public good has been produced, everyone can benefit from it without diminishing others' enjoyment. It can be argued that water does not fully satisfy that criterion, but, on the other hand, water supply and sanitation are nevertheless considered public goods by most people, the provision of which they feel the state has to ensure [21]. Kaul & Mendoza [20], for their part, believe that the definition of a good as public or private should not be based just on technical grounds, but that political and policy aspects should also be considered, and that the definition may change in time. Hutton & Haller [22], again, analysed the value of the future benefits of water and sanitation improvements. They concluded that water and sanitation improvements were cost-beneficial in all regions of the world, and that in the developing regions an investment of \$1 would provide a net economic benefit of a minimum of \$5, often even more.

### ***Water as a non-substitutable good***

Water is a very unique good in the sense that it cannot be substituted. Food is a must, but if we run out of one type of food, we can normally replace it by another. There are also alternative energy sources for cooking and heating, even though the choices may be very limited. We can satisfy our daily drinking water need to some extent with juices, but we cannot wash our clothes or take a shower in it.

### ***Water as a local resource***

In principle, water can be transported even to other continents. Yet, the volumes of water required by communities are so huge that trade across long distances is unprofitable. Therefore, water is clearly a local resource to be drawn, treated and distributed locally. It is different from electricity that can be transmitted over long distances with reasonable losses at high voltage.

Wastewater must also to a large extent be treated and disposed of locally. Transporting of wastewaters over long distances is not economically feasible and can lead to additional quality problems. There has been gradual development towards more centralised wastewater treatment in Finland, for instance in the Helsinki Metropolitan Area. In the 1970s the City of Helsinki, with a population of about half a million, had 11 wastewater treatment plants. Since 1994 all the wastewaters of the city have been treated in a single treatment plant which also purifies the wastewaters from five neighbouring municipalities serving a total population of some 750 000 people.

The longest transfer sewers to treatment plants are about 50 kilometres long. Anything longer than that would not be suitable in Finnish conditions [23]. Technocrats and economic experts may argue that the bigger the system, the better technology can be used, but there are also increasing concerns about the extent to which the systems should be expanded considering the political, social, environmental, and overall vulnerability limitations [24].

## **PESTEL analysis of water and wastewater services**

The PESTE framework has been widely used in analysing, for instance, business environments and process clusters. The acronym refers to Political, Economic, Socio-cultural, Technical and Environmental/ecological dimensions. PESTE has been used in futures studies to provide a framework for thinking about development in a wider context. This research used a modified version of PESTE, which also includes the legal dimension (PESTEL). Inclusion of the legal dimension in the analysis of water and wastewater services is well justified as shown by the



studies on long-term strategic decisions or episodes on water services in Finland [25] and Sweden [26].

This study was conducted in three phases. In the first phase, we requested about thirty Finnish water and environment sector professionals to list the factors that they consider most relevant as regards water and wastewater services. Based on their answers we compiled a summary of the services' "ontology"<sup>2</sup> indicating the key factors and decisions as shown in Figure 1 (see Annex). Each of the PESTEL dimensions includes basic factors which we human beings cannot control such as natural and climatic conditions, as well as decisions that we make and factors that we can control like tariffs, ownership, land use and legislation. The importance of the various factors and decisions of each dimension depends on a wide range of circumstances which may be, for instance, geographical, climatic, financial, cultural, or religious.

In the second phase, we compiled a set of key factors related to water and wastewater services, based on the previous expert group's replies, discussions and feedback during and after the 4<sup>th</sup> IWA World Congress in Marrakesh in 2004 [27] as well as consultations with a few other sector professionals. This way we were able to identify a total of 86 factors classified under the PESTEL framework.

In the third phase, altogether 16 Finnish water and environment sector professionals assessed the importance of each of the 86 factors on a 1 to 3 scale (1 = not important; 3 = very important). Figure 2 (see Annex) shows the average grade received by each factor grouped by PESTEL dimensions. The 16 experts consisted of a variety of professionals including utility managers, municipal council members, consultants, water researchers, water and environmental historians, and futures researchers. Since many factors are strictly country-specific, we requested the group to rate the factors regarding Finnish conditions. Therefore, some of the findings are not necessarily applicable to other countries. Some of these major findings on the six PESTEL dimensions are discussed below (see Annex).

### ***Political dimension***

The most important factors as concerns the political or policy [28] dimension were the long-term solutions or path dependencies typically influencing many decisions on water services as well as

---

<sup>2</sup> Ontology: in philosophy it refers to the subject of existence; here used to describe special features



local authority decisions on issues such as tariffs, and service area. This is an interesting finding considering that the responsibility for water services lies clearly with municipalities in Finland and that political decision makers at the municipal level are often blamed for seeking only short-term political gains and too little long-term thinking. National level decision making such as legislation and standards were also considered important.

### ***Economic dimension***

No economic factors proved relatively as important as the political factors, while the long-term nature of many decisions was considered quite important also in the economic context. The relatively low valuation of economic factors can also be explained by the fairly stable financial state of water services in Finland. There is a long tradition of people paying for water services, and, on average, tariffs do cover costs including investments. Many smaller systems, however, do not cover all their costs with tariffs. More recently the bigger utilities' interpretation of the size of the allowed fair rate of return mentioned in the Water Services Act has been debated. The rate of return they earn for their owners, the cities, can be considered unfairly high while municipal decision makers are complaining that they have insufficient funds for repairs and rehabilitation. [29]

### ***Socio-cultural dimension***

The factor unanimously considered very important by the group was that water is a basic need – that view is probably held across the world. Otherwise, the factors under socio-cultural dimensions were not regarded all that important in the Finnish conditions. The relatively low valuation can be explained by the fact that the coverage of water services in Finland is practically 100 per cent, the level of the services is good, and affordability is normally not a problem. Thanks to the high coverage, the respondents did not find rural areas to be in an unequal situation compared with urban areas. Interestingly, Finland's good water quality was not seen as an important factor in enhancing the competitiveness or image of Finland and Finnish products. It is also doubtful whether the sector professionals with mainly engineering backgrounds have adequately realised the social and cultural challenges. Such challenges have risen, for example, in connection with several large scale water supply projects or when choosing the location of large and centralised wastewater treatment plants.

### ***Technical dimension***

The most valued technical factors were water quality control, followed by the requirements for drinking water and wastewater treatment, and the reliability of the hygienic quality of the systems in preventing epidemics caused by failures. These factors are interconnected. They most likely

received high scores partly due to a couple of recent cases of localised pollution of drinking water due to severe flooding. These rare cases were widely publicised because the availability of good quality drinking water 24 hours a day is taken for granted in Finland and anything less is unacceptable. Preventive planning and the importance of long-term decisions and path dependency were also regarded as rather important.

### ***Environmental/ecological dimension***

In the environmental/ecological sphere the most important factor was sustainability, followed by environmentally effective and safe practices and, once again, decisions of long-term nature. Finland is blessed with plentiful good quality water resources and therefore, understandably, conflicting interests or competing water use purposes were not viewed as a major constraint.

### ***Legal dimension***

Of the legal factors, national legislation and recommendations, and the nature of water as a monopoly service vs. a freely marketable commodity, were regarded as most important. The ownership of water services was also seen as rather important – the general opinion in Finland being that water services should remain in municipal ownership. Thanks to the abundance of water, no reason was seen to prioritise water use purposes by stronger legislation or pricing. The EU's river basin management principle was not regarded as important and, surprisingly, neither were the WHO's recommendations for drinking water quality. Yet, the lower importance placed on WHO's recommendations probably indicates consumers' confidence in national legislation and recommendations.

## **Discussion and policy implications**

Many decisions related to water services have long-term, if not irreversible, consequences. The importance of that came out clearly in the analysis of the political, economic, technical and environmental and legislative factors. Accordingly, what is decided today will affect us still after fifty or even one hundred years. Water services are exceptionally capital intensive – often up to 80 per cent of the assets of water and sewerage systems lie invisible underground in networks which may provide service for one hundred years [30]. By rebuilding and rerouting the existing networks, it is possible to expand their technical life time even further. Thus, we are bound to use structures and networks largely laid by earlier generations.

The selection of a water source may also affect several generations. Since 1982, the Helsinki Metropolitan Area has drawn good quality raw water from Lake Päijänne via a 120-kilometre rock tunnel [31]. Before that its water source was a river flowing through the metropolitan area.

The long-term perspective of decisions should be carefully taken into account in economic analysis. The discount rate makes any future benefits or costs beyond, say, 20 years into the future worthless and thus irrelevant [32]. But, on the other hand, 20 years is far too short a period for assessing environmental effects. There are examples from Finland where it has taken generations for lake water quality to improve significantly after the discharge of wastewater has completely ceased. Thus, mere relying on economic and, particularly neoclassical, calculations may result in formidable challenges in the future. We may need to formulate a new theory for systems with an exceptionally long life-span. In any case, a much broader approach that takes into account various PESTEL dimensions should be the basis for decision making.

Finnish local authorities have traditionally made the important decisions concerning water services. Current legislation also stipulates that local authorities are responsible for the provision of water services. The financial burden of local authorities has increased in recent years as they have been assigned more responsibilities related to the social and welfare services of municipal residents, without corresponding support from the state budget. Therefore, municipal water undertakings are now increasingly used as 'money makers' whose profits go to subsidise other municipal services. There are already signs of such short-sighted financial thinking compromising the long-term needs of water infrastructure management, maintenance and rehabilitation. Bearing in mind the long-term nature of water infrastructure, such short-sighted political thinking may have serious consequences for the futures. It may require introduction of stricter regulation mechanisms [29] which – on the other hand – is against the decentralised administration tradition of the country. In any case, the aging infrastructure will require resorting to all possible means and consideration of the PESTEL dimensions to enable increasing rehabilitation investments two- or three-fold to avoid the collapse of the systems in the future.

The quality of water and the level of water services are generally very high in Finland. According to many international water sector evaluations such as the "water quality index" [33], the "water poverty index" [34], and the "environmental sustainability index" [35], Finland is one of the top countries. This success can be partially explained by the high trust in and obedience to authorities, as well as the fairly small size of the country. The legislation on water quality and water services is also an important contributing factor. However, the success of the implementation of legislation

depends largely on the administrative tradition of the country, as well as on the attitudes of the public and citizens. Thus, legislation as such does not guarantee high level services.

The nature and severity of water problems and challenges differ from country to country due to several reasons: availability and quality of water resources, water pollution and its control, population density, industrial and agricultural development and practices, etc. On the world scale, agriculture is the largest user of water responsible for 69 per cent of the total withdrawal of fresh water used mainly for irrigation, while industry accounts for 23 and domestic use for some eight per cent [36]. Yet, conditions vary immensely by countries, even within Europe. In Spain agriculture's share of water use is about 70 per cent whereas in Finland it is only three per cent. On the other hand, Finland has a large pulp and paper industry, and industries as a whole account for some 85 percent of freshwater use here while its share in Spain only five per cent [31, 37]. In Finland, less than three per cent of total renewable water resources are in use which is why the large industrial consumption as such is not a big problem [38]. In the past, large pulp and paper factories used to cause significant deterioration of local water courses, but the problems were solved thanks to strict wastewater treatment requirements. In comparison, Spain's water resources are not that plentiful, and a controversial water transfer scheme pursued in the early 2000s created massive opposition and brought up to half a million people to the streets of Zaragoza, Madrid and Barcelona [39]. It also created a European-wide initiative called "European Declaration for A New Water Culture" [4].

One of the major challenges of water services in Finland, as well as in many other countries, is aging infrastructure. Other technical infrastructures of communities are also getting old which raises the question of how to guarantee adequate funding for rehabilitation and repairs to avoid disruptions and collapses of the systems [40].

## Conclusions

Water has many features and faces, and water services require a wide range of arrangements. It is universally accepted that access to water is a basic need and a necessity for all human activity. It is now also accepted that the costs of supplying water services have to be covered one way or another. The lack of safe drinking water and proper sanitation facilities are commonly agreed to be among the greatest challenges for the future, while the views on how that challenge should be tackled differ considerably.

It is clear that there is no simple answer to the problem of inadequate water services. Indeed, there is no panacea for the problem of arranging water services – the special conditions and circumstances of each country, region and location have to be taken into account. It is relatively



easy to understand and take into account differences in natural conditions, such as the availability and quality of water and seasonal variations. But it is obviously more demanding to understand and take into account social, cultural, religious, legislative as well as administrative and legal traditions and practices, which often are of vital importance to the success of any societal action. The fact that values and priorities vary a lot from country to country, and even within a single country, makes the task even more challenging.

During recent years the discussion on ownership, operational modes and financing, which are certainly vital components, has unfortunately overshadowed other important dimensions of water services. Water has been considered an economic as well as a public good, but is not exclusively one or the other – it is a mixture of the two and many other features. Furthermore, this mixture is not constant but varies by time and place, and is therefore unique.

## **Acknowledgements**

The authors wish to thank the 30 Finnish water sector experts and the members of CADWES Research Team at Tampere University of Technology for their views. The financial support from Wihuri Foundation and Academy of Finland (decision No. 135843) is gratefully acknowledged.

## REFERENCES

- [1] WHO (The World Health Organisation) 2003. The Right to Water. Health and public rights publication series, no. 3.
- [2] WSSCC (Water Supply and Sanitation Collaborative Council) 2009. Public Funding for Sanitation: The many faces of sanitation subsidies.  
[http://www.wsscc.org/fileadmin/files/pdf/publication/Public\\_Funding\\_for\\_Sanitation\\_the\\_many\\_faces\\_of\\_sanitation\\_subsidies.pdf](http://www.wsscc.org/fileadmin/files/pdf/publication/Public_Funding_for_Sanitation_the_many_faces_of_sanitation_subsidies.pdf)
- [3] Saleth R.M. & Dinar A. 2004. The Institutional Economics of Water. Northampton, MA, Edgar Elgar Publishing Inc.
- [4] European Declaration for a New Water Culture 2005. Zaragoza, Fundación Nueva Cultura del Agua. [www.unizar.es/fnca/euwater/index2.php?idioma=en](http://www.unizar.es/fnca/euwater/index2.php?idioma=en)
- [5] United Nations 2002. Right to Water. United Nations Committee on Economic, Social and Cultural Rights, General Comment No. 15, 26 November 2002, E/C.12/2002/11  
[www.unhcr.ch/html/menu2/6/gc15.doc](http://www.unhcr.ch/html/menu2/6/gc15.doc), accessed on 29 December 2005.
- [6] As of 13 December 2005. Office of the United Nations High Commissioner for Human Rights (available at: <http://www.ohchr.org/english/countries/ratification/3.htm>)
- [7] United Nations 2007. UN Human Rights Council. OHCHR study on human rights obligations related to equitable access to safe drinking water and sanitation.  
<http://www2.ohchr.org/english/issues/water/index.htm>, accessed on 5 February 2010.
- [8] Langford M. 2005. The United Nations Concept of Water as a Human Right: A New Paradigm for Old Problems? *Water Resources Development*, 21, pp. 273-282.
- [9] de Albuquerque C. 2009. Water and Sanitation: A matter of rights, even in times of emergency. World Water Day. 20 March, 2009.  
<http://www.unhcr.ch/hurricane/hurricane.nsf/view015B089A4EE495E7ADC125757F006065D0?opendocument>
- [10] In this paper goods refers to both goods and services
- [11] Dublin Statements and Principles 1992. <http://www.gwpforum.org/servlet/PSP?iNodeID=1345>
- [12] Anon 2003. Return to resources for the World Bank. *Water21*. June, pp. 13-14, 16; Annez P.C. 2006. Urban infrastructure finance from private operators: what have we learnt from recent experience? World Bank Policy Research Working Paper 4045; PPIAF 2009. Public-Private Partnerships For Urban Water Utilities: A Review Of Experiences In Developing Countries.
- [13] Castro, J. E. 2007. Poverty and citizenship: sociological perspectives on water services and public-private participation. *Geoforum*. Vol. 38, no. 5. pp. 756-771; Castro, J. E. 2008. Neoliberal water and sanitation policies as a failed development strategy: lessons from developing countries. *Progress in Development Studies*. Vol 8, no.1. pp. 63-83; Castro J.E. & Heller L. (eds.) 2009. *Water and Sanitation Services - Public Policy and Management*. Earthscan; Hall D. & Lobina E. 2009. The private sector in water in 2009. PSIRU, Business School, University of Greenwich. <http://www.psiru.org/publicationsindex.asp>; Hall D., Lobina E. & Corral V. 2010. Replacing failed private water contracts. PSIRU.  
<http://www.psiru.org/publicationsindex.asp>; Hukka J.J. & Katko T.S. 2003. Water privatisation revisited – panacea or pancake? IRC Occasional Paper Series No, 33. Delft, the Netherlands. 159 p.  
[www.irc.nl/pdf/publ/op\\_priv.pdf](http://www.irc.nl/pdf/publ/op_priv.pdf); Kjellen M. 2003. From public pipes to private hands. Department of Human Geography. Stockholm University; Vinnari E.M. & Hukka J.J. 2007. Great expectations, tiny benefits – decision-making in the privatization of Tallinn Water. *Utilities Policy* 15(2), 78-85.
- [14] Juuti P.S, Katko T.S. & Hukka J.J. 2006. Revisiting Private Water Proposals and Concessions of the 1870-80s in Finland. *Water International*. Vol. 32, no. 3. 288-294.
- [15] North D. C. 1990. *Institutions, institutional change and economic performance*. Cambridge: Cambridge University Press.
- [16] North D.C 2005. *Understanding the Process of Economic Change*. Princeton University Press; Ostrom E. 1990. *Governing the commons: the evolution of institutions for collective action*, Cambridge University Press, Cambridge; Ostrom E., Larry Schroeder L. & Wynne S. 1993. *Institutional Incentives and Sustainable Development: Infrastructure Policies In Perspective*. Oxford University; Stiglitz J. 2006. Making globalization work.
- [17] Mehta, L. (2003) Problems of Publicness and Access Rights: Perspectives from the Water Domain. In: Kaul I., Conceicao P., Le Goulven K. & Mendoza R I. (Eds.) *Providing Global Public Goods*. Oxford University Press.
- [18] Savenije H. 2001. Why water is not an ordinary economic good, or why the girl is special.



2nd WARFSW/WaterNet Symposium: Integrated Water Resources Management: Theory, Practice, Cases. Cape Town, 30-31 October 2001.

- [19] Rodriguez P. 2004. The Debate on Privatization of Water Utilities: A Commentary. *Water Resources Development*, 22, pp. 107-112.
- [20] Kaul, I. & Mendoza R. 2003. Advancing the Concept of Public Good. In: Kaul I., Conceicao P., Le Goulven K. & Mendoza R. (Eds.) *Providing Global Public Goods*. Oxford University Press.
- [21] Tipping, D., Adom, D. and Tibajuka, A. 2005. *Achieving healthy urban futures in the 21st century*. Helsinki Process Publication Series 2/2005. Helsinki, Ministry for Foreign Affairs.
- [22] Hutton G. & Haller L. 2004. *Evaluation of the Costs and Benefits of Water and Sanitation Improvements at Global Level*. WHO, Geneva.
- [23] Kurki V. 2010. Longest transfer sewers in Finland. Unpublished.
- [24] Katko T. 2005 (unpublished). Centralised or decentralised wastewater treatment? National seminar on water services development. 9.11.2005. Kuopio. 11 p. ; Hukka J.J. & Katko T.S. 2008. *Vesihuollon haavoittuvuus (Vulnerability of water services infrastructure)*. Foundation for Municipal Development. Publ. No. 58. (In Finnish)
- [25] Katko T.S, Juuti P.S. & Pietilä P.E. 2006. Key long-term decisions and principles in water services management in Finland, 1860-2003. *Boreal Environment Research*. Vol 11, no. 5. pp. 389–400.  
[www.borenv.net/BER/pdfs/ber11/ber11-389.pdf](http://www.borenv.net/BER/pdfs/ber11/ber11-389.pdf)
- [26] Juuti P., Katko T., Persson K. & Rajala R. 2009. Shared history of water supply and sanitation in Finland and Sweden, 1860-2000. *Vatten*. Vol. 65., no. 3, 165–175.
- [27] Pietilä, P., Hukka, J., Katko, T. & Seppälä, O. 2004. "Ontology" of Water Services. International Water Association. 4th World Water Congress. Marrakech, Morocco. 19-24 Sept 2004. Poster.
- [28] The Finnish language uses only one word meaning "political, policy or polity issues".
- [29] Vinnari E. 2008. *Public service or public investment? An assessment of the consequences of New Public Management in the water sector*" Tampere University of Technology. Publ. no. 726.
- [30] Vehmaskoski T., Pietilä P. & Seppälä O. 2002. *Regional operation of water and wastewater utilities (Original in Finnish: Vesihuollon alueellinen operointi)*. Helsinki, Helsinki University of Technology.
- [31] Hukka J. & Seppälä O. 2004. *National Context Report Finland*. European Commission supported research project Watertime. [www.watertime.net/docs/WP1/NCR/D10b\\_Finland.doc](http://www.watertime.net/docs/WP1/NCR/D10b_Finland.doc)
- [32] Savenije H. & van der Zaag P. 2002. Water as an Economic Good and Demand Management. *Paradigms and Pitfalls*. *Water International*, 27, pp. 98-104.
- [33] water quality index [www.unesco.org/water/wwap](http://www.unesco.org/water/wwap)
- [34] water poverty index [www.nwl.ac.uk/research/WPI/](http://www.nwl.ac.uk/research/WPI/),
- [35] environmental sustainability index [www.ciesin.columbia.edu/indicators/ESI](http://www.ciesin.columbia.edu/indicators/ESI)
- [36] World Bank 2003. *World Development Report 2003*. Washington, D.C, The World Bank.
- [37] Watertime (2004) *National Context Report Spain*. European Commission supported research project Watertime. [www.watertime.net/docs/WP1/NCR/D10k\\_Spain.doc](http://www.watertime.net/docs/WP1/NCR/D10k_Spain.doc)
- [38] FAO 2004. *Aquastat Database Results*. Food and Agriculture Organization of the United Nations.
- [39] Torrecilla, N.J. & Martinez-Gil, J. 2005. *The new culture of water in Spain: a philosophy towards a sustainable development*. *E-Water*. [www.ewaonline.de/journal/2005\\_07.pdf](http://www.ewaonline.de/journal/2005_07.pdf)
- [40] Graham S. (ed.) 2010. *Disrupted cities: When Infrastructure Fails*. Routledge, New York and London. 196 p.

### Annex

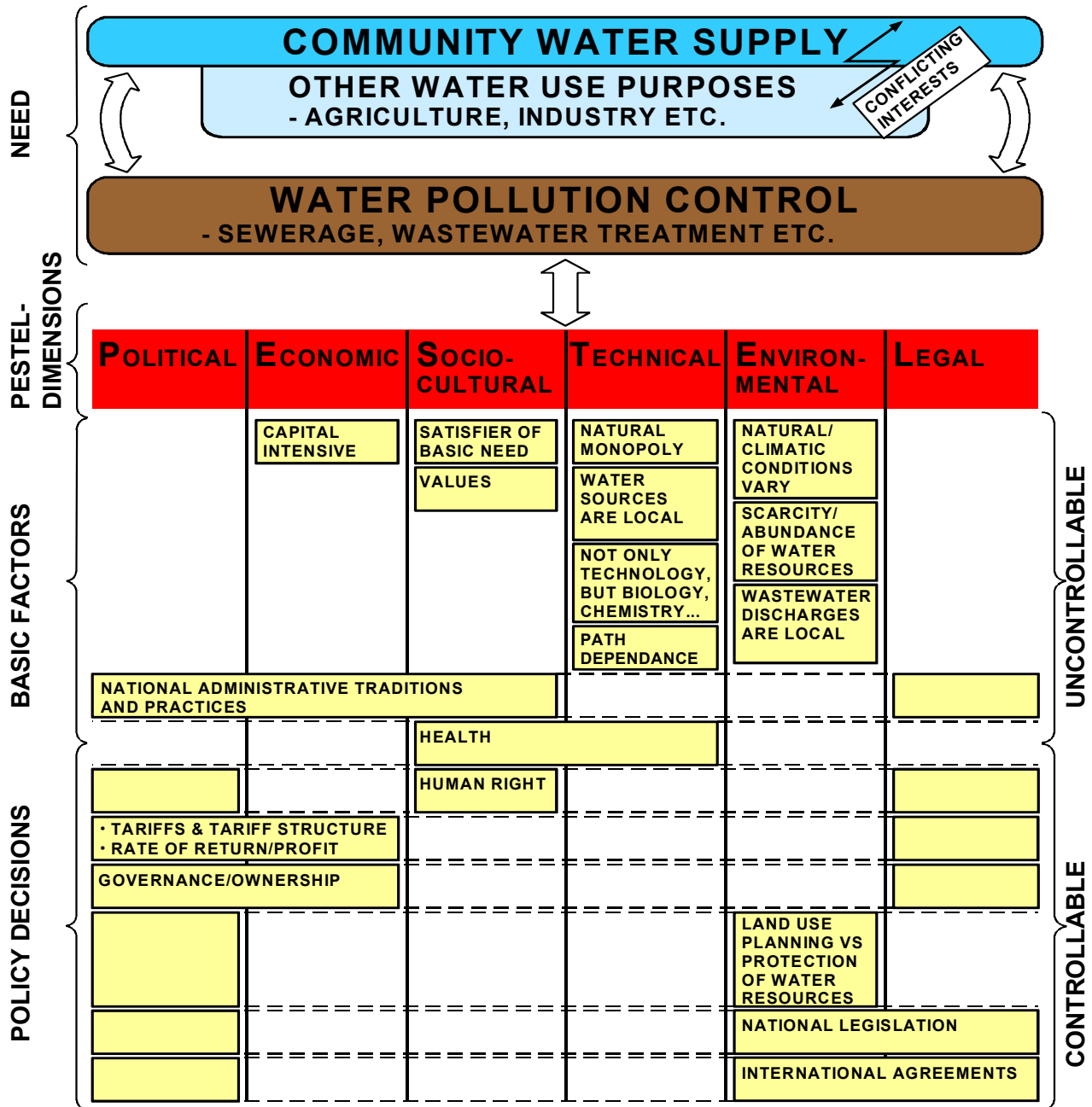


Figure 1.



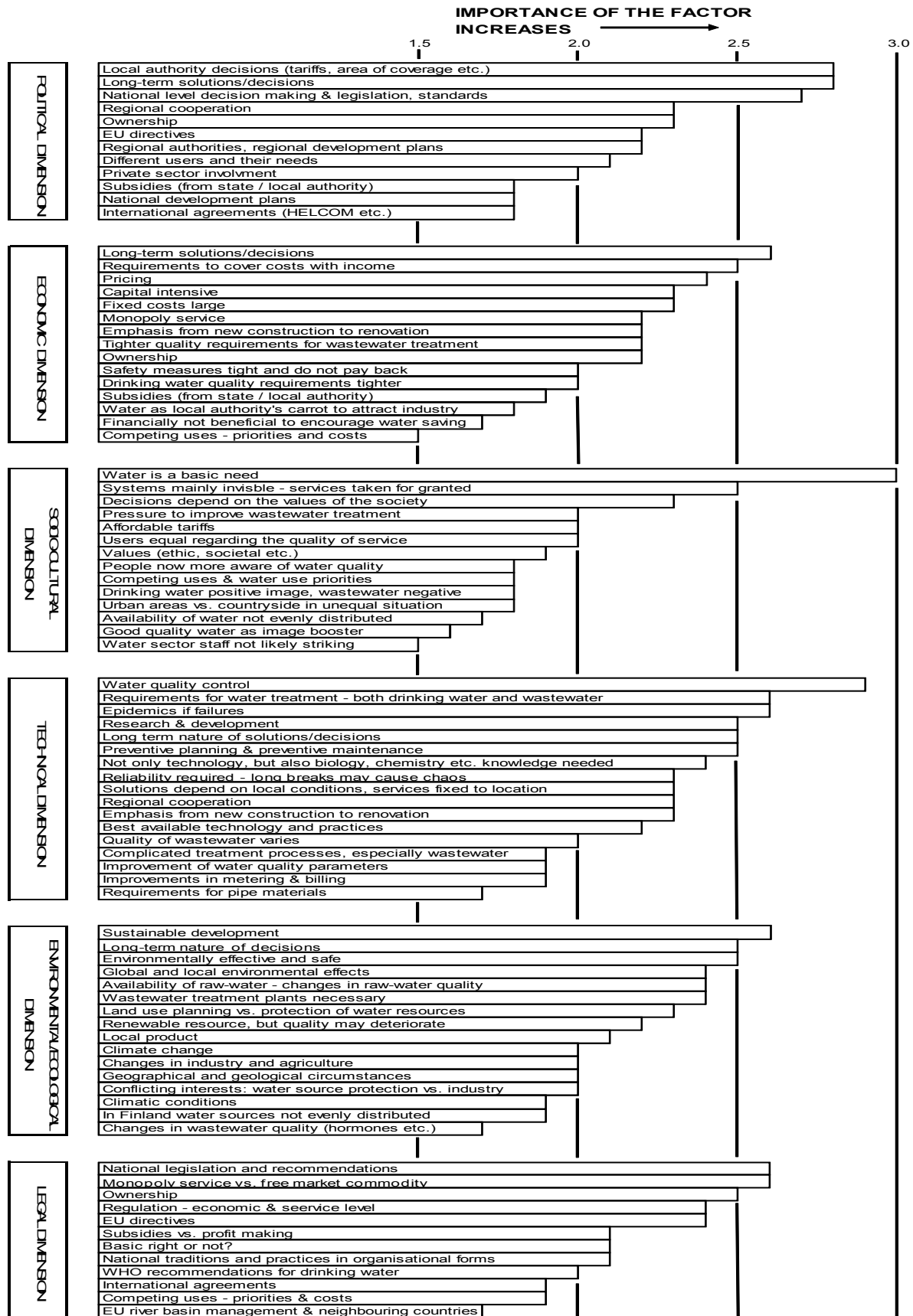


Figure 2