Introduction of a Cost Accounting System and Evaluation of a Cost Recovering Water Tariff

Masterarbeit

von

Thomas HANDSCHMANN, BSc

Technische Universität Graz

Fakultät für Maschinenbau und Wirtschaftswissenschaften

Institut für Betriebswirtschaftslehre und Betriebssoziologie

O.Univ.-Prof. Dipl.-Ing. Dr.techn. Ulrich Bauer

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In Kooperation mit:

Wasserversorgung Grenzland Südost

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Kurzfassung

In Österreich wurden in den Jahren von 1959 bis 2013 12,6 Mrd. EUR in die Wasserversorgung investiert. Von 1959 bis 1993 wurde die Entwicklung der Siedlungswasserwirtschaft durch kostengünstige Darlehen aus Mitteln des Wasserwirtschaftsfonds gefördert. Mit dem Inkrafttreten des Umweltförderungsgesetzes im Jahre 1993 wurde auch das Förderungssystem für die Siedlungswasserwirtschaft neu strukturiert. Die Förderung von Investitionen in der Siedlungswasserwirtschaft erfolgte seitdem in Form von nicht rückzahlbaren Annuitäten- und Investitionszuschüssen. Das tatsächlich für die Wasserversorgung bereitgestellte Förderungsvolumen betrug in den Jahren von 1993 bis 2013 ca. 1,1 Mrd. EUR was ca. 9% des historischen Investitionsvolumens entspricht. Trotz des bisher hohen Förderungsvolumens blicken die meisten Wasserversorger in eine ungewisse Zukunft. Einerseits steigen die Ansprüche an eine moderne Wasserversorgung erheblich an, was mit enormen zusätzlichen Kosten verbunden ist, andererseits nehmen die Bundesfördermittel für die Siedlungswasserwirtschaft jährlich ab. Für das Jahr 2015 sind in der aktuellen Fassung des Umweltförderungsgesetz erst gar keine Fördermittel für die Siedlungswasserwirtschaft verankert. Darüber hinaus stehen die Wasserversorgungsunternehmen vor der Problematik, dass ein Großteil der Erstinvestitionen vor dem Ende ihrer technischen Nutzungsdauer stehen und neue Investitionen getätigt werden müssen um die Wasserversorgung aufrecht erhalten zu können. Konkret bedeutet das, dass die Siedlungswasserwirtschaft zukünftig mehr Geld aufwenden muss, aber gleichzeitig mit weniger Geld auskommen muss. Um die Wasserversorgung trotzdem nachhaltig aufrecht erhalten zu können, muss zumindest kostendeckend operiert werden. Um Wasserversorgungsunternehmen bei der Kostendeckung zu unterstützen wurde im Zuge dieser Arbeit ein Kostenrechnungssystem auf Grundlage betriebswirtschaftlich anerkannter Methoden und den vorherrschenden rechtlichen Rahmenbedingungen entwickelt. Mit Hilfe dieses Kostenrechnungssystems lässt sich einerseits ein Wassertarif zur Kostendeckung, andererseits ein vom Gesetz maximal erlaubter Wassertarif berechnen. Um das Kostenrechnungssystem nicht nur auf eine Abrechnungsperiode zur beschränken, wurde auch eine 10- bzw. 20-Jahresprognose entwickelt. Somit können auch in der Zukunft liegende Ereignisse, wie anfallende Erneuerungen bzw. Sanierungen, aber auch steigende Stromkosten und sinkende Wasserabgabemengen, in die Wassertarifgestaltung einfließen. Zur Validierung des Kostenrechnungssystems wurden zwei Fallbeispiele durchgeführt. Untersucht wurde dabei ein Wasserverband und fünf Gemeinden, welche im Zuge der Gemeindestrukturreform 2015 zu einer Regionsgemeinde fusionieren werden. Die Ergebnisse, welche das Kostenrechnungssystem für die Fallbeispiele lieferte, könnten unterschiedlicher kaum sein. Während der Wasserverband ein solides positives Betriebsergebnis aufweisen kann, zeigen alle fünf untersuchten Gemeinden für das Jahr 2013 ein negatives Betriebsergebnis. Mit Hilfe der 10-Jahresprognose konnte sogar ein negatives kumuliertes Betriebsergebnis von ca. 1,5 Mio. EUR bis zum Jahr 2022 aufgedeckt werden. Um das Betriebsergebnis in den nächsten 10 Jahren in den positiven Bereich zu bringen wurden des Weiteren mögliche Tarifverläufe entwickelt.

Abstract

In the years from 1959 to 2013 a total of 12.6 billion euros has been invested in order to build up the Austrian water supply system. Until 1993 the development in water management was funded by giving away low-interest credit loans. In the course of the introduction of the Austrian environmental aid state act the Austrian government now granted water management facilities non-refundable grants and investment subsidies. As of 2013 a total of 1,1 billion euros had been granted to Austrian water management facilities, which accounts for approximately 9% of the total historical investment volume. Despite the relatively high percentage of government grants, most of the water management facilities face an uncertain future. On the one hand the demands of modern water management facilities are increasing constantly, which involves additional costs, on the other hand the budget for public funds has been decreased severely over the course of the last 20 years. For 2015 the Austrian environmental aid act doesn't even have a budget scheduled for the field of water management. Additionally a fair amount of water management facilities are having issues with financing, as the majority of capital assets are near the end of their operating life and need to be replaced in order to keep up the water supply. Simply put, water management facilities will have to spend more money because of modernization and the need to replace old facilities, but have less money available to do so. In order to keep up the water supply in the long-term the costs that are incurred by the water management facility need to be fully recovered. To support water management facilities in this crisis, a cost accounting system has been developed in the course of this thesis that is capable of calculating a cost recovering water tariff. The just mentioned cost accounting system is based on proven accounting principles and complies with the legal framework prevailing in Austria. Furthermore the cost accounting system is not only capable of calculating a cost recovering water tariff but also a maximum legally allowed water tariff. Additionally a dynamic component was added to the cost accounting system by providing a 10- and 20-years scenario simulation, which forecasts the cost recovering water tariff and the corresponding legal boundaries for this time period. This dynamic component is crucial for strategic decisions and planning, as it allows to implement future events, such as the necessary replacement of capital assets or the change in water consumption. In order to validate the cost accounting system two case studies have been carried out. The first case study examines the water board "Wasserversorgung Grenzland Südost", which is also the initiator of this thesis. The second case study focuses on five municipalities that are about to merge in 2015 to become a regional municipality. The results of the two case studies can't be more different. On the one hand the cost accounting system reveals that the water board is doing excellent by achieving a cost recovery ratio of 105%, on the other hand it shows that almost all municipalities are mismanaging the finances of their municipal water management facility, as they all show a negative operating result for the examined period. The scenario simulation for the future regional municipality even reveals a cumulated deficit of 1.6 million euros, assuming that the municipalities further pursue their strategy of moderate indexation of the water tariff. In order to correct the aforementioned mismanagement various strategies have been developed that aim to break even within the next 10 years.

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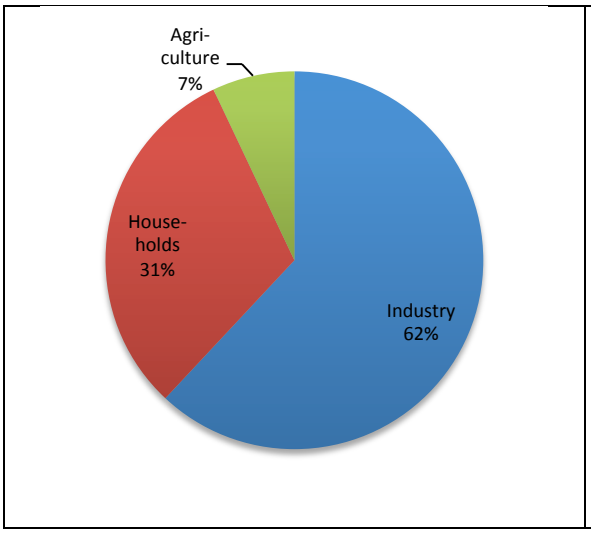
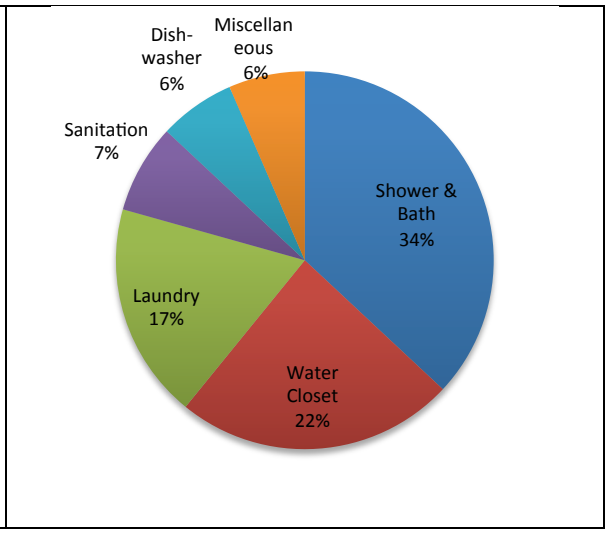
1 Introduction

Austria is fortunate to have water resources of 84 billion cubic meters per year available. If one tries to equally allocate this tremendous amount of water available per year on all of the Austrian citizens, every single citizen would have approximately 10,000 m^3 of water available for use per year. In this regard Austria is ranked in the top five of all European countries. Only Finland, Sweden and Ireland show higher water resources per person and year.[1] In comparison to this the actual annual demand of water accounts for only 3%, that is 2.6 billions cubic meters, of the available water resources per year. Graphic 1 shows that households account for only 31% of the total water demand (equals appr. 135 liters per person and day), whereas 62% of the water is used for industrial and 7% for agricultural purposes. A further disaggregation reveals the purpose of water usage in households, which can be seen in Graphic 2. However, it is worth mentioning that the amount of consumed water could be significantly decreased and will be further decreased due to developments in water-saving household appliances, such as dishwashers, washing machines and water closets[2].



Graphic 1: Disagregated usage of drinking water in Austria



Graphic 2: Usage of drinking water in Austria[3]

In Austria approximately 7.4 of the total 8.4 million citizens are linked to central water supply. There are 1,900 municipal water facilities, 165 water boards and 3,400 water cooperatives that build up this central water supply system. Only 2100 workers and 900 employees are working full-time in the aforementioned approximately 5,500 water supply facilities[4]. This low level of employment is due to the fact that a lot of people participate voluntarily in municipal water facilities and cooperatives.

[1] Cf. WIELAND, U. (2003), p. 2 et seq.
[2] Cf. NEUNTEUFEL, R. et al (2012), p. 221 et seq.
[3] Cf. www.lebensministerium.at/wasser, (11.02.2014)
[4] Cf. www.ovgw.at/wasser, (10.02.2014)

The aforementioned central water supply system consists of a widespread underground water pipe network. As of 2013 there are 77,297 km of water pipes laid underground in Austria alone. If all of those pipes would be linked together to form a straight line, those water pipes would circumference the earth almost twice. But this tremendous underground water pipe network alone isn't sufficient to deliver water to the end customer. To accomplish that, there is a lot more equipment needed, such as spring tapings, wells, high-level tanks, pumps and so forth. However, much more meaningful than the thousand of kilometers of pipes laid in the ground and the dozens of equipment that is necessary to get water supply system going, is the amount of money invested in this whole system. From 1959 until 2013 a total of 12.6 billion Euros has been invested in the Austrian water supply system[5].

Chapter 2 will reveal which resources were used to fund the Austrian water supply system until now. In doing so the financial side of the Austrian water management will be examined. Beginning with on overview of the financing in water management, the origin and share of the funds will be examined in detail. Subsequently the pricing of water services will be discussed. Therefore the legal framework is presented that allows public or private bodies to charge a fee for the consumption of water. Furthermore a closer look on the variety of public charges in water management will be provided. The third chapter will answer the question why it is necessary to tackle the issue of cost accounting in water management. As this chapter will show, finances are not the only cause for the initiation of this thesis. Also legal and ethical obligations require to tackle this very crucial issue. Furthermore this chapter will describe the objective, the used methodology and the scope of this thesis. Chapters 4 lays out the framework for the cost accounting system that will be described in following chapters. The presented framework not only covers the accounting aspect, but also a legal and organizational aspect. The most important result of this chapter is the determination of the legal boundaries of the water tariff. The definition and exact interpretation of these boundaries are crucial for the following cost accounting system, as they require to discard scientifically sound accounting principles and use other methods instead. Chapter 5 is used to lay out the theoretical framework on cost accounting. Therefore scientifically sound methods of cost accounting are presented and furthermore screened for legal compliance. This chapter results in a morphological box that holds all the possible methods for the development of the cost accounting system. Subsequently the most suitable methods are chosen, which are later implemented in the cost accounting system. Chapter 6 describes the practical approach of the cost accounting system. It explains how costs are actually calculated and references the corresponding spreadsheets of the actual cost accounting system that has been programmed in Microsoft Excel. Furthermore two case studies are presented in chapter 7. This chapter contains basic information on the examined organizations, as well as detailed information on the process that has been undergone in order to fill the cost accounting system. The results of the cost accounting system will also be revealed in this chapter. The last chapter summarizes the most important findings and results of this thesis and gives important advice and outlook to the case study participants. Finally the results are critically reviewed and an overall suggestion for improvement is given.

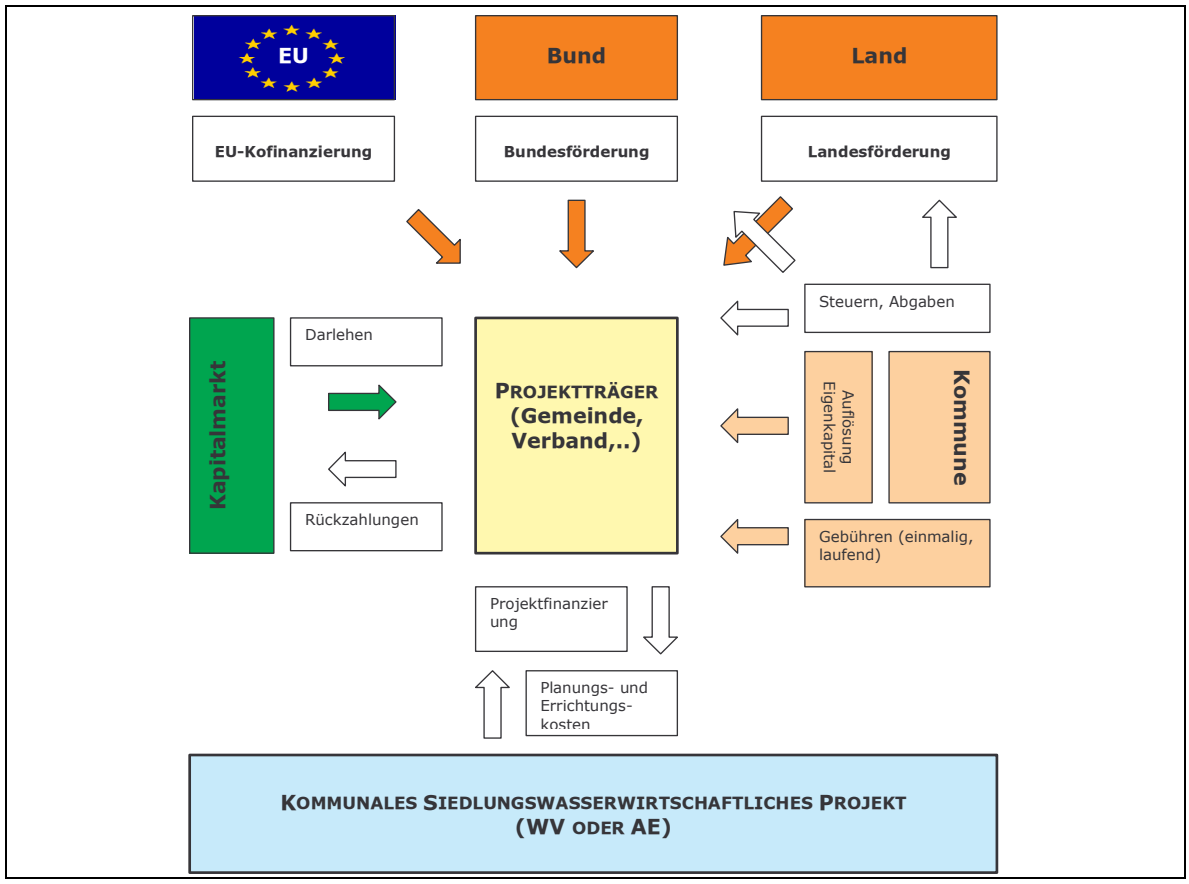
[5] Cf. www.lebensministerium.at/wasser (07.09.2014)

2 Fundamental Knowledge

This chapter contains all the fundamental information on how the financing of the Austrian water supply system works. First of all a look of the bigger picture on the financing in water management facilities will be provided. Therefore the cash flow of a fictitious project will be disaggregated and the single components of this cash flow will be further reviewed. Subsequently the tariff formation in the water industry will be addressed. Therefore the given legal framework concerning water pricing will be described. Furthermore an insight into the actual water tariff formation in Austria will be given.

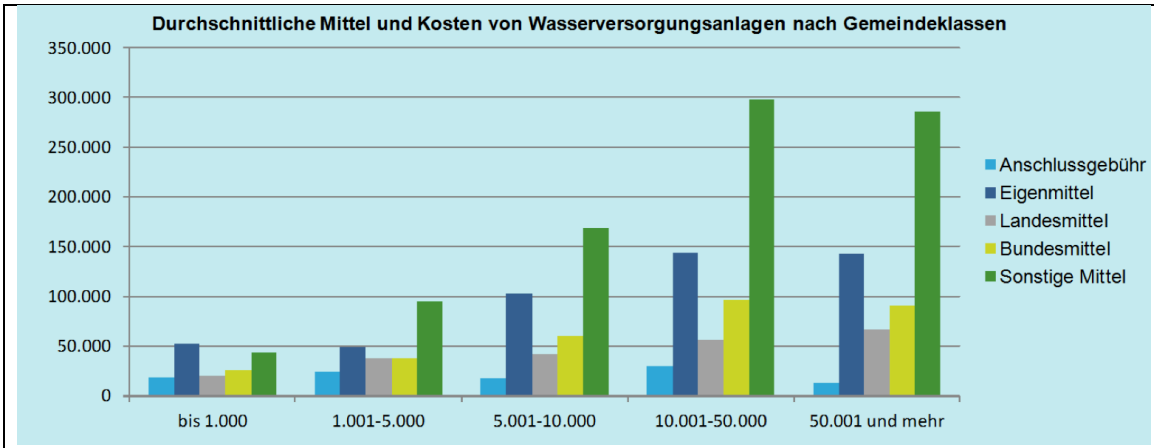
2.1 Financing in water management

Financing in water management is a very complicated matter, which will be clarified in this chapter. As shown in Graphic 3 water companies can raise capital from up to five different sources to fund a project. Three of the five just mentioned sources of capital involve public funding on different levels. On the highest level the European union is funding projects in water management via EFRE and INTEREGG co-financing programs.



Graphic 3: Disaggregated cash flows of a municipal project in water management[6]

[6] DIERNHOFER, W.; HEIDLER, S.; HÖRTENHUBER, A. (2003), S.73



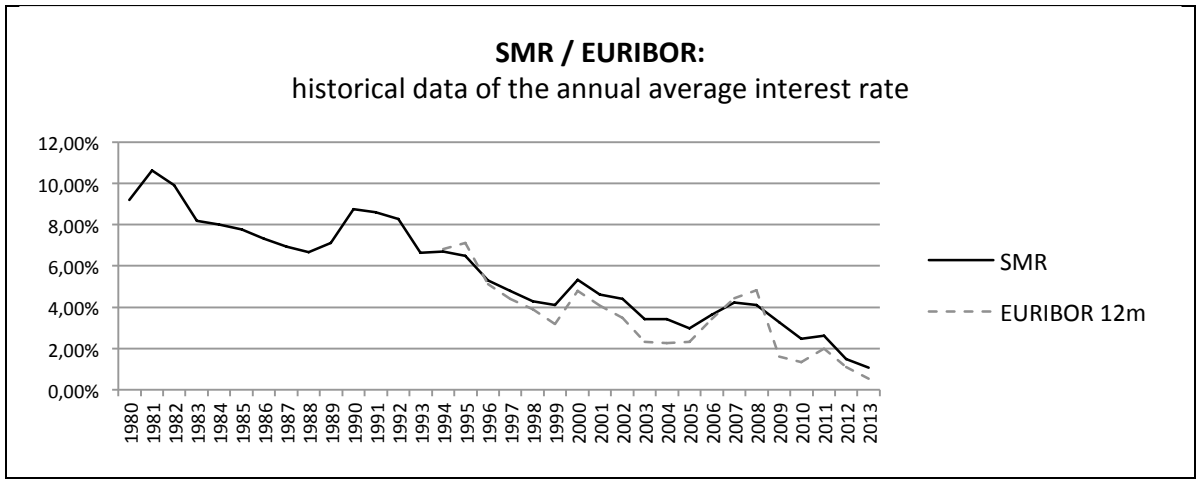
Anschlussgebühr	Connection due		Bundesmittel	Fed. authority funds
Eigenmittel	Own resources		Sonstige Mittel	Misc. Resources
Landesmittel	Reg. authority funds			

Graphic 4: Source of capital of water management facilities grouped by number of inhabitants[7]

On the national and sub-national level the central federal government and federal states administrations also provide public grants to projects in water management. The applicant receive a grant of anywhere from 15% up to 55% percent of the total investment costs. Usually grants are paid to the water companies in slightly decreasing installments over a 25 years period. Since this type of grant is spread over a 25 years period it cannot be used to initially fund the investment. Furthermore investment subsidies are granted for projects with smaller financial volumes and are paid straight away. In contrast to the grants that are spread over a 25 years period, investment subsidies can be used to fund the investment since they are paid out straight away. A deeper look into that matter reveals, that federal government grants make up 15% of the total investment costs[8] and federal states administration grants 0% to 40%, depending on several requirements that the water company has to fulfill, including the level of the water tariff, the usage of a cost accounting system. Furthermore the different regulations in the federal states play a big role in the amount of given funds. As for the federal state of Styria the federal state grants range from 10% up to 20% of the total investment costs. The money that is used for these public grants is accumulated by taxes and public charges. This interdependency of public grants on the one hand and public taxes and charges on the other hand has certain advantages. Firstly distribution measures can be easily accomplished by the authorities and secondly the target-oriented funding of environmentally aware water management facilities empowers the authorities to fulfill environmental goals[9]. Besides public grants water companies also have the possibility to raise capital on the financial market. Therefore water companies mostly take out credit loans and rarely other forms of credits, such as foreign-currency loans (In Graphic 4 credit loans are named “Misc. resources”). By looking at this graphic, one can easily see that credit loans are building up the biggest stake in financing water management facilities,

[7] BOGENSBERGER, M.; CMC; SCHAFFER, N.; REVAY, M. (2012) p. 17
[8] Cf. „Förderungsrichtlinien für die Siedlungswasserwirtschaft i.d.F. 2013“
[9] Cf. SCHWER, S. (2008) p. 11 et seq.

especially in communities with more than one thousand inhabitants. Therefore it's worth mentioning that the water companies have been profiting from the general decrease of interest rates in the recent years (see Graphic 5), as it has become much cheaper to take out a long-term credit loan. The fifth probably most crucial source of capital for projects is the water companies' own resources, which are typically accumulated by public charges. Graphic 4 reveals that own resources are the most important source of capital in water management next to credit loans and gain even more relative importance with decreasing size of the community that provides water services. The reason for the importance of own resources can be explained with Graphic 3. As this graphic depicts, own resources are the sole non-refundable source of capital for water companies, since credit loans have to be paid back to the bank and public grants are usually funded by taxes and public charges, which are initially collected by the water management facilities itself. This means that water companies are mostly dependent on the income that is accumulated by providing water services and collecting a fee instead. The next chapter will provide a closer look on water pricing, the legal framework concerning water pricing and how water pricing is actually executed in Austria.



Graphic 5 : Mean annual value of the SMR / EURIBOR interest rate from 1980 until 2013

2.2 Pricing of water in Austrian water companies

At first this chapter addresses the legal framework of water pricing in Austria that makes it even possible for water companies to sell water to customers. Subsequently the possible public charges that are justified by the legal framework are listed and further examined. Due to the fact that water services in Austria can be provided by companies under public and private law alike, the term "tariff" might substitute the term "fee", since companies under private law do not have the ability to charge customers a fee in the sense of a public fee. However, both terms, tariff and fee, define the exchange of monetary funds for a certain amount of goods or services. In addition to this the term "due" defines the obligatory exchange of monetary funds for a certain good or service, but there is no obligation to actually use the offered good or service. Furthermore tariffs have a recurring character, whereas dues often are one-time payments.

2.2.1 Legal Framework for the allocation of taxing rights

In general the Austrian water pricing policy is defined on three cascading levels to ensure maximum proximity to the water user. The three levels and the corresponding organizations are[10]:

- Central government level → Federal Government
- Federal level → Federal State Administration
- Local self-administration level → Austrian Municipalities

On the central government level article 13 of Austrian the federal constitutional law is referencing the fiscal constitutional law, which builds up the constitutional framework for the allocation of taxing rights. According to the fiscal constitutional law the federal legislators themselves have the power to allocate taxing rights, which is administered in the Austrian fiscal equalization act (Finanzausgleichsgesetz; abbr.: FAG).

The legal framework on the federal level follows the lead of the central government level. Concerning the taxing rights, §8 section 5 of the fiscal constitutional law constitutes that federal state legislation can only specify, but not alter the regulations made on the central government level. Therefore the federal state administration only depicts a link between the federal government and the municipalities, because no considerable deviations from the fiscal constitutional framework can be administered on this level.

According to article 116 section 2 of the Austrian federal constitutional law municipalities are self-administrated public organizations and are appointed to possess assets of any kind, to acquire and dispose thereof and to operate economic businesses. Furthermore municipalities are entitled, in the scope of fiscal constitutional law, to manage its budget autonomously and to make out public charges. According to this article municipalities are free to choose whether they want to operate a business under public or private law. This means that municipalities can collect fees and tariffs alike, depending on the legal status of the business they are operating, unless a legal regulation on federal level, which is conforming to §7 section 6 of the fiscal constitutional law, is explicitly forcing the municipality to collect fees. Finally the fiscal equalization act of 2008 also regulates the maximum allowed water tariff that municipalities can collect in exchange of providing services, such as providing water services. The exact legal boundaries for the determination of the water tariff will be described in chapter 4.3.

[10] Cf. https://www.bka.gv.at/DocView.axd?CobId=41629 (30.09.2014)

2.2.2 Public charges collected for water services

As it was described in the beginning of chapter 2.2, public charges in the area of water services mainly consist of tariffs (fees) and dues. The fees and dues collected for water services can be further specified into three types of fees and four types of dues (see Table 1). As for fees, the most important fee is the water usage fee, which is collected according to the amount of water that was used by the customer. The total amount of the collected fee is calculated as the product of the actual consumed amount of water in cubic meters and the corresponding water tariff in €/m^3. The commitment fee is collected by the water company in exchange for providing the water line and is calculated as the product of the nominal water load per hour and a commitment rate. Furthermore water meter fees are commonly collected to compensate the expenses that have arisen from the supply of a water meter. A common parameter for the determination of the water meter fee is the nominal diameter of the water meter itself.

As for dues, the most common due is the connection due which is collected when a building is initially connected to the water supply network. Usually water companies charge a flat rate, but parameters such as the size of the property to be connected are also often used to determine the connection due. The connection due is to utmost importance to water companies, as they are largely used to fund investments. As can be seen in Graphic 4 the share of connection dues relative to the investment costs are increasing with decreasing size of the municipality that provides water services. Supplementary dues are often collected if determining parameters of the already collected connection due are changing. This might be the case if the size of an object that is connected to the central water supply system is changing. Follow-up dues have to be paid if reinvestments have to be made in the already existing water supply network. Therefore the follow-up due is very similar to the connection due since the collected dues are used for an investment. Opening dues have to be paid for newly acquired or opened property that is, according to the zoning plan, eligible for the connection to the central water supply system. Since properties are usually registered only once in the zoning plan, this due is a onetime payment[11].

name of public charge	Specification of public charge	Recurrence of collection	Defining parameter
Water usage fee /tariff	Fee	Annual	Water usage
Commitment fee	Fee	Annual	Nominal load
Water meter fee	Fee	Annual	Nominal diameter of water meter
Connection due	Due	Onetime	e.g.: sqm of property
Supplementary due	Due	Arbitrary	e.g.: sqm of
Follow-up due	Due	Artbitrary	-
Opening dues	Due	Onetime	-

Table 1: Overview of public charges in the area of water services

[11] Cf. DIERNHOFER, W.; HEIDLER, S.; HÖRTENHUBER, A. (2003), p.112 et seq.

As it was mentioned in chapter 2.2.1, the legislation on federal state level can only specify but not alter the regulations made on the central government level. Since all of the nine provinces in Austria made use of this entitlement, the landscape of public charges looks quite different in the individual provinces. Table 2 shows which federal state authorities actually did specify the regulations made by the central federal government and what public charge is affected by the specification. To complete the information on public charges in the Austrian provinces Table 3 lists the actual laws on federal state level concerning public charges in water services. If no regulation is listed, it means that this specific federal state administration had chosen not to specify the regulations made on central government level.

Province	Water usage fee	Commitment fee	Water meter fee	Connection due	Supplementary due	Follow-up due	Opening due
Burgenland				✔			
Carinthia	✔	✔		✔	✔	✔	✔
Lower Austria	✔	✔		✔	✔		
Salzburg	✔			✔			
Styria				✔	✔		
Tyrol							
Upper Austria				✔			
Vienna	✔			✔			
Vorarlberg	✔						

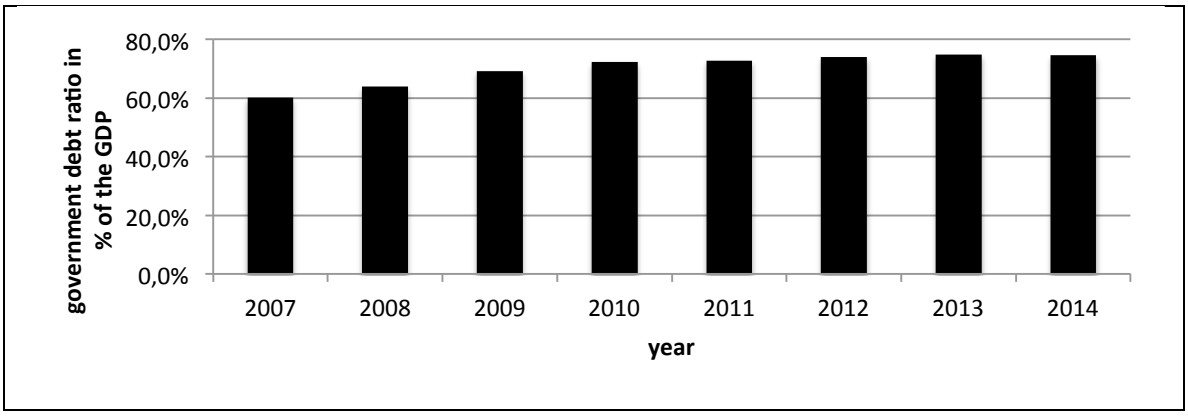
Table 2: Public charge regulations per province

Province	Legal framework on federal state level	
	Fee	Due
Burgenland		Gesetz über die Einhebung von Wasserleitungsabgaben
Carinthia	Gemeindewasserversorgungsgesetz	Gemeindewasserversorgungsgesetz
Lower Austria	NÖ Gemeindewasserleitungsgesetz	NÖ Gemeindewasserleitungsgesetz
Salzburg	Benützungsgebührengesetz	Benützungsgebührengesetz
Styria		Wasserleitungsbeitragsgesetz & Gemeindeswasserleitungsgesetz
Tyrol		
Upper Austria		Interessentenbeiträge-Gesetz
Vienna	Wasserversorgungsgesetz	Wassergebührenordnung
Vorarlberg	Gesetz über die öffentliche Wasserversorgung durch die Gemeinden in Vorarlberg	

Table 3: Legal framework on federal state level concerning fees and dues for water services

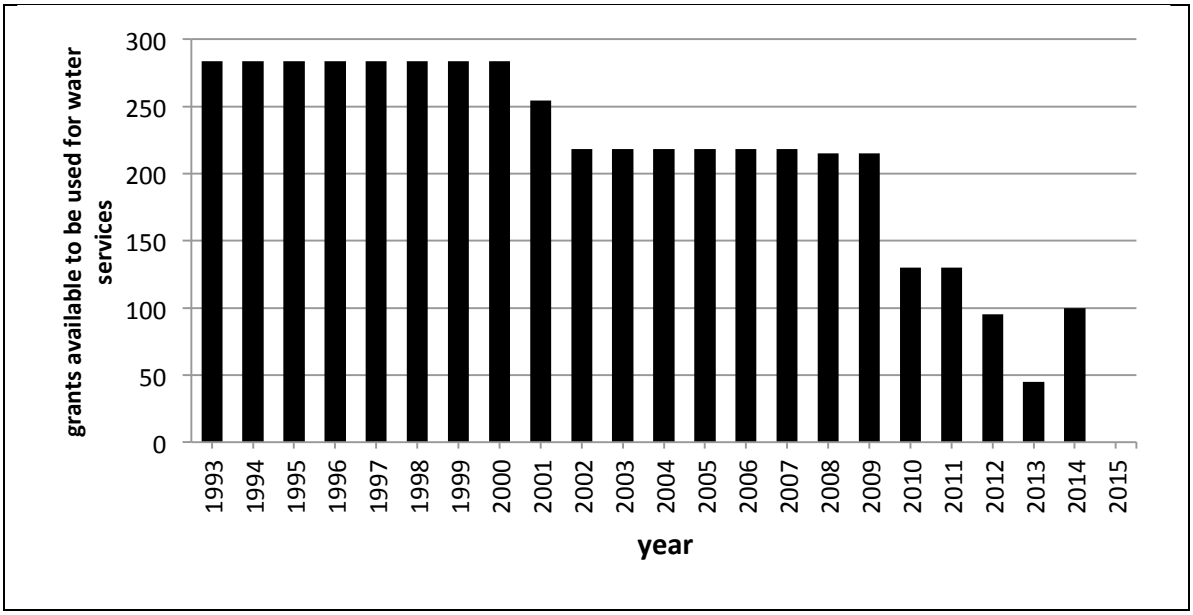
3 Reason and Objective

Nowadays water companies are facing an increasing number of challenges. Besides the fact that water supply facilities always have to use state of the art technology to ensure proper supply of clean water, highly qualified staff is needed to operate and maintain those modern water facilities and the machinery that comes with it. In contrast to the continuously rising requirements in the area of water services, which trigger the need for increased funds, is the increasing level of public debt in Austria, which is indicated by the government debt ratio. The value of the government debt ration in the most recent years can be seen in Graphic 6. As can be seen in this graphic, the increase in the government debt ration was increasing by a fair amount in the period from 2007 to 2010 but could be significantly contained in the following years. This is due the fact that the Austrian central federal government did ratify a stability program for the years from 2011 to 2016 in order to decrease the government debt ratio. The main goal of this program is to economize a total amount of 18.699 billion euros. A closer look at this program reveals that 3.487 billions euros will be economized by cutting the grants for public businesses, such as water services, waste disposal etc.[12]. And indeed the grants that can be used for water management facilities have been decreased annually as can be seen in Graphic 7. In the period from 1993 until 2000 the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management granted 283.424 million euros per year for water management facilities. This sum was decreasing over the years until it reached it's low in 2013, when less then 50 million euros were granted to water management facilities. Finally the latest version of the environmental state aid act reveals that no grants are scheduled at all for the upcoming year[13]. This cut of government grants reflects the nowadays legislation on European[14], central federal government[15] and federal state level[16], which suggests that water management facilities may raise the funds to operate, maintain and extend the water supply system on their own.



Graphic 6: Government debt ration in % of the GDP

[12] Cf. FEKTER, M. (2012), p. 21
[13] Cf. Umweltförderungsgesetz UFG 1993 §6 (30.09.2014)
[14] Cf. Directive 2000/60/EC of the European Parliament
[15] Cf. Wasserrechtsgesetz 1959 i.d.F 2003 §55e
[16] Cf. Steiermärkische Gemeindeordnung §71 section 2

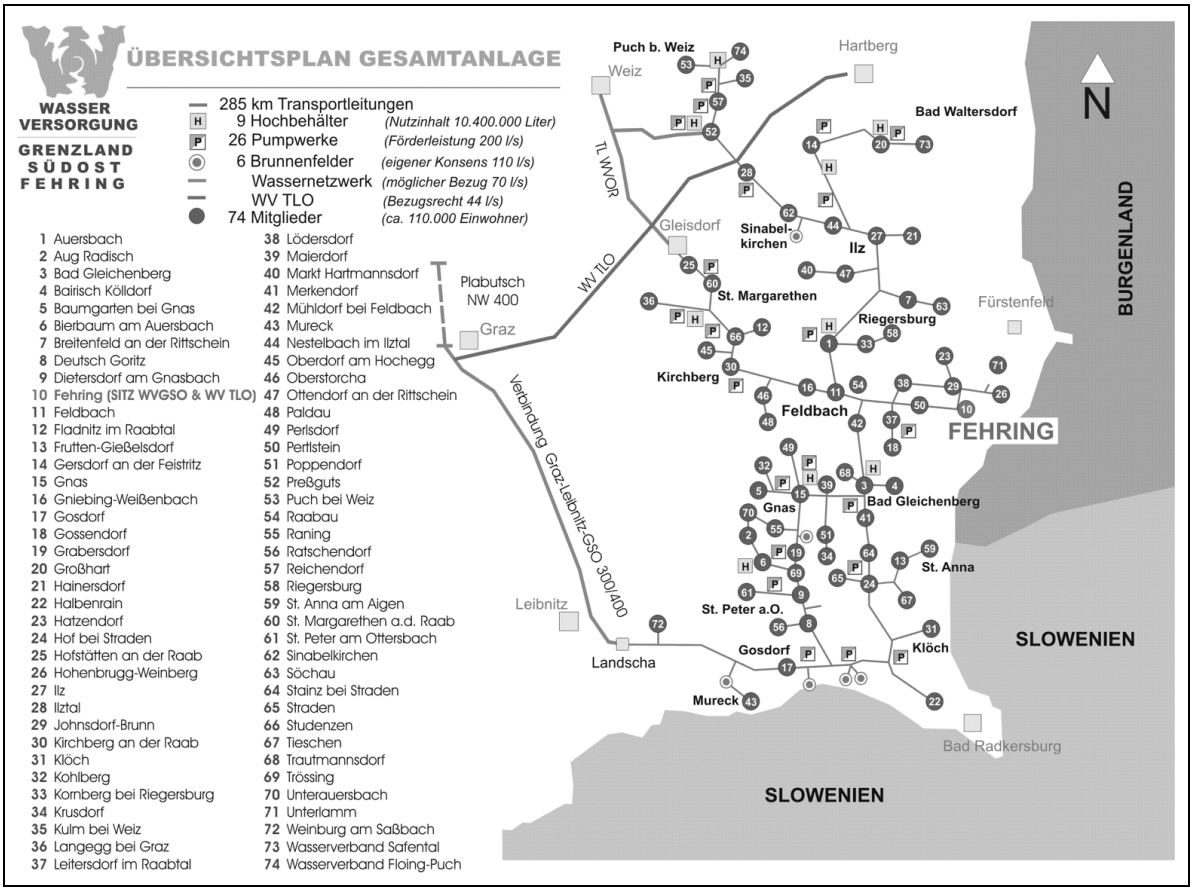


Graphic 7: Grants available to be used for water management facilities provided by the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management[17]

3.1 Water board "Wasserversorgung Grenzland Südost"

The water board "Wasserversorgung Grenzland Südost" (hereinafter referred to as "WVGSO") is a trans-regional provider of water. Hence, the water board usually does not provide water to final customers but to municipal water utilities, water co-operatives and other water boards. The WVGSO is a water board under the water act of 1959[18]. All regulations concerning the water board are constituted in the boards' statutes, as long as there are no overruling regulations constituted in the water act of 1959. In 2014 the WVGSO provided water to a total of 75 municipal water utilities and 2 other water boards. Due to this fact, the WVGSO is one of the biggest providers of water in Styria. The extent of the WVGSO's water supply network can be seen in Graphic 8. This graphic also depicts the location of the member municipalities and the most important equipment, such as pipelines, high-level tanks, wells and pumping stations. Furthmore, the 75 municipalities are also owner of the water board and are therfore obligated by §7 section 3 of the WVGSO's statutes to make cost covering contributions to the water board, so that the WVGSO is able to provide for the construction, operation and maintenance of its water supply facilities. The contribution and voting share are also constituted in the water boards statutes and are based on the ratio of the population number of each municipality. As for 2013 a population number of 1000 would account for approximately 1% voting share or contribution share.

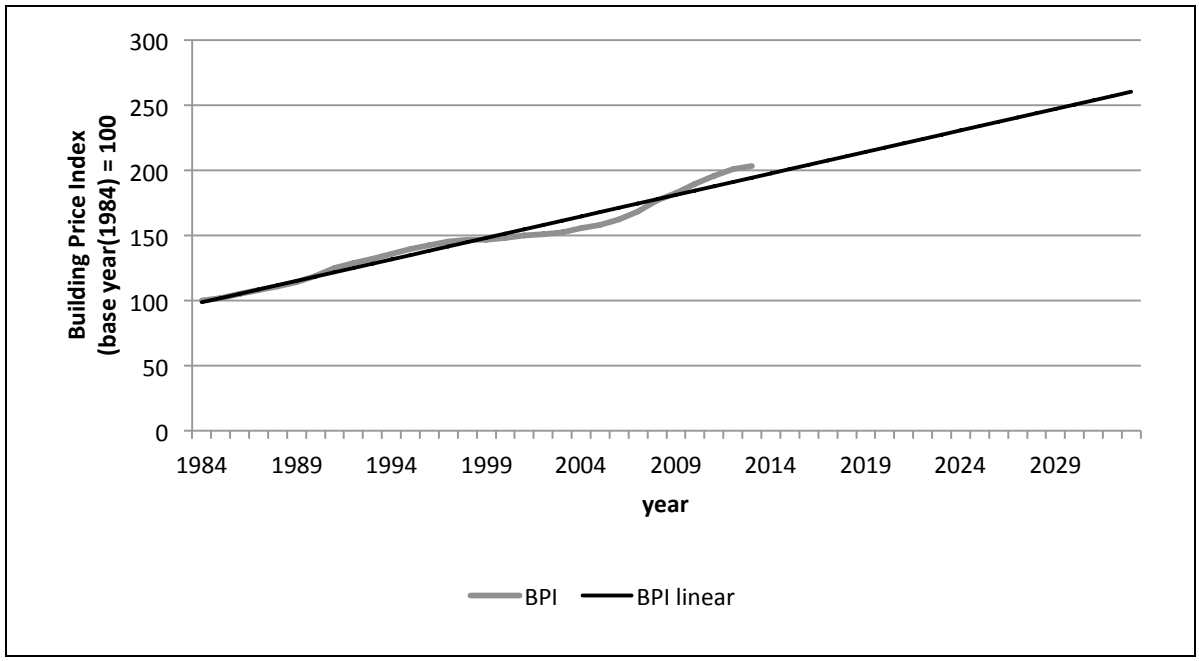
[17] Cf. Umweltförderungsgesetz UFG 1993 §6 section 2
[18] Cf. Wasserrechtsgesetz 1959 i.d.F. 2003



Graphic 8: Map of the WVGSO members (state as of 2013)

As of 2013 the WVGSO's water pipeline network sums up to a total length of 285 km, which has incurred an investment volume of 41 million euros including other equipment. Almost 80% of these water pipelines were built in the period from 1982 to 1986. The constructions of the majority of the pipelines in this short time period results in the fact that, due to limited operating life of the pipelines, these pipelines may break and therefore have to be replaced. Assuming an average operating life of 50 years, this will be the case around the years 2030 and 2035. For sure this replacement of broken pipelines will come with a hefty price tag. Considering that the initial investment for these pipelines summed up to 28 million euros and the fact that prices in this sector increased by the factor of 2.6 (see Graphic 9), the upcoming reinvestments will cost more than 70 million euros. Subsequently these extra costs will have to be passed on the customers. In order to avoid sudden jumps in the water tariff, these extra costs have to be taken into account when it comes to strategically plan a water tariff.

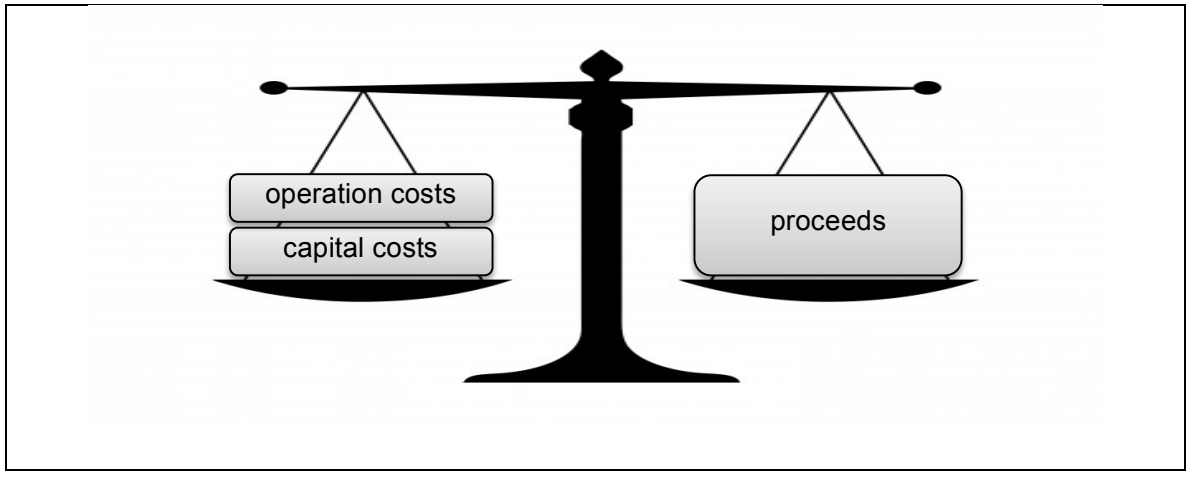
The following chapters will make the case for the establishment of a cost accounting system for water management facilities. As it will be described in these chapters, there is not only an economic aspect concerning the establishment of a cost accounting system, but also a legal and a frequently forgotten educational or ethical aspect.



Graphic 9: Building price index (base year=1984)[19]

3.2 Economic aspects of establishing a cost accounting system

The introduction of a cost accounting system for water management facilities has primarily an economic aspect. In order to operate a sustainable business, it is necessary that costs and are revenues are balanced. This equilibrium of costs and revenues is commonly referred to as cost recovery (see Graphic 10).



Graphic 10: cost recovery displayed as a balance between costs and revenue

[19] Graphic based on data of "Statistik Austria – Baupreisindex für Hoch- und Tiefbau" http://www.statistik.at/web_de/statistiken/produktion_und_bauwesen/konjunkturdaten/baupreisindex/020404.html (13.06.2014)

Article 9 section 1 of the European water framework directive act constitutes that "water-pricing policies provide adequate incentives for users to use water resources efficiently, and thereby contribute to the environmental objectives of this Directive"[20]. This regulation was also incorporated in the Austrian water act §55e. Concerning the incentives in the water price policy that will make users to use water more efficiently there is only one reasonable public charge that fulfills this criterion. Since a more efficient use of the resource water has to be evoked, the measures to be taken clearly have to be linked to the water usage. Therefore the only viable choice in the pool of public charges is the water usage fee, which is calculated by the product of the water tariff and the amount of water obtained. As operation costs and capital costs usually cannot be influenced in a short term, proceeds from sale are the only variable that can be altered in order to establish equilibrium between costs and proceeds. Furthermore it can be assumed that the amount of demanded water also can't be directly influenced by the water management facility, hence the water tariff is the only variable that can establish equilibrium between costs and revenues. In this case the water tariff is called cost recovering water tariff. To calculate a cost recovering water tariff a cost accounting system is inevitable.

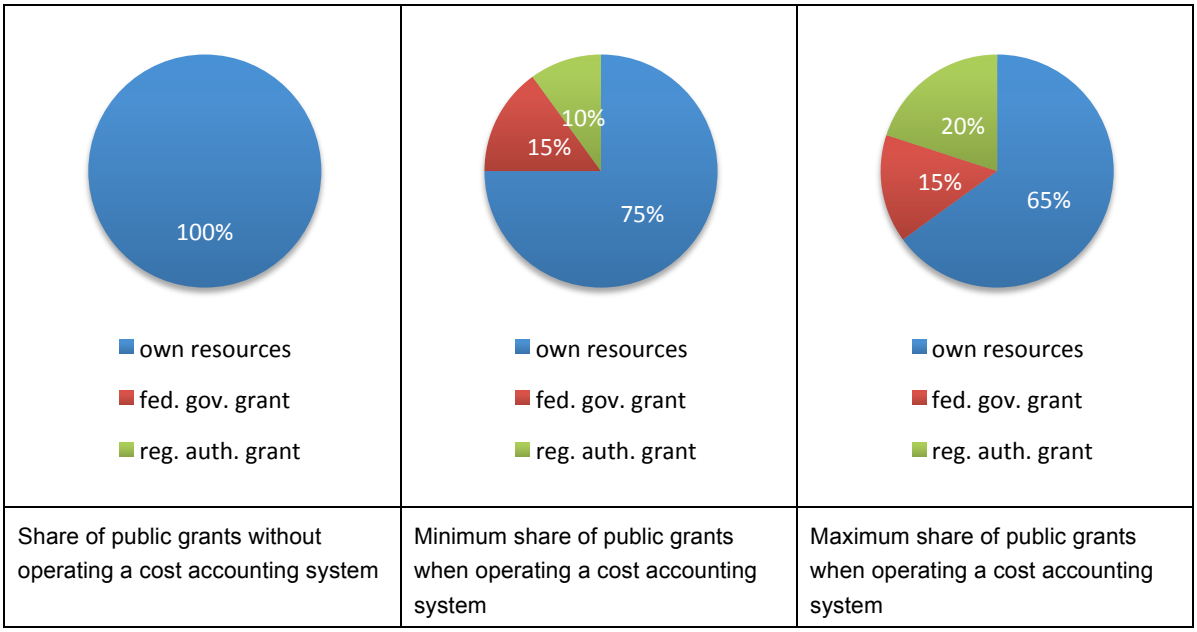
Besides the fact that a cost accounting system is inevitable to calculate a correct cost recovering water tariff, a cost accounting system is also inevitable when it comes to applying for public grants. In the end operating a cost accounting system is a definite requirement that a water management facility has to fulfill in order to obtain the public grant. Receiving public grants are of utmost importance to the water management facilities, since they can recover up to 55% (35% in Styria) of the investment costs. According to the public grant application guidelines for water management facilities, a cost accounting system represents a requirement for a federal grant in at least two cases:

- „... die ökologische Verträglichkeit sowie die volkswirtschaftliche und betriebswirtschaftliche Zweckmäßigkeit der Maßnahmen mit einer Variantenuntersuchung oder Studie belegt ist."[21]
  … the ecological compatibility as well as the economic and business suitability are verified in a study.
- „... sofern es sich nicht um einen Förderungswerber gemäß § 5 Z 5 handelt (Anmerkung: betrifft Einzelversorgungsanlagen), der Förderungsnehmer spätestens zum Zeitpunkt der Kollaudierung eine Kosten- und Leistungsrechnung führt."[22]
  … as soon as the grant applicant doesn't conform with an organization according to §5 section 5 (affects single water supply systems only), the grant recipient has to operate a cost accounting system at least at the time of the grant approval.

On federal state level (e.g. Styria) the public grant application requirements are almost identical to the requirements on federal central government level. The public grant

[20] Article 9 section 1 European Water Framework Directive
[21] FRR SWW 1999 i.d.F. 2014 §4 section 1 para.2
[22] FRR SWW 1999 i.d.F. 2014 §4 section 1 para.10

application guidelines of the province of Styria constitute that the grant applicant has to attach a cost calculation for the last closed accounting year. Finally Graphic 11 visualizes the share of public funds that are granted to applicants depending whether or not they are operating a cost accounting system. As can be seen in the middle and right diagram of this graphic the sum of public funds, granted by the federal central government and the federal state authority of Styria (regional authorities grant), can cover 25% to 35% of the total investment costs of a project. The exact amount of regional authority grants is depending on the water tariff of the grant applicant. Generally speaking the fund granted by the federal state authority of Styria increases with a decreasing water tariff. Additionally the water tariff may not exceed the 1.5 fold of the calculated cost recovering water tariff.



Share of public grants without operating a cost accounting system	Minimum share of public grants when operating a cost accounting system	Maximum share of public grants when operating a cost accounting system

Graphic 11: Share of public grant dependent on the existence of a cost accounting system

3.3 Legal aspect of establishing a cost accounting system

The introduction of a cost accounting system has not only an economical aspect but also a legal aspect. There are several legal frameworks on European, central federal government and central state level that stipulate that water management facilities have to obey the cost coverage principle. For sure the cost coverage principle can only be applied by any water management facility when it operates a cost accounting system. However, the following list will make the case for incorporating a cost accounting system from the legal point of view.

European level:
On the European level the water framework directive 2000/60/EC sets the guidelines in water policies for all members of the European Union. The main goal of this directive is to secure and to keep clean European waters and to establish a water management plan. However, in article 9 section 1 of this directive the EU member states were stipulated to take into

consideration the principle of cost coverage including ecological and resource costs. This directive has to be transposed until 2010.

Central Federal Government level:
One of Austria's obligation concerning the EU-membership is to harmonize European and national law. Therefore the abovementioned EU water framework directive has been transposed into national law as of the 22nd December of 2003. The national law that corresponds with the EU water directive is the Austrian water act ("Wasserrechtsgesetz"). The principle of cost recovery was introduced in this act in §55e section 1 para. 1.

„Zur Verwirklichung der ... festgelegten Ziele hat das
Maßnahmenprogramm zumindest Vorgaben (grundlegende Maßnahmen) zu enthalten,

> *1. die unter Bedachtnahme auf das Kostendeckungsprinzip für Wasserdienstleistungen (Wasserversorgung und Abwasserbeseitigung), einschließlich Umwelt- und Ressourcenkosten und unter Zugrundelegung des Verursacherprinzips bis 2010 auf Grundlage der wirtschaftlichen Analyse der Wassernutzungen*
>
> > *a) adäquate Anreize für Wassernutzer für einen nachhaltigen und effizienten Umgang mit der Ressource Wasser bieten..."*[23]

Federal State Level: (Styria)
In Styria the cost recovery principle is established in §71 section 2 of the styrian municipality code (steirische Gemeindeordnung). This paragraph states:

„Die Gemeinden werden ermächtigt, für die Benützung ihrer öffentlichen Einrichtungen und Anlagen auf Grund eines Gemeinderatsbeschlusses Gebühren zu erheben, die grundsätzlich kostendeckend festzusetzen sind und die geteilt für die Bereitstellung der Einrichtungen und Anlagen und für die Möglichkeit ihrer Benützung (Bereitstellungsgebühr) einerseits und für die tatsächliche Inanspruchnahme der Einrichtungen und Anlagen (Benützungsgebühr) andererseits ausgeschrieben werden dürfen"[24]

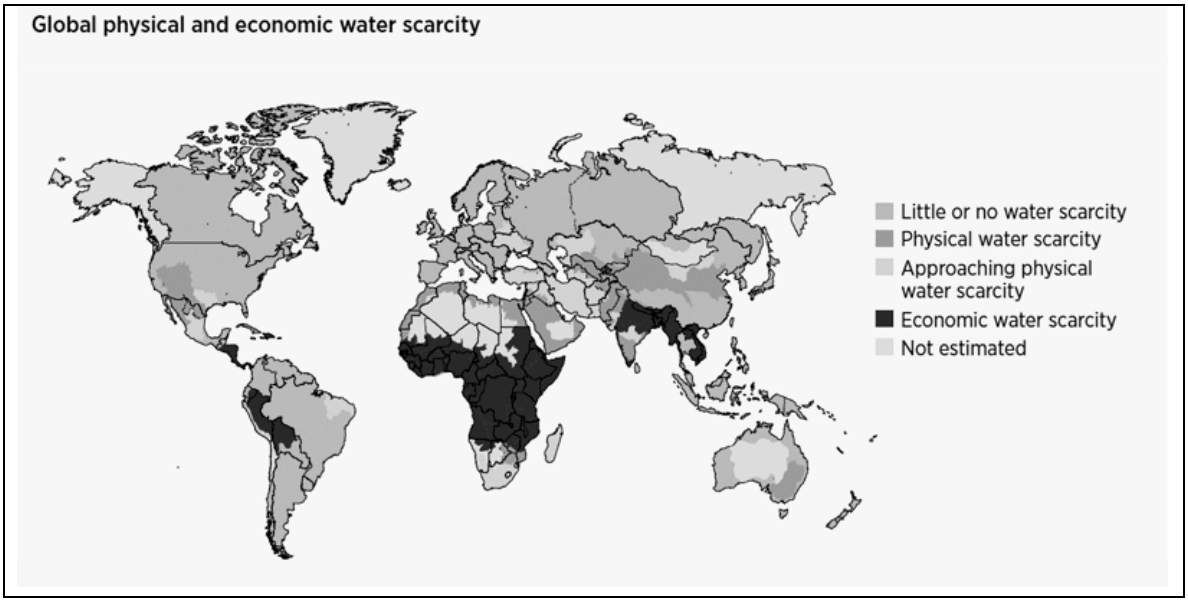
3.4 Educational aspect of establishing a cost accounting system

Finally the introduction of a cost accounting system for water management facilities also has an educational or ethical aspect. As it is stated in the introduction of this thesis Austria is rich in water. Therefore only a small amount of the available water resources are actually used in Austria. However there are a lot of countries and even continents where water is a scarce resource. Graphic 12 reveals that water scarcity is already present on every continent. According to a study of the United Nations a total of 1.2 billion persons suffer from water scarcity. Furthermore forecasts predict that this number will reach 1.8 billion by 2025[25]. The UN defines physical water scarcity as an annual water supply below 1,000m^3 per person. In

[23] Austrian Water Act (WRG 1959) §55e section1 para. 1 (01.05.2014)
[24] Styrian Municipality Code (Steirische Gemeindeordnung) §71 section 2 (01.05.2014)
[25] Human Development Report (2006)

comparison to this annual water supply in Austria equals 10,000m^3 per person and year. Considering the tremendous amount of people suffering from water scarcity it may sound ethically wrong to put a price tag on water in order to achieve efficient usage of this essential resource. However the following will make the case for putting a price tag on water. A closer look on Graphic 12 reveals, that physical or economical aspects can cause water scarcity. As it was already mentioned, physical water scarcity is given when the annual water supply drops below 1,000 m^3. According to the UN economic water scarcity describes the state, when a region may not suffer from physical water scarcity, but does not have the financial resources to build a water-supplying infrastructure. There are currently 1.8 billion people living in areas that suffer from economic water scarcity, meaning that the water may be available, but due to lack of funds and therefore technology people are not able to harness and spread it. This example showcases a problem that often cannot even be imagined in industrialized countries, such as Austria.

Since water is a free good, Austrian water management facilities do not have to pay for water that was extracted from the ground, springs or rivers. It's the process of promoting, cleaning and subsequently spreading the water that causes the costs. In order to operate a sustainable water supply system these costs have to be recovered by public charges. As it was explained earlier, only the water usage fee fulfills the criterion of promoting an efficient use of water. Again, a cost accounting system is inevitable, since a cost covering water tariff is calculated that guarantees a sustainable financing of water management facilities.



Graphic 12: Global physical and economic water scarcity[26]

[26] United Nations World Water Development Report 4 (2012)

3.5 Objective

The previous chapters haven proven that introducing and operating a cost accounting system and subsequently calculating a cost covering water tariff is inevitable for water management facilities in order to operate business sustainably, plan better and comply with legislation on several levels. This master thesis has three main objectives and every single one of them corresponds with the above-described reasons.

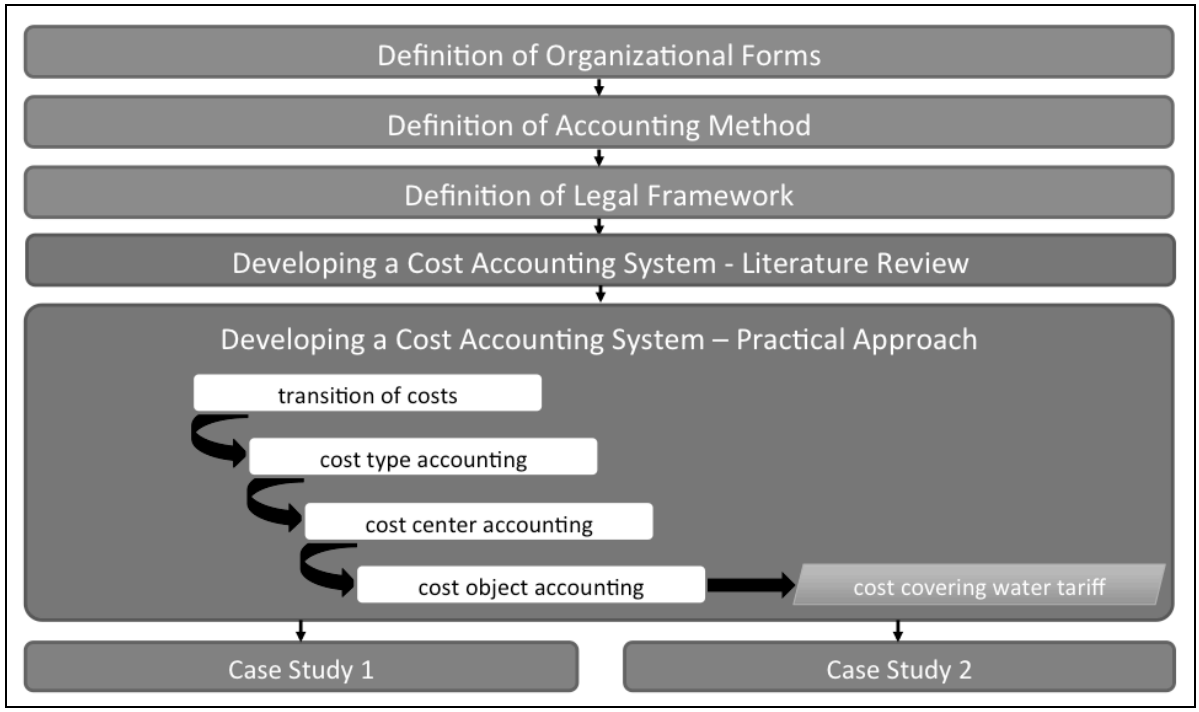
1. As part of this master thesis a cost accounting system shall be developed for the WVGSO water board and his members. The cost accounting system shall be able to calculate a cost covering water tariff and may comply with the legal framework prevalent in Austria and recognized accounting principles alike.
2. The cost accounting system described in paragraph 1 may support all organizational forms relevant within the WVGSO water board and his members. Furthermore the cost accounting system shall support all accounting methods prevalent within the WVGSO water board and his members.
3. In order to validate the cost accounting system, which was defined in paragraph 1 and 2, two case studies shall be performed. For both case studies the fiscal year of 2013 shall be used to perform the case study.
   - Case Study 1: Water board “WVGSO”
   - Case Study 2: Styrian Regional Municipality

3.6 Scope

The scope of this master thesis is limited to the water board “WVGSO” and his members. For the regional extent of this limitation see Graphic 8. Nevertheless the cost accounting system defined in following chapters will work for other water management facilities that comply with the organizational form described in this thesis. The main reason why this thesis is limited to the WVGSO and his members is the fact that water management facilities with special organizational forms could be excluded. Especially water management facilities under company law (e.g. PLC, LLC, SE), whose accounting principles have to comply with the Austrian commercial code (UGB) and several lex specialis, could have been excluded in doing so.

3.7 Methodology

Corresponding with the objectives defined in chapter 3.5 Graphic 13 depicts the methodology used in this thesis in order to achieve these objectives. First of all the organizations forms will be defined in chapter 4.1 in accordance with the scope defined in chapter 3.6. This chapter will reveal all organizational forms prevalent within the area examined in this thesis and will assign each member of the WVGSO to an organization form. Subsequently the accounting methods will be examined in chapter 4.2, based on the organizational forms that were defined in the previous chapter. Furthermore this chapter will list the effects that each specific accounting method may have on the development of the cost accounting system. In chapter 4.3 the legal framework for further proceedings will be elaborated. First of all the legal framework for water management facilities will be described in general. Secondly the prevalent legal framework will be translated into boundary conditions for the calculation of a cost covering water tariff. After the framework was defined in chapter 4, the core topic of this thesis will be displayed in chapter 5 and 6. In chapter 5 an extensive literature review will be performed in order to elaborate state of the art accounting principles. This literature review will be based on the four major tasks that are commonly performed in order to develop a cost accounting system. At the same time these principles will be screened if they comply with legislation. The findings of chapter 5 will result in a morphological box that shows all the accounting principles available for this task and highlights those principles that comply with the prevalent legal framework. Chapter 6 will translate the theoretical accounting principles found in chapter 5 into a practical framework that is used to develop a cost accounting Excel tool. This chapter will also use the common four steps of cost accounting. Furthermore the spreadsheets used in the Excel tool will be assigned to a step and described.



Graphic 13: Flow diagram of the methodology used in the thesis

In Chapter 7 the cost accounting system that emerges from chapter 6 will be tested and verified by performing two case studies. The methodology used in both case studies is the following. First of all the case study candidates are introduced. Subsequently it will be described which data sets were gathered and what steps were necessary to use this data for the cost accounting system. Finally the cost covering water tariff will be presented and compared to the actual water tariff of the organization. A sensitivity analysis will throw light on the variation of the cost covering water tariff depending on the variation of defined system variables. Additionally a 10 or rather 20 years forecast will deliver important data for strategic decision making and planning.

4 Organizational and Legal Framework

This chapter will define the framework for the cost accounting system that will be developed in the following chapters. First of all the WVGSO and his members will be allocated to a matching organization type. Subsequently the accounting method used within each organization type will be defined and its effect on the cost accounting system described. Finally the legal framework and its effect on the cost accounting system will be elaborated.

4.1 Definition of Organizational Forms

As it is shown in this chapter the structure of the cost accounting system is highly dependent on the organizational form of the water management facility. According to the guideline W61 of the Austrian association for gas and water (hereinafter referred to as ÖVGW), water management facilities can be subdivided into pure waterworks and mixed public utility services. Whereas pure waterworks solely supply water, mixed public utility services also provide other services, such as wastewater disposal or waste management. When it comes to accounting, mixed public utility services are difficult to handle, since they don't offer just one product or service, but several products or services. Regarding the cost accounting system, the supply of more than one good or service requires more complex procedures in almost every step of cost accounting. Starting with cost type accounting, where costs have to be accurately subdivided into direct costs and overhead costs through to cost object accounting, where more sophisticated calculation methods have to be used. Since this thesis exclusively focuses on water management facilities only pure waterworks will be examined in order to avoid the above-mentioned complications that come with mixed public utility services.

Pure waterworks can be subdivided into five main categories[27]:

1. **Water co-operative** under § 73 et seq. of the Austrian water act (hereinafter referred to as WRG)
2. **Municipal enterprise that qualifies as market producer** [Account-Nr.: 850 according the Austrian budgeting and accounts regulations (hereinafter referred to as VRV)]
3. **Water board** under § 87 of the WRG
4. **Association of municipalities** under Article 116a of the federal constitutional law
5. **Water management facility under the Austrian commercial code**:
    a. LLC – Limited Liability Company
    b. PLC – Public Limited Company
    c. SE – European Public Limited Company (Societas Europaea)

[27] Cf. ÖVGW W61 p.6

Based on the aforementioned five main categories the WVGSO and his members will be allocated to the a corresponding category.

Water cooperatives:

-

Municipal enterprises that qualify as market producers:

Auersbach	Hofstätten an der Raab	Pertlstein
Aug-Radisch	Hohenbrugg-Weinberg	Poppendorf
Bad Gleichenberg	Ilz	Preßguts
Bad Radkersburg	Ilztal	Puch bei Weiz
Bairisch Kölldorf	Johnsdorf-Brunn	Raabau
Baumgarten bei Gnas	Kirchberg an der Raab	Radkersburg Umgebung
Bierbaum am Auersbach	Klöch	Raning
Breitenfeld an der Rittschein	Kohlberg	Ratschendorf
Deutsch-Goritz	Kornberg bei Riegersburg	Reichendorf
Dietersdorf-Gnasbach	Krusdorf	Riegersburg
Fehring	Kulm bei Weiz	Sinabelkirchen
Feldbach	Langegg bei Graz	Söchau
Fladnitz im Raabtal	Leitersdorf im Raabtal	St. Anna am Aigen
Frutten-Gießelsdorf	Lödersdorf	St. Marein bei Graz
Gersdorf an der Feistritz	Maierdorf	St. Margarethen an der Raab
Gnas	Markt Hartmannsdorf	St. Peter am Ottersbach
Gniebning-Weißenbach	Merkendorf	Stainz bei Straden
Gosdorf	Mühldorf bei Feldbach	Straden
Gossendorf	Mureck	Studenzen
Grabersdorf	Nestelbach im Ilztal	Tieschen
Großhart	Oberdorf am Hochegg	Trautmannsdorf in Oststeiermark
Hainersdorf	Oberstorcha	Trössing
Halbenrain	Ottendorf an der Rittschein	Unterauersbach
Hatzendorf	Paldau	Unterlamm
Hof bei Straden	Perlsdorf	Weinburg am Saßbach

Table 4: List of municipal enterprises that qualify as market producers (Note: All of these municipalities provide mixed public utility services. Therefore this lists exclusively is referring to water section – Account 850 according to the VRV – of this municipalities)

Water board under WRG:

WVGSO	WV Floing-Puch	WV Safental

Association of municipalities under B-VG:

-

Water management facility under UGB:

-

4.2 Definition of Accounting Methods

Until now this chapter did only examine the effects of organizational forms on the cost accounting system. An important characteristic of an organization type is the accounting method used, because it strongly influences the approach of developing a cost accounting system. Therefore the legal framework, which determines the accounting method for each organizational form described in the previous chapter, will be presented.

Before the legal framework, which determines the suitable accounting method for an organizational form, will be described it's useful to describe the mostly unknown term "cameralistics". Cameralistics is the accounting method commonly used by Austrian and German municipalities. The cameralistic accounting method is based on two books, the budget and the annual financial statement. In the budget all planned financial transactions (expenditure / income) are defined for the upcoming accounting period (mostly fiscal year), whereas the annual financial statement is a record of all financial transactions that actually were performed in this period. The draft of the accounts and further regulations that concern cameralistics accounting are determined in the VRV. The major disadvantage of cameralistics in comparison to the commonly used double-entry bookkeeping is that performance figures can't be evaluated due to the lack of accrual accounting mechanisms.

Water co-operative:
The relevant legal framework for water co-operatives is located in the 9th section of the Austrian water act (WRG). § 77 section 3 contains the regulations concerning the statutes of a water co-operative. Surprisingly it contains no information on the usage of an specific accounting method. Nevertheless, § 78 section 1 WRG constitutes that a water co-operative may determines a budget for every fiscal year, which includes all planned expenditures and incomes. Additionally an annual financial statement has to be done. To facility matters water co-operatives therefore often choose to perform accounting on a cash basis (records of expenditures and incomes) according to § 189 of the Austrian commercial code (hereinafter referred to as UGB).

Municipal enterprise that qualifies as market producer:
Municipalities that provide water in accordance with public law are obligated to perform their accounting activities according to the VRV, which regulates the municipal accounting. Therefore this organization type uses cameralistics.

Water board under WRG:
The relevant legal framework for water boards can be found in the 10th section of the Austrian water act (WRG). However, this section does not contain any information on how water boards should keep accounts. Hence water boards are free to choose whether to use cameralistic or double-entry bookkeeping.

Association of municipalities under B-VG:
Since associations of municipalities consist of more than two municipalities, this organization type has to oblige to the VRV and therefore uses cameralistic bookkeeping.

Water management facility under UGB:
As the name implies facilities with this organization type have to oblige to the accounting standards that are stipulated in the UGB. § 189 to § 342 UGB provide the accounting framework for public and closed companies.

Organizational Form	Accounting method	
	Legal obligation	Best practice
Water co-operatives	-	Accounting on cash basis
Municipal enterprise	Cameralistic	Cameralistic
Water board under WRG	-	Cameralistic / Double-Entry Bookkeeping
Ass. of Municipals under B-VG	Cameralistic	Cameralistic
Water management facilities under UGB	Double-Entry Bookkeeping	Double-Entry Bookkeeping

Table 5: Organizational forms and their typical accounting method

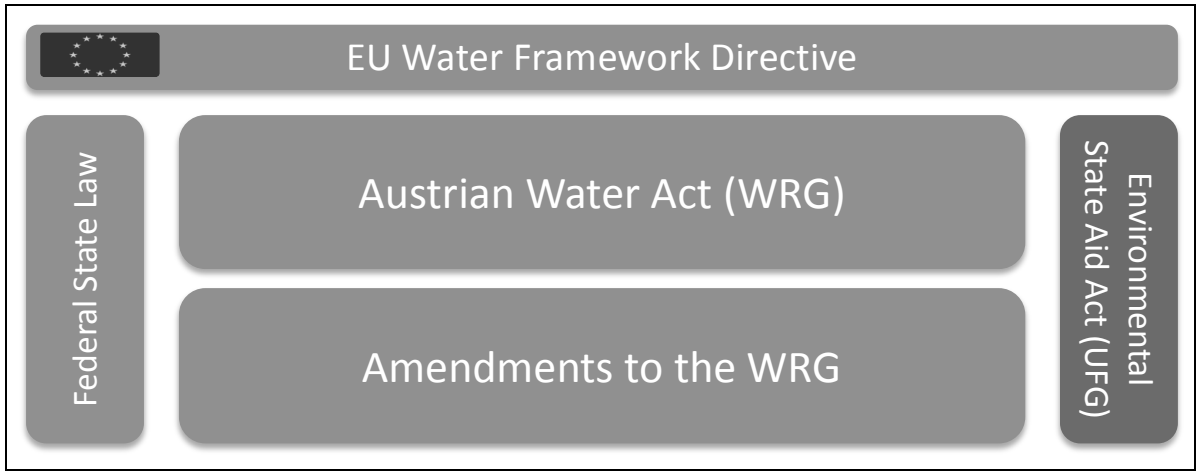
4.3 Definition of the Legal Framework

In this chapter the legal framework will be elaborated. First of all the general laws that provide the legal framework in the field of water management will be described. Subsequently those paragraphs will be addressed that effect the development of the cost accounting system. Finally those paragraphs will be used to define the boundaries for a cost covering water tariff. In doing so two values, minimum and maximum cost recovery barrier, will be introduced.

4.3.1 Review of the legal framework in water management

The different organizational forms described in chapter 4.1 are generally embedded in the same legal environment. Therefore the following described legal framework is valid for all organizational types alike. Graphic 14 displays the most important laws for the national water management. On top there is the European water framework directive, which provides the legal framework for all European member states. On central federal government level the Austrian water act (WRG) contains all regulations that also comply with the European water framework directive. There are several amendments (e.g. indirect discharge regulation) that extend the regulations already defined in the WRG. The regulations constituted in the WRG are furthermore transferred to federal state law. The federal state authority is permitted to specify but not alter the regulations made in the WRG. Beside the already described laws there is the Austrian environmental state aid act (UFG) that contains regulations on the funds granted by public authorities. This law is complemented by two further legal documents, the

funding guidelines and technical guidelines, which specify the grant application requirements and general regulations concerning the funds granted.



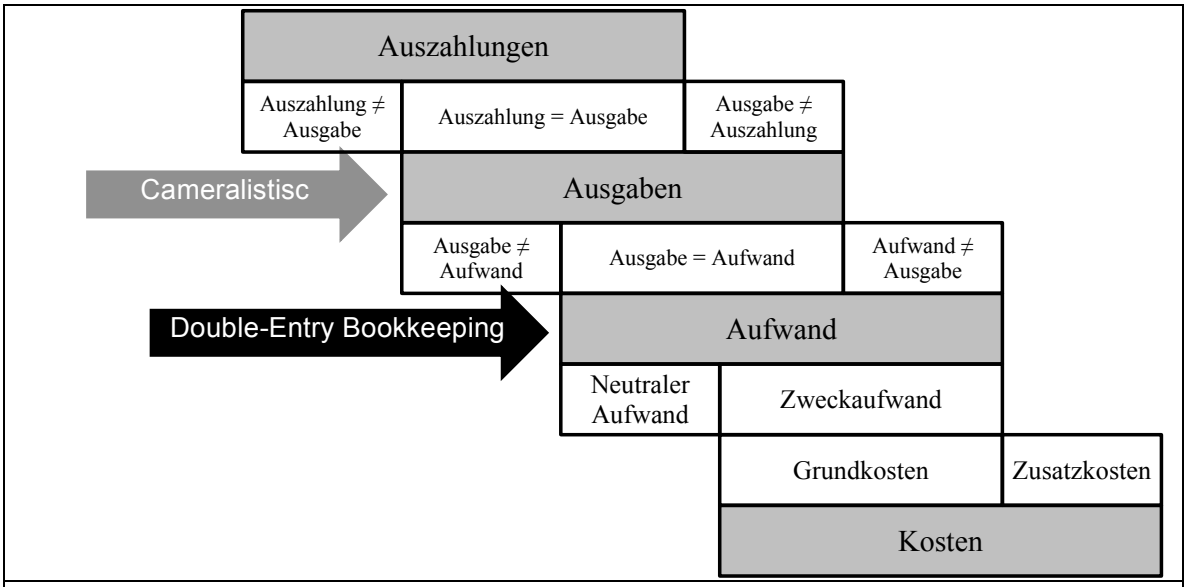
Graphic 14: General legal framework in water management[28]

As it was described in chapter 3.3 the term of cost recovery was introduced first in article 9 of the European water framework directive. This very article constitutes that EU member states have to take measures in order to impose the principle of cost recovery. In § 55e WRG this regulation was transferred into national law and therefore has to be fulfilled by every national water management facility.

To define the term “cost recovery” the term “cost” has to be defined first. According to consistent case law, the Austrian constitutional court has approved the economical cost concept[29]. ZUNK et al define the term cost as business objective and period oriented, ordinary monetary value that is necessary for the production of goods or services and the maintenance of productivity[30]. This definition is of utmost importance, because accounting methods used in water management are not standardized. As it was shown in chapter 4.2, water management facilities us cameralistic or double-entry bookkeeping depending on the form of organization. Graphic 15 depicts the variety of economic flows and allocates cameralistic and double-entry bookkeeping method accordingly. The graphic reveals that both accounting methods use a different set of economic measures. Whereas the cameralistic bookkeeping method uses expenditure and income to operate, the double-entry bookkeeping method uses spending and revenue. Hence, the data sets of both bookkeeping methods have to be transferred into the economic measures of costs and proceeds. An extensive description of this procedure will be provided in chapter 5.3.

As it was described in chapter 2.2.2, the municipalities are free to choose whether to operate business under public or private law. Since the legal framework for both possibilities is different, the boundaries for a cost covering water tariff will be evaluated separately.

[28] Cf. DIERNHOFER, W.; HEIDLER, S.; HÖRTENHUBER, A. (2003), S. 40
[29] Cf. VfSlg 8847/1980
[30] Cf. ZUNK, B.; GRBENIC, S.; BAUER, U. (2013) S.17



Auszahlung	Outpayment	Aufwand	Spending
Ausgabe	Expenditure	Kosten	Costs
Neutraler Aufwand	Neutral Spending	Zusatzkosten	Additional Costs

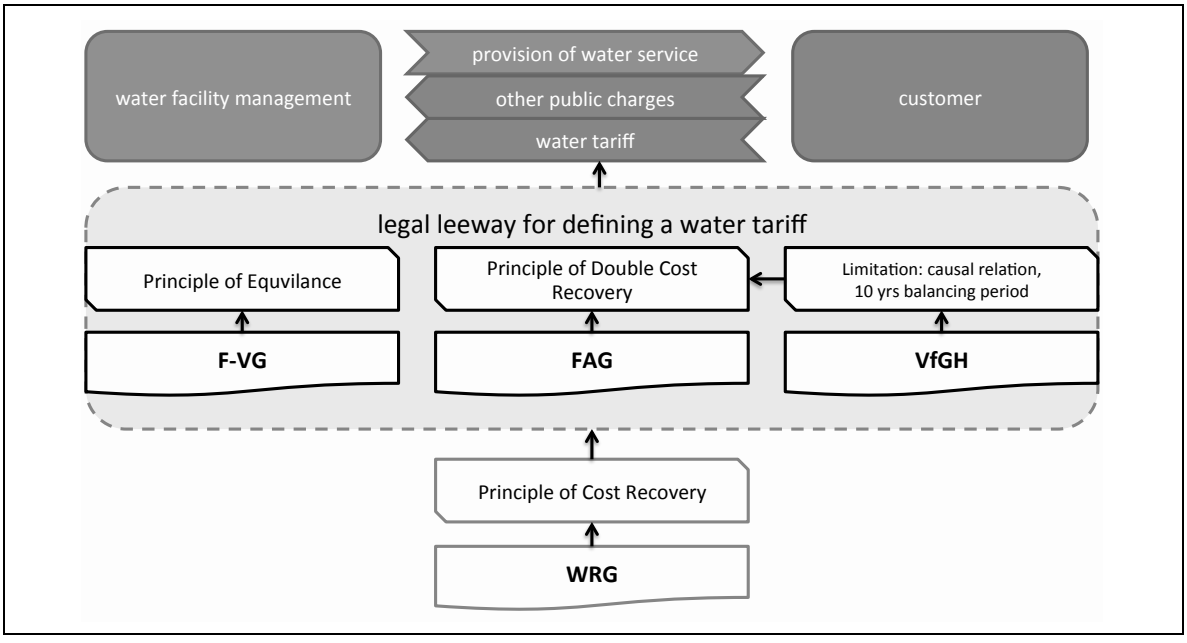
Graphic 15: Comparison of the terms outpayment, expenditure, spending and cost[31]

The concept of the cost recovering water tariff is highly disputed in advanced literature on public charges[32] and often addressed in several court of auditors' reports[33] and decisions of the constitutional court[34]. The reason for this dispute is the ambiguous legislation concerning the regulation of water fees, which was caused by the introduction of the Fiscal Equalization Law (hereinafter referred to as FAG after the German term "Finanzausgleichsgesetz"). Before the introduction of the FAG the legal situation concerning the determination of a fee was solely determined by the principle of equivalence. This principle, which is based on several decisions of the constitutional court, constitutes that a fee may be financially equal to the provided service. Hence, until the introduction of the FAG in 1993 the fees collected by the municipalities were not permitted to exceed the costs that were incurred by providing this service. At this point it has to be mentioned that this principle is actually based on the cost concept used in economics. With the introduction of the FAG in 1993 the legal landscape for water management facilities suddenly changed, as from that point on they were allowed to collect the double of what was necessary for operation, maintenance including the discharge of liabilities and interests with regard to an operating life that suits the facility. This principle is often referred to as the principle of double cost recovery (in German: "Kostendoppeldeckungsprinzip"[35]). The deviation of the principle of double cost recovery constituted in the FAG from the principle of equivalence constituted in the financial constitutional law is further explained in the amendments to the FAG 1993. Turns out that

[31] Cf. ZINGEL, H. (2004) p. 8
[32] Cf. KAMPER K. (2007); p. 247 et seq.
[33] Cf. Report from the Court of Auditors: „Stadt Wien Wasser-, Kanal-, Müllgebühren sowie Energiepreise" (2012)
[34] Cf. Decision of the Constitutional Court VfGH B 260/01 "Perchtolsdorfer Erkenntnis"
[35] Cf. KAMPER K. (2007); p. 255

water management facilities are not permitted to collect the double annual financial necessity stated in the budget or financial annual statement, but that the exceeding of the principle of equivalence and therefore usage of the principle of double cost recovery is only permitted if this exceeding is internally coherent with the facility. A decision of the constitutional court further specifies that inner coherence is given when the exceeding is caused by achieving ecological objectives or building up financial resources for follow-on investments. Additionally to this restriction the constitutional court decided that water management facilities may exceed the principle of equivalence with no internally coherent cause, as long as the exceeding is balanced out within a 10 years time period[36]. Both restrictions that justify the usage of the principle of double cost recovery ensure that financial surpluses caused by over-cost-recovering tariffs are not being withdrawn permanently from the facility. Graphic 16 gives an overview of the just described matter.

The operation of a water management facility under private law is different, as the water management facility cannot collect public charges that are limited by the two aforementioned principles (also see Graphic 16) but a tariff. Since there are no laws regulating the water tariff that can be collected by water management facilities under private law the maximum tariff collectable by private law water management facilities is uncertain. However, the guideline W62 of the Austrian Association for Gas and Water (ÖVGW) lists two main reasons why the principle of equivalence and double cost recovery should be also applicable for private law water management facilities.



Graphic 16: Legal leeway for water management facilities when applying the principle of cost recovery

[36] Cf. Decision of the Constitutional Court VfGH B 260/01 “Perchtolsdorfer Erkenntnis”

1. Water management facilities may abuse the right to choose whether to operate business under public or private law, since there are no laws regulating the water tariff collected by private law water management facilities.
2. From basic civil law regulations it can be deduced that water management facilities have to provide their service under fair conditions, because of their monopoly position.

A recent decision of the Austrian Supreme Court specifies the fair conditions mentioned in paragraph 2 of the previous list. This Supreme Court decisions constitutes that the fair conditions have to be determined in such a way that the monopolist is able to recover its costs that emerged in providing the service[37]. Therefore the water tariffs to be collected by private law water management facilities also have a legal maximum. However, this Supreme Court decision does not contain any regulations whether private law water management facilities are permitted to charge costs that exceed the principle of equivalence. In regard of paragraph 1 of the previous list and the assumption that water management facilities under private law should not be handicapped with respect to water management facilities under public law it can be assumed that the regulations of the FAG concerning the determination of the water tariff are also applicable for water management facilities under private law. Both, water management facilities under public and private law are therefore obligated to collect tariffs within the scope that is defined by the principle of equivalence and the principle of double cost recovery.

4.3.2 Practical interpretation of the legal framework in water management

As it was described in the previous chapter, water management facilities have to comply with certain principles when determining the water tariff. The reason that there are apparently two ambiguous principles (principle of equivalence vs. principle of double cost recovery) is that the legislator is trying to achieve more than one objective. On the one hand the principle of equivalence avoids that water management facilities permanently make a deficit, on the other hand the principle of double cost recovery ensures that water management facilities do not collect unfair fees for an essential good. Subsequently two terms shall be introduced that correspond with the application of either of the aforementioned principles. The definition below will follow the definition elaborated by the Department 14 of the federal state authority of Styria[38].

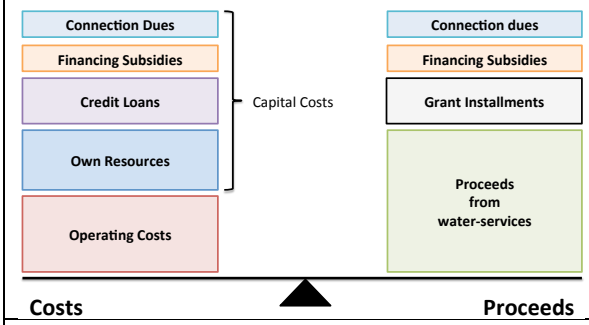
Minimum cost recovery threshold:
The minimum cost recovery threshold corresponds with the principle of equivalence, which constitutes that the collected fee has to be equivalent to the provided service or good. According to this principle, the sum of collected charges, which is the sum of all collected fees and dues, may not exceed the sum of operating costs and capital costs, whereas the

[37] Cf. Decision of the Austrian Supreme Court – Ob 182/13b paragraph 2
[38] Cf. RAPPOLD, P. (2013) S.4

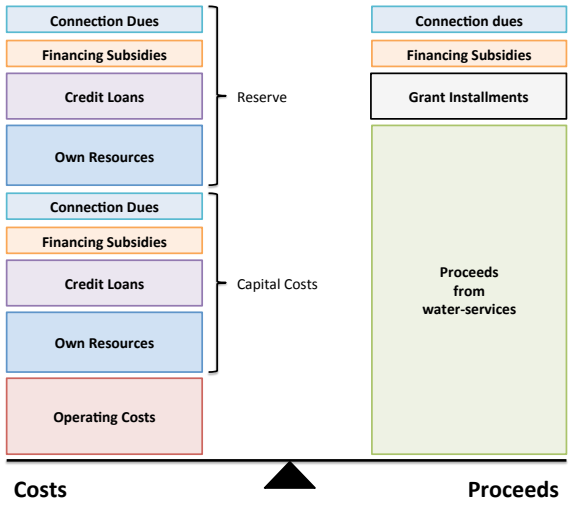
capital costs are calculated in respect of an operating life that suits the facility. Since water management facilities only have to pay back own resources and liabilities (e.g. credit loans) only these shares of the historical investment costs are used to calculate the capital costs (see Graphic 17). The residual share of the investment costs, which is the sum of investment subsidies and connection dues, is neglected in the calculation of the capital costs since these costs were already recovered.
If a water tariff is equal or greater than the minimum cost recovery threshold, then until the end of operating life of the facility the collected proceeds will provide for the operating costs and amortization of own resources and liabilities made to fund the investment taking into account an operating life suitable for the facility.

Maximum cost recovery threshold:
The maximum cost recovery threshold corresponds with the principle of double cost recovery, which constitutes that a water management facility is permitted to collect double of the annual costs that are necessary for operation and maintenance including the discharge of liabilities and interests with regard to an operating life that suits the facility. Additionally the exceeding of the single cost recovery has to serve a purpose of inner coherence. As it was described earlier, this inner coherence is given when the additional costs arise from building up reserves for follow-on investments or achieving ecological targets. Since the pursuit of ecological targets is planned on central federal government level and federal state level and is furthermore executed by providing grants in a way that it will help to achieve these ecological targets, the inclusion of ecological costs will be neglected. Therefore only costs that result from building up reserves for follow-on investments are admissible when exceeding the single cost recovery principle. According to this, the sum of collected public charges may not exceed the sum of operating costs and capital costs including reserves (see Graphic 18), whereas the capital costs are calculated in respect of an operating life that suits the facility. Furthermore the reserves built up are equal to the future follow-on investment costs, which is the sum of the historical investment costs including inflationary compensation.
If a water tariff is equal than the maximum cost recovery threshold, then until the end of operating life of the facility the collected proceeds will not inly provide for the operating costs and amortization of own resources and liabilities made to fund the investment taking into account an operating life suitable for the facility, but also reserves are built up in the extent that follow-on investments can be made after the end of the facilities operating life.

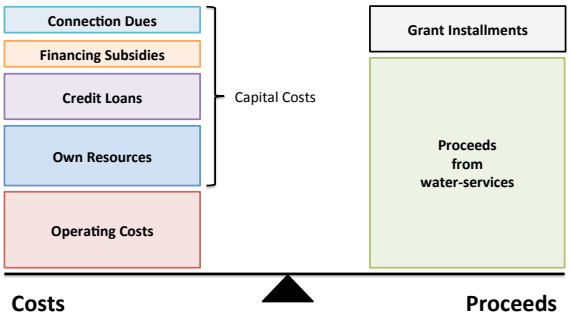
Additionally to the previously described cost recovery thresholds, a third term shall be introduced accordingly to the guideline W61 of the ÖVGW. The term “gross cost recovery threshold” (Ger: Brutto-Darstellung) describes the water tariff that is necessary to recover the sum of operating costs and capital costs, whereas the capital costs include the whole investment costs without subtracting collected connection dues and financing subsidies that were used to fund the investment (see Graphic 19). This additional value is of importance since it displays what the water tariff would be like without collecting financing subsidies and connection dues.



Graphic 17: Disaggregation of costs and proceeds used to determine the minimum cost recovery threshold



Graphic 18: Disaggregation of costs and proceeds used to determine the maximum cost recovery threshold



Graphic 19: Disaggregation of costs and proceeds used to determine the gross cost recovery threshold

5 Cost Accounting System – Literature Review

In this chapter the essential literature on cost accounting and cost accounting systems will be reviewed. The objective of this chapter is to reveal the variety of different approaches that lead to the development of a universal applicable cost accounting system in water management. Furthermore the variety of theoretical approaches will be limited by the fact that the resulting cost accounting system has to comply with the legal framework that has been described in chapter 4.3.

5.1 Cost accounting basics

Cost accounting is a crucial element in corporate accounting next to other areas, such as financial accounting, budgetary accounting and business statistics. The essential function of cost accounting systems is to systematically and institutionally record corporate processes. In contrast to financial accounting, which is part of external accounting and mainly produces information for the capital market, credit lenders and the tax office, cost accounting is considered to be part of internal accounting. Hence, the information produced by a cost accounting system is specifically targeted for managers or employees of the very enterprise. The main duties of a cost accounting system are the evaluation of a short-term profit and loss statement, the return-on-investment (ROI) calculation and controlling tasks within the company. Based on results that were provided by cost accounting, a company's management should be able to make better decisions in the areas of:

- program policy,
- procedure policy,
- make-or-buy decisions,
- pricing,
- calculating unit costs,
- investment decisions,
- finance planning and budgeting,
- inventory valuation and insurance value valuation and
- business statistics[39].

Depending on the given requirements the time period and the extent of costs considered by the cost accounting system may vary (see Table 6). Regarding the time factor, a cost accounting system can generally refer to costs that were caused in the past or future. Costs that were caused in the past can be either historic costs, which are actual costs caused in a specific time period, or standard costs, which are a statistical mean of costs caused in a specified time period. On the other hand budgeted costs are solely future oriented and therefore refer to costs that are determined in the procedure of business planning. Regarding the extent of costs that are used for cost accounting, the literature lists two basic principles.

[39] Cf. ZUNK, B.; GRBENIC, S.; BAUER, U. (2013), p. 11 et seq.

time period	past		future
extent of costs	historic costs	standard costs	budgeted costs
full costs	Historic cost accounting based on full costs	Standard cost accounting based on full costs	Budgeting based on full costs
partial costs	Historic cost accounting based on partial costs	Standard cost accounting based on partial costs	Budgeting based on partial costs

Table 6: Possible variations of a cost accounting system depending on the time period and extent of costs used

Full cost accounting allocates fixed and variable costs alike on cost centers, whereas variable cost accounting only spreads variable costs on cost centers in an initial step and subsequently adds the corresponding fixed costs to the cost object. Both methods can be used to recover the incurred total costs.

Furthermore the basic literature on cost accounting knows several cost accounting principles that have evolved over time. The following list includes the three most important principles of costing:

1. Causation principle:
This principle constitutes says that only costs that were caused by a cost object can be assigned to this cost object. This principle turns out to be problematic, since there are not only variable costs that can be assigned to the cost object but also fixed costs which cannot be assigned exactly to one cost object and furthermore do not change with the output. Since partial cost accounting only considers variable costs, this issue only occurs when full cost accounting is used. In this case the follow two principles are of help.

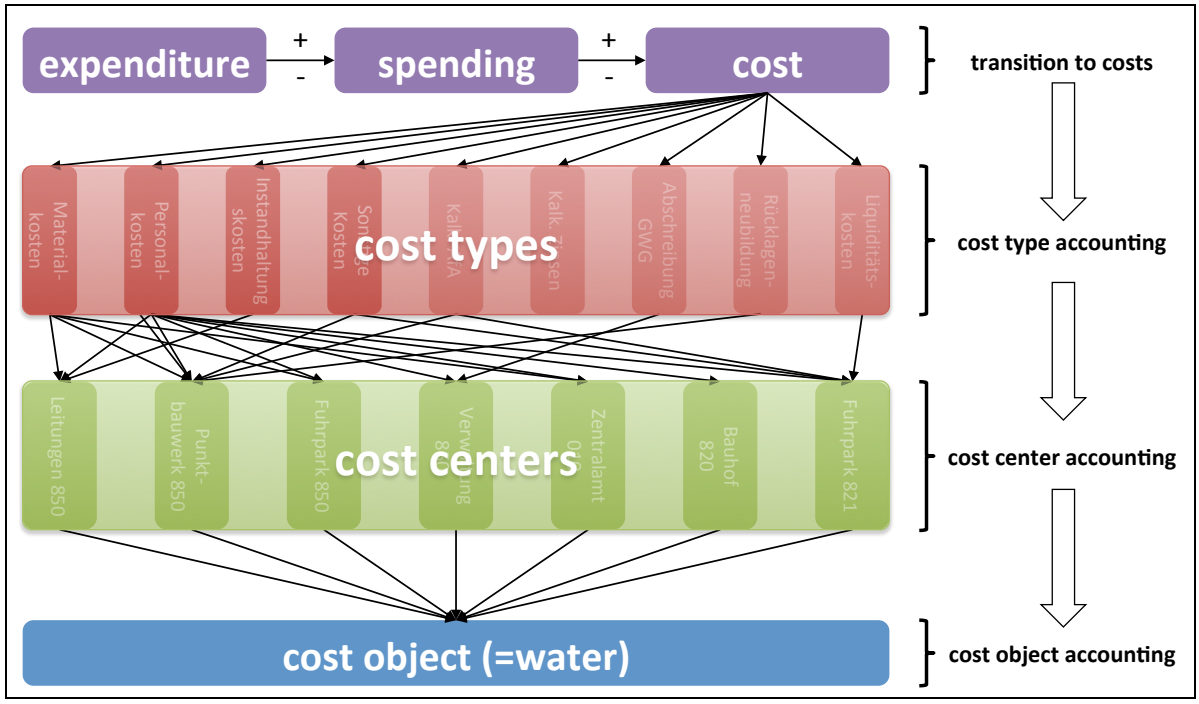
2. Principle of averages:
Using this principle costs or proceeds will be allocated to a cost object using a distribution key. This principle is only suitable for single product businesses, as costs and proceeds can be divided by the sum of a constant performance. For multiple product businesses this principle will deliver wrong results.

3. Principle of resiliency:
Using this principle costs will be allocated to cost objects depending on the resiliency of the cost object itself. The resiliency of a cost object is furthermore defined by the ability to cover costs. Applying this principle can result in lack of motivation in high revenue business departments, as the profits made by this department will be belittled by this principle. Furthermore the affected business department will probably not aim for high profits anymore[40].

[40] Cf. HORSCH, J. (2010), p. 38 et seq.

5.2 The 4 steps of cost accounting

In general the cost accounting procedure can be subdivided into four steps. As Graphic 20 shows, these four steps are transition to costs, cost type accounting, cost center accounting and cost object accounting. The first step, transition to costs, is necessary, because the data of external accounting is not suitable for calculations in internal accounting and cost accounting. In this first step all non-cost values are transitioned into costs (see chapter 5.3 for a detailed description). The set of costs determined in the first step will be subsequently organized into cost types. This step is called cost type accounting, whose objective is to systematically collect and organize the costs of one period (see chapter 5.4 for a detailed description). In a third step the cost types determined in the previous step are now further subdivided and subsequently allocated to cost centers in a way that matches the origin of the cost to be allocated. The final step of cost accounting is the cost object accounting which is used to assign the costs to cost objects, which can be goods are services, according to the causality principle. The following chapters will describe the four just-mentioned steps in a more detailed way. Furthermore several state of the art approaches to achieve each this four steps will be presented and subsequently evaluated if they comply with the legal framework described in chapter 4.3. Finally it has to be mentioned that further explanations are based on German accounting principles that may differ accounting principles, which are prevalent in non-German Countries.



Graphic 20: Overview of the four steps of cost accounting

5.3 Transition to costs

As the term cost accounting indicates, this accounting method uses the operands costs and proceeds. Since costs and proceeds are different to the operands used in external accounting (e.g. financial accounting), the operands different from costs have to be transformed in to costs. The data that is relevant for cost accounting can be extracted from the income statement in case of double-entry bookkeeping or the budget in case of cameralistic bookkeeping. Furthermore data from assets accounting can be used to evaluate additional costs.

5.3.1 Definition of operands used in external and internal accounting

To ensure an exact transformation of external accounting data sets into data that can be used in internal accounting, a definition of the operands used in external and internal accounting will be of help. The following pairs of operands will be examined:

- Outpayment (Ger: Auszahlung) - Inpayment (Ger: Einzahlung)
- Expenditure (Ger: Ausgabe) - Income (Ger: Einnahme)
- Spending (Ger: Aufwand) - Revenue (Ger: Ertrag)
- Costs (Ger: Kosten) - Proceeds (Ger: Erlös)

Outpayment – Inpayment:
Outbound our inbound cash flow related to a point in time.

Expenditure – Income:
Monetary value of goods or services bought (expenditure) or sold (income) related to a point in time. Furthermore an outpayment or inpayment are not obligatory for the existence of an expenditure or income. The accrual of payables and receivables also fulfills the requirements of an expenditure or income.

Spending – Revenue:
The term spending is defined as the sum of expenditures or incomes in a defined period of time. More precisely the term spending defines the monetary valued consumption of goods and services in a defined time period. Additionally, expenditures are not linked to the process of producing goods or services. Revenues are defined as the sum of monetary valued inbound cash flow, receivables, goods and services in a defined time period. In contrast to spending, revenues are linked to the process of producing goods or services.

Costs – Proceeds and Performance:
Costs are defined as period and object related consumptions that are necessary to produce goods or services. Furthermore the following characteristics are linked to the cost principle.

- Consumption of goods and services are existent
- Consumptions are made in order to achieve the company's objectives.

- Normalization of time or matter: The consumption of goods or service only can be declared as costs, if the consumption of goods and services is usually required to produce output. Consumption of goods and services that are caused by extraordinary events, such as force majeure or theft, are not regarded as costs (Normalization of matter). Furthermore consumptions of goods and services that occur sporadic, such as payment of taxes for prior years, are not regarded as costs (Normalization of time).

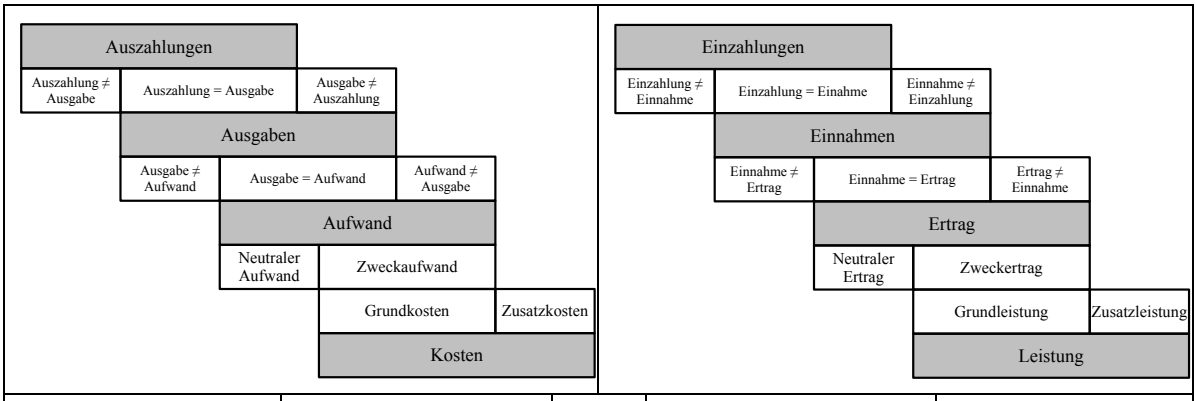
Proceeds and performance are often defined similarly in literature[41], although they do not mean the same. Proceeds are the monetary valued output in a defined time period, whereas performance is the quantified output in a defined time period.

After all operands of internal and external accounting have been thoroughly defined, the transformation process that transforms external accounting operands into internal accounting operands can be explained. Graphic 21 reveals that the operands are overlapping at some points. For the step-by-step transformation certain values have to added or subtracted. Table 7 and Table 8 list examples for all the cases shown in Graphic 21. According to the guideline W61 of the OVGW the following steps have to be performed when determining costs in a water management facility:

- Subtraction of expenditure ≠ spending
- Subtraction of neutral spending
- Addition of additional costs

Chapter 5.3.2 to 5.3.4 will describe in detail the steps that are necessary to transform external accounting operands into internal accounting operands. In doing so examples regarding water management will be given.

[41] Cf. ZUNK, B.; GRBENIC, S.; BAUER, U. (2013), p.16 vs. SCHWEITZER, M.; KÜPPER, H.-U. (2008), p. 21



Auszahlung	Outpayment		Einzahlung	Inpayment
Ausgabe	Expenditure		Einnahme	Income
Aufwand	Spending		Ertrag	Revenue
Neutraler Aufwand	Neutral Spending		Neutraler Ertrag	Neutral Revenue
Kosten	Costs		Erlös / Leistung	Proceeds
Zusatzkosten	Additional Costs		Zussatzerlös /-leistung	Additional Proceeds

Graphic 21: Relation between operands of external and internal accounting

Case	Example
Outpayment ≠ Expenditure	Profit withdrawal in cash by the shareholder
Outpayment = Expenditure	Cash payment of goods
Expenditure ≠ Outpayment	Credit purchase of goods
Expenditure ≠ Spending	Purchase of goods in this period but consumption in another period
Expenditure = Spending	Purchase and consumption of goods in the same period
Spending ≠ Expenditure	Depreciation of an investment asset that was purchased in a previous period
Neutral Spending	Depreciation of financial assets
Spending = Costs	Energy costs, insurance premium
Additional Costs	Imputed depreciation, imputed interest, calculated risk, calculated rent

Table 7: Examples that help identify outbound accounting operands[42]

Case	Example
Inpayment ≠ Income	Capital raising by the shareholder, borrowing
Inpayment = Income	Cash sale of goods
Income ≠ Inpayment	Sale of goods on deferred terms
Income ≠ Revenue	Received payment
Income = Revenue	Sale of finished goods that were produced in this period
Revenue ≠ Income	Increase in stock; internal activity performed
Neutral Revenue	Tax refund, Revenues made by non-operating assets
Revenue = Proceeds	Revenues made by operating assets (sale of goods and services)
Additional Proceeds	Goods and services disposed free of charge

Table 8: Examples that help identify inbound accounting operands[43]

[42] Cf. DÄUMLER, K.; GRABE, J. (2008)
[43] Cf. DÄUMLER, K.; GRABE, J. (2008)

5.3.2 Expenditure ≠ Spending

According to the guideline W61 of the ÖVGW, water management facilities usually have one type of expenditure that does not qualify as a spending and these are capital-forming expenditures. The following entries can be identified as capital-forming expenditures and usually can be found in a cameralistic budget:

- Investments
- Building up reserves
- Redemption payments

As it was mentioned before, these entries are typically for cameralistic budgets only, since double entry organized income statements have already transformed these capital-forming expenditures into depreciations. As a consequence, this step is only necessary when cost accounting is performed for a water management facility that uses cameralistic bookkeeping.
However, it's not clear whether expenditures, which are incurred by repair work or redevelopment, qualify as costs or if they qualify as capital-forming expenditures and therefore have to be initially dismissed, but subsequently transformed to (imputed) costs. According to the guideline W61 with further references to the Austrian Corporate Code (UGB) and the Austrian Income Tax Act (EStG) the following facts have to be true, so that expenditures for repair or redevelopment can be capitalized:

- Fact 1: The repair / redevelopment affects the whole integrated asset. The asset is to be considered as integrated, if the single parts combined serve an integrated function.
- Fact 2: The repair / redevelopment results in a substantial change of asset's character or in an improvement of the asset. A change of the asset's character or an improvement is given if the change in character or improvement brings an improvement in functionality, capacity or a broader field of application[44].

Furthermore it has to be mentioned that only one of the stated facts has to be true. Table 9 lists a few case examples that should make the facts clearer.

Example	Capitalization (applied fact)
Exchange of 1km water pipe of a total 50km pipe network	No
Exchange of a pump in a pressure rising facility by a pump of equal performance	No
Exchange of a pump in a pressure rising facility by a pump of higher performance	Yes (Fact 2)
Exchange of an high level tank by an high level tank with the same capacity	Yes (Fact 1)

Table 9: Case examples for capitalization[45]

[44] Cf. BALDAUF, A. et al. (2011) p. 225
[45] Cf. Guideline W61 of the ÖVGW, p. 14

5.3.3 Neutral Spending

Graphic 21 shows that neutral spending have to be dismissed when transforming spending to costs. Neutral spending can be defined as non-operating, non-ordinary consumption of goods and services and can be furthermore subdivided into three types[46]:

- Non-operating spending (e.g. company sports facility)
- Extraordinary spending (e.g. damage of an asset)
- Spending that don't relate to an accounting period (e.g. increase / decrease in stock; severance payments; pension payments)

5.3.4 Additional Costs

After the capital-forming expenditures and neutral spending have been dismissed, the additional costs have to be added in order to finish the transformation. The literature on cost accounting subdivides additional costs in the broad sense into:

- Additional costs with valuation differences
- Additional costs in the narrow sense[47].

Additional costs with valuation differences are costs that are related to neutral spending, such as depreciations, but are valued differently. The reason for this is that neutral spending that can be found in the income statement follow other objectives than it's counterpart, the additional costs. Whereas in external accounting an asset is depreciated in regard of commercial and taxation laws, internal accounting doesn't have to obey these laws, as the information produced is solely for internal purposes. As a consequence, the calculation parameters (e.g. operating life) can be determined in a way that reflects the consumption of assets more accurately. The literature generally lists three types of additional costs with valuation differences:

- Imputed depreciation
- Imputed interest
- Calculated risk

Additional costs in the narrow sense compensate the loss of benefit and are often referred to as opportunity costs. The most common opportunity costs are:

- Calculated employer's remuneration
- Calculated rent

The basic literature on cost accounting lists a couple of approaches on how to evaluate the single types of additional costs. It has to be mentioned again that the final approach used in the development of the cost accounting system has to comply with trusted accounting principles but more importantly with the legal framework described in chapter 4.3.

[46] Cf. ZUNK, B.; GRBENIC, S.; BAUER, U. (2013), p. 75 et seq.
[47] Cf. ZUNK, B.; GRBENIC, S.; BAUER, U. (2013), p. 41 et seq.

5.3.4.1 Imputed depreciation

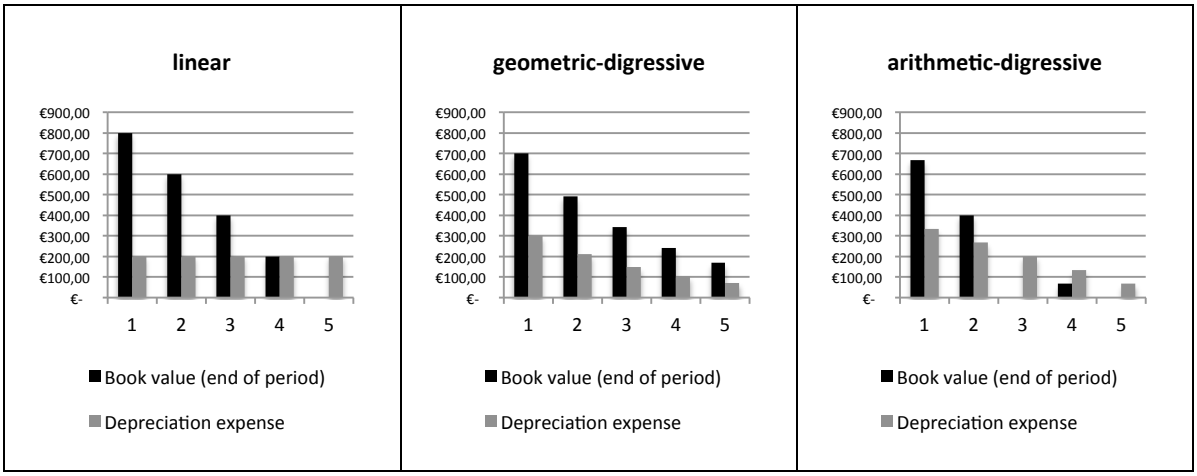
Imputed depreciations reflect the wear and tear of investment assets, which are regularly used for goods and services provisioning. The following three parameters define the value of imputed depreciations.

- Depreciation procedure
- Depreciation basis
- Depreciation period

Depreciation procedure:
The depreciation procedure defines how the depreciation amount is spread on the depreciation period. The basic literature on this topic suggests the following procedures[48]:

- Linear depreciation
- Digressive depreciation
  - Geometric-digressive depreciation
  - Arithmetic-digressive depreciation
- Performance related depreciation

The linear and digressive depreciation procedures are both time-related. The linear depreciation is spreading the depreciation basis evenly on the depreciation periods, which results in constant annual depreciations (see Graphic 22: left). In contrast to this, the annual depreciation according to the geometric-digressive depreciation procedure equals a defined percentage of the assets residual value. In the first period the residual value equals the depreciation basis. As Graphic 22 shows the geometric-digressive depreciation procedure is not able to completely depreciate the asset, due to the nature of this procedure. Using the arithmetic-digressive depreciation procedure the depreciation of $period_{n+1}$ is calculated by the product of the depreciation basis and $(n\text{-}N)/\sum N$, whereas N is the total deprecation period and n is the sum of previous depreciation periods.



Graphic 22: Comparison of the time related depreciation procedures (depreciation amount = EUR 1000, depreciation period = 5 yrs, digression rate for geometric-digressive depreciation = 30%)

[48] Cf. HORSCH, J. (2010), p. 62

Using this procedure instead of the geometric-digressive procedure solves the problem that the asset cannot be completely depreciated. The performance related depreciation procedure is the only non-time-related procedure listed in literature. Using this method, the depreciation of a period is determined according to a depreciation key that suits the facility (e.g. operating hours, unit-produced, etc.).

A legal obligation for water management facilities concerning the depreciation procedure is not existent, although there are reasons to favor the linear depreciation. First of all water management facilities are trying to avoid fluctuating water tariffs. For this reason the linear depreciation procedure will be the way to go, since the annual depreciation remains constant over the whole depreciation period. Secondly the guideline W61 of the ÖVGW is using the linear depreciation to calculate the imputed depreciation, although it doesn't acknowledge other depreciation procedures, which were mentioned above. Finally, a study carried out interviewing 55 companies revealed that 90,3% of the companies interviewed are using the linear depreciation procedure[49].

Depreciation basis:
The depreciation basis reflects the historical value of an investment asset and is used to define the depreciation amount. The depreciation amount is furthermore defined in Formula 1. Since the estimated sales proceeds are often equal to the costs of removal the residual book value can be assumed to be zero[50].

$$Depreciation\ Amount = Depreciation\ Basis - Residual\ Book\ Value$$

Formula 1: Calculation of the depreciation amount

According to Formula 1 and regarding the assumption that the residual book value is zero, the depreciation amount is solely dependent on the depreciation basis. Concerning the depreciation basis, the basic literature on this topic lists the following approaches:

- Historical acquisition value
- Current replacement value
- Future replacement value at the end of planned operating life

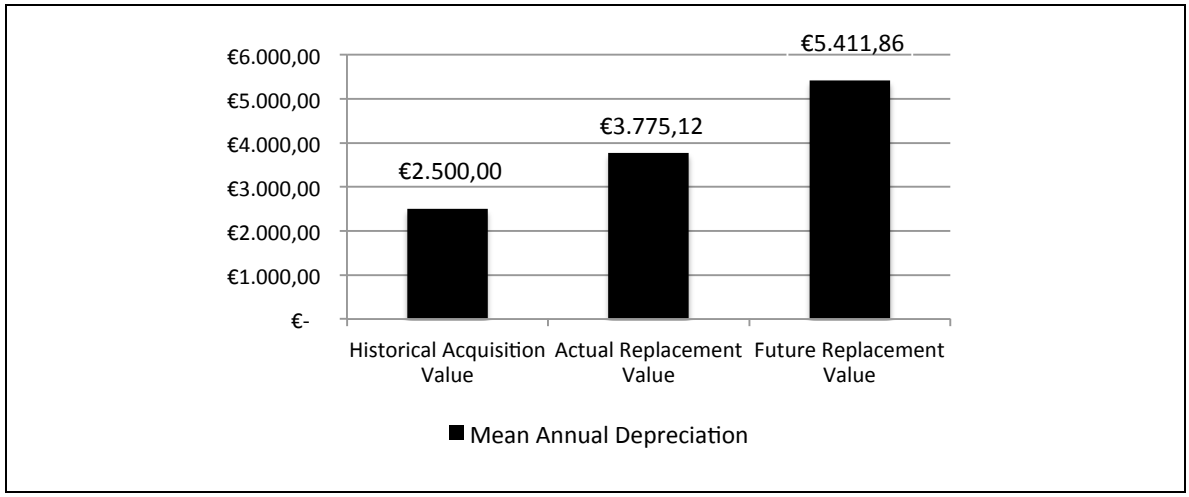
The historic acquisition value contains all expenditures that were necessary to obtain the asset. Besides the initial acquisition costs, also costs for delivery, assembly and eventual transport insurance premiums are included in the historical acquisition value. The major advantage of using this method is the easy determination of the depreciation basis, which doesn't involve calculations. However, this method also comes with a down side, as preservation of assets cannot be assured with this method. The reason for this disadvantage is the fact that the current or future replacement value will be inevitably higher than the historical acquisition value, due to inflation. As a consequence, the sum of depreciations at the end of the planned operating life of the asset will not be sufficient to replace this very asset. Thus the company will loose substance when using this method.

[49] Cf. HORSCH, J. (2010), p. 70
[50] Cf. ZUNK, B.; GRBENIC, S.; BAUER, U. (2013), p. 93 et seq.

The approach of using the current replacement value as depreciation basis compensates the effect of real substance loss, as depreciations of a period depend on the replacement value of this asset in the same period. In order to execute this method every asset has to be valued for every period to come. This annual or even monthly revaluation results in a huge administrative expense and may not be feasible.

The approach of using the future replacement value at the end of the planned operating life appears to solve the disadvantages of the previous mentioned methods to determine the depreciation basis. On the one hand using the future replacement value avoids loss of substance and on the other hand the future replacement value only needs to be calculated once. However also this approach comes with a disadvantage, as the future replacement value is highly dependent on price trends, which can substantially deviate from the actual movement of prices[51].

Conducting a real world example with the three aforementioned approaches of determining the depreciation basis reveals that the mean annual depreciations deviate more than 100% from each other depending on the depreciation basis used (see Graphic 23). Since the depreciation basis is a crucial parameter in the calculation of imputed depreciations and therefore substantially affects the water tariff, the determination of the depreciation basis is highly disputed in literature[52]. However the Austrian Constitutional Court has previously accepted exclusively the usage of the historical acquisition value for calculating imputed costs[53]. Therefore it can be assumed that only the historical acquisition value is applicable for the calculation of imputed costs.



Graphic 23: Mean annual depreciation using a different depreciation basis (historical acquisition value = EUR 100.000; mean annual asset value increase = 2%; depreciation procedure = linear)

[51] Cf. SZYSZKA, U. (2011), p. 111 et seq.
[52] Cf. KAMPER, K. (2007), S. 254
[53] Cf. Decision of the Austrian Constitutional Court VfSlg. 7583/1975

Depreciation period:

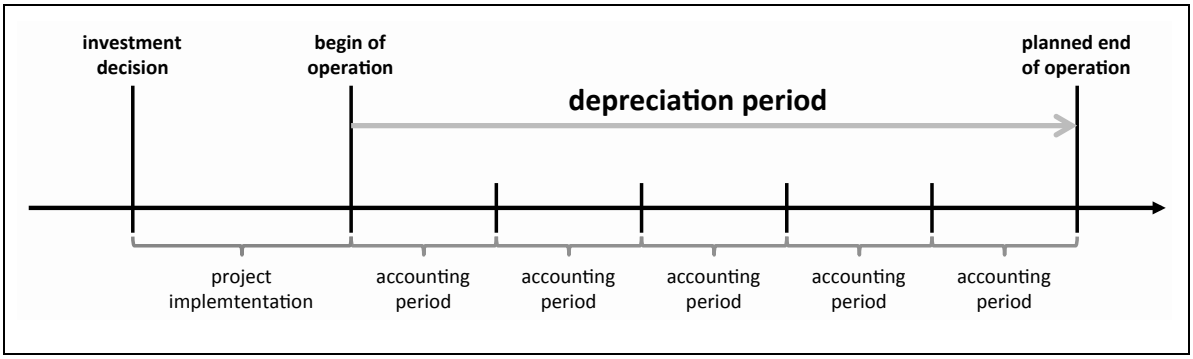
The depreciation period defines the period of time in which the asset is used for the production of goods and services. Graphic 24 shows that the depreciation period doesn't begin with the investment decision, which usually causes an outbound cash flow, but with the begin of operations. This means that all payments or payables made in order to get the asset up and running are collected in asset accounting and are capitalized when the operation of this asset begins. Concerning the definition of the depreciation period basic accounting literature lists two main approaches[54]:

- Technical operating life
- Economical operating life

The technical reflects the maximum possible operating life of the asset and also takes into account eventual maintenance programs. The economical operating life is limiting the technical operating life by also considering the feasibility of an asset. In doing so, the following parameters are being taken into account:

- Technological advance or production processes with improved cost position.
- Change in cost structure (e.g. increase in automation).
- Increasing repair and maintenance costs at the end of operating life (also referred to as bath tub curve).
- Product cycle is shorter than operating life.

In legal documents no hints can be found whether to use the technical or economical operating life for the determination of the depreciation period. However the guideline W61 of the ÖVGW doesn't mention any of the aforementioned economic aspects and furthermore refers to technical operating life values that are used by German and Austrian organizations in water management (see Table 10). As economical operating lives are hard to determine and require updated industry information, the usage of the technical operating life has to be favored.



Graphic 24: Definition of the depreciation period[55]

[54] Cf. ZUNK, B.; GRBENIC, S.; BAUER, U. (2013), p. 93
[55] Cf. SZYSZKA, U. (2011), p.111

Asset type	Depreciation period in years		
	LAWA 2005[56]	BMF – (DE)[57]	Ø Austria[58]
Electrical Facility			10 – 20
Facility Building	50	50	50
High Level Tank (Equipment)	25 – 30	25	10 – 15
High Level Tank (Structure)	50	50	25 – 50
Machines		15	
Pumps		10 – 15	10 – 15
Pumps and Electrical Facilities	15 – 20		
Water Meter	15 – 20	15	15
Water Pipes	40 – 60	30 – 50	20 – 50
Water Treatment Plant	20 – 30	20	20 – 30
Well	20 – 70	20 – 50	25 – 50

Table 10: Depreciation period per asset type

5.3.4.2 Imputed interest

Imputed interests reflect the costs incurred by capital that is tied up in the company. Depending on the origin of the interest rate base, imputed interests can be assigned to

- Additional costs with value differences (interest rate base = liabilities) or
- Additional costs in the narrow sense (interest rate base = own resources).

Interests on borrowed capital have to be paid for the assignment of capital and are therefore already recorded in cameralistic and double entry books alike. However, since these interests do not comply with the cost principle they have to be initially dismissed and recognized as additional costs The sum of interests on borrowed capital therefore has to be spread on the operating life of the corresponding asset. Interests on own resources reflect the loss of interest income that could have been collected when the own resources would haven been invested alternatively. For this reason, this loss of income is also referred to as opportunity costs. The following parameters define the actual value of imputed interests:

- Interest rate base
- Interest rate

Furthermore the imputed interests are calculated with Formula 2.

$$Imputed\ Interests = Interest\ Rate\ Base * Interest\ Rate$$

Formula 2: Calculation of imputed interests

[56] LAWA 2005 = German Federal State Association for Water 2005
[57] BMF – (DE) = German Ministry of Finance
[58] ø Austria = Mean values for depreciation periods used in Austria according to ÖVGW W61 p. 33

Interest rate base:

Concerning the determination of the interest rate base, the basic accounting literature uniformly references the usage of the necessary operating capital, which is calculated with Formula 3.

1.		Total Assets
2.	-	Non-Operating Assets
3.	+/-	Valuation Adjustments
4.	**=**	**Operating Assets**
5.	-	Deductible Capital
6.	**=**	**Operating Capital**

Formula 3: Calculation of the operating capital

1. The starting point for the calculation of the interest rate base according to Formula 3 is the sum of total assets. In order to calculate the operating capital, adjustments have to be made to assets and capital.

2. Concerning the assets, the non-operating assets have to be subtracted from the total assets. Examples for non-operating assets are non-used company owned property or bonds that are held for speculative objective.

3. Furthermore valuation adjustments have to be made to the operating assets in order to receive the real value of the assets. Two parameters influence the valuation adjustment.
   Firstly the valuation method has to be chosen. The literature on this topic is often very contradictory. Whereas one group of authors suggests to value the assets according to the current replacement value[59], the other group of authors suggest to value the assets according to the historical acquisition value[60].
   Secondly it has to be decided whether to add interest to the value of residual assets or the mean value of assets. In the first case (also referred to as residual value method) the interest rate base is depreciated linearly over the depreciation period. Hence the interest rate base is decreasing from period to period. Although this method reflects the consumption of goods very realistically, it's almost impossible to compare different periods due to the very different interest rate base. In the latter case (also referred to as mean value method) the comparability of different periods is better, due to the fact that the interest base rate remains constant. Furthermore the value of the average tied up investment assets is calculated with Formula 4.

$$mean\ tied\ up\ investment\ assets = \frac{(hist.acquisition\ value + residual\ value)}{2}$$

Formula 4: Calculation of the mean tied up investment assets

[59] Cf. DÖRRIE, U.; PREISSLER, P.R. (2004), p. 109 and also GÖTZE, U. (2007), p. 58
[60] Cf. HORSCH, J. (2010), p. 72

4. Executing step 1, 2 and 3 of Formula 3 results in the operating assets value.

5. In order to calculate the operating capital, step 5 suggests subtracting the deductible capital. Deductible capital is capital that was lent to the company free of interests (e.g. liabilities from sales and services, customer prepayments and current provisions).

6. Executing all the previous steps will deliver the operating capital value, which is furthermore used to determine the interest rate base.

Concerning the valuation base of the interest base rate, there are no legal obligations whether to use historical acquisition values or current replacement values. However, in order to avoid legal uncertainties the historical acquisition value is to be favored over the current replacement value, since this example is similar to the depreciation basis that was defined earlier. Concerning the choice of either residual value method or mean value method there are also no legal obligations so far. Even the guideline W61 of the ÖVGW doesn't mention either of the two described valuation methods. However it can be assumed that, despite the fact that the residual value method delivers more realistic results, the mean value method is more suitable for water management facilities, as the constant interest rate base results in constant interests and subsequently a more stable water tariff.

Interest rate:
A study initiated by the German Federal Association for Energy and Water Management (BDEW) suggests the following methods in order to determine the imputed interest rate[61]:

- Capital Asset Pricing Model (CAPM)
- Arbitrage Pricing Model (APM)
- Fama-French Three Factor Model
- Dividend-Growth Model

All of the four just mentioned methods to determine the interest rate are scientifically sound. Furthermore the BDEW references an expert's report on this topic that suggests the capital asset pricing model[62]. According to this model the interest rate is calculated by the sum of a risk-free interest rate and risk premium, which is also often referred to as β-factor. The β-factor itself is calculated as the product of the market risk premium, which can be deduced from market parameters, and the security beta value which is dependent from the company itself.

According to a court of auditor's report, none of the four above-mentioned methods are eligible to calculate the interest rate in a water management facility. Instead the report suggests using a medium-term average of the secondary market premium that includes

[61] Cf. BDEW „Leitfaden zur Wasserpreiskalkulation" (2012), p. 30
[62] Cf. HERN, R. et al (2012), p.54 et seq.

national, fixed-interest bonds and is published by the Austrian National Bank[63]. A closer look at this method reveals that it is indeed very similar to the capital asset pricing method, since CAPM also uses a market premium plus risk premium, although the method suggested by the court of auditor's report is lacking the risk premium.

5.3.4.3 Calculated risk

Risks reflect the eventual loss of performance in a company. In internal accounting calculated risk costs are set in order to compensate this risk. Calculated risks can be subdivided into:

- normalization of sporadic, performance-related single events that are not covered by the insurance and
- company risks that lie in the future.

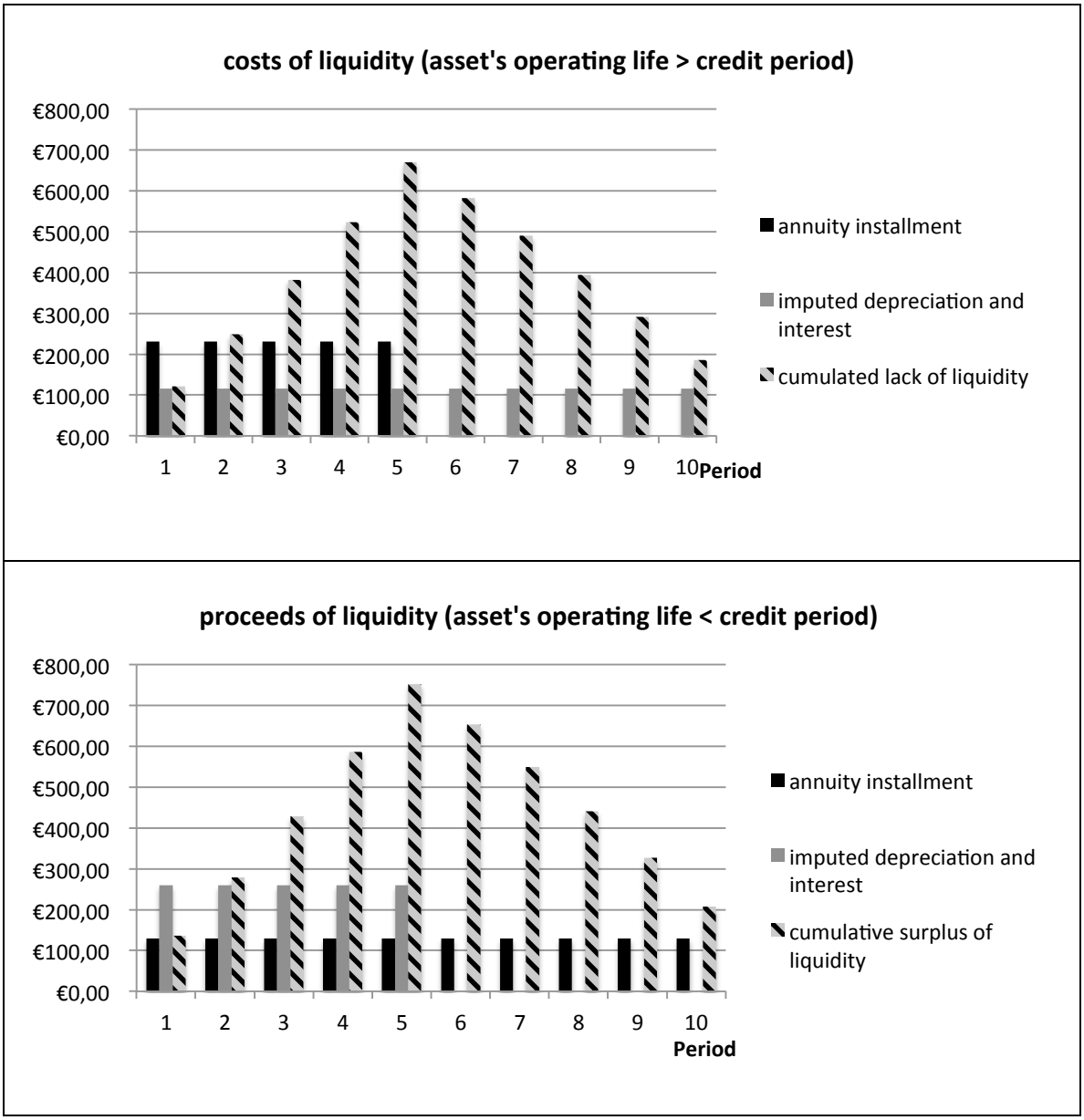
Cases of damage, theft, loan default and any events caused by force majeure qualify as sporadic events. These events are usually monetary valued by empirical or statistical values. Since the risk remains equal for every period, the calculated risks costs have to remain constant too. The issue with future company risks is that often these risks are caused earlier but lead to an actual consumption of goods in a later period. Also these risks are evaluated via empirics or statistics.

The guideline W61 of the ÖVGW complies with the just described theory on calculated risk. According to this guideline risks shall be compensated by a medium-term average of actual costs that were incurred by non-insured events.

5.3.4.4 Calculated costs of liquidity

A widely not acknowledged topic in cost accounting is the calculation of liquidity costs. Leveraged assets, whose operating life's is differing from the credit period, incur costs of liquidity. If the asset's operating life surpasses the credit period, the annuity installment that has to be paid is bigger than the revenue that corresponds with the costs incurred by imputed depreciation and interests (see Graphic 25). In order to repay the annuity installments the difference between the annuity installment and the sum of imputed costs and interests have to be bridged. Therefore a second loan, also often referred to as bridge loan, has to be taken out, which incurs compound interests. If the bridge loan is leveraged, the corresponding interest rates will depend on the financial market situation. If the bridge loan is funded with own resources, the corresponding interest rate will reflect the opportunity costs. In the latter case the interest rate will equal a risk-free secondary market premium.

[63] Cf. Court of auditor's report „Wasserversorgung Stadt Villach, Landeshauptstadt Klagenfurt am Wörthersee, Landeshauptstadt Innsbruck"; 2009



Graphic 25: Costs/Proceeds of liquidity incurred by not sufficient income [Case: Asset value = 1000 EUR; interest rate = 5%; liability = annuity loan; credit period = 5 yrs (costs of liq) / 10 yrs (proceeds of liq); operating life = 10 yrs (costs of liq) / 5 yrs (proceeds of liq)]

On the other hand liquidity surpluses are incurred when an asset's operating life is shorter than the credit period. In this case the sum of imputed depreciation and interest is bigger than the annuity installment. The yielded liquidity surplus can be furthermore invested on the capital market, which will produce interest yields. In this case the interest rate can also be assumed to equal to a risk-free secondary market premium.

Furthermore the incurred liquidity costs or proceeds have to be spread over the asset's operation life in order to comply with the cost principle and ensure a stable water tariff.

5.3.4.5 Summary

In the course of chapter 5.3.4 the theoretical foundation was laid out to determine:

- Imputed depreciation
- Imputed interest
- Calculated risk
- Calculated cost of liquidity / Calculated proceeds of liquidity

In doing so, several approaches for the determining parameters were described and subsequently evaluated whether the approach complies with the legal framework or the suggestions made in the guideline W61 of the ÖVGW. The morphological box displayed in Graphic 26 is summarizing all mentioned parameters and highlights the chosen approaches. The evaluation of costs of liquidity is not shown in this morphological box, as there is hardly any literature on this topic.

Parameter	Variants			
Imputed depreciation				
Depreciation method	linear	Geometric-digressive	Arithmetic-digressive	Performance-related
Valuation of the depreciation basis	Historical acquisition value	Actual replacement value	Future replacement value	
Depreciation period	Technical operating life	Economical operating life		
Imputed interest				
Valuation of the interest rate base	Historical acquisition value	Actual replacement value	Future replacement value	
Interest rate base method	Residual value method	Mean value method		
Evaluation of the interest rate	CAPM	APM	Dividend growth model	Risk-free interest rate (=SMP)
Calculated Risk				
Evaluation of the risk costs	Empirical Data	Statistical Data		

Black font	*Scientifically sound*
Red font	*Not sufficient scientifically verified, but in compliance with the law and the guideline W61 of the ÖVGW*
Green background	*According to the guideline W61 of the ÖVGW (= In compliance with the law)*

Graphic 26: Morphological Box - additional costs parameter

5.4 Cost type accounting

Cost type accounting is the second step in the course of setting up a cost accounting system. After the transitioning to costs delivered the required data, cost type accounting creates an adequately organized data set that is required to execute step three and four. The main purpose of cost type accounting is to systematically record costs of a defined accounting period and subsequently organize these costs according to its origin. The resulting cost types are often used to define performance figures (e.g. personnel costs → personnel cost rate).

5.4.1 Principles of cost type accounting

As it was mentioned above, cost type accounting defines the data structure for the whole procedure of cost accounting. Failures in cost type accounting have to be avoided, since these failures will also affect all following steps and most importantly the final outcome of the cost accounting system. As the costs can be recorded on different levels (e.g. department level, company level), the following principles have to be taken into account[64]:

- Principle of purity
- Principle of unity
- Principle of completeness
- Principle of efficiency

The principle of purity requires that one cost type shall be only dependent on one primary cost type. Primary costs are defined as the consumption of productive inputs that are acquired from outside the company. Furthermore cost types have to be defined in a way that the corresponding costs can be assigned without doubt. The double recording of costs is inadmissible. Additionally, the existence of mixed cost types (e.g. miscellaneous costs) has to be avoided.

The principle of purity stipulates that every cost type has to be defined so accurately and consistent that a uniform assignment of costs to cost types is ensured in every accounting period. This principle is crucial since it enables a comparison between different periods. A suitable structure and numbering of cost types are of help in order to fulfill this principle.

The principle of completeness stipulates that all costs have to be taken into account.

The principle of efficiency is concerning the determination of cost types. As a more detailed cost type structure requires more administration, cost types have to be defined in a way that they meet but not exceed the required demand and level of detail.

[64] Cf. ZUNK, B.; GRBENIC, S.; BAUER, U. (2013), p. 81 et seq.

5.4.2 Cost type structure

In order to fulfill the principles of cost type accounting, a sound structure of the costs is necessary. The basic literature on this topic suggests to structure costs considering the following aspects[65]:

- Production factors (e.g. labor, material, interests, etc.)
- Functional aspect (e.g. purchasing, production, distribution, etc.)
- Employment conditionality (e.g. fixed or variable costs)
- Assignability (e.g. direct or overhead costs)

However, the latter three cost structuring possibilities can conflict with the principles of cost type accounting, as the following example will show. Energy costs can occur in every department of the company and can be fixed, variable, direct and overhead costs alike. A precise and uniform assignment of energy costs using this three structuring methods is not possible. For this reason the further explanations will refer to cost structuring accord to production factors.

The structuring of costs also has to meet the demands of cost center accounting. Since the structure of cost centers differ depending on the company, the cost structure has to be individualized for every company. Nevertheless, a few basic cost structures have evolved in the course of time, which basically can be applied to the majority of companies (see Table 11). These basic cost structures only define cost type groups. A detailed cost structure therefore has to be defined for every company individually. As for the cost accounting system described in chapter 6, the cost structure according to the guideline W61 of the ÖVGW will be used.

Cost structure usually used in Austria[66]	International chart of accounts GKR[67]	Cost structure acc. to the guideline W61 of the ÖVGW
• Personnel Costs • Material Costs • Energy Costs • Maintenance Costs • Taxes, Dues und Insurance premium • Imputed Costs • Misc. Costs	• Material Costs • Personnel Costs • Maintenance Costs, External Service Costs, Taxes and dues, Misc. Costs • Imputed Costs • Special direct costs and extra costs	Operating Costs: • Personnel Costs • Material Costs • Maintenance Costs • Administrative Costs and other costs of operation Capital Costs: • Imputed Depreciation • Imputed Interest • Other Costs of Financing

Table 11: Comparison of popular cost type structures

[65] Cf. SZYSZKA, U. (2011), p. 74
[66] Vgl. ZUNK, B.; GRBENIC, S.; BAUER, U. (2013), S.83
[67] Vgl. SZYSZKA, U. (2011), S.79

5.5 Cost center accounting

After the costs have been evaluated and structured in the initial two steps the third step of cost accounting is used to spread the cost types on the very cost centers that incurred these specific costs. The allocation of costs on cost centers follows certain objectives.

- Cost center accounting serves as a link between cost type accounting and cost object accounting. Cost center accounting enables the allocation of overhead costs on different cost objects.
- A report of costs per cost center can be realized.
- Cost center accounting enables performance controlling of cost centers. In doing so, a budget (target costs) for future periods is initially allocated to a cost center. The actual costs that occurred in this cost center can then be compared to the previously planned budget.

5.5.1 Principles of cost center accounting

When setting up cost centers, the following principles should be taken into account:

- Each cost center must be self-controlled in order ensure an effective performance control. Hence the person in charge of the cost center must be able to influence the costs.
- A relation between costs and performance has to be existent. Furthermore this relation has to be quantified by an adequate measure.
- Cost centers have to be adequately encapsulated in order to ensure an unambiguous allocation of costs.
- The definition of cost centers should also include aspects of efficiency. A higher degree of detail results in a more accurate cost control, but also comes with increased administrative effort, since every single cost center requires an own budget, cost recognition and cost control.

5.5.2 Cost center structure

Setting up cost centers can be done regarding the following aspects[68]:

- Functional aspect (e.g. purchasing, production, distribution)
- Spatial aspect (e.g. workshop 1, workshop 2, admin building)
- Administrative aspect (e.g. area of responsibility)

Due to accountancy issues the aforementioned aspects have to be further divided according to the settlement type:

- Sender cost center
- Receiver cost center

[68] Cf. ZUNK, B.; GRBENIC, S.; BAUER, U. (2013), p. 105

Sender cost centers include cost centers which costs are not directly used for cost object accounting, but are sent to down stream cost centers or receiver cost centers. Sender cost centers can be further subdivided into:

- General sender cost centers and
- Assisting sender cost centers.

General sender cost centers are recognized due to the fact that they carry out services for many other cost centers. Examples for general sender cost centers are in-house maintenance, energy supply and a company canteen. On the other hand, assisting sender cost centers only provide services to certain sender cost centers (e.g. departments). For example the assisting sender cost centers “production planning”, “construction” and “quality management” provide services for the receiving cost center “production”.

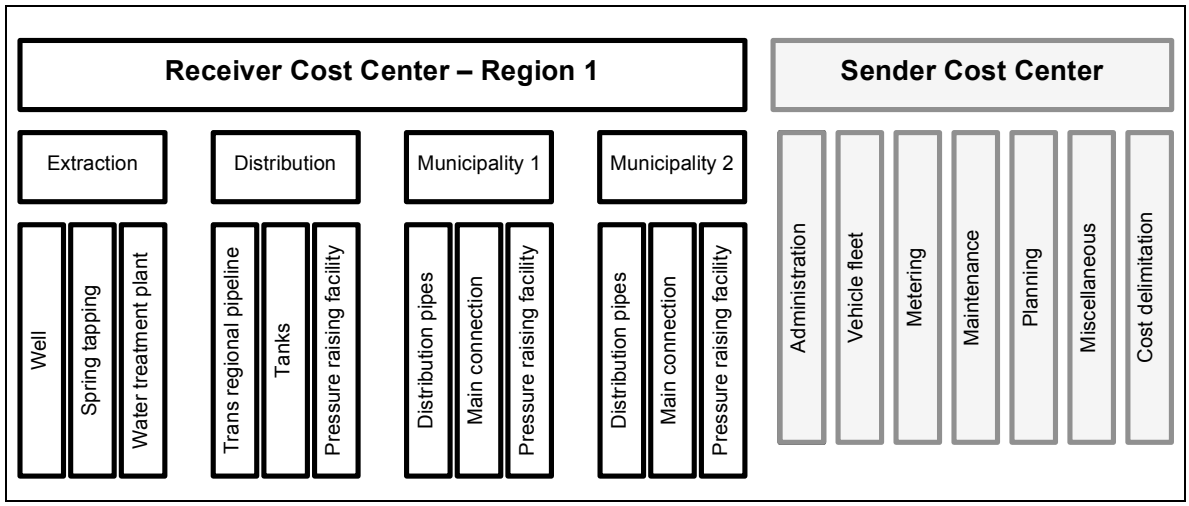
Costs that occur in receiver cost centers are not further allocated. Furthermore receiver cost centers are subdivided into:

- Primary receiver cost centers
- Secondary receiver cost centers

Primary receiver cost centers directly influence parts of the production process and its costs can be directly transferred to cost object accounting when taking into account adequate measures. Examples for primary receiver cost centers are cost centers for material, production and distribution. Secondary receiver cost centers are characterized by the production of non-operating goods or services. Also the costs of secondary receiver cost centers can be directly used for cost object accounting. An example for a secondary receiver cost center is an in-house printing service[69].

Analogous to cost type accounting, also in cost center accounting there is no universally applicable cost center structure. Thus the cost center structure has to set up individually according to the actual structure of the company and the demands of the cost accounting system. However, the guideline W61 of the ÖVGW provides a generic cost center structure that is suitable for most water management facilities (see Graphic 27). The big advantage of this generic cost structure is that it can be suited to the actual number of regions that are supplied with water.

[69] Cf. ZUNK, B.; GRBENIC, S.; BAUER, U. (2013), S.83



Graphic 27: Generic cost center structure for water management facilities[70]

5.5.3 Cost accounting matrix

Probably the most important tool in operative cost center accounting is the cost accounting matrix. The basic idea of this matrix is to organize cost types horizontally and cost centers vertically (see Graphic 28).

Cost centers / Cost types	Sender Cost Centers		Receiver Cost Centers	
	Gen.Send. CC	Ass.Send. CC	Prim.Rec. CC	Sec.Rec. CC
Cost center direct costs				
Primary cost center overhead costs				
Secondary cost center overhead costs				

Graphic 28: Cost account matrix scheme

In order to set up and fill in this matrix the following seven steps have to be carried out:

1. Setting up the cost center structure (columns)
2. Setting up the cost type structure (rows)
3. Distributing the cost center direct costs on the cost centers
4. Distributing the primary cost center overhead costs on the cost centers
5. Redistribute the secondary cost center overhead costs on the receiver cost centers
6. Summing up primary and secondary cost center overhead costs
7. Evaluating costing rates

[70] Cf. guideline W61 of the ÖVGW, p. 32

Ad 1.) Setting up the cost center structure:
The defined cost centers have to be written in the first row of the matrix.

Ad 2.) Setting up the cost type structure:
The defined cost types have to be written in the first column of the matrix and organized in the following order and structure:

- Cost center direct costs
- Primary cost center overhead costs
- Secondary cost center overhead costs

Ad 3.) Distributing the cost center direct costs on the cost centers:
As the name suggests, direct costs can be directly assigned to a cost abject. However in cost center accounting they are used as reference values to calculate costing rates.

Ad 4.) Distributing the primary cost center overhead costs on the cost centers:
The distribution of overhead costs on cost centers can be performed either

- directly or
- indirectly.

The direct distribution of overhead costs on cost centers is based on receipts or other records that allow a proper allocation (e.g. salaries for production workers that are only employed by one cost center; imputed depreciation costs for a machine that is used only in one cost center; etc.)

The indirect distribution of overhead costs is performed via distribution keys. This method has to be used, if a direct allocation of overhead costs is not possible or simply not feasible (e.g. salary of a manager who is responsible for several cost centers; costs of office supplies). Table 12 lists a few quantitative and monetary-related distribution keys that can be used for indirect distribution of overhead costs.

Quantitative key	Monetary-related key
Number value	Cost value
Time value	Stock value
Area value	Turnover / Sales value
Weight value	
Other technical measurement values	

Table 12: List of suitable distribution keys

Ad 5.) Redistribution of secondary cost center overhead costs on the receiver cost centers:
Secondary costs are incurred by services that are produced and consumed in-house. The redistribution of secondary cost center overhead costs on receiver cost centers is also often referred to as internal service allocation. In order to distribute the secondary costs properly

on receiver cost centers, a suitable distribution key has to be found for every sender cost center (also see Table 12). The basic literature on internal service allocation suggests the following methods[71]:

- Cost type method
- Cost center balancing method
- Cost object method
- Direct method
- Step-down method
- Equation method

The step-down method is probably the most used method to allocate secondary costs on receiving cost centers, due to its simplicity. Using the step-down method the cost centers have to be organized in a way that reflects the performance flow. Then the costs of the first senders cost center are allocated to the following sender cost center until all sender cost centers have been allocated. Finally the costs of the last sender cost center are allocated to the receiving cost centers.

Ad 6.) Summing up primary and secondary cost center overhead costs

After all overhead costs have been allocated to receiving cost centers, the allocated costs have to be summed up for each cost center. The sum of all receiving cost centers furthermore has to be equal to the sum of all receiving and sending cost centers prior to the internal service allocation.

Ad 7.) Evaluating costing rates:

The overhead costs of a cost center are determined by the sum of primary and secondary cost center overhead costs. These overhead costs can be used to calculate costing rates, which is essential since every cost object uses a specific cost center in a different intensity. In general costing rates are calculated according to Formula 5.

$$costing\ rate\ of\ the\ cost\ center = \frac{\sum overhead\ costs\ of\ the\ center\ [€]}{reference\ value\ of\ the\ cost\ center}$$

Formula 5: Basic formulation of costing rates

Furthermore it has to be mentioned that the proper choice of the cost center's reference value is crucial (see Table 12). In practice the direct costs of production-related cost centers are used as a reference value. In this case the reference value will have no dimension. If a quantitative key is used, the costing rate will have the dimension of monetary unit per key unit.

[71] Cf. HORSCH, J. (2010), p. 95 et seq.

5.6 Cost object accounting

Cost object accounting is the last step in order to set up a cost accounting system. After the costs were recorded, organized according to their type and allocated to cost centers, cost object accounting is used to allocate costs to a product or service, hereinafter referred to as cost object. After the costs were allocated to an object, unit costs can be calculated. The literature lists six methods to determine unit costs (see Table 13). Furthermore cost object accounting is used to perform a short-term profit and loss statement. The objective of this short-term profit and loss statement is to compare costs and proceeds of a defined period.

	Calculation method	Production method
Division-calculation	Division calculation (single/multiple steps)	Mass production (single product company)
	Equivalence number calculation	Batch production
	Co-product calculation	Co-production
Overhead-calculation	Overhead calculation	Single-item production (multiple product company)
	Overhead calculation	Serial production
	Reference- and sales Calculation	Trade and exports

Table 13: Calculation methods and their field of application[72]

As water management facilities usually only have one cost object, which is water, the division calculation is the suitable method in order to calculate unit costs (see Table 13). The division calculation method can be further subdivided into:

- Single-step division calculation
- Dual-step division calculation
- Multiple-step division calculation

Furthermore the selection of a division calculation type is depending on the changes in inventories of finished goods and work in progress. If no changes in inventory occur the single-step division calculation is the right choice. As water management facilities do not store but only distribute water it can be assumed that no changes in inventory occurs. For this reason the average unit costs are calculated with Formula 6.

$$average\ unit\ costs = \frac{total\ costs\ of\ one\ period}{output\ of\ a\ period}$$

Formula 6: Average unit costs according to the single-step division calculation method

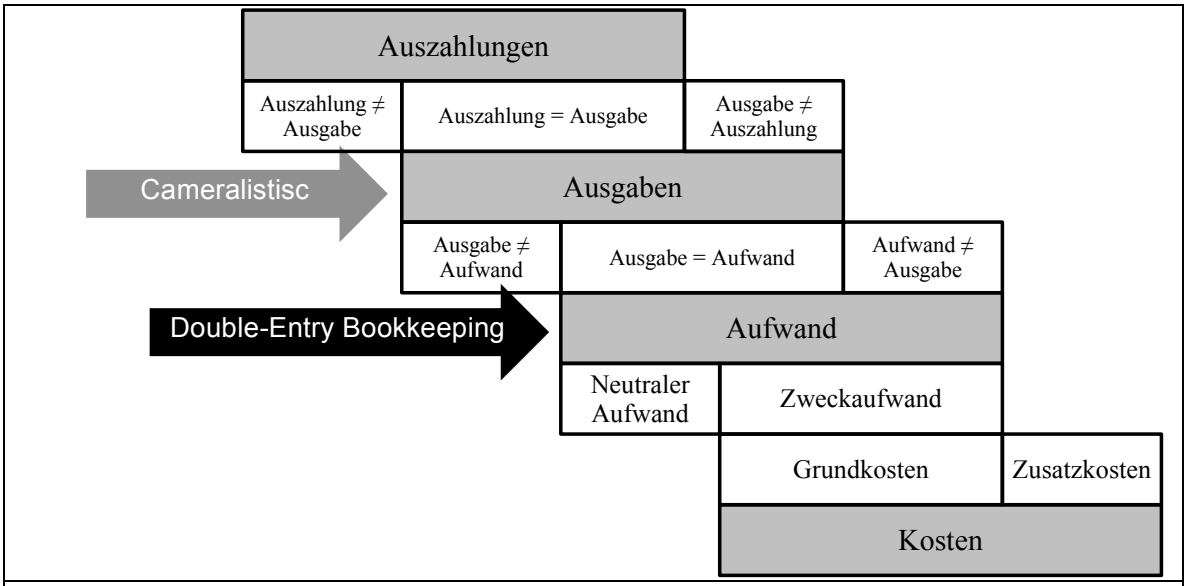
[72] Cf. ZUNK, B.; GRBENIC, S.; BAUER, U. (2013), p. 124

6 Cost Accounting System – Practical Approach

Chapter 4 and 5 laid out the theoretical framework and boundaries for a cost accounting system in water management. Based on this framework a cost accounting system that is specifically designed for water management facilities shall be introduced in this chapter. This chapter too will follow the four steps of cost accounting, which were already described in chapter 5.

6.1 Transition to cost – Practical Approach

As it was described in chapter 5.3, the first step of cost accounting is to transfer external accounting operands, such as outpayments, expenditures and spending, into costs, which is the operand used in internal accounting (see Graphic 29). Furthermore the theoretical approach has to be expanded to evaluate minimum, maximum and gross cost recovery thresholds. Therefore the additional costs have to be calculated separately for each cost recovery threshold. As water management facilities can either operate with cameralistic or double entry bookkeeping the transition to costs is partly described separately for both of these bookkeeping methods.



Auszahlung	Outpayment	Aufwand	Spending
Ausgabe	Expenditure	Kosten	Costs
Neutraler Aufwand	Neutral Spending	Zusatzkosten	Additional Costs

Graphic 29: Comparison of the terms outpayment, expenditure, spending and cost[73]

[73] Cf. ZINGEL, H. (2004) p. 8

6.1.1 Determination of operating costs – Cameralistic bookkeeping

Graphic 29 shows that cameralistic bookkeeping operates with expenditures and income. In order to determine costs and proceeds the following operations have to carried out:

- Subtracting expenditure ≠ spending and neutral spending
- Adding spending ≠ expenditure and additional costs

In cameralistic bookkeeping the budget records are the suitable source to determine costs, as the budget is closer to the actual consumption of goods and services than the annual financial statement[74]. For municipal water management facilities the following accounts are relevant:

- 850 – "Betriebe der Wasserversorgung" (Eng: Water management facilities)
- 010 – "Zentralamt" (Eng: Central office)
- 820 – "Wirtschaftshöfe" (Eng: Farmyard)
- 821 – "Fuhrpark" (Eng: Vehicle Fleet)

A major advantage of municipal cameralistic bookkeeping is the uniform chart of accounts, which is settled in addendum 3b of the VRV. Therefore each expenditure or income can be easily assigned to an expenditure or income type. This uniform assignment will be leveraged to determine costs, as the accounting matrix will only held expenditure or spending types that qualify as costs or proceeds. The choice of expenditure and income types was made according to the manual "Kosten- und Leistungsrechnung in der Siedlungswasserwirtschaft", which was published in the series of papers "Rechts- und Finanzierungspraxis der Gemeinden 02/2005". This approach covers the subtraction of expenditure ≠ spending and neutral spending. Hence, capital forming expenditures, such as loan redemptions and interest payments, are categorically excluded from determining costs of operation. Furthermore the accruals principle can be ignored for small water management facilities[75]. Finally, the budget records equal the value of consumptions of goods and services that comply with the business objectives.

6.1.2 Determination of operating costs – Double entry bookkeeping

The transition of costs is usually easier to handle for double entry bookkeeping, since the profit and loss statement already complies with the accruals principle. Therefore only one transformation step has to be carried out (see Graphic 29), which involves two operations:

- Subtracting neutral spending
- Adding additional costs

Concerning the first mentioned operation, a form (see Table 14) helps to determine the operating costs. All spending entries of the profit and loss statement are transferred to this form and are subsequently altered. In the columns titled with plus and minus, neutral

[74] Cf. Guideline W61 of the ÖVGW, p. 11
[75] Cf. HEISS, R.; PILZ, D. (2005), p. 21 et seq.

spending and additional costs are recorded. Finally the costs will result from adding additional costs and subtracting neutral spending from the spending entries, which were taken from the annual profit and loss statement.

Cost Type Group	Cost Type	Note	Spending	+	-	Costs
Material	Electricity	for operating the water supply system only (no administration)	3000	-	-	3000
...	...	...	...	...	...	...

Table 14: Operating costs form

6.1.3 Determination of capital costs

After the determination of operating costs was described in the previous two chapters, this chapter aims to describe the determination of capital costs. As the determination of capital costs is solely dependent on records of assets accounting, financing and public grants approvals this chapter is applicable for cameralistic and double entry bookkeeping water management facilities alike. The determination of capital costs represents the addition of additional costs. According to chapter 5.3.4 the following cost types have to be determined:

- Imputed depreciation
- Imputed interest
- Calculated risk
- Calculated costs of liquidity

As it was described in the corresponding chapters (chapter 5.3.4.1 until 5.3.4.5), the basic literature on this topic offers a couple of variants to determine imputed costs. For further proceedings the methods that are highlighted in green color in Graphic 26 are chosen.

6.1.3.1 General definitions

To ensure a proper and equal spread of costs on the single accounting periods the annuity method will be used. The annuity method transforms the capital value of an investment plus interests into equal payments per period. These equal payments are furthermore referred to as annuities. The annuity of one period is calculated according to Formula 7. By applying this method, fluctuations in the water tariff can be avoided and accounting periods can be compared with one another. The period that defines the spreading is determined by weighing the operating life of a construction phase. A construction phase is furthermore defined as a collective of facilities, which can be assigned to one project or was approved for public grants at the same time. Thus the weighed operating life of a construction phase is calculated according to Formula 8.

$$annuity = capital\ value * \frac{(1+i)^n * i}{(1+i)^n - 1}$$	
with:	
i ... interest rate	n ... weighed operating life of the construction phase

Formula 7: Annuity formula

$$weighed\ OL\ of\ the\ CP = \sum^{N} OL\ of\ the\ single\ facility \times \frac{acquisition\ value\ of\ single\ facility}{acquisition\ value\ of\ all\ facilities\ within\ the\ CP}$$	
with:	
CP ... Construction phase	N ... Number of Facilities included in the construction phase
OL … Operating life	

Formula 8: Calculation of the weighed operating life of a single construction phase

Furthermore the determination of additional costs is based on the following documents:

- Assets accounting
- Records of financing of the assets
- Records of approval of public grants
- Records of not insured cases of damage within the last 7 years

6.1.3.2 Determination of imputed depreciation

Input:

- Spreadsheet “Anlagenverzeichnis” (Eng: assets accounting; see Addendum 3)
- Spreadsheet “Finanzierung” (Eng: records of financing of the assets; see Addendum 3)
- Spreadsheet “gewichtete Nutzungsdauer” (Eng: weighed operating life)

Calculation:

According to chapter 5.3.4.1 the calculation of imputed depreciations is based on the following parameters:

- Depreciation procedure
- Depreciation period
- Depreciation basis

As it was described before, the annuity method is used to spread the assets historical value over the weighed operating life of a construction phase. The annuity method corresponds with the linear depreciation procedure, as the annual or periodical depreciations are constant. Furthermore the weighed operating life corresponds with the technical operating life, as the weighed operating life is deduced from the technical operating life.

The depreciation basis is furthermore determined according to the legal framework that was described in chapter 4.3. Since the definition of minimum, maximum and gross cost recovering threshold deviates only in respect of the capital costs, the depreciation basis for all of the cost recovering thresholds has to be determined separately. In order to meet the definitions of cost recovering thresholds, the historical acquisition costs of a facility or construction phase have to be disaggregated into the sources of funds. The depreciation basis for the three cost covering thresholds is then calculated with Formula 9. The sum of depreciations over the total depreciation period is calculated with Formula 10. As it can be seen in Formula 10 the gross cost recovery threshold ignores the collection of connection dues and investment subsidies. Thus, the depreciation basis for the gross cost recovery threshold equals the historical acquisition costs.

Min. cost recovery threshold:	$DB_{(min)} = AC * \frac{OR_{(CP)} + CL_{(CP)}}{TC_{(CP)}}$
Gross cost recovery threshold:	$DB_{(gross)} = AC$
Max. cost recovery threshold:	$DB_{(max)} = AC * \frac{2 * (OR_{(CP)} + CL_{(CP)}) + CD_{(CP)} + IS_{(CP)}}{TC_{(CP)}}$

with:

min ... Minimum cost recovery threshold

gross ... Gross cost recovery threshold

max ... Maximum cost recovery threshold

AB ... Depreciation basis for the single facility

AC ... Historical acquisition costs of the single facility

$TC_{(CP)}$ ... Total costs of the construction phase

$OR_{(CP)}$ ... Own resources used to realize the construction phase

$CL_{(CP)}$ ... Credit loans taken out to realize the construction phase

$CD_{(CP)}$ ... Connection dues collected in order to realize the construction phase

$IS_{(CP)}$ ... Investment subsidies (single payment) that were granted to fund this construction phase

Formula 9: Calculation of the depreciation basis for minimum, maximum and gross cost recovery threshold

Min. cost recovery threshold:	$DS_{(CP;\,min)} = OR_{(CP)} + CL_{(CP)}$
Gross cost recovery threshold:	$DS_{(CP;gross)} = OR_{(CP)} + CL_{(CP)} + CD_{(CP)} + IS_{(CP)}$
Max. cost recovery threshold:	$DS_{(CP;\,max)} = 2 * (OR_{(CP)} + CL_{(CP)}) + CD_{(CP)} + IS_{(CP)}$

with:

DS ... Depreciation sum of the construction phase

Formula 10: Sum of depreciations for minimum, maximum and gross cost recovering threshold

6.1.3.3 Determination of imputed interests

Input:

- Spreadsheet “Anlagenverzeichnis” (Eng: assets accounting; see Addendum 3)
- Spreadsheet “Finanzierung” (Eng: records of financing of the assets; see Addendum 4)
- Spreadsheet “gewichtete Nutzungsdauer” (Eng: weighed operating life)

Calculation:

According to chapter 5.3.4.2 the defining parameters of imputed interests are:

- Interest rate base
- Interest rate

Because of the legal framework and the three cost recovering thresholds that come with it, the actual calculation of imputed interests deviates from the theoretical approach, which was described in chapter 5.3.4.2. Since minimum, maximum and gross cost recovery thresholds are linked to the sources of financing of an asset, the calculation of the interest rate base has to be performed separately for:

- Capital assets and
- Current assets.

The interest rate base for capital assets is determined analogous to the determination of the depreciation base. Hence, the interest rate base for the capital asset is calculated with Formula 11.

Min. cost recovery threshold:	$IRB_{(CA-min)} = AC * \frac{OR_{(CP)} + CL_{(CP)}}{TC_{(CP)}}$
Gross cost recovery threshold:	$IRB_{(CA-gross)} = AC$
Max. cost recovery threshold:	$IRB_{(CA-max)} = AC * \frac{2 * (OR_{(CP)} + CL_{(CP)}) + CD_{(CP)} + IS_{(CP)}}{TC_{(CP)}}$

with:

min ... Minimum cost recovery threshold

gross ... Gross cost recovery threshold

max ... Maximum cost recovery threshold

IRB ... Interest rate base for the single facility

AC ... Historical acquisition costs of the single facility

$TC_{(CP)}$ ... Total costs of the construction phase

CA … Capital asset

$OR_{(CP)}$ ... Own resources used to realize the construction phase

$CL_{(CP)}$ ... Credit loans taken out to realize the construction phase

$CD_{(CP)}$ ... Connection dues collected in order to realize the construction phase

$IS_{(CP)}$ ... Investment subsidies (single payment) that were granted to fund this construction phase

Formula 11: Calculation of the interest rate base for capital assets

The interest rate base for currents assets is the same for all three cost recovery thresholds. For the calculation of the interest rate base for current assets the average value method will be used. The interest rate base for current assets is then calculated with Formula 12.

$$IRB_{(CUR)} = \frac{CUR_{(t=0)} + CUR_{(t=1)}}{2} - deductible\ capital$$

with:

$CUR_{(t=0)}$ ... Value of the capital assets at the beginning of the accounting period

$CUR_{(t=1)}$ ... Value of the capital assets at the end of the accounting period

Formula 12: Calculation of the interest rate base for current assets

Concerning the determination of the interest rate, the practical approach will deviate from the theoretical approach that was described in chapter 5.3.4.2. The reason for deviating from this approach is that the secondary market premium, which defines the imputed interest rate in the theoretical approach, changes currently and therefore would need to be updated every period. To avoid the need to update the interest rate in every accounting period, the credit liabilities bear the actual interest rates of the corresponding interest and all other sources of capital bear a fixed interest rate. Concerning the credit liabilities, the interest rate will be taken from the corresponding record in the spreadsheet “Finanzierung”. If the interest rate of the credit liability is variable, an average interest rate has to be determined. In case of the EURIBOR (=European Interbank Offered Rate) the average interest rate is displayed in Table 15. Own resources and current assets bear a fixed interest rate of 3% per anno. This fixed interest rate is based on a long-term study that was carried out by the German association “Länderarbeitsgemeinschaft Wasser”[76]. This low interest rate on own resources is also applicable for Austrian water management facilities, because of the general high degree of cost coverage. According to a study that was carried out by the Federal Ministry of Agriculture, Forestry, Environment and Water Management, an average of 108% of the costs are recovered by Austrian water management facilities[77]. All other financial sources for funding a project and current assets bear an interest rate of 2% per anno, which is sufficient to compensate the inflationary prices in the construction business[78]. Table 16 delivers an overview of the aforementioned interest rates.

ø 3M-EURIBOR	ø 6M-EURIBOR	ø 12M-EURIBOR
2,53% p.a.	2,64% p.a.	2,79% p.a.

Table 15: Average EURIBOR[79]

[76] Cf. FLICK et al. (2012), p. 29 et seq.
[77] Cf. DIERNHOFER, W.; HEIDLER, S.; HÖRTENHUBER, A. (2003), p. 27
[78] According to a target value search that has been performed for the linearized building price index (base value in 1983 = 100; linearized trend value in 2033 = 260)
[79] www.euribor-rates.eu (16.07.2014) – Average = arithmetic mean of the monthly published EURIBOR; time period = 01.01.1999 – 02.12.2013

Source of capital	Interest rate
Own resources and current assets	3% p.a.
Credit liabilities	Acc. to terms of credit
Connection dues	2% p.a.
Investment subsidies	2% p.a.
Reserves	2% p.a.

Table 16: Interest rate per source of capital

Taking into account the aforementioned practical definition of the interest rate base and the interest rate, the imputed interests for the three cost recovering thresholds are calculated with Formula 13.

Min. cost recovery threshold:

$$I_{(min)} = AC * [\frac{OR_{(CP)} + IRB_{(CUR)}}{TC_{(CP)}} * I_{OR} + \frac{CL_{(CP)}}{TC_{(CP)}} * I_{CL}]$$

Gross cost recovery threshold:

$$I_{(gross)} = AC * [\frac{OR_{(CP)} + IRB_{(CUR)}}{TC_{(CP)}} + \frac{CL_{(CP)}}{TC_{(CP)}} * I_{CL} + \frac{CD_{(CP)} + IS_{(CP)}}{TC_{(CP)}} * I_{INF}]$$

Max. cost recovery threshold:

$$I_{(max)} = AC * [2 * \frac{OR_{(CP)} + IRB_{(CUR)}}{TC_{(CP)}} + 2 * \frac{CL_{(CP)}}{TC_{(CP)}} * I_{CL} + \frac{CD_{(CP)} + IS_{(CP)}}{TC_{(CP)}} * I_{INF}]$$

with:

I ... Imputed interests

min ... Minimum cost recovery threshold

gross ... Gross cost recovery threshold

max ... Maximum cost recovery threshold

i_{CL} ... interest on credit liabilities

i_{OR} ... return on own resources and current assets

i_{INF} … interest rate to compensate inflation

n ... weighed operating life of the construction phase

$IRB_{(CUR)}$ ... Interest rate base for the single facility

AC ... Historical acquisition costs of the single facility

$TC_{(CP)}$ ... Total costs of the construction phase

$$I_{CL} = \left[\frac{(1 + i_{CL})^n * i_{CL}}{(1 + i_{CL})^n - 1} - 1\right]$$

$$I_{OR} = \left[\frac{(1 + i_{OR})^n * i_{OR}}{(1 + i_{OR})^n - 1} - 1\right]$$

$$I_{INF} = \left[\frac{(1 + i_{INF})^n * i_{INF}}{(1 + i_{INF})^n - 1} - 1\right]$$

$OR_{(CP)}$ ... Own resources used to realize the construction phase

$CL_{(CP)}$ ... Credit loans taken out to realize the construction phase

$CD_{(CP)}$ ... Connection dues collected in order to realize the construction phase

$IS_{(CP)}$ ... Investment subsidies (single payment) that were granted to fund this construction phase

Formula 13: Calculation of imputed interests

6.1.3.4 Determination of the calculated risks

Input:

- Spreadsheet “Kalkulatorische Wagnisse” (Eng: Calculated risk)

Calculation:

In order to compensate the risk, the average value of all non-insured damages that occurred in the previous seven years is taken as the value of the calculated risk. Therefore the calculated risk is calculated with Formula 14.

$$Calculated\ risk = \frac{\sum_{t=1}^{t=7} Value\ of\ damages_{(t)}}{7}$$

Formula 14: Calculation of the calculated risk

6.1.3.5 Determination of the calculated costs of liquidity

Input:

- Spreadsheet “Finanzierung” (Eng: Records on Financing; see Addendum 4)
- Spreadsheet “gewichetete Nutzungsdauer” (Eng: weighed operating life)

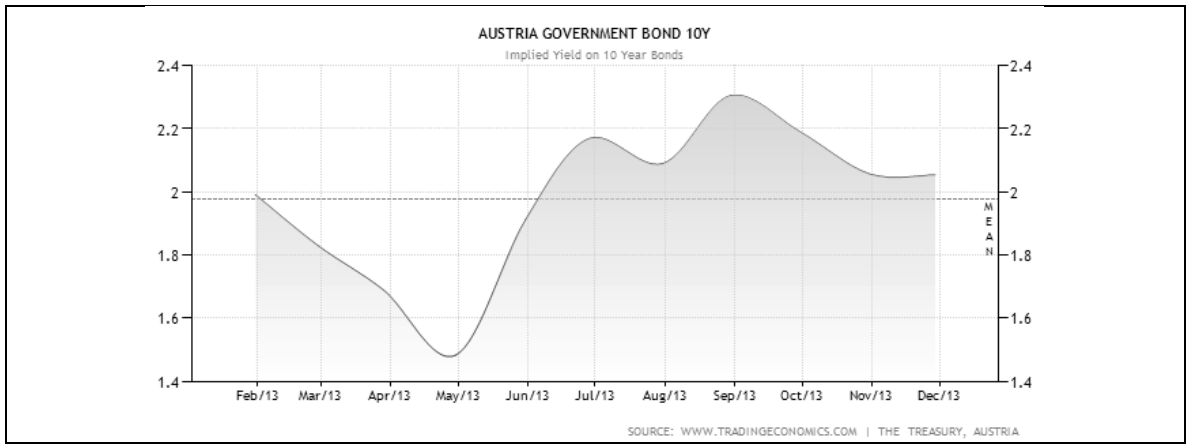
Calculation:

According to chapter 5.3.4.4 costs of liquidity occur if the operating life of the construction facility deviates from the credit period. Since the cost accounting system only uses a weighed operating life, which is linked to whole construction phases, the costs of liquidity or therefore calculated on the construction phase level rather than the single facility level. Concerning the calculation of the costs of liquidity, the following parameters are relevant:

- Credit period
- Weighed operating life of the construction phase
- Interest rate for leveraged bridge loans
- Interest rate for bridge loans that were funded from own resources
- Return rate for liquidity surpluses

The values for the credit period and weighed operating life of the construction phase are taken from the assets accounting records and the records on financing the assets. In order to avoid annual updates the interest rate for leveraged and internal funded bridge loans, a fixed interest rate of 3% and 2% respectively is assumed. Furthermore the return rate for liquidity surpluses is also assumed to bear a return rate of 2%. This assumption is based on the following facts:

- The interest rate for leveraged bridge loans is calculated as the sum of the average historical value of the EURIBOR (2,53% p.a. – 2,79% p.a.; see Table 15) and an added risk premium of 0,3% p.a. to 0,5% p.a..
- The interest rate for internal funded bridge loans and the return rate for liquidity surpluses is deduced from the average return rate of the 10 years Austrian government bond (see Graphic 30).



Graphic 30: mean value of the 10 years Austrian government bond (assessment period: 02/2013 – 12/2013[80])

A demonstration of the calculation of the costs of liquidity will be given in Table 17. The example that was used for the demonstration used the following parameters:

- Weighed operating life of the construction phase = 20 years
- Interest rate for leveraged bridge loans = 5%
- Return rate for liquidity surpluses = 2,5%

Table 17 shows that the credit loan redemption payments exceed the sum of imputed depreciations and interests in the first 10 years. In order to fully repay the loan redemptions on time, additional funds are necessary. Since these additional funds have to be leveraged, additional interests will occur. In the 10th period the liabilities incurred by leveraged bridge loans are worth 81.441,85 EUR. Beginning with the 11th period the cash flow turns around as the loan redemption payments cease. Until the 20th period the loan can be reduced to 51.218,34 EUR. This value is regarded as the cost of liquidity and furthermore has to spread equally over all periods. Thus, the cost of liquidity per period is 2.560,92 EUR.

[80] http://www.tradingeconomics.com/austria/government-bond-yield (29.08.2014)

Period	Loan redemption	Imputed depreciation + interests	Liquidity deficit (+) or – surplus (-)	accumulated	Compound interests
1	€ 12.950,00	€ 6.475,00	€ 6.475,00	€ 6.475,00	€ 323,75
2	€ 12.950,00	€ 6.475,00	€ 6.475,00	€ 13.273,75	€ 663,69
3	€ 12.950,00	€ 6.475,00	€ 6.475,00	€ 20.412,44	€ 1.020,62
4	€ 12.950,00	€ 6.475,00	€ 6.475,00	€ 27.908,06	€ 1.395,40
5	€ 12.950,00	€ 6.475,00	€ 6.475,00	€ 35.778,46	€ 1.788,92
6	€ 12.950,00	€ 6.475,00	€ 6.475,00	€ 44.042,39	€ 2.202,12
7	€ 12.950,00	€ 6.475,00	€ 6.475,00	€ 52.719,50	€ 2.635,98
8	€ 12.950,00	€ 6.475,00	€ 6.475,00	€ 61.830,48	€ 3.091,52
9	€ 12.950,00	€ 6.475,00	€ 6.475,00	€ 71.397,00	€ 3.569,85
10	€ 12.950,00	€ 6.475,00	€ 6.475,00	€ 81.441,85	€ 4.072,09
11		€ 6.475,00	-€ 6.475,00	€ 79.038,95	€ 3.951,95
12		€ 6.475,00	-€ 6.475,00	€ 76.515,89	€ 3.825,79
13		€ 6.475,00	-€ 6.475,00	€ 73.866,69	€ 3.693,33
14		€ 6.475,00	-€ 6.475,00	€ 71.085,02	€ 3.554,25
15		€ 6.475,00	-€ 6.475,00	€ 68.164,27	€ 3.408,21
16		€ 6.475,00	-€ 6.475,00	€ 65.097,49	€ 3.254,87
17		€ 6.475,00	-€ 6.475,00	€ 61.877,36	€ 3.093,87
18		€ 6.475,00	-€ 6.475,00	€ 58.496,23	€ 2.924,81
19		€ 6.475,00	-€ 6.475,00	€ 54.946,04	€ 2.747,30
20		€ 6.475,00	-€ 6.475,00	€ 51.218,34	€ 2.560,92
			Total costs / proceeds of liquidity	**€ 51.218,34**	
			Costs / proceeds of liquidity per period	**€ 2.560,92**	

Table 17: Demonstration of the calculation of the costs of liquidity for a given example

6.2 Cost type accounting – Practical approach

Cost type accounting is performed to systematically record and categorize the costs of one period. The implementation of cost type accounting is not dependent on the accounting type and therefore has to be performed equally for water management facilities with cameralistic and double entry bookkeeping. The cost types used in cost type accounting are borrowed from the cameralistic budget or the annual profit and loss statement. Therefore the cost types are different for the two bookkeeping methods. However, in order to enable the comparability among water management facilities with cameralistic and double entry bookkeeping, the cost types are uniformly grouped according to the guideline W61 of the ÖVGW and a few minor alterations (see Table 18). For example, the imputed interests and costs of liquidity were summarized to the cost type group imputed costs of financing. Furthermore the imputed depreciations were divided into depreciation according to the minimum cost recovering threshold and imputed reserve building. This altered cost type group structure allows to quickly compare the three cost recovery thresholds among one another. Additionally a new

cost type group was formed in order to record the capitalized self-constructed assets, which have to be subtracted from the total operating costs.

Cost type groups acc. to the guideline W61 of the ÖVGW	Cost type groups actually used in the cost accounting system
Operating Costs: • Personnel Costs • Material Costs • Maintenance Costs • Administrative Costs and other costs of operation Capital Costs: • Imputed Depreciation • Imputed Interest • Other Costs of Financing	**Operating Costs:** • **Personnel Costs** • **Material Costs** • **Maintenance Costs** • **Administrative Costs and other costs of operation** • **Deduction of capitalized self-constructed assets** **Capital Costs:** • **Imputed Depreciation** • **Imputed Reserve Building** • **Calculated Risk** • **Imputed Costs of Financing** **Proceeds:** • **Proceeds from sale** • **current grants (central government and federal state grants)** • **misc. proceeds**

Table 18: Comparison of the cost type groups according to the guideline W61 of the ÖVGW and actually used cost type groups

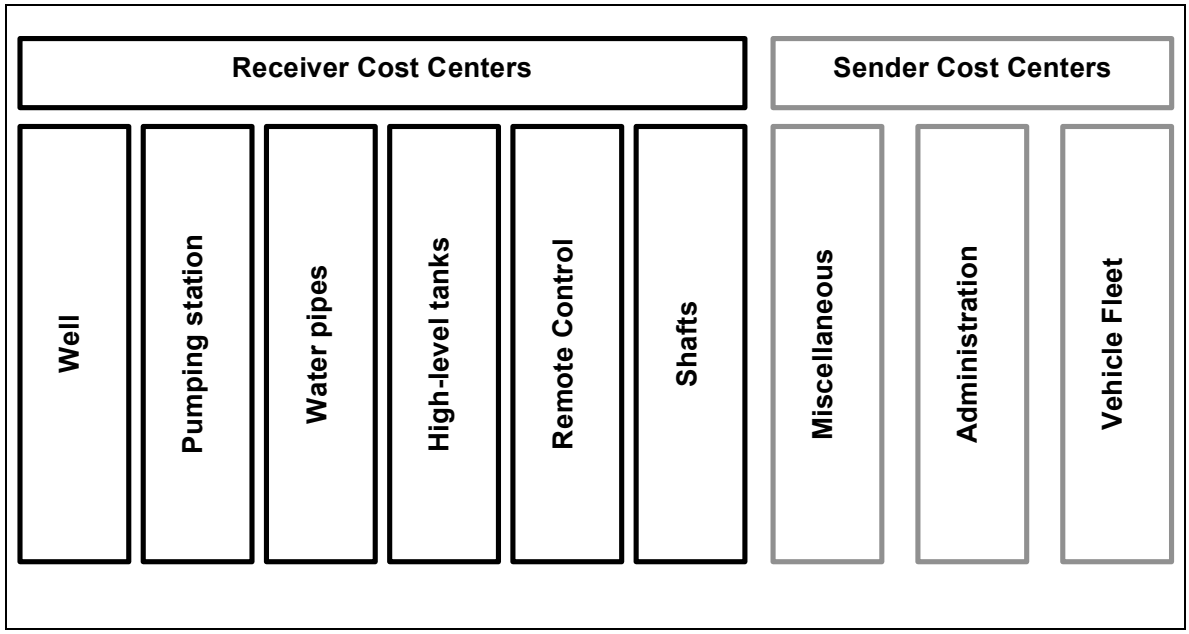
6.3 Cost center accounting – Practical Approach

Cost type accounting is performed to allocate the occurring cost types to cost center. The following operations need to be carried out:

1. Determine a suitable cost centers structure
2. Fill in the cost accounting matrix in order to allocate costs to cost centers

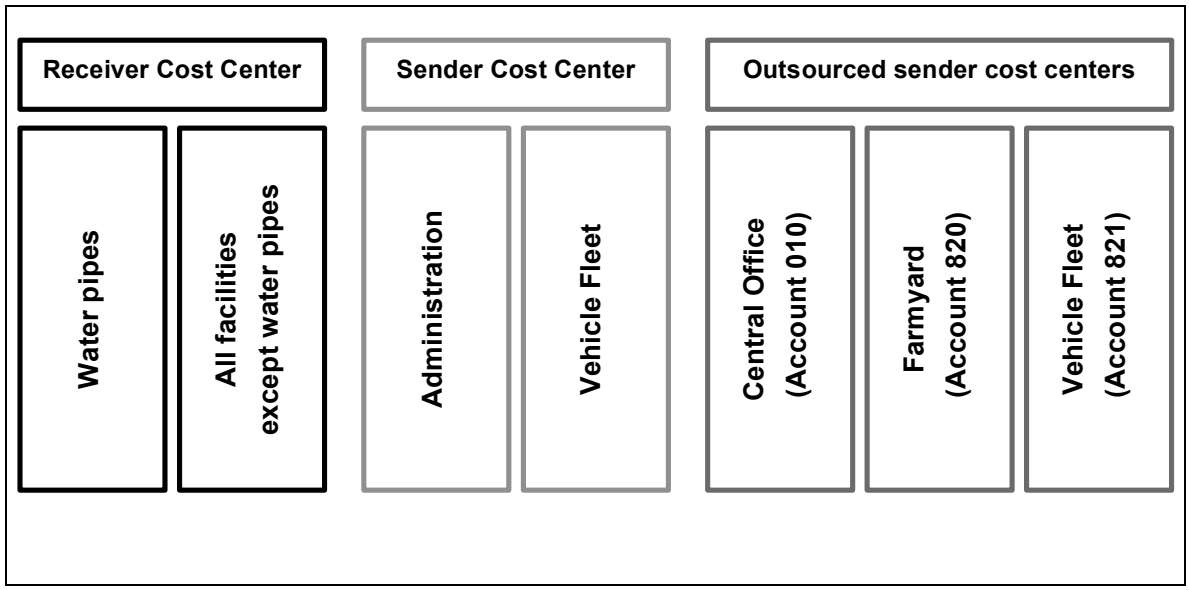
6.3.1 Cost center structure

The determination of the cost center structure is highly dependent on the structure of the company it reflects. As there are big differences in data acquisition between municipal water management facilities and other water management facilities, the cost center structuring has to be performed separately. However, the design of a cost center will follow the suggestions of the guideline W61 of the ÖVGW. Non-municipal water management facilities usually record the data in a more detailed way. Hence, the cost centers can be defined more accurately. Graphic 31 depicts the final cost center structure, which is also used in the case study 1. The graphic also shows that the must important functional units of the water board form the cost centers.



Graphic 31: Cost center structure of the case study water board WVGSO

The municipal water management facilities, which are examined in the case study, do not record the costs in a way so that the cost center structure displayed in Graphic 31 can be used. Because of the very simple data acquisition of municipal water management facilities a reduced cost center structure needs to be implemented. Graphic 32 shows that there are only two receiver cost center, two sender cost centers and three outsourced sender cost centers. The costs of the three outsourced cost centers are not fully allocated on the receiver cost centers, but allocated using a distribution key[81].



Graphic 32: Cost center structure of the case study Styrian municipality

[81] Cf. HEISS, R.; PILZ, D. (2005), p. 34

6.3.2 Cost accounting matrix

The allocation of costs on the cost centers is performed within the spreadsheet "Betriebsabrechnungsbogen" (Eng: Cost accounting matrix; see Addendum 5 and Addendum 6). The cost accounting matrix is a two-dimensional matrix that holds cost types in rows and cost centers in columns and enables every cost type to be allocated to one or more cost centers.

As imputed depreciations and interests are calculated for every single facility separately, they also can be directly assigned to cost centers. Therefore imputed depreciations and interests qualify for direct costs. The primary cost center overhead costs are allocated to the cost centers using a suitable distribution key. The system is designed in a way that leaves the choice of the distribution key and the allocation of costs up to the operator. The secondary cost center overhead costs are allocated to the cost centers using the step-down method. The step-down method requires that the sender cost centers are ordered according to the performance flow[82]. For municipal water management facilities the overhead costs of the outsourced sender cost centers are allocated on the receiver cost centers using a weighed distribution key. This distribution key is determined according to the relation of income and entries of the municipal water management facility and other municipal services[83]. As water management facilities are single-product businesses the calculation of costing rates can be neglected.

6.4 Cost object accounting – Practical approach

Cost object accounting is used to correctly allocate the costs to a cost object. Since water management facilities are single-product businesses, the one-step division calculation is the suitable calculation procedure. Therefore the costs incurred by one unit are calculated with Formula 15.

$$costs\ per\ m^3\ water = \frac{total\ costs\ of\ a\ single\ accounting\ period}{supplied\ water\ in\ m^3\ in\ a\ single\ accounting\ period}$$

Formula 15: Calculation of the unit costs

6.5 Proceed accounting

Proceed accounting can be performed analogous to the four steps of cost accounting and therefore won't be explained in detail. The following operations are required to receive accrual proceeds:

- Spreading the connection dues that were collected in order to build the facility over the weighed operating life of corresponding the construction phase.

[82] Cf. HORSCH, J. (2010), p. 98
[83] Cf. HEISS, R.; PILZ, D. (2005), p. 35

- Spreading the current public grants (not investment subsidies) over the weighed operating life of corresponding the construction phase.
- Income arising from the sale can be transferred to proceed accounting with no further alterations.
- All other income / revenue is taken into account as a 7-year average value.

6.6 Evaluation of a cost recovering water tariff

After accrual costs and proceeds were determined using the cost accounting system explained in the previous chapters, a cost recovering water tariff can be calculated. Starting point for the evaluation of a cost recovering water tariff is the internal short-term profit and loss statement. The basic idea of the internal short-term profit and loss statement is to compare the costs and proceeds of one accounting period. The difference between costs and proceeds is referred to as operating result. Cost recovery is given if the difference of costs and proceeds is zero. Therefore the water tariff has to be determined in a way that this condition is given. If a variable water tariff without base fee can be assumed, two equation systems can be established that frame the cost covering water tariff (see Formula 16 and Formula 17). If these equations are solved for the water tariff, the cost recovering water tariff can now be formulated as in Formula 18. It has to be mentioned that due to different formulations of the maximum, minimum and gross cost recovery threshold the cost recovering water tariff has to be calculated for all three cost recovery thresholds.

$$proceeds_{(sale)} = water\ tariff\ \left[\frac{€}{m^3}\right] * sold\ water\ [m^3]$$

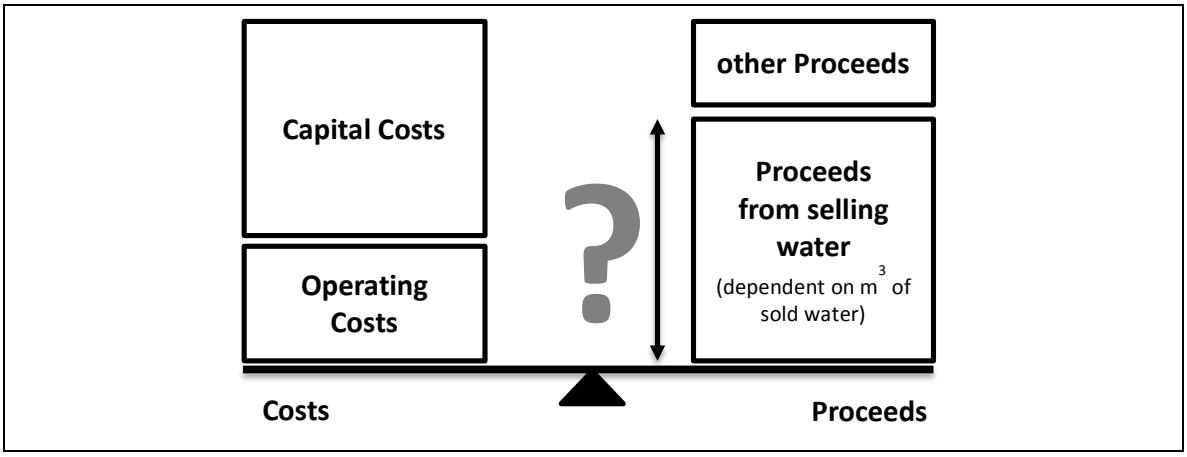
Formula 16: Calculation of the proceeds from sales

$$capital\ costs + operating\ costs = proceeds_{(sale)} + other\ proceeds$$

Formula 17: Definition of cost recovery

$$cost\ recovering\ water\ tariff\ \left[\frac{€}{m^3}\right] = \frac{capital\ costs + operating\ costs - other\ proceeds\ [€]}{sold\ water\ [m^3]}$$

Formula 18: Calculation of a cost recovering water tariff



Graphic 33: Graphic interpretation of the water tariff evaluation process

7 Case Study

The case studies are performed to practically apply and validate the cost accounting system that has been described in chapter 6. The first case study examines the water board "Wasserversorgung Grenzland Südost", the second case study examines five yet autonomous municipalities that are going to be merged to a regional municipality in 2015. Both case studies follow the methodology described below:

1. Data acquisition
2. Data editing
3. Implementing the data in the cost accounting system
4. Presentation and analysis of the results
5. Sensitivity analysis
6. Scenario simulation

7.1 Case Study 1: "Wasserversorgung Grenzland Südost"

Name of the organization	Wasserversorgung Grenzland Südost
Organization type	Water board
Accounting method used	Double entry bookkeeping
No. of customers as of 2013	75 municipalities, 2 water boards
Length of water pipes [km]	285
No. of high-level tanks	9 (Capacity = 10,400 m^3)
No. of pumping stations	26 (Performance = 200 l/s)
No. of Wells	6 (Performance = 110 l/s)
Annual water supply in m^3 as of 2013	2,524,062

7.1.1 Data acquisition

Besides providing water to municipalities and other water boards, the water board "Wasserversorgung Grenzland Südost" (hereinafter referred to as WVGSO) also operates a second business under private law that provides water management related services. Both businesses are strictly separated in terms of accounting. Therefore the cost accounting system is only performed for the water board that provides water. The following documents for the accounting year of 2013 have been acquired:

1. Annual profit and loss statement
2. Assets accounting
3. Grants approval documents
4. Documents on financing
5. Amount of water sold

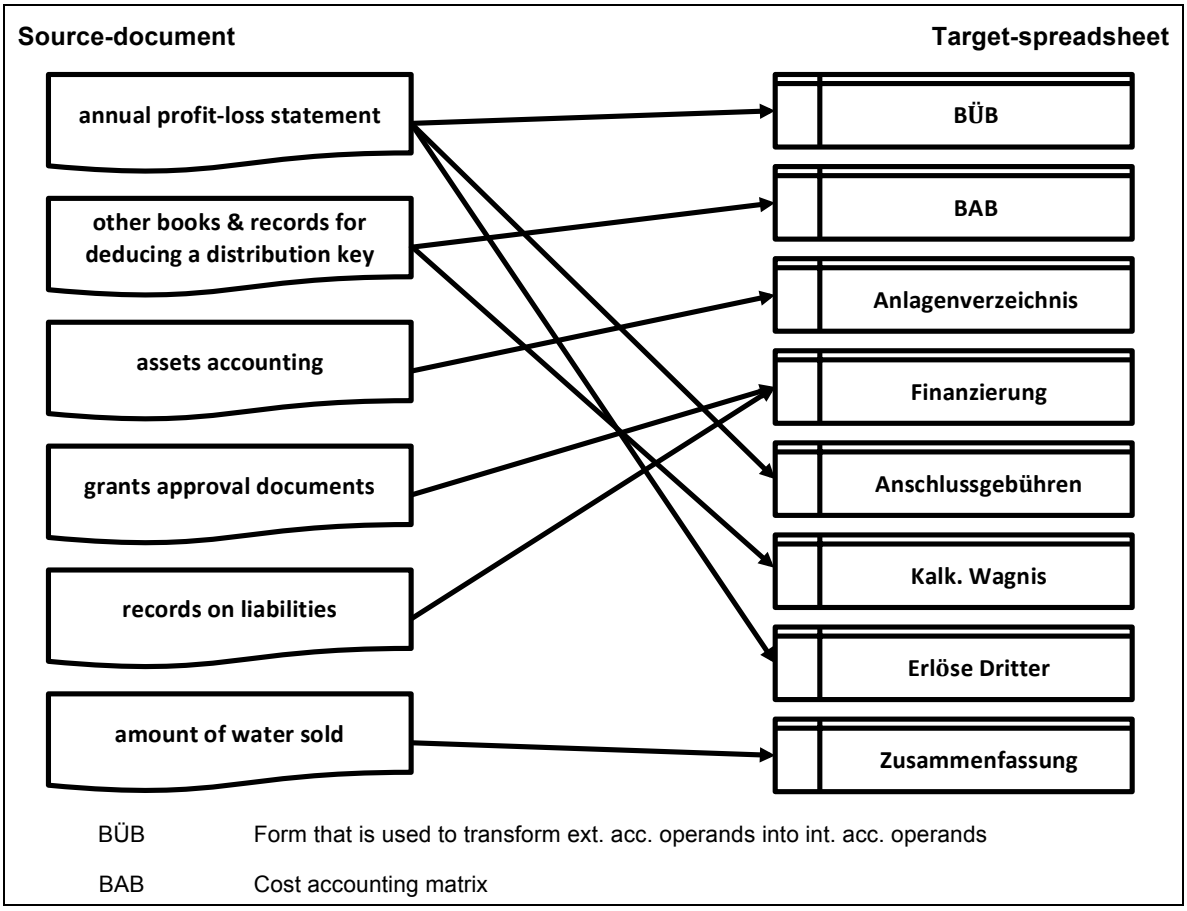
7.1.2 Data editing

There was hardly any data editing necessary, as the required documents were available and sufficiently detailed. However the following data editing was necessary to meet the demands of the cost accounting system described in chapter 6.

- Separation of the facilities in structure and machinery in order to ensure a correct calculation of the weighed operating life of the construction phase
- Adding incidental acquisition costs (e.g. assembly costs, deliver costs)

7.1.3 Implementation of the data

After the data has been edited according to the requirements of the cost accounting system, the data is being filled in the cost accounting system. Graphic 34 shows how the single source documents are transferred to the spreadsheets of the cost accounting system.



Graphic 34: Graphical interpretation of the data implementation (Case Study 1)

7.1.4 Results & Analysis

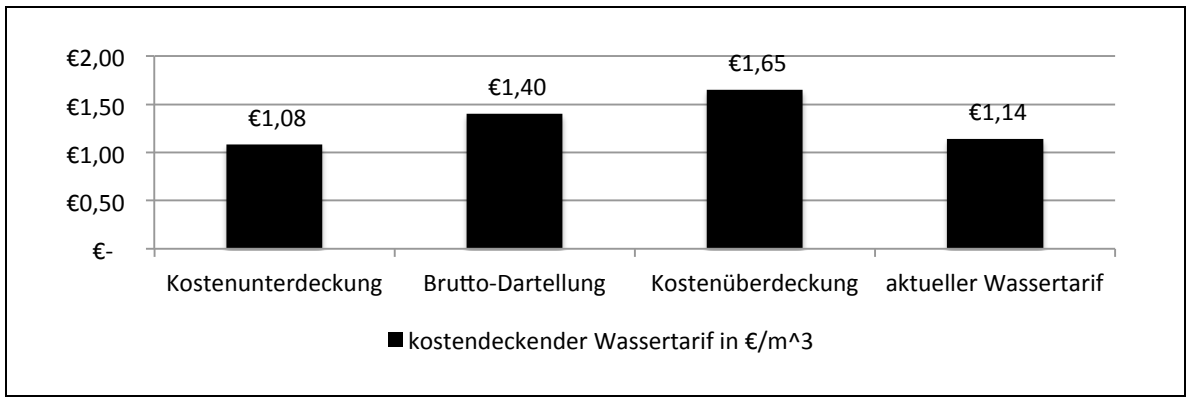
The implemented data deliver the cost recovering water tariff for the minimum, maximum and gross cost recovery threshold as of 2013 shown in Table 19.

	Minimum Cost recovery threshold	Gross Cost recovery threshold	Maximum Cost recovery threshold
Operating costs	-€ 2.044.859,65	-€ 2.044.859,65	-€ 2.044.859,65
Capital costs	-€ 832.309,30	-€ 1.625.182,29	-€ 1.625.182,29
Total Costs	**-€ 2.866.871,59**	**-€ 3.659.744,58**	**-€ 4.291.746,36**
Proceeds from sale	€ 2.888.616,71	€ 2.888.616,71	€ 2.888.616,71
Other proceeds	€ 126.183,08	€ 126.183,08	€ 126.183,08
Total Proceeds	**€ 3.022.091,42**	**€ 3.014.799,79**	**€ 3.014.799,79**
Operating result	**€ 144.922,47**	**-€ 655.242,15**	**-€ 1.287.243,93**
Supplied water		**2.524.062 m³**	
Cost recovering Water tariff in m³ (excl. sales tax)	**€ 1,09**	**€ 1,40**	**€ 1,65**

Table 19: Minimum, gross and maximum cost recovery threshold for the WVGSO as of 2013

As Graphic 35 depicts, the actual water tariff of 1.14 EUR per cubic meter lies above the minimum cost recovery threshold (1.08 EUR/m^3). Therefore the operating costs can be recovered. Furthermore, the own resources and credit liabilities that were used to fund investments can be repaid taking into account the weighed operating life of the construction phase. The positive operating result of 144,922.42 EUR can be used to build up a reserve.

Graphic 35 also shows that the gross cost recovery threshold is 0.32 EUR/m^3 above the minimum cost recovery threshold. This means that due to connection dues and public grants the water tariff could be reduced from 1.40 EUR/m^3 to 1.08 EUR/m^3.

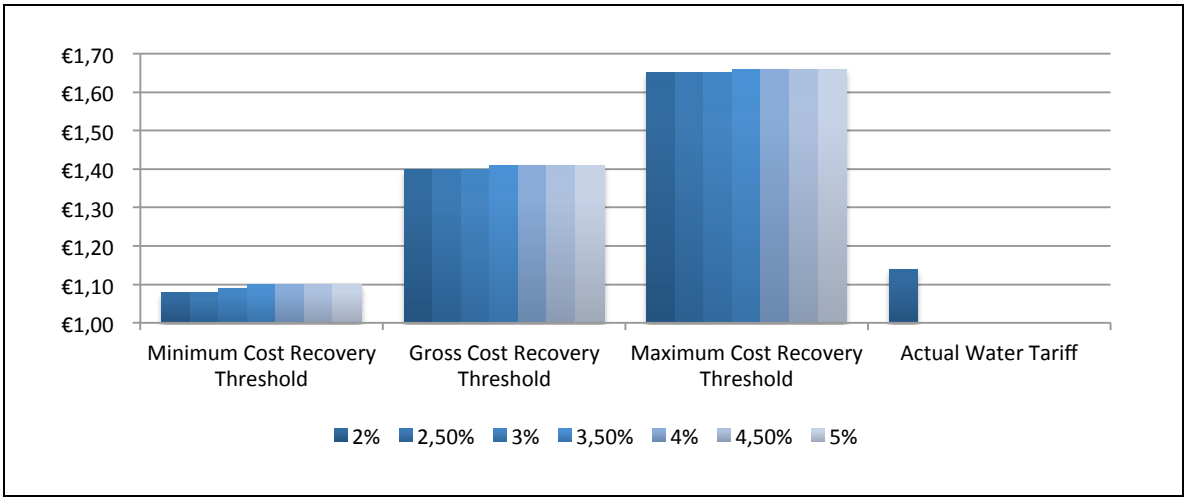


Graphic 35: Comparison of the actual water tariff and the minimum, gross and maximum cost recovery threshold (WVGSO)

Finally Graphic 35 also reveals that the maximum cost recovery threshold drastically exceeds the actual water tariff. To recover the costs of the maximum cost recovery threshold a total of 1,287,243.93 EUR in proceeds are lacking. Setting the water tariff to 1.65 EUR/m3 could have accumulated these extra proceeds. By doing so, not only the operating costs and the own resources and liabilities, considering the weighed operating life, could have been recovered, but also reserves could have been built up in order to replace the facilities at the end of the operating life taking into account the price rise. The follow-up investments furthermore could be made without taking out a credit loan.

7.1.5 Sensitivity analysis

The German federal state association for water (LAWA) suggests varying the interest rate on own resources from 2% p.a. to 5% p.a.[84]. The interval for the variation of the interest rate on own resources was set 0.5% p.a.. Graphic 36 shows that the variation of the interest rate on own resources doesn't have a strong impact on the cost recovery thresholds. The cost recovery thresholds only deviate ± 0.01 EUR from the base value (i_{OR} = 3%). This relatively small influence can be explained by the sources of funds that were used to realize the facilities. None but one construction phase (CP 1) was funded with own resources, but the corresponding resources did only account for 3.5% of the total investment volume of the whole facility.



Graphic 36: Cost recovery thresholds for a varied interest rate on own resources

7.1.6 Scenario simulation

The simulation of scenarios adds a dynamic component to the usually static cost accounting system. The consideration of future events, such as follow-on investments or redevelopment of facilities, is essential for planning and making strategically sound decisions. The implementation of the time dimension requires that the system-determinant parameters are

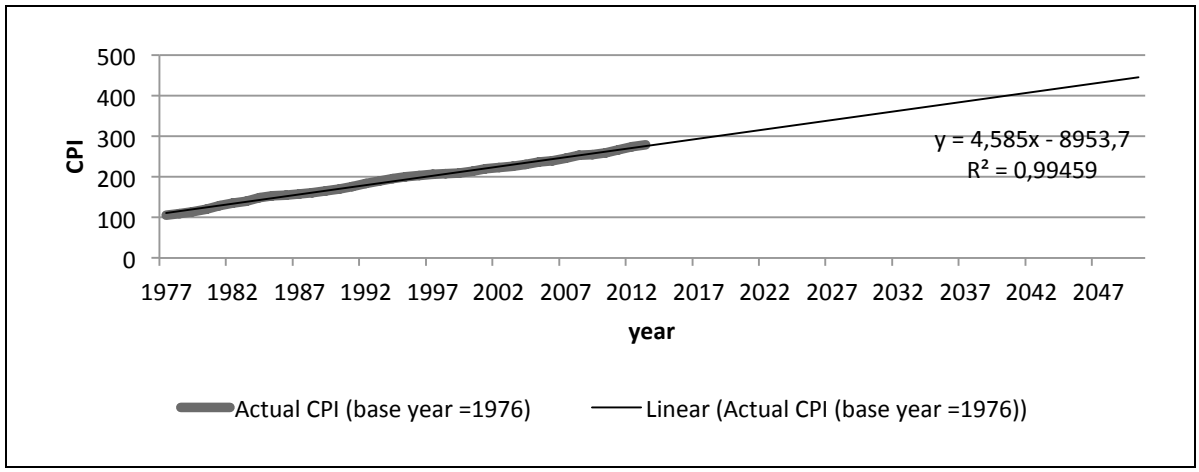
[84] Cf. FLICK et al. (2012), p. 30

defined over the examined period. The following parameters have been defined for the examined 20 years timeline.

- Operating costs
- Capital costs
- Sales volume

Ad 1.) Operating Costs:

The future operating costs are subject to an annual indexation, which depends on the linearized consumer price index (CPI). Graphic 37 shows the linearized CPI until the year 2050.



Graphic 37: Consumer price index (base year = 1976)[85]

Ad 2.) Capital Costs

Concerning the capital costs, two variants were developed. Table 20 describes the two variants in detail.

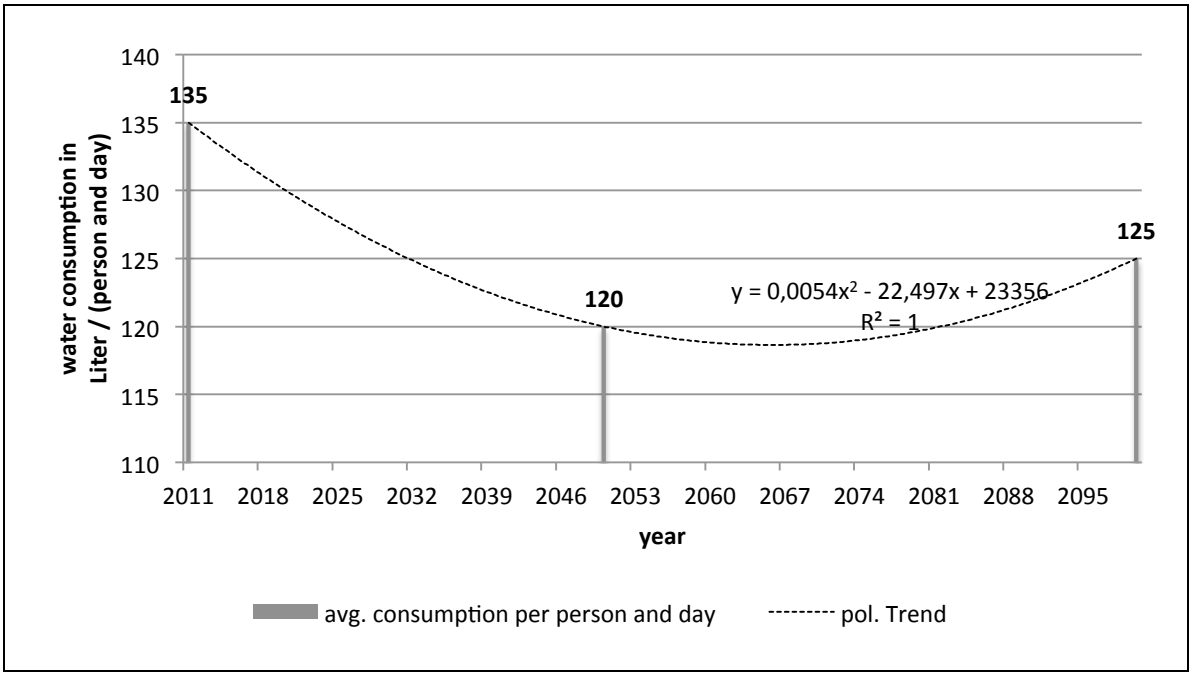
Variant 1	Variant 2
Imputed costs cease at the end of the operating life	Imputed costs continue at the end of the operating life
No replacement of facilities at the end of their operating life	Replacement of facilities at the end of their operating life. The depreciation base is determined by the acquisition costs under consideration of the building price index (see Graphic 9).
	Follow-up investments are internally funded (100% own resources, no liabilities)

Table 20: Assumptions made concerning the capital costs

[85] http://www.statistik.at/web_de/statistiken/preise/verbraucherpreisindex_vpi_hvpi (28.08.2014)

Ad 3.) Sales volume

The amount of water that is sold in each accounting period is crucial for the scenario simulation since this amount bears the total costs. A study carried out by the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management predicts three values for the average daily water consumption per person. Since this study only comprises forecast values for the years 2011, 2050 and 2100 the values in between had to be interpolated by using a polynomial function of the second order. Graphic 38, which was deducted from the results of the aforementioned study, shows a decrease in the specific water consumption from now on until 2050. The study explains that this decrease in water consumption is caused by the technological progress that results in more water efficient products. According to the study the increase in water consumption in the period from 2050 until 2100 is caused by an increase in population, the effects of climate change [86].

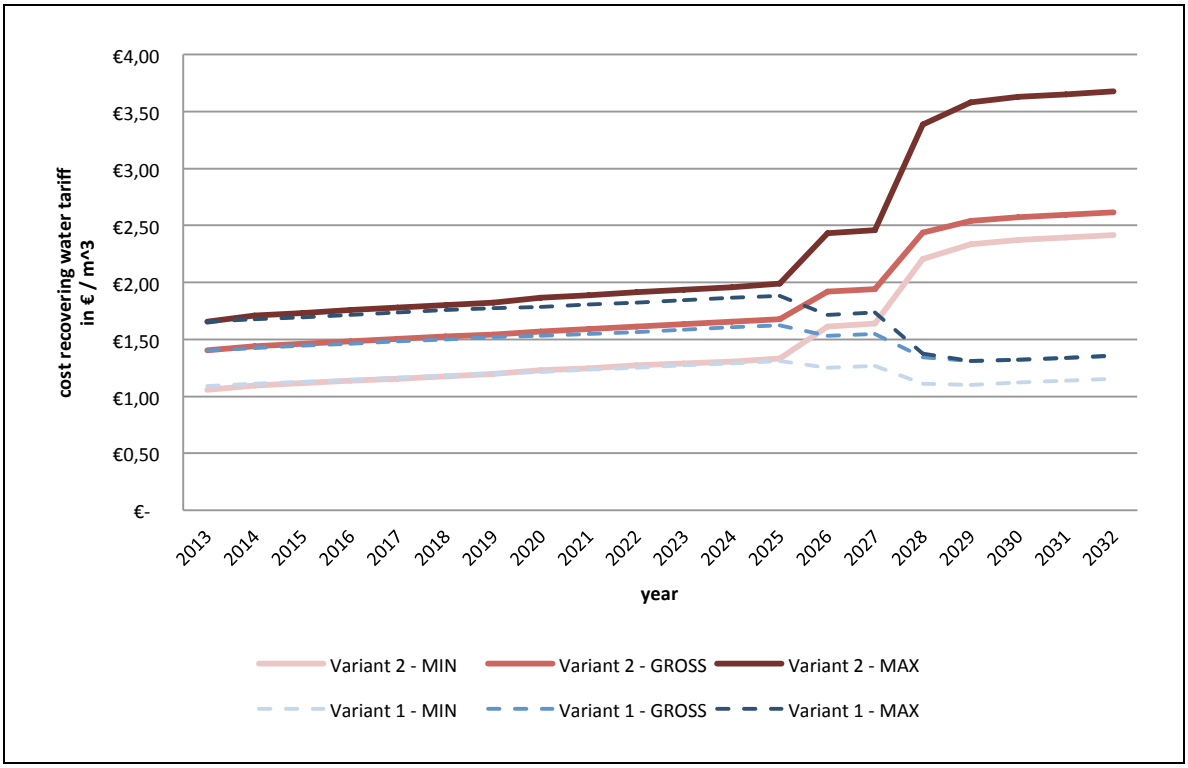


Graphic 38: Average daily water consumption per person

The aforementioned assumptions implemented in the cost accounting system deliver two sets of cost recovery thresholds, which can be seen in Graphic 39. This graphic reveals that the all predicted cost recovery thresholds follow a positive trend until 2025. The increase in the water tariff can be explained by increasing operating costs and the decreasing amount of water sold. Simply put, a smaller number of cost objects have to bear more costs.

Whereas the cost recovery thresholds of the two variants increase moderately in the period from 2013 until 2025, an abrupt change can be observed in 2026. Due to the fact that the

[86] Cf. NEUNTEUFEL, R. et al (2012), p. 225



Graphic 39: 20 years forecast for the cost recovery thresholds in two variants (Case Study 1)

construction phase 1, 2 and 3 are exceeding their planned operating life, variant 1 and variant 2 strongly deviate from each other. Concerning variant 1, the cost recovery thresholds decrease by 0.50 EUR from 2026 until 2029, because the fully depreciated assets are not replaced. In this case the total depreciation base is reduced by more than 50%. On the other hand the cost recovery thresholds of variant 2 experience a gain, because the already fully depreciated assets are replaced. Considering the slope of the building price index (see Graphic 9) the depreciation base of the replaced assets increases by more than 150%. Due to the hypothetical follow-on investment the minimum cost recovery threshold increases from 1.33 EUR/m^3 in 2025 to 2.33 EUR/m^3 in 2029. Furthermore Graphic 39 shows that from 2028 on the gross and maximum cost recovery thresholds of variant 1 overlap. This is due the fact that from 2028 on almost all assets that are depreciated were funded with connection dues. Therefore the depreciation and interest basis for the gross and maximum cost recovery threshold are equal. Furthermore the capital costs of the minimum cost recovery threshold of variant 1 are zero at this point, because the minimum cost recovery threshold only recovers own resources and liabilities that were used to fund a project (see Formula 9; p. 62).

7.2 Case Study 2: Styrian regional municipality

This case study examines five autonomous municipalities, which will be merged in 2015 in course of the restructuring of Styrian municipalities. The objective of the municipality restructuring is to build more efficient, more productive and more professional municipalities that cover the basic care of the population[87]. In a long-term the restructuring of municipalities will have the following effects on the water management facilities of the five municipalities:

- Central organization of the public water management facilities
- Central accounting
- A uniform water tariff needs to be established for the whole regional municipality, under the condition that the water tariff is not altered by more than 20%. If the water tariff has to be altered by more than 20%, the alteration needs to spread over a seven years period[88].

As the restructuring of the municipalities hasn't been performed yet, the results will be presented and analyzed for the single municipalities and the future regional municipality, which comprises the five single municipalities. The steps of data acquisition, data editing and data implementation won't be separated, as the data were only available for the single municipalities.

7.2.1 Data acquisition

The following documents and data for the accounting year of 2013 were collected from the municipalities:

- Budget for:
    - Account 850 – Water management facility
    - Account 010 – Central Office
    - Account 820 – Farm yard
    - Account 821 – Vehicle fleet
- Assets accounting (Account 850 – water management facility)
- Grants approval documents
- Documents on financing
- Amount of water sold

All of the five municipalities use cameralistic accounting in compliance with the VRV. The VRV requires that the municipalities organize their accounts in a defined structure. Due to this defined structure the expenses and income incurred by the municipal water management facility can be easily determined. The usage of accounting software was also of great help, as the budgets for the required accounts and the documents on financing could be easily collected.

[87] Cf. http://www.gemeindestrukturreform.steiermark.at/cms/dokumente/11820435_97007261/f8130d9d/Präsentation_GSR_end.pdf
[88] Cf. KINDERMANN, M. (2014) p. 10

However issues did occur with the collected assets accounting books, as none of the examined municipalities manages the assets according to §16 VRV and §7 section 3 EStG. According to these paragraphs a municipality is obliged organize the assets accounting in a way that the following data is recorded:

- Acquisition date
- Acquisition costs
- Name and address of the supplier
- Planned operating life
- Annual depreciation value
- Residual book value

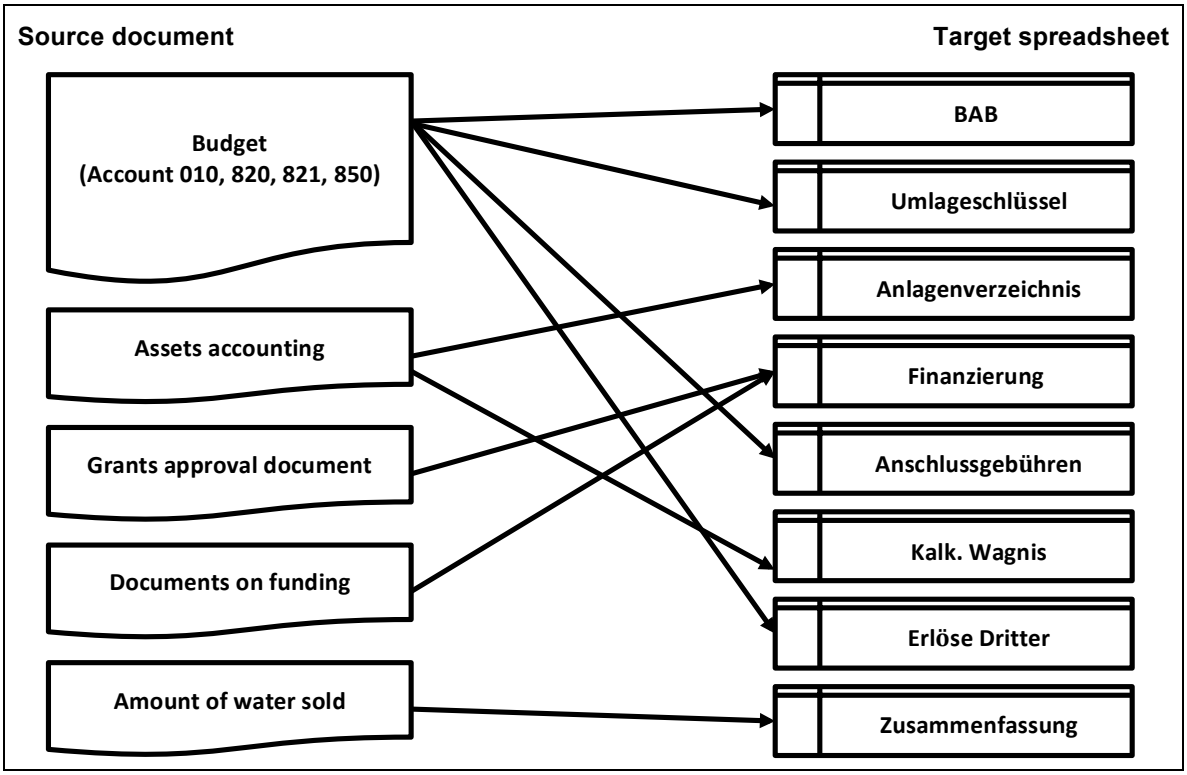
7.2.2 Data editing

Compared to the first case study, the data editing for this case study was far more complex. Since the assets accounting books were partly incomplete additionally data mining had to be done. In order to receive sound data the following steps were performed:

1. Matching of the assets recorded in the assets accounting books and the grants approval documents
2. If the data didn't match municipal workers were interviewed

7.2.3 Implementation of the data

After all the data was collected and edited, the data was implemented according to Graphic 40.



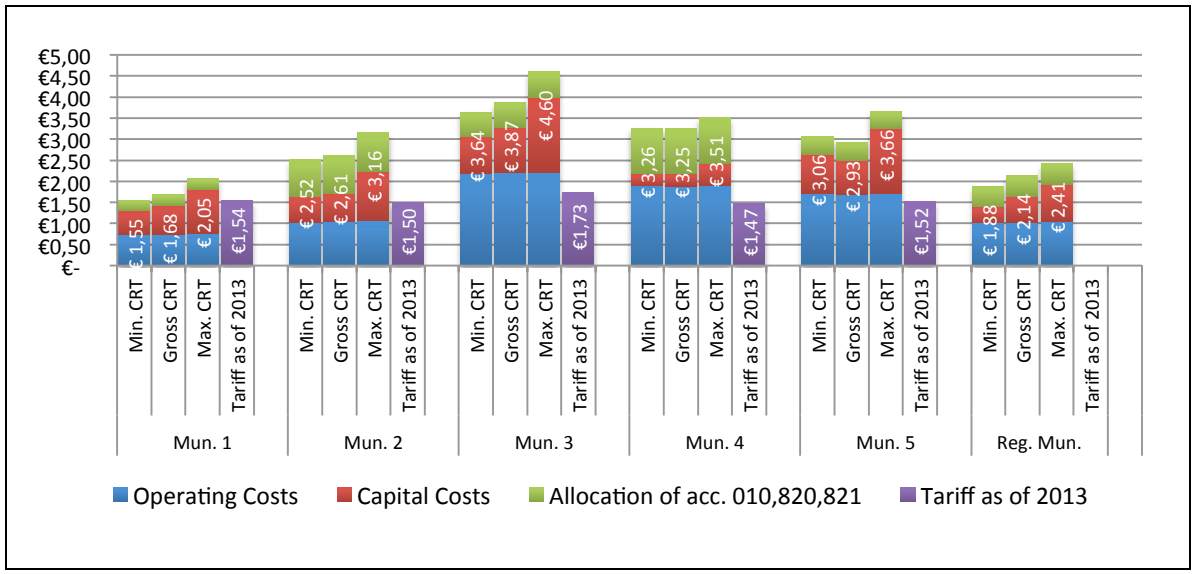
Graphic 40: Graphical interpretation of the data implementation (Case Study 2)

7.2.4 Results & Analysis

The tables Table 22 to Table 26 show the results of the short-term profit and loss statement, which was performed for all municipalities and the future regional municipality. Furthermore Graphic 41 offers an overview of the values of the minimum, gross and maximum cost recovery thresholds and the corresponding actual water tariff as of 2013. This graphic reveals that the actual water tariff of all municipalities is far below the minimum cost recovery threshold. Only the actual water tariff of municipality 1 is very close to the minimum cost recovery threshold (-0.01 EUR/m^3). Due to this fact all municipal water management facilities show a negative operating result (see Table 22 to Table 26). Furthermore the municipalities were obviously not able to recover the total costs that were incurred by the water management facility. In order to recover the total costs, internal or external liabilities must have been taken out. The cause for the uniformly negative results are divers, but can be explained widely by three factors, which are assumed to be:

- Stake of external water purchase
- Ratio of m^3 supplied water to the length of the total water pipe network
- Stake of costs that were allocated from the auxiliary accounts (010, 820 and 821) to the municipal water management facility's account (850).

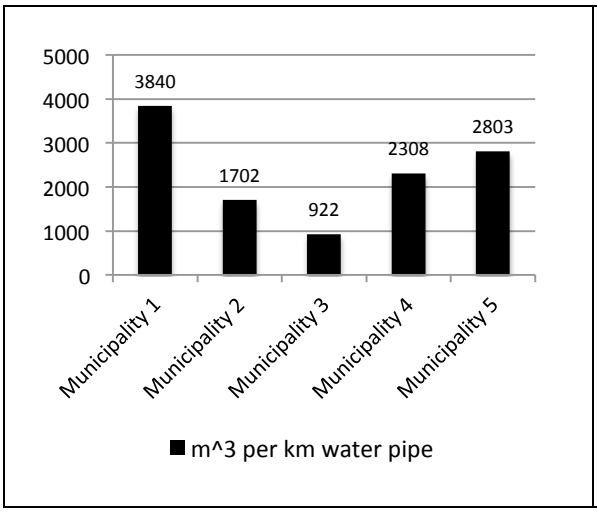
The stake of external water purchase probably has the biggest impact on the total unit costs and the cost structure. As the costs for the external water purchase is included in the operating costs and the external water supply ranges from 19% to 100% (see Graphic 43), the overall cost structure of the municipalities must be affected. Indeed Graphic 41 shows that the operating costs of municipality 1 and municipality 2 account for 0.76 EUR/m^3 and 1.03 EUR/m^3 of the cost recovery threshold. In comparison to this the relative operating costs of municipality 3, 4 and 5 account for 2.18 EUR/m^3, 1.89 EUR/m^3 and 1.71 EUR/m^3 of the cost recovery thresholds.



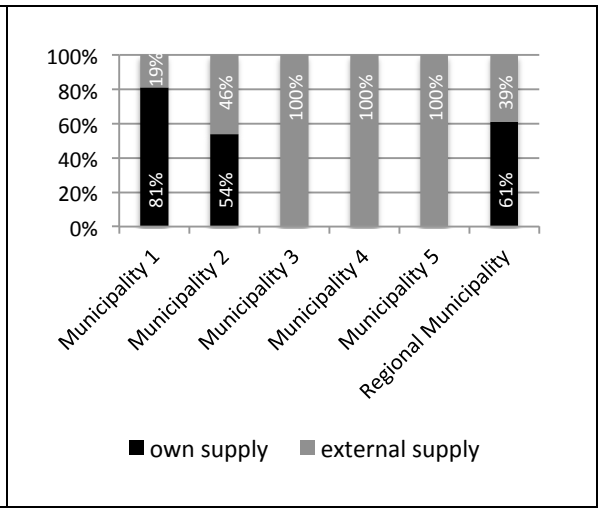
Graphic 41: Comparison of the minimum, maximum and gross cost recovery thresholds and the actual water tariff as of 2013

The ratio of the amount of supplied water to the total length of the water pipe network shows how many cost object units a kilometer of a water pipe bears. Considering the fact that water pipes account for a big stake of the capital costs and assuming a fixed ratio of water pipes to other facilities, a higher ratio means that the capital costs can be allocated to a higher amount of cost object units. Thus, higher water consumption with the same water pipe network results in a lower water tariff per cubic meter. This ratio can be furthermore influenced by two variables. On the one hand there is the overall water consumption, on the other hand there is the length of the water pipe network that is necessary to supply all customers. The overall water consumption is usually very similar for private use. However industrial water consumption can be excessive and consequently has a big impact on this ratio. For example municipality 1 sells almost half of the total sold water to a single industrial company, which results in an extremely high ratio. On the other hand the total length of the water pipe network influences the ratio and subsequently the capital costs one cost object unit must bear. Furthermore the length of the water pipe network is strongly dependent on the urbanity of the area to be supplied with water. For example the total length of the water pipe network of municipality 3 is 28.5 km, but only 760 people are connected to this water supply system. In comparison this municipality 4 manages to supply 647 people with water by using only 12.2 km of water pipe.

The third factor that influences the water tariff is the allocation of auxiliary accounts (010 – central office, 820 – farmyard, 821 – vehicle fleet) to the municipal water management facility's account (Account 850). Furthermore the value of costs allocated from the auxiliary accounts to the water management facility's account depends on the distribution key that is used and the total costs to be distributed. Since the distribution key, which determines how much the auxiliary account's costs are allocated to the water management facility's account, is calculated by weighing the income (50%) and book entries (50%) the distribution key depends not only on the municipal water management facility, but also on other facilities,

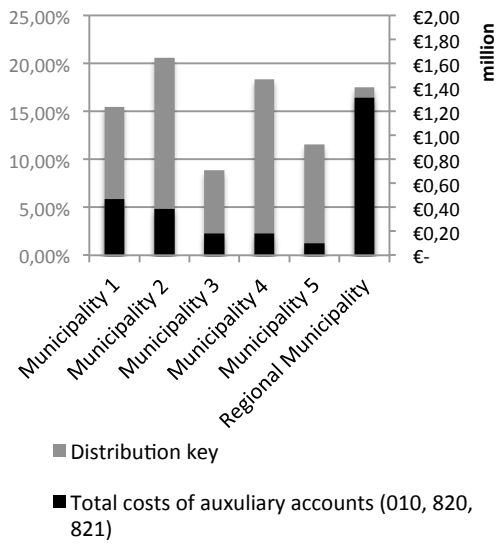


Graphic 42: Ratio of the m^3 supplied water to the total length of the water pipe network

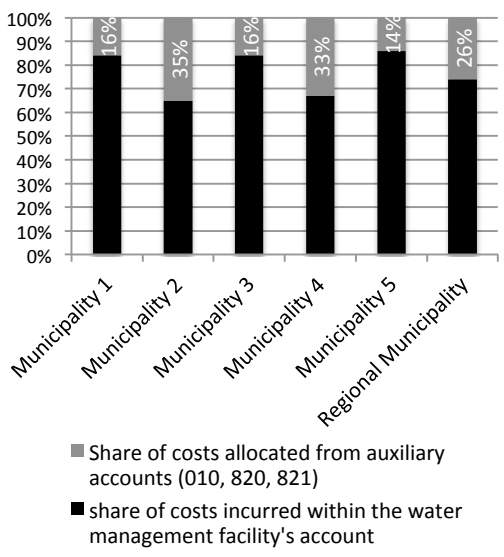


Graphic 43: Share of own water supply (from wells) and external water supply

such as waste water disposal and garbage disposal. Graphic 44 shows that the aforementioned distribution key ranges from 8.9% (municipality 3) to 20.59% (municipality 2). Additionally this graphic shows the total costs of the auxiliary accounts that are allocated respectively to the distribution key on the water management facility's account. Considering both determinants of Graphic 44 and the total costs in the water management facility's account, deliver the results in Graphic 45. As can be seen in this graphic, the costs that were not incurred directly by the water management facility but by auxiliary organizations account for up to 35% of the total costs of the water management facility. These costs added from auxiliary accounts account for 0.88 EUR/m^3 of the minimum cost recovery threshold of 2.52 EUR/m^3.



Graphic 44: Distribution key and total costs to be allocated from the auxiliary accounts



Graphic 45: Share of costs allocated from auxiliary accounts (010, 820, 821) to the municipal water management facility's account

	Minimum Cost recovery threshold	Gross Cost recovery threshold	Maximum Cost recovery threshold
Operating costs	-€ 290.753,22	-€ 290.753,22	-€ 290.753,22
Capital costs	-€ 164.785,46	-€ 200.808,76	-€ 298.645,22
Total Costs	**-€ 455.538,68**	**-€ 491.561,98**	**-€ 589.398,44**
Proceeds from sale	€ 376.528,60	€ 376.528,60	€ 376.528,60
Other proceeds	€ 38.924,89	€ 38.924,89	€ 38.924,89
Total Proceeds	**€ 415.453,49**	**€ 415.453,49**	**€ 415.453,49**
Operating result	**-€ 40.085,19**	**-€ 76.108,49**	**-€ 173.944,95**
Supplied water		**268.834 m³**	
Cost recovering Water tariff in m³ (excl. sales tax)	**€ 1,55**	**€ 1,68**	**€ 2,05**
Cost recovering Water tariff in m³ without allocation of acc. 010, 820, 821 (excl. sales tax)	**€ 1,28**	**€ 1,41**	**€ 1,78**

Table 21: Minimum, gross and maximum cost recovery threshold for municipality 1 as of 2013

	Minimum Cost recovery threshold	Gross Cost recovery threshold	Maximum Cost recovery threshold
Operating costs	-€ 173.979,44	-€ 173.979,44	-€ 173.979,44
Capital costs	-€ 55.723,32	-€ 62.234,46	-€ 104.605,51
Total Costs	**-€ 229.702,77**	**-€ 236.213,91**	**-€ 278.584,96**
Proceeds from sale	€ 112.965,79	€ 112.965,79	€ 112.965,79
Other proceeds	€ 36.243,80	€ 36.243,80	€ 36.243,80
Total Proceeds	**€ 149.209,59**	**€ 149.209,59**	**€ 149.209,59**
Operating result	**-€ 80.493,17**	**-€ 87.004,31**	**-€ 129.375,36**
Supplied water		**76.725 m³**	
Cost recovering Water tariff in m³ (excl. sales tax)	**€ 2,52**	**€ 2,61**	**€ 3,16**
Cost recovering Water tariff in m³ without allocation of acc. 010, 820, 821 (excl. sales tax)	**€ 1,49**	**€ 1,57**	**€ 2,12**

Table 22: Minimum, gross and maximum cost recovery threshold for municipality 2 as of 2013

	Minimum Cost recovery threshold	Gross Cost recovery threshold	Maximum Cost recovery threshold
Operating costs	-€ 78.044,74	-€ 78.044,74	-€ 78.044,74
Capital costs	-€ 25.264,47	-€ 31.195,98	-€ 50.108,41
Total Costs	**-€ 103.309,21**	**-€ 109.240,72**	**-€ 128.152,15**
Proceeds from sale	€ 47.027,86	€ 47.027,86	€ 47.027,86
Other proceeds	€ 8.207,54	€ 8.207,54	€ 8.207,54
Total Proceeds	**€ 55.235,40**	**€ 55.235,40**	**€ 55.235,40**
Operating result	**-€ 48.073,82**	**-€ 54.005,33**	**-€ 72.917,76**
Supplied water		**26.103 m³**	
Cost recovering Water tariff in m³ (excl. sales tax)	**€ 3,64**	**€ 3,87**	**€ 4,60**
Cost recovering Water tariff in m³ without allocation of acc. 010, 820, 821 (excl. sales tax)	€ 3,03	€ 3,26	€ 3,98

Table 23: Minimum, gross and maximum cost recovery threshold for municipality 3 as of 2013

	Minimum Cost recovery threshold	Gross Cost recovery threshold	Maximum Cost recovery threshold
Operating costs	-€ 90.963,25	-€ 90.963,25	-€ 90.963,25
Capital costs	-€ 9.008,57	-€ 8.859,35	-€ 16.169,34
Total Costs	**-€ 99.971,82**	**-€ 99.822,61**	**-€ 107.132,59**
Proceeds from sale	€ 44.009,15	€ 44.009,15	€ 44.009,15
Other proceeds	€ 6.887,45	€ 6.887,45	€ 6.887,45
Total Proceeds	**€ 50.896,60**	**€ 50.896,60**	**€ 50.896,60**
Operating result	**-€ 49.075,22**	**-€ 48.926,01**	**-€ 56.235,99**
Supplied water		**28.573 m³**	
Cost recovering Water tariff in m³ (excl. sales tax)	**€ 3,26**	**€ 3,25**	**€ 3,51**
Cost recovering Water tariff in m³ without allocation of acc. 010, 820, 821 (excl. sales tax)	€ 2,09	€ 2,09	€ 2,34

Table 24: Minimum, gross and maximum cost recovery threshold for municipality 4 as of 2013

	Minimum Cost recovery threshold	Gross Cost recovery threshold	Maximum Cost recovery threshold
Operating costs	-€ 57.260,93	-€ 57.260,93	-€ 57.260,93
Capital costs	-€ 25.124,90	-€ 21.889,82	-€ 40.972,63
Total Costs	**-€ 82.385,82**	**-€ 79.150,75**	**-€ 98.233,56**
Proceeds from sale	€ 40.486,87	€ 40.486,87	€ 40.486,87
Other proceeds	€ 2.715,27	€ 2.715,27	€ 2.715,27
Total Proceeds	**€ 43.202,14**	**€ 43.202,14**	**€ 43.202,14**
Operating result	**-€ 39.183,68**	**-€ 35.948,61**	**-€ 55.031,42**
Supplied water		**26.073 m³**	
Cost recovering Water tariff in m³ (excl. sales tax)	**€ 3,06**	**€ 2,93**	**€ 3,66**
Cost recovering Water tariff in m³ without allocation of acc. 010, 820, 821 (excl. sales tax)	€ 2,60	€ 2,48	€ 3,21

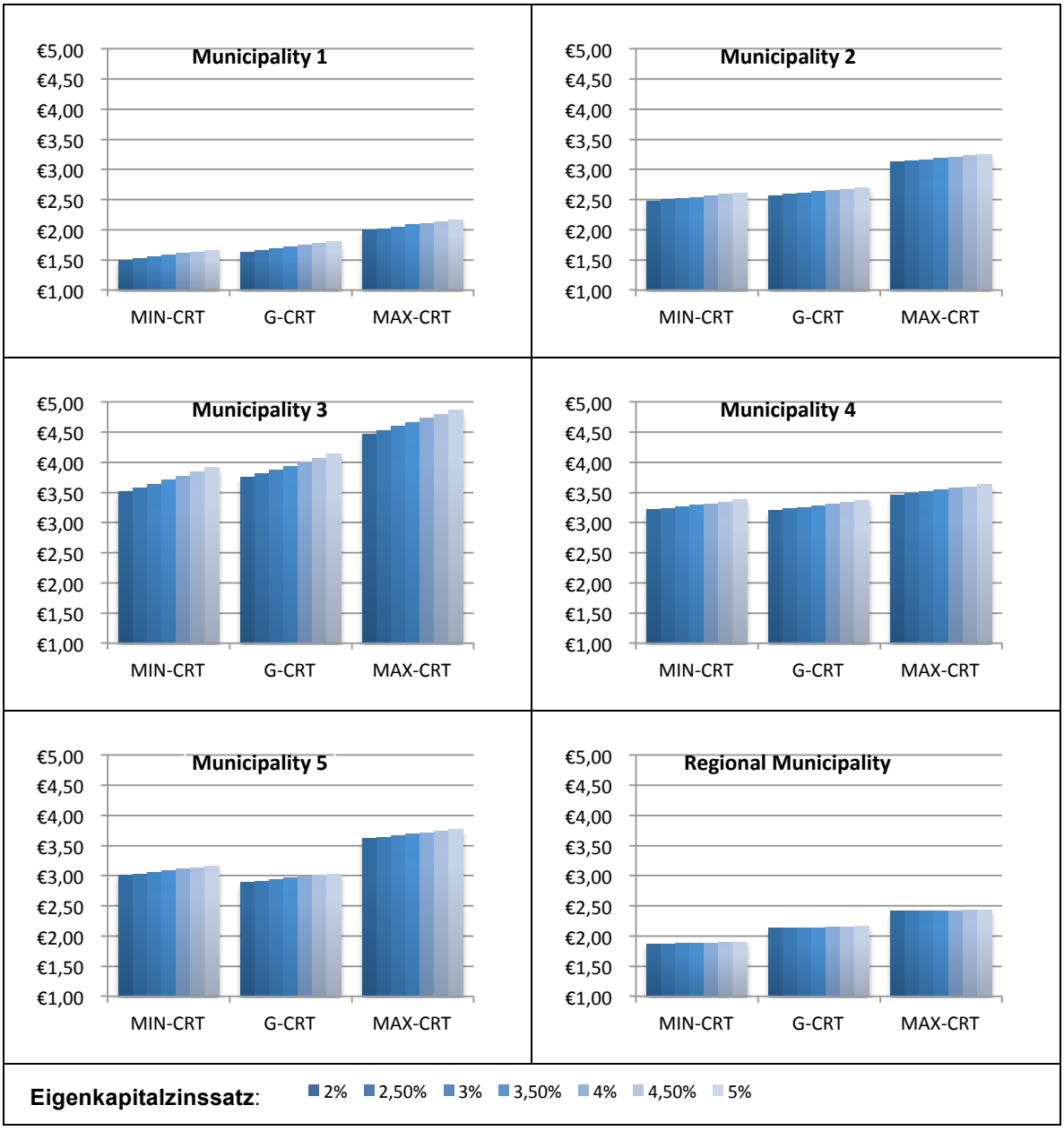
Table 25: Minimum, gross and maximum cost recovery threshold for municipality 5 as of 2013

	Minimum Cost recovery threshold	Gross Cost recovery threshold	Maximum Cost recovery threshold
Operating costs	-€ 708.763,36	-€ 708.763,36	-€ 708.763,46
Capital costs	-€ 180.601,90	-€ 292.317,15	-€ 410.462,14
Total Costs	**-€ 889.365,36**	**-€ 1.001.080,61**	**-€ 1.119.225,60**
Proceeds from sale	€ 621.018,27	€ 621.018,27	€ 621.018,27
Other proceeds	€ 89.818,23	€ 89.818,23	€ 89.818,23
Total Proceeds	**€ 710.836,50**	**€ 710.836,50**	**€ 710.836,50**
Operating result	**-€ 178.528,86**	**-€ 290.244,11**	**-€ 408.389,10**
Supplied water		**424.935 m³**	
Cost recovering Water tariff in m³ (excl. sales tax)	**€ 1,88**	**€ 2,14**	**€ 2,41**
Cost recovering Water tariff in m³ without allocation of acc. 010, 820, 821 (excl. sales tax)	€ 1,33	€ 1,60	€ 1,87

Table 26: Minimum, gross and maximum cost recovery threshold for the regional municipality as of 2013

7.2.5 Sensitivity analysis

As it was already described in chapter 7.1.5 the German federal association for water (LAWA) suggests to perform a sensitivity analysis that shows the impact of the interest rate on own resources. Furthermore LAWA suggests varying the interest rate on own resources from 2% to 5%. The chosen interval for the sensitivity analysis is 0.5%.



Graphic 46: Minimum, gross and maximum cost recovery threshold calculated with varying interest rates for own resources

Graphic 46 shows that a defined variation of the own resources' interest rate (hereinafter referred to as i_{OR}) has a very different impact on the cost recovery thresholds of the five municipalities and the regional municipality. Whereas the variation of i_{OR} has almost no impact on the regional municipality's cost recovery thresholds (appr. ± 0.01 EUR/m^3), the

same variation has a much bigger impact on the cost recovery thresholds of municipality 3 (appr. ± 0,2 EUR/m^3). The different behavior of the cost recovery thresholds can be explained by the underlying cost structure of the municipalities. Since the variation in i_{OR} only affects the part of capital that was purchased with own resources, the ratio of the value of assets purchased with own resources to the total value of assets determines how much the cost recovery thresholds are influenced.

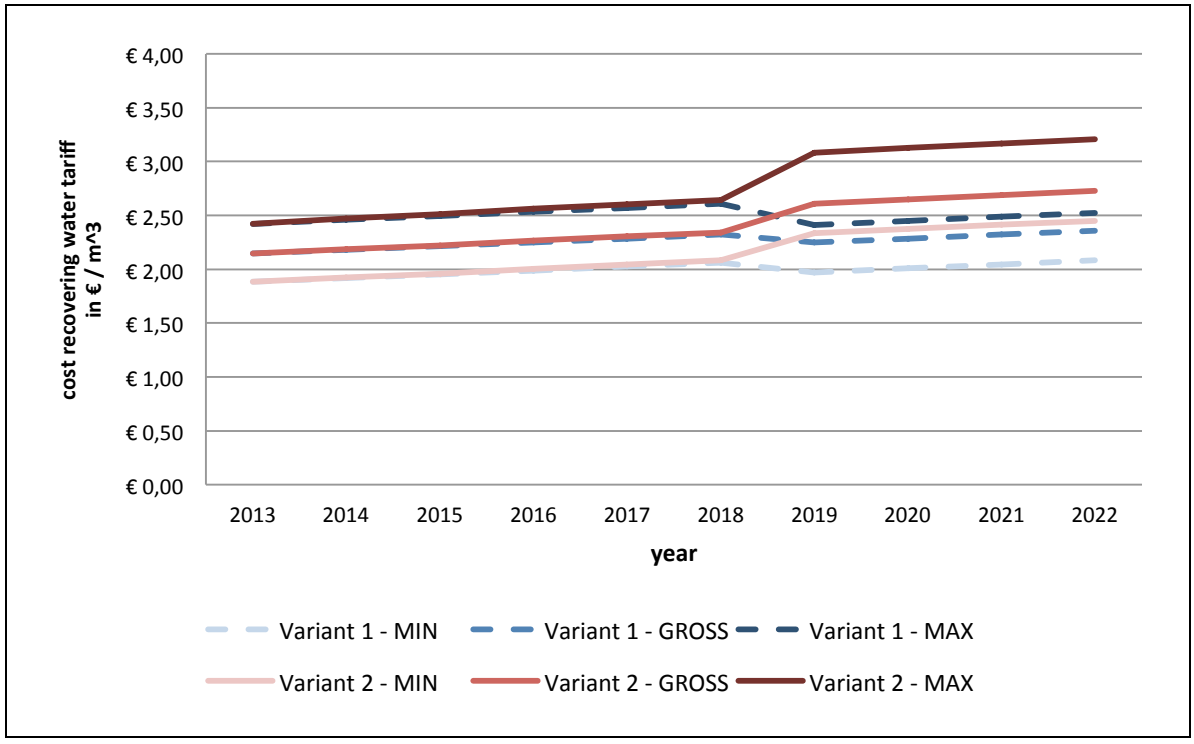
Name	Share of capital costs on the total costs	Share of own resources on assets value
Fehring	41%	10%
Hatzendorf	26%	30%
Hohenbrugg – Weinberg	28%	42%
Johnsdorf – Brunn	9%	90%
Pertlstein	28%	29%
RG Fehring	29%	20%

Table 27: Share of own resources on the assets value

7.2.6 Scenario simulation

The scenario simulation will only be performed for the regional municipalities, as the single municipalities will merge in 2015 and therefore won't exist anymore in this structure. However, the simulations to be performed in this chapter are based on the same parameters and assumptions that were made in chapter 7.1.6. The scenario simulation will also comprise two variants, which are also identical to definitions in chapter 7.1.6. Hence, the annual depreciations of variant 1 will cease at the end of the operating life, whereas the depreciations of variant 2 will continue at the end of the operating life. Furthermore the depreciation after the end of the operating life will be altered according to the building price index in order to simulate a follow-on investment. Additionally, follow-on investments are funded solely by own resources.

Graphic 47 shows the 10 years scenario simulation for the regional municipality of case study 2. The initial moderate incline of variant 1 and also variant 2 is caused by the adjustment of the operating costs according to the CPI and also by the predicted stagnating water consumption in this period. The abrupt decrease in the cost recovery thresholds of variant 1 in 2019 is due to the fact that a cost intensive construction phase surpasses it's planned operating life. This results in a drop of 0.09 EUR/m^3 of the minimum cost recovery threshold. On the other hand the replacement of the facilities that have just exceeded it's planned operating life in variant 2 leads to an increase in the minimum cost recovery threshold of 0.26 EUR/m^3. After this abrupt decrease in Variant 1 and increase in Variant 2. the cost recovery thresholds are inclining again, due to the CPI indexation and the declining water consumption.



Graphic 47: 10 years forecast for the cost recovery thresholds in two variants (Case Study 1)

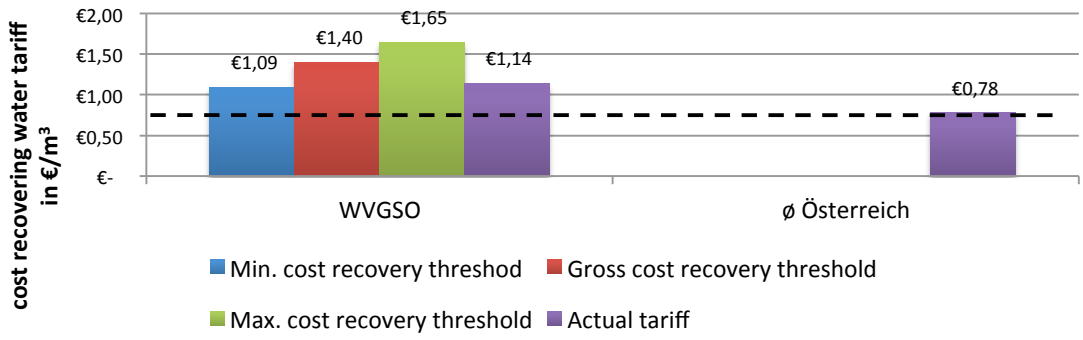
8 Conclusion and Further Outlook

In the course of this thesis, a cost accounting system for water management facilities has been developed, that is capable of calculating a cost recovering water tariff. Furthermore the cost recovering water tariff was defined in a way, that the proceeds and costs of one accounting period are equal. After examining the legal framework, which is applicable for water management facilities of all kinds, two values have been introduced that reflect the legal boundaries of the determination of a water tariff. On the one hand the minimum cost recovery threshold defines the lower legal boundary, on the other hand the maximum cost recovery threshold represents the upper legal boundary. The implementation of both boundaries has a crucial impact on the definition of the costs of capital and subsequently on the value of the water tariff. The minimum cost recovery threshold can be used to recover the operating costs and the own resources and credit liabilities that were used to fund the capital assets, taking into account an operating life that suits the facility. The maximum cost recovery threshold not only recovers the costs that are also recovered by the usage of the minimum cost recovery threshold but also the costs for building up a reserve, so that follow-on investment can be made solely with own resources when the asset exceeds it's planned operating life. Additionally the acquisition costs of the follow-on investment also include the rise in prices. By setting the water tariff as the maximum cost recovery threshold credit liabilities and the additional costs that are cause by interests and costs of liquidity can be avoided. For this reason, any water management facility should strive to minimize the costs of financing as they can account for a fair share of the total costs. In case study 1 and case study 2 the costs of financing amount for 14.9% and 16.2% of the total costs respectively.

Furthermore two case studies had been performed in order to validate the cost accounting system. Due to the case studies the following important results could have been obtained:

- Minimum, gross and maximum cost recovery threshold for the year 2013
- Development of the minimum, gross and maximum cost recovery threshold for the upcoming 10 to twenty years for two scenarios:
    - Variant 1: no replacement of assets that exceed their operating life
    - Variant 2: replacement of assets that exceed their operating life, taking into account the rise in prices.

Graphic 48 shows that the actual water tariff of the water board "Wasserversorgung Grenzland Südost" is above the average water tariff for Austrian supra national water management facilities. However, this graphic also shows that the actual water tariff of the water board is legally defensible, as it is within the range of the minimum and maximum cost recovery threshold. Selling approximately 2,500,000 m^3 of water at a water tariff of 1.14 EUR/m^3 the water board managed to achieve a positive operating result of appr. 125,000 EUR, which can be used to build up reserves.

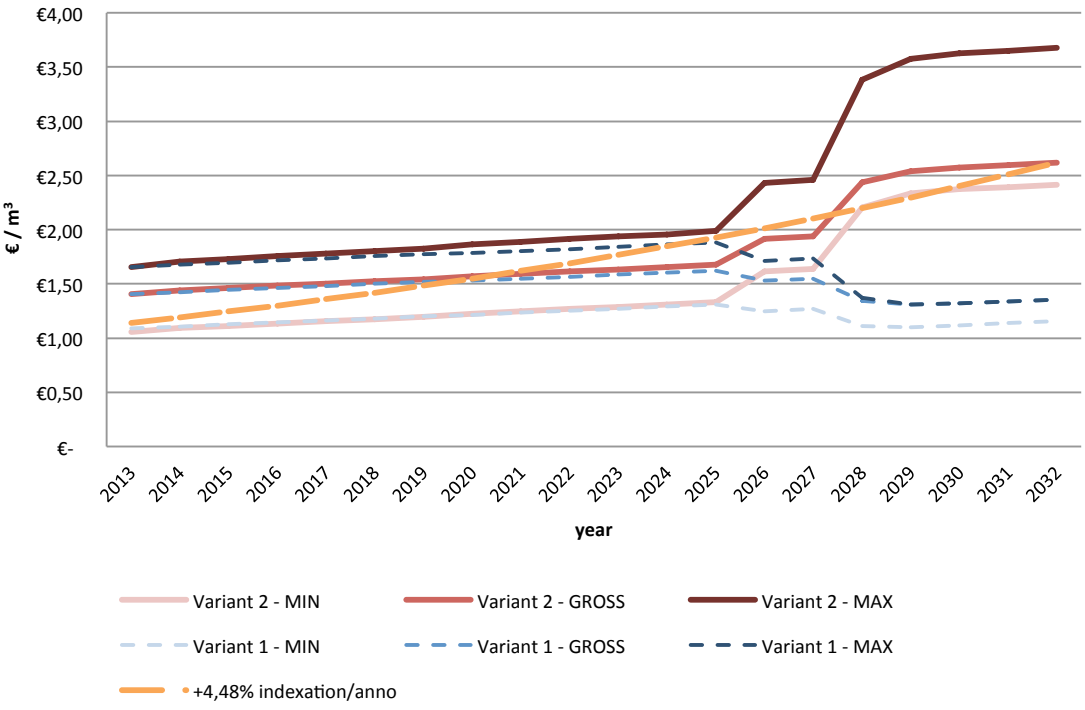


Ø Österreich = Average water tariff for Austrian supra national water management facilities

[avg. water tariff as of 2011 = 0,75 €/m[389]; + 2% / anno adjustment to estimate value for 2013]

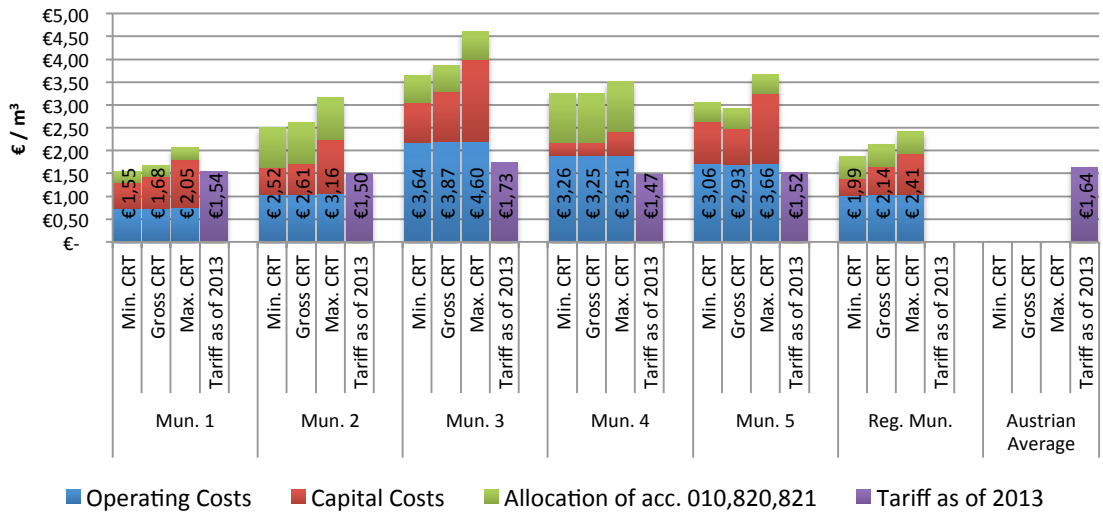
Graphic 48: Comparison of the cost recovery thresholds of case study 1 and the average Austrian water tariff

Furthermore the 20 years scenario simulation did prove the assumption (see chapter 3.1) that massive follow-on investment will need to be done in the mid-term (see Graphic 49). In order to avoid an abrupt raise in the water tariff an indexation of the actual water tariff (1,14 EUR/m^3 as of 2013) of 4.48% p.a. is suggested. This indexation would build up reserves of 9.5 million euros until 2025 and 12.5 million euros until 2032, without violating the legal boundaries that are defined by the minimum and maximum cost recovery threshold.



Graphic 49: Case Study 1 - suggested development of the water tariff

[89] Cf. NEUNTEUFEL R. et al (2012), p. 82



Austrian Average =	Average water tariff for end customers of municipal water manamgent facilities with a specific water supply of less than 5,000 m^3/(km * a); [Avg. water tariff as of 2011 = 1.58 €/m^3[390]; + 2% / anno indexation in order to estimate the value of 2013]

Graphic 50: Comparison of the cost recovery thresholds of case study 2 and the average Austrian water tariff

Graphic 50 compares the cost recovery thresholds and actual water tariffs of the five municipalities and the future regional municipality to the average Austrian water tariff for municipalities of this category. Despite the fact that three of the five municipalities must raise their water tariff by more than 100% in order to recover costs (see Table 28), the comparison shows that the municipalities' water tariff is almost always lower than the Austrian average. Only municipality 1 was close to fully recover the costs (99% of the minimum cost coverage ratio). The reasons for the fairly negative results were explained in chapter 7.2.4 by three major factors:

- Stake of external water purchase
- Ratio of m^3 supplied water to the length of the total water pipe network
- Stake of costs that were allocated from the auxiliary accounts (010, 820 and 821) to the municipal water management facility's account (850).

Since the first two factors are determined by the location and urbanity of the municipality and therefore cannot be influenced in the short or mid-term, the third factor is rooted in the definition of the cost accounting system itself and therefore qualifies to be further scrutinized.

	Mun. 1	Mun. 2	Mun. 3	Mun. 4	Mun. 5
cost coverage ratio (min. cost rec. threshold)	99%	60%	48%	45%	50%
cost coverage ratio (max. cost rec. threshold)	75%	47%	38%	42%	42%

Table 28: Minimum cost coverage ratios (Case Study 2)

[90] Cf. NEUNTEUFEL R. et al (2012), p. 82

Graphic 44, which was displayed in chapter 7.2.4, shows that the distribution key that is used to allocate costs that were incurred by auxiliary accounts (account 010, 820 and 821) to the municipal water management facilities' accounts range from 8,9% to 20,59%. Furthermore this key is calculated by a 50/50 weighting of income and book entries of the municipalities' accounts. Hence the municipality's account, which accounts for the most profit and book entries, has to bear the biggest stake of the costs that were incurred by the auxiliary accounts. Although this method of costs allocation is probably not in the interest of the costs-by-cause principle, which is stated in §55e of the Austrian water act, the usage of a different and more suitable distribution key was not applicable, due to the very basic data that was provided by the municipalities. A cost-by-cause principle could only be enforced if the consumption of goods and services is recorded in a way so it can be allocated to a specific function or account. However, this would also result in additional costs of administration.

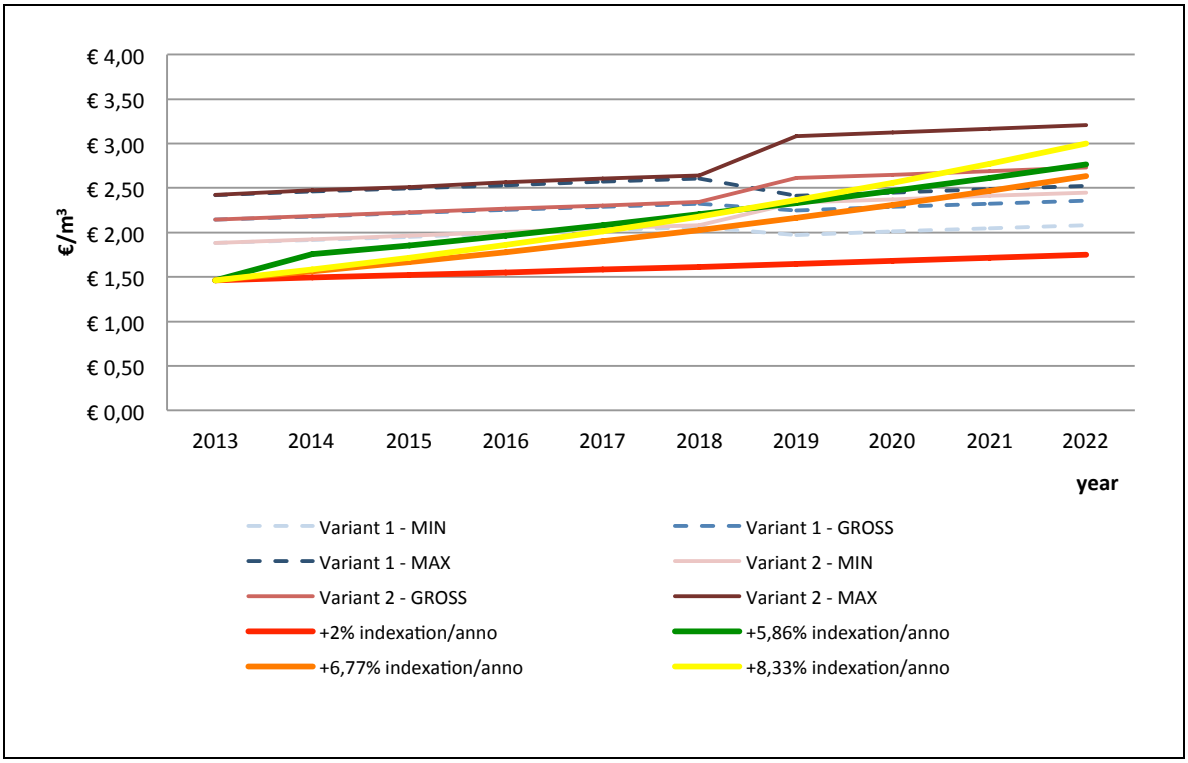
Regarding the future regional municipality, a water tariff that is equal to the minimum cost recovery threshold would mean a significant increase of the actual municipalities' water tariff. However, this increase in the water tariff would be a good deal for all municipalities but municipality 1, because only the minimum cost recovery threshold of municipality 1 is lower than the minimum cost recovery threshold of the future regional municipality. Additionally to the benefits for most of the municipalities, the restructuring of the municipalities promises saving potentials, especially in the central office, personnel, farmyard and vehicle fleet[91]. An exact evaluation of the savings potential has not been published yet by the federal state government and therefore does not allow further calculations that would show the effect of the savings on the water tariff.

Graphic 51 shows the development of the cost recovery threshold in two variants over a ten years period. Additionally, four specific scenarios have been simulated that follow a different objective. All scenarios simulate a steady increase of the actual water tariff according to a fixed annual increase rate. The actual water tariff of the regional municipality is calculated by dividing the sum of the municipalities' proceeds from sale by the sum of the municipalities' total amount of water sold. This results in an actual water tariff for the regional municipality of 1,46 EUR/m^3.

Based on an initial water tariff of 1,46 EUR/m^3 the following scenarios are calculated:

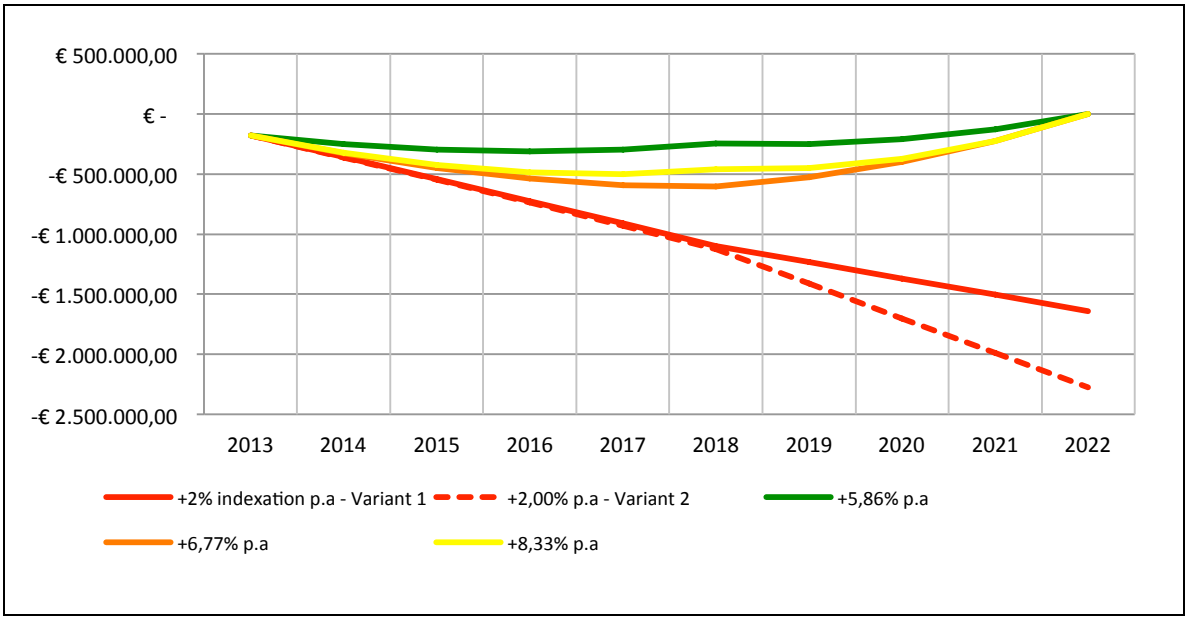
- **2% indexation / anno:** This scenario is the least ambitious scenario to be calculated. An indexation of 2% p.a. reflects the common procedure of a municipality and is usually performed to compensate inflation. However, a further pursuit of this strategy would result in a total cumulated deficit of more than 1.5 million euros for variant 1 and more than 2 million euros for variant 2 in 2022 (see Graphic 52). For this reason this strategy cannot be recommended.

[91] Cf. http://www.gemeindestrukturreform.steiermark.at/cms/ziel/69771465/DE/ (12.09.2014)



Graphic 51: Suggested development of the water tariff (Case Study 2)

- **6,77% indexation/anno:** This scenario is based on variant 1. Hence, assets that exceed their operating life are not replaced and therefore the corresponding imputed costs cease. The objective of this scenario is to break even at the end of 2022. Thus the cumulative proceeds of the period from 2013 to 2022 equal the cumulative costs of the same period. Furthermore the cumulative operative result of this period is zero. However, a closer look at Graphic 51 reveals that pursuing this strategy leads to a violation of the maximum cost recovery threshold of variant 1 in 2022. Due to this fact a long-term persuasion of this strategy can't be recommended either.



Graphic 52: Cumulated operating result depending on the indexation per anno

- **8,33% indexation/anno:** This scenario is identical to the previous scenario (6,77% indexation/anno), but is based on the assumptions of variant 2. Hence the assets that exceed their planned operating life are replaced, taking into account the raise in prices. Beginning with a water tariff of 1,46 EUR/m^3 this strategy annually alters the water tariff by 8,33% in order to break even at the end of 2022. As Graphic 51 demonstrates, the break-even point can be achieved without violating the maximum cost recovery threshold. The only downside of this scenario is that follow-on investments have to be made, otherwise the cost recovery thresholds of variant 1 would be applicable, which would lead to a violation of these boundaries in 2019. Despite this fact this strategy is worth pursuing by the future regional municipality.

- **5,86% indexation/anno:** This scenario is based on variant 2 and documents regarding the restructuring of the municipalities. According to this documents abrupt increases of the water tariff of more than 20% should be avoided[92]. Therefore the water tariff is increased by 20% in the first period and subsequently increased by 5,86% p.a. The advantage of this strategy is that the water tariff can be moderately altered after the hefty initial increase. Furthermore the objective of this strategy is to break even at the end of 2022. Therefore the cumulated operating result must be zero at the end of 2022. As Graphic 51 shows, also this strategy is within the legal boundaries of variant 2, but also exceeds the legal boundaries of variant 1 in 2020. Despite this fact the pursuit of this strategy is recommended as the water tariff can be altered more moderately, after the first alteration of 20%.

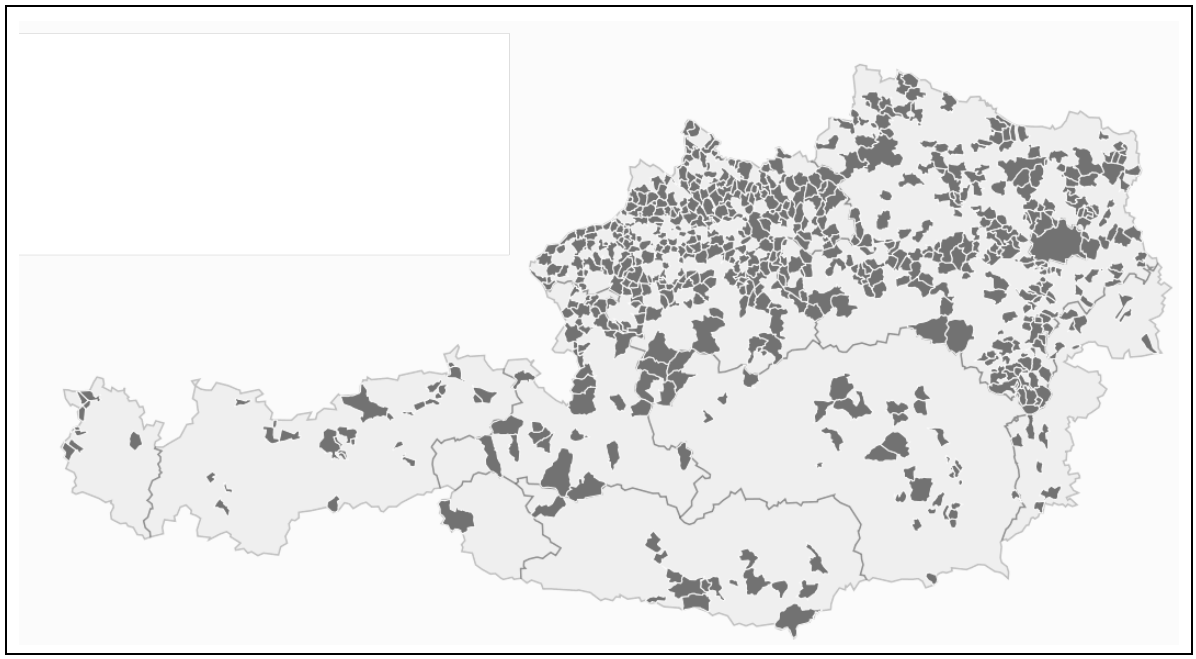
Finally it has to be mentioned that the recommended strategies require an implementation in the short term, because as Graphic 52 shows, a minor increase of the water tariff leads to a huge deficit that is hard to recover in the short to mid-term.

In conclusion, the determination of the water tariff of the examined municipal water management facilities often follows political aspects instead of proven accounting methods. Selling water at a water tariff that is below the minimum cost recovery threshold will result in huge deficits in the long-term. As a consequence of a long-term financial mismanagement the sustainability of the examined municipal water management facilities is at risk. Furthermore the intergenerational equality pact postulates that all generations and generations to come should be equal. This equality also involves financial equality, which forbids that costs are postponed and therefore have to be paid by another generation. For the just mentioned reasons of financial sustainability and intergenerational equality, it has to be of interest to politics to recover costs in the short-term. The following two measures would help to improve the acceptance among the population for a higher, but cost recovering water tariff.

[92] KINDERMANN, M. (2014) p. 10

1. **Improvement of the municipal accounting:**
   According to a court of auditor's report, a further development of the municipal accounting is crucial. Furthermore the future accounting methods should follow uniform principles and international accounting standards.[93] Especially in the fields of data acquisition and assets accounting improvements have to be made in order to obtain a solid basis for further calculations and subsequently exact results.

2. **Create transparency:**
   In order to increase acceptance for a higher, but cost recovering water tariff it is crucial to make municipal finances available to the public. By doing so, it is possible for everyone understand why the costs have been incurred. On the website of the Austrian center for administrational science (KDZ) the municipal finances of over 650 of the total 2354 municipalities are already available to the public (see Graphic 53). The only criticism that can be made about the otherwise very good transparency is the level of detail on this website. A higher level of detail increases the transparency even further and makes it easier for the public to understand the cost structure.



Graphic 53: Publicly availabe finances of municipalities[94]

[93] Cf. Court of Auditor's report: „Gemeindequerschnitt – Allgemeiner Teil" (2013)
[94] Cf. http://www.offenerhaushalt.at

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List of Abbreviations

Acc. to	According to
AG	Aktiengesellschaft
Appr.	approximately
B-VG	Bundesverfassungsgesetz (Eng: Austrian Federal Constitutional Law)
CRT	Cost recovery threshold
etc.	et cetera
EUR	Euro
FAG	Finanzausgleichsgesetz (Eng: Financial Equalization Law)
Max.	Maximum
Min.	Minimum
UGB	Unternehmensgesetzbuch (Eng: Austrian Commercial Code)
VRV	Voranschlags- und Rechnungsabschlussverordnung (Eng: Budget and accounting order)
WRG	Wasserrechtsgesetz (Eng: Austrian Water Act)

Addendum

Addendum 1: Betriebsüberleitungsbogen - Kameralistik

Kostenart	Klasse	Unterklasse	Gruppe	Bezeichnung
Materialkosten				
				Energie gesamt
	4		451	Brennstoffe
	4		453	Schmier- und Schleifmittel
	6		600	Strom
	6		601	Gas
	4	**48**		**Fremdbearbeitung (Lohnarbeit)**
	6		**602**	**Wasser (Fremdwasserbezug) oder 403 Handelwaren**
	4		**455**	**Chemische und sonstige artverwandte Mittel**
		40		**Materialien**
	4		401	Materialien (soweit nicht zugeordnet)
	4		402	Materialien für innerbetriebliche Leistungen
	4		403	Handelswaren
	4	**42**		**Werkstoffe**
	4		422	Mineralische Rohstoffe, soweit nicht unter 423 oder 424 fallend
	4		423	Roh- und Hilfsstoffe für das Bauhauptgewerbe
	4		424	Roh- und Hilfsstoffe für das Baunebengewerbe
	4		425	Sonstige Roh- und Hilfsstoffe
	4		428	Fertig bezogene Teile
	4	**45**		**Betriebsstoffe und sonstige Verbrauchsgüter**
	4		454	Reinigungsmittel
	4		459	Sonstige Verbrauchsgüter
	7		728	Entgelte für sonstige Leistungen
Instandhaltungskosten				
	6	**61**		**Instandhaltung Eigenreparaturen**
	6		610	Instandhaltung von Grund und Boden
	6		611	Instandhaltung von Straßenbauten
	6		612	Instandhaltung von Wasser- und Kanalisationsanlagen
	6		613	Instandhaltung von sonstigen Grundstückseinrichtungen
	6		614	Instandhaltung von Gebäuden
	6		616	Instandhaltung von Maschinen und maschinellen Anlagen

	6		617	Instandhaltung von Fahrzeugen
	6		618	Instandhaltung von sonstigen Anlagen [5])
	6		619	Instandhaltung von Sonderanlagen
	6	**61**		**Instandhaltung Fremdreparaturen**
	6		610	Instandhaltung von Grund und Boden
	6		611	Instandhaltung von Straßenbauten
	6		612	Instandhaltung von Wasser- und Kanalisationsanlagen
	6		613	Instandhaltung von sonstigen Grundstückseinrichtungen
	6		614	Instandhaltung von Gebäuden
	6		616	Instandhaltung von Maschinen und maschinellen Anlagen
	6		618	Instandhaltung von sonstigen Anlagen [5])
	6		619	Instandhaltung von Sonderanlagen
Personalkosten				
	5	**50**		**Geldbezüge der Beamten**
	5		500	Geldbezüge der Beamten der Verwaltung
	5		501	Geldbezüge der Beamten in handwerklicher Verwendung
	5	**51**		**Geldbezüge der Vertragsbediensteten**
	5		510	Geldbezüge der Vertragsbediensteten der Verwaltung
	5		511	Geldbezüge der Vertragsbediensteten in handwerklicher Verwendung
	5	**52**		**Geldbezüge der sonstigen Bediensteten**
	5		520	Geldbezüge der ganzjährig beschäftigten Angestellten
	5		521	Geldbezüge der ganzjährig beschäftigten Arbeiter
	5		522	Geldbezüge der nicht ganzjährig beschäftigten Angestellten
	5		523	Geldbezüge der nicht ganzjährig beschäftigten Arbeiter
	5	**53**		**Sachbezüge der Beamten**
	5		530	Sachbezüge der Beamten der Verwaltung
	5		531	Sachbezüge der Beamten in handwerklicher Verwendung
	5	**54**		**Sachbezüge der Vertragsbediensteten**
	5		540	Sachbezüge der Vertragsbediensteten der Verwaltung
	5		541	Sachbezüge der Vertragsbediensteten in handwerklicher Verwendung
	5	**55**		**Sachbezüge der sonstigen Bediensteten**

	5	550	Sachbezüge der ganzjährig beschäftigten Angestellten
	5	551	Sachbezüge der ganzjährig beschäftigten Arbeiter
	5	552	Sachbezüge der nicht ganzjährig beschäftigten Angestellten
	5	553	Sachbezüge der nicht ganzjährig beschäftigten Arbeiter
	5 **56**		**Nebengebühren und Geldaushilfen**
	5	563	Sonstige Aufwandsentschädigungen
	5	564	Vergütungen für Nebentätigkeit
	5	565	Mehrleistungsvergütungen
	5	566	Zuwendungen aus Anlass von Dienstjubiläen
	5	567	Belohnungen und Geldaushilfen
	5	569	Sonstige Nebengebühren
	5 **58**		**Dienstgeberbeiträge**
	5	580	Dienstgeberbeiträge zum Ausgleichsfonds für Familienbeihilfen [4])
	5	581	Sonstige Dienstgeberbeiträge zur sozialen Sicherheit [4])
	5	582	Leistungen aus der Selbstträgerschaft (soweit gesondert ausgewiesen)
	5 **59**		**Freiwillige Sozialleistungen (nur Barleistungen)**
		729	**sonstige Ausgaben**
	7	**760**	**Pensionen und sonstige Ruhebezüge (einschließlich Dienstgeberbeiträge)**
sonstige Kosten			
	div.		**Fuhrpark gesamt**
	6	617	Instandhaltung von Fahrzeugen
	4	452	Treibstoffe
			Parkgebühren
	4	453	Schmier- und Schleifmittel
	div.		**Gebrauchs- und Verbrauchsgüter sowie Handelswarenverbrauch**
		401	Materialien (soweit nicht zugeordnet)
	4	403	Handelswaren
	4	451	Brennstoffe
	4	453	Schmier- und Schleifmittel
	4	454	Reinigungsmittel
	4	455	chemische Reinigungsmittel
	4	456	Schreib-, Zeichen- und sonstige Büromittel
	4	457	Druckwerke
	4	458	Mittel zur ärztlichen Betreuung und Gesundheitsvorsorge

4		459	Sonstige Verbrauchsgüter
5		**560**	**Reisegebühren**
6	**61**		**Instandhaltung**
6		610	Instandhaltung von Grund und Boden
6		611	Instandhaltung von Straßenbauten
6		613	Instandhaltung von sonstigen Grundstückseinrichtungen
6		614	Instandhaltung von Gebäuden
6		616	Instandhaltung von Maschinen und maschinellen Anlagen
6		618	Instandhaltung von sonstigen Anlagen [5])
6		619	Instandhaltung von Sonderanlagen
6	**62**		**Personen- und Gütertransporte**
6	**63**		**Post- und Telekommunikationsdienste**
6		631	Telekommunikationsdienste
6		630	Postdienste
6	**64**		**Rechts- und Beratungskosten**
6		640	Rechtskosten
6		641	Prüfungskosten
6		642	Beratungskosten
6	**67**		**Versicherungen**
6	**69**		**Schadensfälle**
7	**70**		**Miet- und Pachtzinse**
7		700	Mietzinse
7		701	Pachtzinse
7		710	Öffentliche Abgaben (Ausgaben), ohne Gebühren gemäß FAG
7		**711**	**Gebühren für die Benützung von Gemeindeeinrichtungen und –anlagen gemäß FAG (Ausgaben)**
7		**720**	**Kostenbeiträge (Kostenersätze für Leistungen)**
7		**723**	**Amtspauschalien und Repräsentationsausgaben**
7		**728**	**Entgelte für sonstige Leistungen**
7		**721**	**Bezüge der gewählten Organe**
7		**751**	**Laufende Transferzahlungen an Länder, Landesfonds und Landeskammern**
7		**772**	**Kapitaltransferzahlungen an Gemeinden, Gemeindeverbände 1) und -fonds**
6	**60**		**Energiebezüge**
6		600	Strom
6		601	Gas
6		602	Wasser

Tabelle 1: Betriebsüberleitungsbogen – Kameralistik

Addendum 2: Betriebsüberleitungsbogen „Doppik“

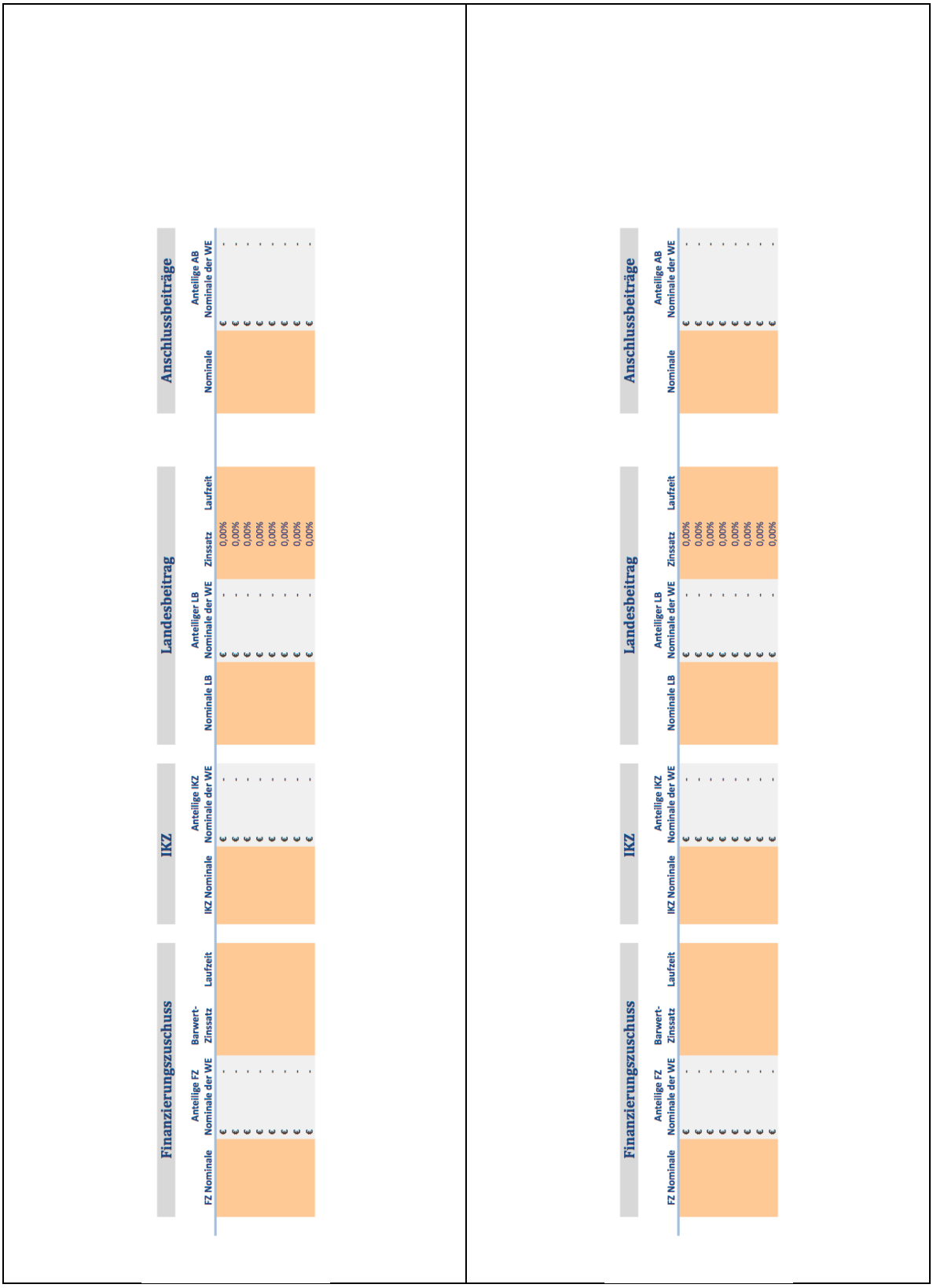
Kostenarten-gruppe	Kostenart	Aufwand	+	-	Kosten
Material	Strom				€ -
	Gas				€ -
	Treibstoffe				€ -
	Schmierstoffe				€ -
	Fremdleistungen				€ -
	Wasseruntersuchungen				€ -
	Fremdwasserbezug				€ -
	Verbrauchsstoffe				€ -
Instandhaltung	Inst. bauliche Anlagen				€ -
	Inst. BGA				€ -
	Inst. Werkzeuge				€ -
	Inst. Betriebsgebäude				€ -
	Inst. Mess- & Kontrollg.				€ -
	Wartungsverträge				€ -
Personal	Lohn / Gehalt				€ -
sonstige Kosten	Treibstoffe				€ -
	Schmierstoffe				€ -
	Instandhaltung Furhpark				€ -
	Parkgebühren				€ -
	Servereinrichtung lfd.				€ -
	Kammerumlage KU1				€ -
	Grundsteuer				€ -
	Heizmaterial				€ -
	Verbrauchsstoffe Büro				€ -
	Laufende Entschädigungszahlungen				€ -
	Grundwasserschutzmaßnahmen				€ -

	Studien, Untersuchungen	€ -
	Brunnenmonitoring	€ -
	ÖKO-AUDIT lfd. Überw.	€ -
	Frachtkosten	€ -
	Miete	€ -
	Gerätemiete	€ -
	Anerkennungszins	€ -
	Müll. Wasser, Gde-Abg.	€ -
	Rauchfangkehrergeb.	€ -
	GIS-Gebühren	€ -
	Versicherungen	€ -
	Versicherungen Fuhrpark	€ -
	Verlorener Aufwand Anlagen	€ -
	Büromaterial	€ -
	Reisekosten Funktionäre	€ -
	Post- u. Telefongeb.	€ -
	Telefonkosten Gew/Verb	€ -
	Rechts- u. Beratungsk.	€ -
	Bankspesen	€ -
	Beiträge Verband	€ -
	Öffentlichkeitsarbeit	€ -
	Aufwand Angebotsunterlagen	€ -
	Fachliteratur	€ -
	Tagungs- und Fortbild.Ko.	€ -
	Chronikkosten	€ -
	Aufwendungen Beteiligungen	€ -
	Vergütungen an Organe	€ -
	Reisekosten	€ -
	Sonstiger Aufwand	€ -

Addendum 3: Anlagenverzeichnis

Bauabschnitt	Bezeichnung	Kategorie	Anschaffungsdatum	AK1 - Anschaffungskosten per 1.1.20xx	Zugänge an Vermögensgegenständen zu Anschaffungskosten	Abgänge an Vermögensgegenständen zu Anschaffungskosten
BA 01	Brunnen	Brunnen	01.01.1980	150.000 €	-	-

Addendum 4: Finanzierungsnachweis



Addendum 5: Cost Accounting Matrix – Case Study 1

Betriebsabrechnungsbogen

Kostenartengruppe	Kostenart	Kosten	Check	Kostenstellen: Brunnen	PW	TL	HB	FFWA	Schächte	Sonstiges	Verwaltung	Fuhrpark
Betriebskosten												
Material	Strom	€ 321.695,72	OK	€ 77.440,81	€ 229.706,42	€ -	€ 11.431,59	€ 239,03	€ 835,61	€ -	€ 2.042,26	€ -
Material	Gas	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
Material	Treibstoffe	€ 132,54	OK	€ 13,79	€ 17,04	€ 13,36	€ 6,34	€ 0,39	€ 3,87	€ 31,79	€ 45,96	€ -
Material	Schmierstoffe	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
Material	Fremdleistungen	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
Material	Wasseruntersuchungen	€ 38.656,80	OK	€ 20.958,20	€ 2.023,70	€ -	€ 9.774,60	€ -	€ 5.900,30	€ -	€ -	€ -
Material	Fremdwasserbezug	€ 606.669,46	OK	€ 606.669,46	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
Material	Verbrauchsstoffe	€ 26.226,39	OK	€ 332,16	€ 322,52	€ 231,79	€ 1.369,83	€ 6,74	€ 67,08	€ 23.556,66	€ 339,61	€ -
Instandhaltung	Inst. bauliche Anlagen	€ 207.276,62	OK	€ 15.703,06	€ 55.893,92	€ 60.287,95	€ 48.057,10	€ 225,80	€ 20.277,41	€ -	€ 6.831,38	€ -
Instandhaltung	Inst. BGA	€ 4.159,58	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 4.159,58	€ -
Instandhaltung	Inst. Werkzeuge	€ 2.190,31	OK	€ 11,54	€ 14,27	€ 11,18	€ 5,31	€ 0,33	€ 3,24	€ 2.004,30	€ 140,14	€ -
Instandhaltung	Inst. Betriebsgebäude	€ 4.178,91	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 4.178,91	€ -
Instandhaltung	Inst. Mess- & Kontrollg.	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
Instandhaltung	Wartungsverträge	€ 9.771,92	OK	€ 1.485,00	€ -	€ -	€ -	€ -	€ -	€ -	€ 8.286,92	€ -
Personal	Lohn / Gehalt	€ 648.655,46	OK	€ 74.661,59	€ 92.274,63	€ 72.335,33	€ 34.339,90	€ 2.104,70	€ 20.936,26	€ 72.889,20	€ 275.371,51	€ 3.742,34
sonstige Kosten	Treibstoffe	€ 19.303,41	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 19.303,41
sonstige Kosten	Schmierstoffe	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten	Instandhaltung Furhpark	€ 16.920,88	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 16.920,88
sonstige Kosten	Parkgebühren	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten	Servereinrichtung lfd.	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten	Kammerumlage KU1	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten	Grundsteuer	€ 1.229,93	OK	€ 324,15	€ 129,56	€ -	€ 108,25	€ -	€ -	€ -	€ 667,97	€ -
sonstige Kosten	Heizmaterial	€ 1.937,49	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 1.937,49	€ -
sonstige Kosten	Verbrauchsstoffe Büro	€ 695,12	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 695,12	€ -
sonstige Kosten	Laufende Entschädigungszahlungen	€ 11.042,58	OK	€ 11.042,58	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten	Grundwasserschutzmaßnahmen	€ 5.260,00	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 5.260,00	€ -
sonstige Kosten	Studien, Untersuchungen	€ 21.231,60	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 21.231,60	€ -
sonstige Kosten	Brunnenmonitoring	€ 7.150,00	OK	€ 7.150,00	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten	ÖKO-AUDIT lfd. Überw.	€ 3.670,89	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 3.670,89	€ -
sonstige Kosten	Frachtkosten	€ 1.063,31	OK	€ -	€ -	€ -	€ 86,79	€ -	€ -	€ 94,33	€ 882,19	€ -
sonstige Kosten	Miete	€ 2.979,49	OK	€ 486,85	€ 110,83	€ 158,30	€ -	€ 2.055,71	€ 117,80	€ -	€ 50,00	€ -
sonstige Kosten	Gerätemiete	€ 2.058,22	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 2.058,22	€ -
sonstige Kosten	Anerkennungszins	€ 2.826,76	OK	€ -	€ -	€ 768,54	€ -	€ -	€ -	€ -	€ 2.058,22	€ -
sonstige Kosten	Müll. Wasser, Gde-Abg.	€ 2.968,88	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 2.968,88	€ -
sonstige Kosten	Rauchfangkehrergeb.	€ 89,16	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 89,16	€ -
sonstige Kosten	GIS-Gebühren	€ 274,63	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ 274,63	€ -	€ -
sonstige Kosten	Versicherungen	€ 9.870,38	OK	€ 4.284,24	€ 2.356,77	€ -	€ 166,51	€ 67,72	€ 102,51	€ -	€ 2.892,63	€ -
sonstige Kosten	Versicherungen Fuhrpark	€ 9.330,90	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 9.330,90
sonstige Kosten	Verlorener Aufwand Anlagen	€ 177,41	OK	€ -	€ -	€ -	€ 0,02	€ -	€ -	€ -	€ 177,35	€ 0,04
sonstige Kosten	Büromaterial	€ 4.540,79	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 4.540,79	€ -
sonstige Kosten	Reisekosten Funktionäre	€ 9.971,70	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 9.971,70	€ -
sonstige Kosten	Post- u. Telefongeb.	€ 3.394,18	OK	€ 378,42	€ 699,37	€ 74,05	€ 25,30	€ 1.872,56	€ 163,86	€ -	€ 180,62	€ -
sonstige Kosten	Telefonkosten Gew/Verb	€ 9.414,38	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 9.414,38	€ -
sonstige Kosten	Rechts- u. Beratungsk.	€ 2.705,42	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 2.705,42	€ -
sonstige Kosten	Bankspesen	€ 1.323,35	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 1.323,35	€ -
sonstige Kosten	Beiträge Verband	€ 2.363,35	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 2.363,35	€ -
sonstige Kosten	Öffentlichkeitsarbeit	€ 5.082,55	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ 127,40	€ 4.741,29	€ 213,86
sonstige Kosten	Aufwand Angebotsunterlagen	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten	Fachliteratur	€ 2.382,07	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ 2.382,07	€ -
sonstige Kosten	Tagungs- und Fortbild.Ko.	€ 4.353,45	OK	€ 571,53	€ 706,35	€ 553,72	€ 262,87	€ 262,87	€ 16,11	€ 160,27	€ 1.819,73	€ -
sonstige Kosten	Chronikkosten	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten	Aufwendungen Beteiligungen	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten	Vergütungen an Organe	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten	Reisekosten	€ -	OK	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten	Sonstiger Aufwand	€ 9.633,66	OK	€ 355,68	€ 196,84	€ 337,14	€ 42,63	€ 2,61	€ 25,99	€ -	€ 8.672,77	€ -
	Summe	**€ 2.044.859,65**		€ 821.869,06	€ 384.452,22	€ 134.771,36	€ 105.677,02	€ 6.838,48	€ 48.450,04	€ 99.138,58	€ 394.151,46	€ 49.511,43
		OK		€ 830.756,55	€ 389.776,89	€ 142.103,93	€ 109.465,09	€ 8.510,95	€ 53.346,89	€ 107.943,24	€ 402.956,12	
		OK		€ 1.034.640,90	€ 485.435,98	€ 176.979,09	€ 136.330,02	€ 10.599,71	€ 66.439,29	€ 134.434,68		
	check sum	OK		€ 1.107.447,53	€ 519.595,61	€ 189.432,92	€ 145.923,43	€ 11.345,60	€ 71.114,56			

Umlageschlüssel: Einheit	Gesamt	Brunnen	PW	TL	HB	FFWA	Schächte	Sonstiges	Verwaltung	Fuhrpark
kWh	1	24%	71%	0%	4%	0%	0%	0%	1%	0%
m^3	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	10%	13%	10%	5%	0%	3%	24%	35%	0%
	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
Anzahl	1	54%	5%	0%	25%	0%	15%	0%	0%	0%
m^3	1	100%	0%	0%	0%	0%	0%	0%	0%	0%
	1	1%	1%	1%	5%	0%	0%	90%	1%	0%
	1	8%	27%	29%	23%	0%	10%	0%	3%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	1%	1%	1%	0%	0%	0%	92%	6%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	15%	0%	0%	0%	0%	0%	0%	85%	0%
Stunden	1	12%	14%	11%	5%	0%	3%	11%	42%	1%
km	1	0%	0%	0%	0%	0%	0%	0%	0%	100%
km	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
km	1	0%	0%	0%	0%	0%	0%	0%	0%	100%
km	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	26%	11%	0%	9%	0%	0%	0%	54%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	100%	0%	0%	0%	0%	0%	0%	0%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	100%	0%	0%	0%	0%	0%	0%	0%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	0%	0%	0%	8%	0%	0%	9%	83%	0%
	1	16%	4%	5%	0%	69%	4%	0%	2%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	0%	0%	0%	27%	0%	0%	0%	73%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	0%	0%	0%	0%	0%	0%	100%	0%	0%
Versicherungswert	1	43%	24%	0%	2%	1%	1%	0%	29%	0%
	1	0%	0%	0%	0%	0%	0%	0%	0%	100%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	11%	21%	2%	1%	55%	5%	0%	5%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	0%	0%	0%	0%	0%	0%	3%	93%	4%
	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	0%	0%	0%	0%	0%	0%	0%	100%	0%
	1	13%	16%	13%	6%	6%	0%	4%	42%	0%
	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	0	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	4%	2%	3%	0%	0%	0%	0%	90%	0%
Kilometer	**181.116,00**	32.511,00	19.478,00	26.823,00	13.857,00	6.118,00	17.913,00	32.208,00	32.208,00	

Kapitalkosten			Kostenstellen: Brunnen	PW	TL	HB	FFWA	Schächte	Sonstiges	Verwaltung	Fuhrpark	Unterdeckung gesamt	Brutto-Darst. gesamt	Überdeckung gesamt
	Kalkulatorische Abschreibungen	-€ 1.025.731,86	-€ 77.193,16	-€ 83.376,15	-€ 580.871,94	-€ 96.239,60	-€ 51.935,44	-€ 12.257,41	-€ 72.976,91	-€ 38.505,17	-€ 12.376,08	-€ 419.552,09	-€ 1.025.731,86	-€ 1.025.731,86
	Abschreibungen GWG	€ -										€ -	€ -	€ -
	Kalkulatorische Zinsen	-€ 356.491,18	-€ 28.348,62	-€ 26.078,30	-€ 217.606,97	-€ 31.573,85	-€ 15.504,22	-€ 3.214,43	-€ 20.715,76	-€ 12.079,92	-€ 1.369,11	-€ 95.643,96	-€ 356.491,18	-€ 356.491,18
	Liquiditätskosten (Haben-ZS)	-€ 89.533,25	-€ 2.991,28	-€ 6.391,65	-€ 64.859,94	-€ 8.049,79	-€ 3.959,31	-€ 1.168,46	-€ 2.112,82	€ -	€ -	-€ 163.687,25	-€ 89.533,25	-€ 89.533,25
	kalkulatorische Wagnisse	-€ 153.426,00	-€ 8.651,52	-€ 9.231,87	-€ 106.151,90	-€ 11.645,27	-€ 5.636,64	-€ 1.462,42	-€ 6.248,77	-€ 3.738,94	-€ 658,66	-€ 153.426,00	-€ 153.426,00	-€ 153.426,00
	Rücklagenneubildung	€ -												-€ 632.001,78
		-€ 1.625.182,29	-€ 117.184,59	-€ 125.077,96	-€ 969.490,76	-€ 147.508,51	-€ 77.035,61	-€ 18.102,73	-€ 102.054,26	-€ 54.324,03	-€ 14.403,85	**-€ 832.309,30**	**-€ 1.625.182,29**	**-€ 2.257.184,08**
		OK	-€ 118.232,47	-€ 126.196,43	-€ 978.160,11	-€ 148.827,55	-€ 77.724,48	-€ 18.264,61	-€ 102.966,84	-€ 54.809,80				
		OK	-€ 122.359,07	-€ 130.600,99	-€ 1.012.300,27	-€ 154.022,00	-€ 80.437,25	-€ 18.902,08	-€ 106.560,63					
	check sum	OK	-€ 130.944,92	-€ 139.765,17	-€ 1.083.332,68	-€ 164.829,61	-€ 86.081,48	-€ 20.228,43						

Erlöse			Kostenstellen: Brunnen	PW	TL	HB	FFWA	Schächte	Sonstiges	Verwaltung	Fuhrpark	Unterdeckung gesamt	Brutto-Darst. gesamt	Überdeckung gesamt
	Verbrauchsgebühren	€ 2.888.616,71	€ 2.888.616,71									€ 2.888.616,71	€ 2.888.616,71	€ 2.888.616,71
	Wasserzählergebühr	€ -										€ -	€ -	€ -
	Förderungen (FZ) von Bund und Land	€ 45.846,23	€ 4.341,58	€ 7.336,34	€ 21.004,16	€ 2.974,90	€ 3.386,21	€ -	€ 6.803,05	€ -	€ -	€ 45.846,23	€ 45.846,23	€ 45.846,23
	Erlöse von Dritten und sonstige Erlöse	€ 67.285,71	€ 3.794,17	€ 4.048,68	€ 46.553,43	€ 5.107,09	€ 2.471,98	€ 641,35	€ 2.740,43	€ 1.639,73	€ 288,86	€ 67.285,71	€ 67.285,71	€ 67.285,71
	Erlöse aus Netzverdichtungen	€ 4.900,00	€ 276,31	€ 294,84	€ 3.390,20	€ 371,92	€ 180,02	€ 46,71	€ 199,57	€ 119,41	€ 21,04	€ 4.900,00	€ 4.900,00	€ 4.900,00
	Liquiditätserlöse (Haben-ZS)	€ 8.151,14	€ 328,98	€ 555,90	€ 6.869,47	€ 396,78	€ -	€ -	€ -	€ -	€ -	€ 8.151,14	€ 8.151,14	€ 8.151,14
		€ 3.014.799,79	€ 2.897.357,74	€ 12.235,76	€ 77.817,26	€ 8.850,69	€ 6.038,20	€ 688,06	€ 9.743,04	€ 1.759,14	€ 309,89	**€ 3.014.799,79**	**€ 3.014.799,79**	**€ 3.014.799,79**
		OK	€ 2.897.655,59	€ 12.237,02	€ 77.825,26	€ 8.851,60	€ 6.038,82	€ 688,13	€ 9.744,04	€ 1.759,32				
		OK	€ 2.899.347,54	€ 12.244,17	€ 77.870,71	€ 8.856,77	€ 6.042,35	€ 688,53	€ 9.749,73					
	check sum	OK	€ 2.908.754,33	€ 12.283,89	€ 78.123,35	€ 8.885,50	€ 6.061,95	€ 690,77						

Adddendum 6: Cost Accounting Matrix – Case Study 2

BAB - Ansatz 850 Wasserversorgung

Kostenarten-übergruppe / Kostenartengruppe / Kostenarten / Preisumlageschlüssel Gruppe

Kostenunterdeckung

						Leitungen 850	Punktbauwerk 850	Fuhrpark 850	Verwaltung 850	Gemeindeamt 010	Bauhof 820	Fuhrpark 821
Betriebskosten												
Materialkosten					€ 285.390,11	€ 32.122,41	€ 250.797,65	€ -	€ 2.470,06	€ 6.262,92	€ 614,69	€ 480,93
	Energie	div	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Fremdleistungen	4	48		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Fremdwasserbezug	6	602		€ 231.124,81	€ 32.122,41	€ 199.002,41	€ -	€ -	€ -	€ -	€ -
	Kosten der Wasseraufbereitung	4	455		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	sonstige Materialkosten		40		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	sonstige Materialkosten	4	42		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	sonstige Materialkosten	4	45		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
					€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
Instandhaltungskosten					€ 46.696,38	€ 36.027,06	€ 10.669,33	€ -	€ -	€ 801,92	€ -	€ 11.652,65
	Eigenreparaturen	6	61		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Fremdreparaturen	6	61		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
					€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
Personalkosten					€ 90.331,39	€ 24.994,84	€ 24.994,84	€ -	€ 40.341,72	€ 633.201,22	€ 126.689,54	€ 15.949,26
		5	50		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	51		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	52		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	53		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	54		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	55		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	56		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	58		€ -	€ -	€ -	€ -	€ -	€ -	€ 4.512,71	€ -
		5	59		€ 156,10	€ -	€ -	€ -	€ 156,10	€ 2.420,20	€ 415,00	€ 160,00
				729	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		7		760								
	Pensionskosten				€ -	€ -	€ -	€ -	€ -	€ 12.019,57	€ -	€ -
	Abfertigungskosten	nicht definiert			€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
					€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten					€ 55.918,48	€ 6.717,66	€ 9.842,35	€ 5.243,20	€ 34.115,27	€ 385.780,63	€ 48.964,91	€ 85.575,64
	Fuhrpark	#WERT!	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		#WERT!	div.									
		5	560		€ 102,60	€ -	€ -	€ -	€ 102,60	€ 1.317,30	€ -	€ 40.015,52
		6	61		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		6	62		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		6	63		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		6	64		€ -	€ -	€ -	€ -	€ 8.756,66	€ -	€ -	€ -
		6	67		€ 5.211,16	€ -	€ -	€ 5.211,16	€ 11.797,63	€ 2.490,05	€ 5.379,51	
		6	69		€ -	€ -	€ -	€ -	€ 1.564,57	€ -	€ -	€ -
	Miete & Pacht	7	70		€ -	€ -	€ -	€ -	€ 6.553,71	€ -	€ -	€ -
		7		711								
					€ 278,74	€ -	€ -	€ -	€ 278,74	€ 1.519,92	€ 959,60	€ 334,75
		7	720		€ 31.332,21	€ 6.717,66	€ -	€ -	€ 24.614,55	€ 5.379,46	€ -	€ -
		7	723		€ -	€ -	€ -	€ -	€ 7.350,78	€ -	€ -	€ -
		7	728		€ 3.427,24	€ -	€ 3.023,44	€ -	€ 403,80	€ 85.149,51	€ 923,88	€ 2.607,09
	Bezüge der Organe	7	721		€ -	€ -	€ -	€ -	€ -	€ 42.246,00	€ -	€ -
		7	751			€ -	€ 6.818,91	€ -	€ 674,40	€ 39.293,75	€ 10.846,29	€ -
		7	772			€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Energie	6	60		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Öffentlichkeitsarbeit	#WERT!	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Tagungskosten	#WERT!	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Reinigungskosten	#WERT!	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
					€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
- Korrekturposition	Abzug von aktivierten Eigenleistungen im Jahr der erbrachten L				€							
					€ 478.336,36	€ 99.861,96	€ 296.304,16	€ 5.243,20	€ 76.927,05	€ 1.026.046,69	€ 176.269,14	€ 113.658,48
						€ 147.968,06	€ 439.041,60	€ 7.768,99	€ 113.984,81	17,51%	17,51%	17,51%
						€ 178.658,66	€ 530.104,81					

Umlageschlüssel

Kostenüberdeckung

						Leitungen 850	Punktbauwerk 850	Fuhrpark 850	Verwaltung 850	Gemeindeamt 010	Bauhof 820	Fuhrpark 821
Betriebskosten												
Materialkosten					€ 285.390,11	€ 32.122,41	€ 250.797,65	€ -	€ 2.470,06	€ 6.262,92	€ 614,69	€ 480,93
	Energie	div	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Fremdleistungen	4	48		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Fremdwasserbezug	6	602		€ 231.124,81	€ 32.122,41	€ 199.002,41	€ -	€ -	€ -	€ -	€ -
	Kosten der Wasseraufbereitung	4	455		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	sonstige Materialkosten		40		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	sonstige Materialkosten	4	42		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	sonstige Materialkosten	4	45		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
					€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
Instandhaltungskosten					€ 46.696,38	€ 36.027,06	€ 10.669,33	€ -	€ -	€ 801,92	€ -	€ 11.652,65
	Eigenreparaturen	6	61		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Fremdreparaturen	6	61		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
					€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
Personalkosten					€ 90.331,39	€ 24.994,84	€ 24.994,84	€ -	€ 40.341,72	€ 633.201,22	€ 126.689,54	€ 15.949,26
		5	50		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	51		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	52		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	53		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	54		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	55		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	56		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	58		€ -	€ -	€ -	€ -	€ -	€ -	€ 4.512,71	€ -
		5	59		€ 156,10	€ -	€ -	€ -	€ 156,10	€ 2.420,20	€ 415,00	€ 160,00
				729	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		7		760								
	Pensionskosten				€ -	€ -	€ -	€ -	€ -	€ 12.019,57	€ -	€ -
	Abfertigungskosten	nicht definiert			€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
					€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten					€ 55.918,48	€ 6.717,66	€ 9.842,35	€ 5.243,20	€ 34.115,27	€ 385.780,63	€ 48.964,91	€ 85.575,64
	Fuhrpark	#WERT!	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		#WERT!	div.									
		5	560		€ 102,60	€ -	€ -	€ -	€ 102,60	€ 1.317,30	€ -	€ 40.015,52
		6	61		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		6	62		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		6	63		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		6	64		€ -	€ -	€ -	€ -	€ 8.756,66	€ -	€ -	€ -
		6	67		€ 5.211,16	€ -	€ -	€ 5.211,16	€ 11.797,63	€ 2.490,05	€ 5.379,51	
		6	69		€ -	€ -	€ -	€ -	€ 1.564,57	€ -	€ -	€ -
	Miete & Pacht	7	70		€ -	€ -	€ -	€ -	€ 6.553,71	€ -	€ -	€ -
		7		711								
					€ 278,74	€ -	€ -	€ -	€ 278,74	€ 1.519,92	€ 959,60	€ 334,75
		7	720		€ 31.332,21	€ 6.717,66	€ -	€ -	€ 24.614,55	€ 5.379,46	€ -	€ -
		7	723		€ -	€ -	€ -	€ -	€ 7.350,78	€ -	€ -	€ -
		7	728		€ 3.427,24	€ -	€ 3.023,44	€ -	€ 403,80	€ 85.149,51	€ 923,88	€ 2.607,09
	Bezüge der Organe	7	721		€ -	€ -	€ -	€ -	€ -	€ 42.246,00	€ -	€ -
		7	751			€ -	€ 6.818,91	€ -	€ 674,40	€ 39.293,75	€ 10.846,29	€ -
		7	772			€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Energie	6	60		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Öffentlichkeitsarbeit	#WERT!	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Tagungskosten	#WERT!	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Reinigungskosten	#WERT!	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
					€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
- Korrekturposition	Abzug von aktivierten Eigenleistungen im Jahr der erbrachten L				€							
					€ 478.336,36	€ 99.861,96	€ 296.304,16	€ 5.243,20	€ 76.927,05	##########	€ 176.269,14	€ 113.658,48
						€ 147.968,06	€ 439.041,60	€ 7.768,99	€ 113.984,81	17,51%	17,51%	17,51%
						€ 178.658,66	€ 530.104,81					

Umlageschlüssel

Brutto-Darstellung

						Leitungen 850	Punktbauwerk 850	Fuhrpark 850	Verwaltung 850	Gemeindeamt 010	Bauhof 820	Fuhrpark 821
Betriebskosten												
Materialkosten					€ 285.390,11	€ 32.122,41	€ 250.797,65	€ -	€ 2.470,06	€ 6.262,92	€ 614,69	€ 480,93
	Energie	div	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Fremdleistungen	4	48		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Fremdwasserbezug	6	602		€ 231.124,81	€ 32.122,41	€ 199.002,41	€ -	€ -	€ -	€ -	€ -
	Kosten der Wasseraufbereitung	4	455		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	sonstige Materialkosten		40		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	sonstige Materialkosten	4	42		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	sonstige Materialkosten	4	45		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
					€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
Instandhaltungskosten					€ 46.696,38	€ 36.027,06	€ 10.669,33	€ -	€ -	€ 801,92	€ -	€ 11.652,65
	Eigenreparaturen	6	61		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Fremdreparaturen	6	61		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
					€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
Personalkosten					€ 90.331,39	€ 24.994,84	€ 24.994,84	€ -	€ 40.341,72	€ 633.201,22	€ 126.689,54	€ 15.949,26
		5	50		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	51		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	52		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	53		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	54		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	55		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	56		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		5	58		€ -	€ -	€ -	€ -	€ -	€ -	€ 4.512,71	€ -
		5	59		€ 156,10	€ -	€ -	€ -	€ 156,10	€ 2.420,20	€ 415,00	€ 160,00
				729	€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		7		760								
	Pensionskosten				€ -	€ -	€ -	€ -	€ -	€ 12.019,57	€ -	€ -
	Abfertigungskosten	nicht definiert			€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
					€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
sonstige Kosten					€ 55.918,48	€ 6.717,66	€ 9.842,35	€ 5.243,20	€ 34.115,27	€ 385.780,63	€ 48.964,91	€ 85.575,64
	Fuhrpark	#WERT!	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		#WERT!	div.									
		5	560		€ 102,60	€ -	€ -	€ -	€ 102,60	€ 1.317,30	€ -	€ 40.015,52
		6	61		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		6	62		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		6	63		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
		6	64		€ -	€ -	€ -	€ -	€ 8.756,66	€ -	€ -	€ -
		6	67		€ 5.211,16	€ -	€ -	€ 5.211,16	€ 11.797,63	€ 2.490,05	€ 5.379,51	
		6	69		€ -	€ -	€ -	€ -	€ 1.564,57	€ -	€ -	€ -
	Miete & Pacht	7	70		€ -	€ -	€ -	€ -	€ 6.553,71	€ -	€ -	€ -
		7		711								
					€ 278,74	€ -	€ -	€ -	€ 278,74	€ 1.519,92	€ 959,60	€ 334,75
		7	720		€ 31.332,21	€ 6.717,66	€ -	€ -	€ 24.614,55	€ 5.379,46	€ -	€ -
		7	723		€ -	€ -	€ -	€ -	€ 7.350,78	€ -	€ -	€ -
		7	728		€ 3.427,24	€ -	€ 3.023,44	€ -	€ 403,80	€ 85.149,51	€ 923,88	€ 2.607,09
	Bezüge der Organe	7	721		€ -	€ -	€ -	€ -	€ -	€ 42.246,00	€ -	€ -
		7	751			€ -	€ 6.818,91	€ -	€ 674,40	€ 39.293,75	€ 10.846,29	€ -
		7	772			€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Energie	6	60		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Öffentlichkeitsarbeit	#WERT!	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Tagungskosten	#WERT!	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Reinigungskosten	#WERT!	div.		€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
					€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
- Korrekturposition	Abzug von aktivierten Eigenleistungen im Jahr der erbrachten L				€							
					€ 478.336,36	€ 99.861,96	€ 296.304,16	€ 5.243,20	€ 76.927,05	##########	€ 176.269,14	€ 113.658,48
						€ 147.968,06	€ 439.041,60	€ 7.768,99	€ 113.984,81	17,51%	17,51%	17,51%
						€ 178.658,66	€ 530.104,81					

Umlageschlüssel

Kapitalkosten

					Leitungen 850	Punktbauwerk 850	Fuhrpark 850	Verwaltung 850	Gemeindeamt 010	Bauhof 820	Fuhrpark 821
Abschreibungskosten				€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Kalkulatorische Abschreibungen			-€ 79.430,60	€ 50.092,97	-€ 29.337,63	€ -	€ -	€ -	€ -	€ -
	Abschreibungen GWG			-€ 2.344,76	€ -	€ -	€ -	-€ 2.344,76	-€ 1.184,25	-€ 578,65	€ -
	Verbandsumlagen Abschreibungen			€ -							
Rücklagenneubildung				€ -							
kalkulatorische Wagnisse				€ -	€ -	€ -		€ -	€ -	€ -	€ -
Finanzierungskosten				€ -							
	Kalkulatorische Zinsen			-€ 29.692,38	€ 22.525,31	-€ 7.167,07	€ -	€ -	€ -	€ -	€ -
	Liquiditätskosten			-€ 68.856,01	€ 51.667,58	-€ 17.188,43					
	Verbandsumlage Zinsen										
				-€ 180.323,75	€ 124.285,86	-€ 53.693,13	€ -	-€ 2.344,76	-€ 1.184,25	-€ 578,65	€ -
					-€ 124.498,61	-€ 53.785,05	€ -	-€ 2.348,77	17,51%	17,51%	17,51%
					-€ 126.117,48	-€ 54.484,42					

Kostenüberdeckung

					Leitungen 850	Punktbauwerk 850	Fuhrpark 850	Verwaltung 850	Gemeindeamt 010	Bauhof 820	Fuhrpark 821
Abschreibungskosten				€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Kalkulatorische Abschreibungen			-€ 79.430,60	€ 50.092,97	-€ 29.337,63	€ -	€ -	€ -	€ -	€ -
	Abschreibungen GWG			-€ 2.344,76	€ -	€ -	€ -	-€ 2.344,76	-€ 1.184,25	-€ 578,65	€ -
	Verbandsumlagen Abschreibungen			€ -							
Rücklagenneubildung				€ -							
kalkulatorische Wagnisse				€ -	€ -	€ -		€ -	€ -	€ -	€ -
Finanzierungskosten				€ -							
	Kalkulatorische Zinsen			-€ 29.692,38	€ 22.525,31	-€ 7.167,07	€ -	€ -	€ -	€ -	€ -
	Liquiditätskosten			-€ 68.856,01	€ 51.667,58	-€ 17.188,43					
	Verbandsumlage Zinsen										
				-€ 180.323,75	€ 124.285,86	-€ 53.693,13	€ -	-€ 2.344,76	-€ 1.184,25	-€ 578,65	€ -
					-€ 124.498,61	-€ 53.785,05	€ -	-€ 2.348,77	17,51%	17,51%	17,51%
					-€ 126.117,48	-€ 54.484,42					

Brutto-Darstellung

					Leitungen 850	Punktbauwerk 850	Fuhrpark 850	Verwaltung 850	Gemeindeamt 010	Bauhof 820	Fuhrpark 821
Abschreibungskosten				€ -	€ -	€ -	€ -	€ -	€ -	€ -	€ -
	Kalkulatorische Abschreibungen			-€ 79.430,60	€ 50.092,97	-€ 29.337,63	€ -	€ -	€ -	€ -	€ -
	Abschreibungen GWG			-€ 2.344,76	€ -	€ -	€ -	-€ 2.344,76	-€ 1.184,25	-€ 578,65	€ -
	Verbandsumlagen Abschreibungen			€ -							
Rücklagenneubildung				€ -							
kalkulatorische Wagnisse				€ -	€ -	€ -		€ -	€ -	€ -	€ -
Finanzierungskosten				€ -							
	Kalkulatorische Zinsen			-€ 29.692,38	€ 22.525,31	-€ 7.167,07	€ -	€ -	€ -	€ -	€ -
	Liquiditätskosten			-€ 68.856,01	€ 51.667,58	-€ 17.188,43					
	Verbandsumlage Zinsen										
				-€ 180.323,75	€ 124.285,86	-€ 53.693,13	€ -	-€ 2.344,76	-€ 1.184,25	-€ 578,65	€ -
					-€ 124.498,61	-€ 53.785,05	€ -	-€ 2.348,77	17,51%	17,51%	17,51%
					-€ 126.117,48	-€ 54.484,42					

Erlöse

					Leitungen 850	Punktbauwerk 850	Fuhrpark 850	Verwaltung 850	Gemeindeamt 010	Bauhof 820	Fuhrpark 821
Erlöse des laufenden Betriebs				€ -							
	Verbrauchsgebühren var.	852		€ 621.018,27		€ 621.018,27					
	Wasserzählergebühr	852		€ 56.922,67		€ 56.922,67					
laufende Förderungen (Land, Bund)				€ 24.547,41	€ 20.620,50	€ 3.926,91					
sonstige Erlöse											
	Erlöse von Dritten + sonstige Erlöse			€ -	€ -	€ -					
	Erlöse aus Netzverdichtungen	850		€ -	€ -	€ -					
	Liquiditätserlöse			€ 8.348,15	€ 7.182,50	€ 1.165,65					
				€ 710.836,50	€ 27.803,00	€ 683.033,50	€ -	€ -	€ -	€ -	€ -
					€ 27.803,00	€ 683.033,50	€ -	€ -	17,51%	17,51%	17,51%
					€ 27.803,00	€ 683.033,50					

Kostenüberdeckung

					Leitungen 850	Punktbauwerk 850	Fuhrpark 850	Verwaltung 850	Gemeindeamt 010	Bauhof 820	Fuhrpark 821
Erlöse des laufenden Betriebs				€ -							
	Verbrauchsgebühren var.	852		€ 621.018,27		€ 621.018,27					
	Wasserzählergebühr	852		€ 56.922,67		€ 56.922,67					
laufende Förderungen (Land, Bund)				€ 24.547,41	€ 20.620,50	€ 3.926,91					
sonstige Erlöse											
	Erlöse von Dritten + sonstige Erlöse			€ -	€ -	€ -					
	Erlöse aus Netzverdichtungen	850		€ -	€ -	€ -					
	Liquiditätserlöse			€ 8.348,15	€ 7.182,50	€ 1.165,65					
				€ 710.836,50	€ 27.803,00	€ 683.033,50	€ -	€ -	€ -	€ -	€ -
					€ 27.803,00	€ 683.033,50	€ -	€ -	17,51%	17,51%	17,51%
					€ 27.803,00	€ 683.033,50					

Brutto-Darstellung

					Leitungen 850	Punktbauwerk 850	Fuhrpark 850	Verwaltung 850	Gemeindeamt 010	Bauhof 820	Fuhrpark 821
Erlöse des laufenden Betriebs				€ -							
	Verbrauchsgebühren var.	852		€ 621.018,27		€ 621.018,27					
	Wasserzählergebühr	852		€ 56.922,67		€ 56.922,67					
laufende Förderungen (Land, Bund)				€ 24.547,41	€ 20.620,50	€ 3.926,91					
sonstige Erlöse											
	Erlöse von Dritten + sonstige Erlöse			€ -	€ -	€ -					
	Erlöse aus Netzverdichtungen	850		€ -	€ -	€ -					
	Liquiditätserlöse			€ 8.348,15	€ 7.182,50	€ 1.165,65					
				€ 710.836,50	€ 27.803,00	€ 683.033,50	€ -	€ -	€ -	€ -	€ -
					€ 27.803,00	€ 683.033,50	€ -	€ -	17,51%	17,51%	17,51%
					€ 27.803,00	€ 683.033,50					