

## A REVIEW OF RISKS IN THE WATER UTILITIES SECTOR

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### ABSTRACT

*The complex and dynamic environment where the activity of public utilities' services is being performed, as well as their particular features are important arguments in favor of implementing the risk management by these services' operators. Basing on studies achieved so far in Romania's public services sector, we can acknowledge a precarious implementation of such practices, and consequently the service's sustainability is being endangered. The special traits of the public utilities' services involve specific risks, both strategic as well as operational, that require special methods of identification, assessment and treatment.*

*The present work's proposed theme is to identify the risks that are specific to public utilities services, generally, and those that are particular for water and sewerage services, as well as an emphasis on the impact that the risks that are specific to the water and sewerage services are having upon the operators of this kind of services.*

**KEYWORDS:** *risk, public services, water utilities.*

**JEL CLASSIFICATION:** *M10, G30*

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### 1. INTRODUCTION

The public utilities' services are particularly important in order to maintain the social cohesion, increase of life's quality and ensuring sustainable development (European Commission, 2003). This is the reason why, after the accession to European Union, Romania's public utilities services are in a continuous process of transformation, development and adjustment to the European demands in view of ensuring a high level of quality, safety and accessibility, an equal treatment, promotion of universal access and of users' rights (Romania's Parliament, 2016).

According to Law no. 51/2006, with subsequent modifications and completions, there are considered as public utilities' services the following: water supply, wastewater collection and treatment, collection and discharge/treatment of rainwater, supply of district heating, sanitation of localities, public lighting, and local public transportation.

Public services are held upon the direction, coordination and responsibility of local authorities and their purpose is to address public needs. Practice implies these services be delegated to a specialized operator to ensure the infrastructure's operation and providing the service.

Because of their specific nature, the public utilities services have several definitely and particular traits that make them different from other types of services (Romania's Parliament, 2016):

- (a) Have economic and social character;
- (b) Respond to requirements and needs of public interest and utility;
- (c) Have technical-urban character;
- (d) Have permanent character and need continuous operation;
- (e) The operating regime has monopoly characteristics;

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- (f) Need an adequate technical infrastructure;
- (g) Organized on economic and efficiency principles;
- (h) Provided on the basis of the "payee" principle;
- (i) Recovery of operating or investment costs is through pricing, tariffs or special charges.

Being services that address overall population's needs, under responsibility of local public authorities and dependent upon the existence of a technical- urban infrastructure, public utilities' services are strongly influenced by environmental, social, economic, technical and political factors. The quality and level of water sector's utilities services define the functions and values of a settlement and determine the living standards and well-being of the population.

Supply of safe and permanent potable water, as main aim of water and sewerage services, is permanently in science's focus and it is influenced by technology's evolution and financial resources' availability. Despite all these, we can still acknowledge the primordial character of issues related to water quality in developed countries, with reasons the start from technical faults to institutional deficiencies and even sometimes because of negligence manifested by staff. No matter of the particular manifest of these incidents, they all derive from operators' limited organizational capabilities or interest in learning how to prevent failures, that is, how to manage risks.

The existing literature defines risk as a combination of the likelihood of an event in a system and the corresponding consequences (Ciocoiu, 2014).

Risks in water utilities sector are perceived, if the expected performance of the system is affected. Thus, this research defines risk as a violation of the minimum expected level of performance and the associated negative consequences.

From debates with the representatives of Romania's main operators and of employers' associations working in this field, it generally results that dealing with risks by a public utilities operator is part of conforming to legal provisions or to specific regulations. The risk management activity is not a systematized and structured one, as part of organization's culture or be applied as a current management instrument.

The main public utilities operators in Romania are certified with ISO 9001. In order to keep the certification, according to the revised standard ISO 9001: 2015, operators must comply with standard's new requirements, thus being able to fulfil risks' management. That is why, in late year, risk management has been in focus of these operators' management staff.

Lack of a specific methodology of a structured implementation of risk management makes operators individually adapt the general management practices to their own activity.

This methodology has to start from acknowledgement of all types of risks, as well as of the threats and opportunities due to public utilities' services, respectively of water and sewerage ones.

This work aims at identifying the main risks' categories that public utilities operators are facing and, particularly, those from the field of water and sewerage services.

## **2. RESEARCH METHODOLOGY**

In order to make research, available and relevant information has been consulted, generally relating to public services and more particularly referring to water and sewerage services.

There have been consulted available information in databases from Web of Science, Scopus and Google Scholar, Romanian specific legislation has been analyzed as regards public utilities services, and also general and definitory applicability documents, such as regulations elaborated by regulation authorities and the framework delegation contract for water and sewerage' services operators.

Empiric research has also been made from formal debates within working meetings with representatives of national and municipal regulation authorities and of employers' associations from this field (such as: Romanian Water Association, Water Employers' Association, Public Services' Employers Association and Romania's National Federation of Public Services' Employers) and with representatives of Romania's large operators' management staff.

In order to achieve a comprehensive analysis of risks intervened in a public utilities' service, the risk must be reviewed from the perspective of all parties involved, but primarily from the perspective of the public services' user, from that of the operator and also of the local public authority, as responsible for ensuring this service.

The view that we have been analyzed during this work has been the one of the public utilities services' operator. The identified risks are those with direct influence upon achieving public services' targets, on one part, and upon the operator as economic enterprise, on the other side.

### 3. LITERATURE REVIEW

Following research in the international database, few works were identified that treat exhaustively and wholly the risks in public utilities' services, and above all, a specific methodology of implementing risk in water and sewerage companies.

Identified studies are mainly focused upon operational or investment risks.

The US event that occurred on September 11, 2001, has generated intense concerns regarding the critical infrastructure risk management, a category where most public utilities' services can be included.

Seger (2003) talks about a new paradigm regarding public services' security. The study addresses the threats to utility systems and provides an approach to assessing vulnerabilities and developing and implementing security countermeasures.

In the book called „Water Safety Plan Manual: Step-by-Step Risk Management for Drinking Water Suppliers”, World Health Organization (2004) approaches risks that influence safety of potable water from operator's perspective and proposes a methodology of making a “Water Safety Plan”. The principles as to approach the operational risk, described in this textbook, may be also applied for other public utilities.

In the work called “Benchmarking risk management practice within the water utility sector” (2006), MacGillivray starts with a general approach of risk management and after an inventory of the internationally used methods and techniques in European countries, he proposes a capability model for benchmarking risk analysis and risk based decision making practice, with case study application to the water sector.

Within the book “Risk Management of Water Supply and Sanitation Systems” (Hlavinek and co, 2009), it is addressed the risk management of water supply and sanitation systems impaired by operational failures, natural disasters and war conflicts.

Van Leuven (2011) treats threats and vulnerabilities upon United States' water and sewerage infrastructure. This is focused on the terrorist attacks (September 11, 2001) and extreme natural phenomena (Katrina Hurricane).

A study elaborated by Ernst & Young Company in 2013 identifies the most important current risks of businesses involved in the field of public utilities services insurances, respectively: conformity and regulations, political interventions in utilities markets, uncertainties at level of climatic and prices' setting policies, costs' and capital access' volatility, major projects implementations, fight for talents, network and infrastructure process of getting older, planning and public acceptance management. At the same time, there are identified the main influence factors on achieving public utilities' services, such as: climate change, urbanization, demographic growth / decline, damage of infrastructure systems, changes in socio-economic conditions, increase of the quality of life, environmental pollution.

Khatri (2013) has developed a decision-making framework, methodology, and tools for analyzing the risks and uncertainties for urban water systems considering future change pressures and their associated uncertainties. The research focuses on the main four future change pressures: climate change, population growth and urbanization, socio-economic change, and deterioration of urban infrastructure systems.

Pollard, S. (2016) in the work „Risk Management for Water and Wastewater Utilities” treats briefly strategic risks, but it doesn’t offer an implementation methodology that could be applied by the public services operators in Romania.

The identified works can offer the informational basis, necessary for making an overall image of the risks present in public utilities and their impact, and can contribute to defining a methodology of dealing with risks that is applicable to utilities services operators.

Identification of risks starts with a study of threats and opportunities that a organization deals with. This process is extensive and it requires a deep knowledge both of the activity field as well as of the respective organization’s activity specifics.

## 4. DISCUSSIONS

### 4.1. Specific risks for public utilities’ services

A complex and dynamic approach it is strongly required in order to efficiently address and manage the particular features of public utilities’ services, among which we mention: the economic and social character, the capacity to respond to public utility and interest necessities and demands, the permanent character and the continuous functioning regime, the natural monopoly imposed by an adequate technical and urban infrastructure functioning, responsibility of local public administration authorities (Romania’s Parliament, 2006, 2016).

The context where these services must be ensured is in a continuous transformation process, being characterized by climate changes, population increase, infrastructure systems and social and economic conditions’ downgrading (Khatri, 2013; Pollard, 2016).

On another hand, the multitude of these services’ stakeholders (users, operators, regulation authorities, local authorities etc.) generates conditions for complex interactions and interdependencies within the planning and decision-making process (MMP, 2008).

All of these factors lead to a high uncertainty degree, they raise the risk of not attaining the expected level of system’s performances and also they render the service not being profitable (Manso, 2007). Variety of above named factors determines a diversity of risks that are specific to public utilities services.

Risks may come out from inside the company or from outside of it (Marsalek, 2009).

Starting with the particular features of public services and from their major objectives, the following risks’ types may be found (Figure 1):

- (a) **Legal risks**, are the risks that may affect compliance of operator’s activity to legal requirements. The risks may outcome from inside the company, from non-observance of legal regulations, or from the external environment, such as unpredictable legal changes.
- (b) **Operational risks** are risks that can affect attainment of operational objectives regarding the supply of product/service by the user or affecting system’s efficiency;
- (c) **Financial risks**, are risks that may affect attainment of company’s financial objectives, wherein the most important in the public utilities sector are to be found those regarding approval of tariffs, consumption evolution and invoices’ cashing rate;
- (d) **Social and human risks**, wherein are comprised socially generated risks, both internal and external to the company. Here, we can comprise risks of strikes, popular rebellions, corruption, hostile social trends;
- (e) **Security risks** refer to risks that may endanger systems’, infrastructure’s and people safety. In this category there are included risks such as natural catastrophes, terrorism, emergency cases, accidents risks;
- (f) **Environmental risks**, are risks with direct influence upon company’s environmental goals, where there can be included risks like water sources pollution, infrastructure getting old etc.;



**Figure 1. Categories of risks in public utilities**

*Regulatory (or legal) risk* results from nature of regulatory norms and practices, with rules that determine the extent to which the interventions are discretionary and practices related to the interpretation that regulatory authorities gives to rules (Parker, 2003).

Conformation to regulations and to new standards represents a powerful threat for public utilities services operators, taking into account that most times in order to reach new quality standards and to respond to new regulations there are necessary massive investments and major changes in operators' organization and working manner.

In most cases, the tariffs and prices that are applied in public utilities services are regulated under strict rules and upon endorsement of local authorities (that is political decision-makers), thus determining a difficult process of change and many times without a proportional rate related to costs' changes within their structure.

This is one of the reasons for which, in an environment with a raised volatility in the costs of raw materials, fuels and other costs incurred by tariffs structure, there is a big challenge in keeping the economic efficiency of the public utilities services'.

Operators in the field of public services are frequently confronted with *operational risks*. These are associated to specific operations at level of installation, as the risk of a device to get broke or a process component or risk to exceed certain quality standard.

Extension of infrastructure, as well as rehabilitation of existing infrastructure, that in many cases is old, requires massive investment and developing extensive projects. Because of the long periods of recouping investments in utilities infrastructure, as well as the difficulties encountered in projects' implementation, the operators or the public authorities, according to the case, are confronting with banks or investors' reserves in awarding the necessary capital. These are generating *financial risks* that affect the stability of system's operators.

*Social-human risks* are generated by the workforce in the field, as well as trends in people's expectations to provided services. Difficulty in assuring human resources that have a field expertise

is another threat to public utilities services that may represent a cause for other issues. The reason of this problem is migration of the qualified workforce in European Union's free extended market and on another hand, to the lack of specialized staff in the newly-used technology in the field.

On another hand, the raise in life's quality increases pressure on the managers of public utilities' services in order to improve quality of supplied services and their adjustment to the increasing needs of population. Urbanization brings about a raise in population's density per km of water and sewerage network, this process involving the need for significant investments in order to adjust the infrastructure to the new city's demands. Demographic modifications determine changes in system's consumption's profiles and distribution, with major influences, both technical, as well as financial.

*Security risks* became more and more concerning for the experts, as a consequence of major events happened in the last decades. Van Leuven (2011) explains how serious the consequences of an attack may be for critical infrastructures, because of their interconnections with other sectors of activity. An intentional attack towards an energy or water system would spread fear and anxiety on the entire society.

Vulnerabilities of public utilities systems have existed since their building and, even progresses have been recorded in their monitoring, services interruptions are still rather frequent. Water and sewerage systems are rather often affected by natural disasters. They were always in connection with extreme weather conditions' impact and with defaults of conduits or equipment that determines interruptions in service's supply (Van Leuven, 2011).

In last decades, significant changes occurred in Romania's raining profile (as duration and intensity), thus determining major problems on the operation of the pluvial water collections systems, that are designed for different parameters, thus becoming unadjusted and inefficient. Also, the climate changes bring about important changes in raw water quality that is used in potable water's production process.

*Environmental pollution* has multiple effects upon water and sewerage public utilities services, affecting both supplied potable water quality, as well as waste water quality that is discharged in the affluent waters.

Though threats are numerous, the current context also offers *opportunities* that operators of public utilities services can benefit from and thus assuring the sustainable services' development.

Increase of demand in emergent markets, availability of cohesion funds for the sector of public utilities services, development of product suppliers' market, of consultancy services and urban building, all these are being premises for development and extension of production and distribution capacities and for improvement of public utilities services.

Operators' merging or acquisition in view of raising capacities and capabilities represent solutions for consolidation of existing capacity, but also for developing services on emergent markets.

Stimulation of innovation, introducing new technologies in the production and distribution technologies, implementation of a smart management of territory and infrastructure, are essential measures for adapting to the actual context and for raise in activities' efficiency.

Focus on customers' and stakeholders' satisfaction, good communication with all interested parties, strengthening relationship with regulators and assuring a good perception within population, are essential factors for ensuring necessary climate and support for deployment of public utilities services.

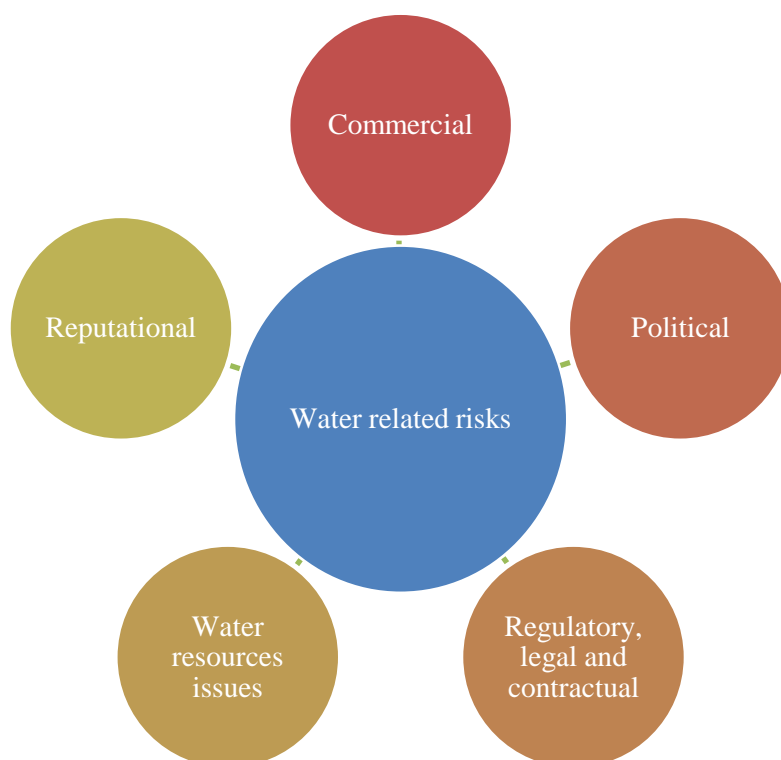
Under given circumstances, entities that manage public utilities services must be able to adapt to change, to stimulate the innovation capacity, to exploit at best extent smart technologies, to implement models of smart territories' use, to be able to provide complex solutions at major problems such as demographic decrease, increase of living quality standard or environmental pollution. Competitiveness and performances in use of the available resources are mostly dependent of their capacity to rapidly adapt to all of these changes. (Matei et al., 2016),

#### 4.2. Risks of water and sewerage utilities

Water and sewerage public utilities services are overtaking general risks of the services category they are a part of, but with certain specific risks, given by own nature and objectives.

Specific features refer to the fact that they serve vital needs, they are important for public health, they must be continuously assured, they use limited and spare resources, they have a high impact upon environment, and they are under control and responsibility of public authorities (Pascalev, 2003).

According to the categorization made by UNEP FI and UNEP GPA (2008), the risks related to water and sewerage services are divided in 5 categories, presented in figure 2.



**Figure 2. Water-related risks**

Source: adapt from UNEP FI and UNEP GPA (2008, p. 5)

*Commercial risks* are to be found in the area of commercial relationship with customers and suppliers. Their impact upon company's interests is a major one. Among the most important risks in this category are those related to the decrease in consumptions and tariffs adjustment.

Public services are under the responsibility of local authorities, politically represented and directed. Though in most cases, services are delegated to an operator, the public authority has a tendency to excessively control its activity or even to intervene in the management act. The threats are likely to come as well from central authorities that may influence modifications of legislation which can affect operators' activity (Pollard, 2016).

Public utilities are regulated fields, both in what concerns the relationship between the operator and the users, systems' use, performing services, as well as setting tariffs. Excessive or incorrect regulations harden operator's activity and its relationship with authorities and users (Robinson, 2004).

Supply of water and sewerage supply services involve deployment of complex operational processes, by using an extended urban infrastructure and with vital impact on population and major effects to the environment. That is where it derives the multitude of operational risks to be managed

by the water and sewerage services operators: extreme weather events, climate change, population growth, demographic changes, infrastructure renewal and the requirements for financial sustainability (Water Research Foundation, 2013; Popovska & Ivanoski, 2009).

Development of confidence relationship with the stakeholders is essential for ensuring stability and necessary climate in order to carry on the activity. Operators' reputation may be easily altered by events, such as strikes, popular rebellions, corruption, authorities' hostility, non-observance of the business ethics (Chalker et al., 2017).

Risks' categorization may be also made according to their source, which can be internal or external to the company. Among the internal risks' sources, we can identify: natural and contextual environment, the customers, the suppliers, the authorities, the regulators, the business environment and the competitors.

By analyzing the impact that can be generated by the risks of water and sewerage services upon company's interests, we can find 7 major categories of effects, as presented in Figure 3.



**Figure 3. Strategic risks impact**

Risks can involve several effects that can be framed into different categories. For instance, a water operator's activity implies a risk of occurring a work accident. If such an event would occur, the effects would be multiple, the safety of the involved people would be damaged, the reputation of the company would be deteriorated, financial losses would be registered.

Both risks and opportunities are essential for future successes (Ernst & Young, 2013) in conditions where they are discovered in due time and they are treated efficiently. Within this context, the implementation of a risk management system by public utilities operators is essential. Operators must be able to identify risks, to assess them, to give due priority, to anticipate and to act in order to develop the opportunities that occur (Ciocoiu, 2014; Paskalev, 2003).

Risk management must become a current and integrated practice in the activity of public utility companies. The results of risks analysis must be part of decision-making factors, while the risk

plans would ensure resources' optimization and increase of chances to attain company's objectives (Andersen et al., 2014).

## 5. CONCLUSIONS

In this paper we have made a brief review of the available literature from electronic and printed sources in field of risk management, applicable to public utilities services.

Taking this opportunity, we have acknowledged the existence of a useful informational base, covering most risks encountered in the public utilities services. Going through this information can give public services' operators an understanding of the risks they are confronted with and can offer several methods and techniques to deal with them. At the same time, the available information can serve to research activities in view of achieving an integrated model of risk management within public utilities' companies.

Starting from the peculiarities of public utilities' services, in the present work there have been identified the main risks' categories that occur in the activity of public operators' activity. Specifically, the risks that are present in the activity of water and sewerage activity have been analyzed, categorizing them in accordance to their source, the area they are deriving from and the impact on operator's activity.

The complexity and multitude of identified risks within water and sewerage public utilities' services, in correlation with operators' lack of experience in approach of risk management, make necessary a scientific approach of risks, based on field's recent research and adapted to the specific of the internal and external environment of each operator in this field of activity.

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