

2.5 Water Market Value Chain Approach

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The Institute of Environmental Engineering and Management at the Witten/Herdecke University is an autonomous, non-profit research institute. IEEM combines the academic fields of environmental engineering and economics into an applied scientific approach. Technology and economics are the foundations of the work of IEEM and a precondition to develop modern management concepts and organisational models, which are needed to design and realise both technical and institutional solutions, focused on efficiency for environmental protection and supply services. IEEM focuses on topics of water and sanitation, closely linked to applied environmental economics. IEEM has many years of experience in developing, coordinating and implementing international water projects in Europe, Asia, South America and Africa.

IEEM is the leading coordinator of the MOSA Project – Integrated Water Resources Management in the ‘Middle Olifants’ river basin, South Africa – Phase II and is responsible for parts of the economic analysis of MOSA. The results of this research work are presented below (see Chapter 2.5.1-2.5.5). Beside its research tasks, IEEM is in charge of a whole range of other functions. The institute is responsible for the successful execution of the different measures developed by the project partners. For that purpose, IEEM provides schedules, organises team meetings and supports the MOSA partners with the provision of workshops to generate knowledge transfer and improve technical as well as managerial competence of the local authorities. IEEM also plays an important role to entrench the project among the South African partner institutions like the DWS – Department of Water and Sanitation (former DWA), WRC – Water Research Commission, CSIR – the Council for Scientific and Industrial Research etc. Therefore regular correspondence with local institutions as well as continuous screening of local water developments, publications and policies are required. IEEM also engages with local stakeholders like the local irrigation boards and the Middle Olifants River Forum to increase awareness for the project and enhance local ownership.

2.5.1 Research objective and research design

The catchment of the Middle Olifants was selected as a study area because of its regional water challenges including water shortage, water pollution and imbalanced water distribution. Regarding these water problems the use of optimised technologies, the development of local structures and capacity development in management and operations in the local water sector are crucial.

Therefore IEEM research focus lies on the question of how to enhance the value chain for production and services in the water sector as an important part of an integrated water resources management approach for the Middle Olifants. Besides the

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conceptual design of a value chain model for the water sector, IEEM also developed strategies for the empowerment of local actors and improvement of local ownership in the region in terms of a professionalisation process especially in regard to operations and maintenance of water facilities. These strategies can comprise anything from private sector involvement (including international cooperation) to a solid investment programme in infrastructure improvement (e.g. refurbishment concepts of WWTPs). In this way the research work of IEEM accounts for the present National Water Resource Strategy (DWA 2013), which named planning, infrastructure development and operation and maintenance of water resources infrastructure as one water sector priority focus area. On these matters, IEEM combined different economic aspects of IWRM-measures in the Middle Olifants catchment following two integrated economic research approaches with different research tasks and outputs, which should be seen as complementary and were pursued in parallel

- 1) Conceptual research work: Analyse the share of functions on the basis of a value chain approach in the water sector with the goal to find solutions for improved water quality management in the Middle Olifants region according to local priorities and needs.

Output:

- Detailed analysis and approach of value chains in the water sector
- Business model for improved water services
- Refurbishment programme with REMONDIS
- Water financing approach

- 2) Empiric research work: Understand and identify existing strategies and business opportunities of internationalisation in the water sector on the basis of a sector wide survey and interviews in Germany and South Africa

Output:

- Detailed analysis of internationalisation strategies in the water sector
- Detailed analysis of the South African water sector
- South African water marketguide
- Case study on refurbishment measures for the WWTP Groblersdal with REMONDIS and HUBER
- Financial tool and investment schemes for the WWTP Groblersdal

For the conceptual design of a water value chain approach for the water sector, IEEM transferred and adapted the classic value chain model, originally developed in the field of business strategy by Michael Porter (Porter 1985, 1990), to the field of water management. In order to do so, an intensive literature study on existing value chain models and approaches was necessary as well as an in-depth analysis of the given national and international share of functions/actions in the water sector such as hierarchical and vertical working relations, supply chains and other operational value creation processes in the context of a sustainable water management scheme (including e.g. reliable water service provision).

Based on the findings two value chain models were developed that represent a disaggregated view on the water company's activities and interlinkages. They can be

used to assess all value adding and non-value adding activities associated with the production of a good (or service) in the water sector (see Chapter 2.5.2).

On the basis of this information companies from the water sector can decide to modify their value chains with regard to a new aggregation of functions internationally and also with regard to new cooperation models in the water market. In view of that the IEEM carried out a detailed analysis on the South African water sector as such, including an examination of existing water laws, governance and management structures, both on a national and local level (see Chapter 2.5.3).

This water sector analysis also included empirical studies on the status quo of the available wastewater treatment services in the region of the Middle Olifants. Together with REMONDIS IEEM developed a Refurbishment Programme which was conceived to support an in-depth case study on the WWTP of Groblersdal (see Chapter 2.6). IEEM took responsibility for the investment schemes and the setup of a financial tool to evaluate the different scenarios of the case study from an economic perspective (see Chapter 2.5.2.2).

In addition, the institute conducted a sector wide survey and expert interviews with private companies and public organisations from the German and the South African water sector to explore the motives and strategies of internationalisation as one main aspect in terms of a new share of functions in order to improve local water services, such as wastewater treatment. It was evaluated that a mix of internal and external factors defines the wealth-maximising opportunities of internationalisation and cooperation in the water sector. Although, the size of an organisation is not necessarily the dominant factor in determining strategies, internal constraints such as financial, human and technical resources, which are often related to size, play a central role in this discussion (see Chapter 2.5.4) In conclusion IEEM developed a market guide that focuses on business opportunities for sharing activities and functions between international water companies willing to enter the South African water market and local business partners from the Middle Olifants region (available for download from www.iwrm-southafrica.de).

Within this process, IEEM also developed a new “sustainable water finance approach” that addresses the lack of investment for the water sector in the region of the Middle Olifants. Sustainable water finance promotes solutions that underpin the establishment of optimised technologies, access to sufficient funding opportunities and the development of local structures including the local economy and effective governance mechanisms (see Chapter 2.5.6). Consequently all economic measures found to be reasonable should be designed in a way that they will not fail during implementation due to a lack of “local ownership”.

2.5.2 Enhancing the Value Chain for Production and Services in the Water sector

2.5.2.1 Introduction/initial situation

Many countries face enormous obstacles regarding the implementation of a sustainable water resource management in terms of quantity (e.g. allocation trade-offs) and quality issues (e.g. pollution matters). The enormous obstacles result from the complexity of water management “beginning with technical, institutional and organisational

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challenges, the application of new technologies, legal and regulatory considerations and regulatory effectiveness. Other aspects are standards, investment, costs, financing, pricing, governance, and economic, financial, social and environmental sustainability (PWC 2012, p. 3).

In this context a well-known problem is that many countries miss supply-side infrastructure to assure reliable drinking water supply and sufficient wastewater treatment¹. The results are negative impacts on the environment, livelihoods and at worst human health². For the majority of states water services are provided by municipalities or contracting partners through direct or delegated management contracts. South Africa is no exception, water treatment and water supply infrastructure is mainly in public hands while water and wastewater services are mostly performed by the municipalities directly, or through municipally-owned companies (e.g. DWA 2010). This might be a problem in the sense that missing market structures and a lack of operation capability, both by local contract partners and in the public domain, too often fail to foster sustainability in the water sector (e.g. Marin 2009, p.7).

According to the Department of Water and Sanitation (DWS 2015b) water services delivery in South Africa faces the following major challenges:

- Poor water services planning and prioritisation
- Ageing water infrastructure; increasing investment needs
- Changing workforce with rising lack of technical skills
- Poor economic conditions, with water services provision often a “bankrupt business”
- Adequacy of water resources; climate change impact
- Shifting patterns in water demand; rising energy costs
- Competing political priorities (LG elections).

In regard to MOSA, a lack of efficient local structures in the project area, meaning the physical condition of the local infrastructure and little to “no” operational functionality of water facilities are crucial issues to tackle, especially in terms of the sustainable delivery of water services (e.g. DWAF 2006)

As described by the Development Bank of South Africa (DBSA) before:

The existing municipal ownership models in the region lead to poorly operated and maintained potable water and wastewater treatment works, adversely impacting the supply of water and the protection of the quality of the resource (DBSA 2011, p. 8).

¹ Not only for households but also for industries that discharge untreated or at least insufficiently treated wastewater into the basins.

² To remedy such problems, as early as in the 80s and 90s some countries followed the route of liberalisation of the water service sector with the aim to advance the situation through private sector involvement and to avoid further “economic state failures²”. However, a closer examination today shows in fact that the responsibility of water services provision (water supply and waste water management) predominantly remains in public hands; this is also the case in South Africa. Today (2013) there exist 169 (out of 278 in total) municipalities are entrusted with the responsibility of water supply and wastewater services assigned as water service authorities (WSA).

The lack of asset management, plant operation and maintenance (O & M) leads to the deviation of the existing water infrastructure and in return to water quality problems and insufficient water services. In this way water shortage does not only mean a surplus of demand over supply, but also results from the great quantity of polluted water that requires extensive treatment before it can be (re-) used for different purposes. Coming from there it is no surprise that the polluted water in the region also triggers water scarcity and vice versa influences available water yields for different water users (e.g. Rudolph et.al. 2010).

In the Olifants catchment, water demands are already at their peak for consumption and production purposes. Regarding sectoral water demands, agriculture represents the biggest share with an estimated 66 % of aggregated water demand (e.g. DWA 2011, p. 7).

To face the named challenges and develop sustainable solutions IEEM followed a twofold approach:

From a practical point of view IEEM, together with the industry partners REMONDIS and HUBER, developed a refurbishment programme, which was elicited within an in-depth case study on the WWTP Groblersdal. This included the evaluation of different investment schemes according to local needs. To compare the different investment scenarios, IEEM framed a financial analysing tool (available for download from www.iwrm-southafrica.de). The main aspects of the financial analysis based on the Groblersdal WWTP are presented in Chapter 2.5.2.2.

On the other hand, IEEM generated a conceptual design of a value chain model for the water sector which should help to identify how to improve the water sector through the enhancement of the value chain for production and services in the water sector including aspects of professionalisation of water services (such as drinking water supply and wastewater treatment) through private sector involvement, particularly in form of foreign direct investments (FDI) that might facilitate capacity building, technology transfer and access to financial resources. The main results are presented in Chapter 2.5.2.3.

2.5.2.2 Financial Analyses of refurbishment measures for the Groblersdal WWTPs in the Middle Olifants

In regard to sustainable infrastructure investments overall costs consideration for a defined period are essential in order to evaluate the “real costs”, which come with the investment over time. Especially those investments made by the public sector, which are planned on a budgetary basis, need to account for operations and maintenance as well as re-financing expenses from the beginning. That is to assure sustainability in the matter of operations and maintenance of the facilities but also in the matter of financial terms. In the Middle Olifants region for example many plants were not maintained probably and eventually fell into disrepair what produced high sunk costs and negative impacts on water quality in the region.

That is why MOSA developed a financial tool following the approach to create a business model around different investment alternatives in the wastewater sector and shows how an operationalisation of the results can be achieved. Thus, the tool can serve

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as a means for comparing the results from the case study on the refurbishment of the wastewater treatment plant Groblersdal in a more dynamic and comprehensive way.

First of all, a short description of the functions will be given before further elaborating on assumptions and limitations. The tool comes with four input sheets (one for each concept) and an additional output sheet for evaluation. In each sheet there is a menu section, where critical parameters can be selected manually. Amongst them are capacity, period under view, interest rate as well as the parameters for different scenarios. In a next step, the user will be asked to provide numbers on capital requirements and operational expenses for all alternatives in the operational expenses sections. Blue highlighting guides the user through the tool, as it marks the columns where entries are required. All further calculations are based on the entries made in both the menu and cost section and do not require further interventions from the user.

The total costs determined in the operating expenses section are used as a reference point for calculations of the income (total and per m³) from wastewater treatment activities. The best case (Scenario I – 100 %) assumes that revenues generated cover full costs. Scenario II and III are cases in which revenues are below costs (percentages can be selected in the menu section). If applicable the user can also enter values into the revenue from reuse section. This applies if the wastewater can be sold after treatment.

Profit/loss for the periods is then calculated for each scenario based on the revenues and costs calculated. This first result is followed by a life cycle cost calculation and a life cycle assessment which also includes receipts and the balance for each period. The surplus or deficit that each period exhibits is used to determine the capital/financing requirements for each period. For all scenarios the payments for investing activities (CAPEX) need to be financed, so the annuity goes into the operational expenses (OPEX) section and increases the costs. This derives from the fact that most public entities do not have sufficient financial reserves or cash flows from which to cover all costs upfront of the investment.

The additional capital requirements which stem from the deficits due to insufficient revenue streams are also outlined and must be covered through alternative capital sources such as subsidies, credit or increased charges etc. (which comes close to the actual conditions).

For further comparison of the different concepts the Net Present Value (NPV) of the scenarios is also provided. The output section then summarizes the results and compares the different concepts regarding price per m³, capital/financing requirements, annuities and total costs. The output section is meant to facilitate and simplify the decision making process.

The biggest achievement of the tool is that not only the costs outlined in the case where used, but the revenue streams were also considered to increase its meaningfulness. Even though the wastewater treatment usually is a not for profit business model, costs have to be covered, either by user charges (tariffs) or funding from other public budget sources (taxes, transfers). Besides, the service should be provided to the users at low costs. Thus it is the aim to minimize investment and operating costs likewise.

In addition, the tool allows for choosing longer periods (over five years), which helps with the evaluation in so far as only longer periods usually require repair and replacement of e.g. machinery and equipment. The questions regarding reinvestment

requirements and which costs occur when can solely be assessed by looking at a longer period. This is in line with the principle the life cycle assessment, which is used to evaluate the performance of a building throughout its life cycle, including acquisition, development, operation, management, repair and even disposal and decommissioning. It allows comparisons among different investment scenarios, designs and specifications based on their life cycle performance. In regard to the case of Groblersdal the life cycle assessment allows comparisons of costs among different investment scenarios accounting for the best technology (in terms of design and specifications towards local conditions) as well as adequate maintenance through reliable services contracts, all together producing lower costs altogether, when accounting the total costs over a life time span of the water facilities and their networks.

Even though the tool is narrowed down to the most important parameters, it can easily be used for similar projects and can be altered to account for various specifications, not reflected in the example at hand. It serves as a starting point and guiding principle to be used by people in charge of investment. It does certainly not replace a detailed planning and budgeting process, but it serves as a good first assessment and overview. Especially when considering cases, where no assessment methods are in place.

2.5.2.3 Conceptual Design of a Value Chain Model for the water sector

According to the neoclassical theory of the firm, a company always follows the fundamental rational of profit maximisation (e.g. Veblen 1997, Weintraub 2007). This prevailing neoclassical postulate has been challenged repeatedly, for example by leading economist William Baumol who argues that the quantity corporations act to maximise is not really profits but sales (Baumol 1967, p. 45). Yet, we can also ground the rational of profit maximisation in practice, knowing from real world experience that economic organisations do need to serve their shareholders. Shareholders strive to maximise their own utilities – meaning they want to earn money.

Likewise, companies do act in an institutional setting, whereas this setting can range from free-market economy (today's dominant model even though excluding water services as other infrastructural services which are organised under a public monopoly) to centrally administered planned economy (as we still observe in North Korea for example). Hence the institutional setting depends to a great extent on the political system and political agenda in place. At the same time, the regulating rules within the institutional setting can differ from industry to industry. Moreover the development status of a country plays an essential role for the organisation of national economies and the establishment of functioning market structures (e.g. North 2005).

In general, it is important to recognise that economic organisations are shaped as a function of external constraints (e.g. national market structures, specific industry regulations or international trading rules etc.) and internal constraints such as certain preferences, technology, human capital, financial resources, etc.

Consequently, the wealth-maximising opportunity of a firm results from the interaction of these constraints (e.g. Zuckin & DiMaggio 1990). Furthermore, business enterprises today act as economic players embedded in a global market system. In order to survive and succeed, these companies need to compete with many more “economic players in the field” than before times of globalisation. Schumpeter already postulated in 1912 the competitive environment within which firms operate is one of “struggle and motion”

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(e.g. Schumpeter 1912). This is still true today and applies to both, national and international markets.

In the 1980s a new research field of business strategy evolved that was mainly concerned with the understanding of entrepreneurial success in such a competitive environment. On a broad empirical basis the concepts of business strategy attempt to explain, why some companies succeed in the market and others fail. This includes the analysis of strategic choices and competitive issues.

Here Michael Porter is certainly among the most influential authors in the field of business strategy research. He seeks to identify the reasons for a company's success in maintaining/increasing/realising its competitive advantage. A firm can generate such advantages from its value chain, meaning "from the many discrete activities a firm performs in designing, producing, marketing, delivering and supporting its products [and services]". To him "each of these activities can contribute to a firm's relative cost position and create a basis for differentiation" and thus lead to a competitive advantage in the market (Porter 1985, p.33).

The generic logic of Porter's value chain in terms of added value creation entails competitive advantages based on two types: cost leadership or differentiation.

Differentiation implies the provision of a good or service that is valuable to the customer, at its best unique and beyond the offering of a low price. For example, the inclusion of a service as an integrative part of a product can be critical for the value realised by customers and thus improve the competitive position in the market through differentiation. In this way differentiation results in a competitive advantage if it allows the firm "to command a premium price, to sell more of its products at a given price or to gain equivalent benefits such as a greater buyer loyalty during cyclical or seasonal downturns" (Porter 1985, p. 120). In contrast, a low price can also be a dominant factor of demarcation, however it is associated with a cost advantage.

To Porter a company can gain a cost advantage "if the firm achieves a lower cumulative cost of performing value activities than its competitors" (Porter 1985, p. 97). Due to this cost advantage the firms can demand a lower price and by this generate added value in terms of savings for the buyer. As Porter states: "Buyers also have value chains and a firm's product represents a purchased input to the buyer's chain" (Porter 1985, p. 52). Consequently „to attain a competitive advantage a firm must make a choice about the type of competitive advantage it seeks to attain and the scope within which it will attain it" (Porter 1985, p. 50).

In spite of this, a number of internal and external factors constitute a firm's competitive advantage of differentiation and/or cost advantage. Porter identifies the following generic drivers that impact value creation and the cost structures of activities (Figure 2.5-1).

Cost Driver	Explanation	Drivers of Uniqueness	Explanation
Scale	E.g. economies of scale E.g. scale of facilities, regional scale, national scale etc.	Scale	E.g. Large scale can allow an activity to be performed in a way that is not possible at smaller volumes
Capacity utilisation	E.g. seasonality, fluctuations in demand	Linkages	Within the value chain, to suppliers etc.
Linkages	E.g. to suppliers	Interrelationships	Uniqueness might stem from sharing activity with other business units
Interrelationships	E.g shared purchasing with other business units	Location	E.g. access to resources
Vertical integration	E.g. make versus buy decisions	Timing	First mover or late mover
Location	E.g. cost of labour	Learning and spillover	Proprietary learning
Timing	First mover or late mover	Integration	Of value chain activities e.g. uniqueness of after-sales services
Learning	Experience, capacity development	Institutional factors	E.g. unique job definitions for employees
Internal policy decision	E.g. Payment schedule to supplier, credit policy etc.		
Government regulation	In favour of /or against industry- e.g. environmental obligations for certain production processes		

Figure 2.5-1: Drivers of competitive advantage
(Compiled by the authors according to Porter (1985), p. 62–120)

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Then again, none of these drivers comprises the competitive position of a firm alone. It is always a combination of these factors that determines, for example, the costs of a particular activity.

Within the context of differentiation and cost advantage, technology also plays a central role regarding competitiveness. Above all this applies to industries with technology intensive production processes and products³. However, technology ranges from classical operations technologies such as materials handling technology, machine tool technology, build and design to the communication and information system used within the scope of marketing activities. Thus, technology might affect the relative cost position of any firm.

On this basis a company also has to decide on the technological strategy it wants to follow, whether to become a technological leader or a technological follower (Porter 1985, p. 175–180).

As a technological leader the company can achieve a cost-advantage in terms of

- 1) Pioneer the lowest cost product design,
- 2) Be the first firm down the learning curve, or
- 3) Create low cost ways of performing value activities.

As a technological follower the company can achieve a cost advantage through lowering the cost of the product or value activities by learning from the leader's experience. To achieve competitive advantage through differentiation the technological leader will pioneer a unique product that increases buyer value or innovate in other activities to increase buyer value. As a technological follower the company will adapt the product or delivery system more closely to buyer needs by learning from the leader's experience (e.g. Porter 1985, p.181).

Thus, at the core of a technology strategy is the type of competitive advantage a firm is trying to achieve. Furthermore, a competitive advantage is always relative to existing and potential competitors (e.g. Porter 2001, p. 79–81). Other authors chose Porter's idea to further develop the framework of a value chain. In order to model a more accurate picture for different industries and production processes, distinctive pictures for the production process of a good or a service were developed (e.g. Stabell et. al 1998). This is why we can find for example so called value shops or value networks beside the classical picture of a chain. However all these frameworks are based on the same underlying assumptions of Porter's value chain approach to analyse a company.

Above these value-chain models, there exists a broad range of empirical research work in the field of so-called "supply and global commodity chains". Triggered by trends of globalisation and increasing international trade activities, these approaches mainly occurred in the 1990s. Apparently companies today need to compete not only with national firms but also with international companies penetrating their home markets. As export rates rise, processes of internationalisation take place within the whole value chain. Manufacturers for example, not only export their finished products to foreign markets, but also procure materials and design, manufacture and assemble products in

³ Here companies try to protect their competitive advantages through patents or at least licensing to avoid involuntary transfer of knowledge to external parties.

other countries. Besides, services are also disaggregated and traded separately. In this way, the configuration of value chains in terms of internationalisation (like the outsourcing of a certain activity to another country) constitutes global market structures.

For the purpose of MOSA research work, the quantification of value adding activities and their interlinkages among the value chain is at the centre of analysis also in terms of internationalisation processes. To Porter the identification of added value creation and sources of differentiation refer directly to a firm's competitive position in the market. That is why Michael Porter's approach of competitive advantage through value chain modification provides the best analytical framework to define where improved value creation can be reached by a new sharing of functions in the water sector.

"Water sector" is a general term that incorporates all water related institutions, infrastructure and management strategies. Contrary to the term water sector, the term water industry is normally used to describe all institutions that are in charge of drinking water supply and wastewater treatment services. For the majority of states, the public domain, predominantly municipalities are legally responsible for the reliable delivery of clean drinking water and sewage disposal. Yet, many local authorities delegate the operational business to other public or private entities.

These service companies can then again be differentiated into operators under public law and operators under private law. The operators under public law are normally partially or completely owned by the municipality, while operators under private law can be owned by one or more private shareholders.

In the past years, many states promoted the involvement of private companies with the goal to improve service quality through efficiency gains and to relieve the municipal budget. Generally speaking, private sector participation can be shaped in various forms, may it be through different ownership and management models, as for example full divesture, partial divesture, concession, lease, or BOT-models, management contracts and pure service contracts (e.g. GWP 1998, p. 15; Rudolph et. al. 1991, 1993, 2005 and 2006).

Nevertheless, many countries still fail to foster sustainability in the water sector because of investments gaps and missing operation capability, both by local contract partners and in the public domain (e.g. Rodriguez et al. 2012, p. 7).

To tackle these problems private sector participation has also been used as a tool to open up the market for international water companies. Then again, for the reliable delivery of clean drinking water and sanitation services for private households and/or commercial clients, operational capacity is not the only obstacle to achieve functioning water services.

The use of optimised technologies, the development of local structures and access to sufficient funding opportunities are as crucial as capacity development in management and operations. Therefore, the term water industry as used by IEEM in this research project is not reduced to water services companies but ranges from technology providers to project developers. In this way, the water industry covers all companies that participate in the water market with regard to the creation of an overall sustainable water sector.

2.5.2.4 Water Sector Value Chain Models

To analyse the share of functions and roles among these firms, IEEM developed two value chain models based on Michael Porter’s general value chain approach. To get a better picture of the functions and roles in the water market one needs to make an analytical distinction between two different forms of companies which participate in the water sector. As a result the following two value chain models have been developed:

1. **Service providers** (water supply and wastewater treatment for municipal or industrial systems): These companies are those who provide typically operations management of drinking waterworks and/or wastewater treatment plants. Some of these operators provide a whole range of services related to water management (Figure 2.5-2).



Figure 2.5-2: Value Chain Model 1: Service providers
(Compiled by the authors)

2. **Producers** (of material and immaterial goods): These companies can range from technology providers as for example a plant or component manufacturer (provision of material goods) to an engineering service provider or software developer (provision of immaterial goods) (Figure 2.5-3).



Figure 2.5-3: Value Chain Model 2: Producer
(Compiled by the authors)

These two models represent a disaggregated view on the water company’s activities and interlinkages. They can be used to assess all value adding and non-value adding activities associated with the production of a good (or service) in the water sector. On the basis of this information companies can decide to modify their value chains with regard to a new aggregation of functions internationally and new cooperation models with local companies from emerging countries. A new share of functions in the water market ideally leads to a win-win situation and value creation on both sides.

In order to reach this goal and to apply the concept, the next step is to examine the local water sector to identify priorities related to local water management needs (basin specific) and business opportunities according to local market demand (Middle Olifants region).

2.5.3 Analysis of the water sector in South Africa (and Middle Olifants)

Water supply outstrips demand in the Middle Olifants region due to a series of problems such as, for example, inefficient water use (water losses and run-off), over-exploitation due to a lack of demand management and insufficient sewerage disposal and wastewater treatment. The fact that the Olifants River is a tributary of the Limpopo River Basin, which is shared by four riparian states: South Africa, Botswana, Zimbabwe and Mozambique, exacerbates the situation of competitive water shares in the region.

For that reason the riparian states of the Limpopo River implemented certain cooperation mechanisms with respect to the use and management of the water resources of the whole basin, including the Olifants River. The first multilateral agreement regarding the Limpopo Catchment was already signed in 1986. This agreement provided the legal framework for the establishment of the Limpopo Basin Permanent Technical Committee (LBTC) with the purpose to advise the concerned parties on transboundary issues related to the management and utilisation of the water resources. Furthermore in 1995 all riparian states signed the protocol on shared watercourses in the Southern African Development Community (SADC)⁴. The protocol was revised in 2000. This document in general regulates transboundary water management, according to concepts of international water law⁵, for all member countries of the Southern African Development Community on a general cross-border scale. Although only Botswana, Lesotho, Namibia and South Africa have ratified the revised protocol of 2000 so far, all riparian states of the Limpopo basin follow a shared management approach. In 2003 the LBTC was replaced by the Limpopo Watercourse Commission, which is the responsible authority at present to “advise the Contracting Parties and provide recommendations on the uses of the Limpopo, its tributaries and its waters for purpose and measures of protection, preservation and management of the Limpopo” (LIMCOM Agreement 2003, Article 3). Moreover, South Africa and Mozambique already achieved a bilateral agreement in 1996. In the same year they established a Joint Water Commission for the Olifants River with the objective to facilitate the shared use of the water resources.

However, today human induced stressors on both sides of the border impair the aquatic ecosystem of the shared water resource, triggering a decrease of biodiversity, changes in water flow and sediment patterns, limited recharge, changes in nutrient cycling, primary production and so on.

On a national scale the Olifants River catchment also exceeds several administrative boundaries. The Olifants Water Management Area covers parts of Gauteng, Limpopo and Mpumalanga Provinces, it includes eight district municipalities and 25 local

⁴ The member states of the SADC protocol on shared watercourses are: The Republic of Angola, the Republic of Botswana, the Kingdom of Lesotho, the Republic of Malawi, the Republic of Mozambique, the Republic of Namibia, the Republic of South Africa, the Kingdom of Swaziland, the United Republic of Tanzania, the Republic of Zambia and the Republic of Zimbabwe. However, until today “only” Botswana, Lesotho, Namibia and South Africa have ratified the agreement.

⁵ Like the 1997 UN Watercourses Convention and the historical important Helsinki Rules of 1966 both providing general rules on the uses, protection, preservation and management of international shared watercourses and their waters.

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municipalities. Thus cooperation and sectoral integration is necessary on different policy and governance levels.

There are great efforts made by the South African government to mitigate the described water issues and respond to the continued deterioration of water quality (also in the Middle Olifants region). Water quality management has a long history in South Africa and dates back to 1919, with the Public Health Act No. 36 of 1919 of the former Union of South Africa. This Act regulated the management of sewage disposal. Further laws were enforced, including the first sole Water Act 54 of 1956 (Union of South Africa 1956). By 1956 it was becoming apparent that reconciling water supply with water demand would be increasingly difficult and that re-use of effluent would have to play a major role in the management of the country's scarce water resources. Consequently, after 1956 the earlier requirement of the health authorities that prohibited the disposal of effluent to natural watercourses had to fall away. The 1956 Act in fact required that all effluent be returned to the water body from which the water was originally abstracted. In the following years the act was modified and amended by a list of uniform effluent standards (most recently in 2013) with special effluent standards (DWA 1998 b). All the laws mentioned were important milestones that shaped the South African water sector until the end of the 20th century.

Nowadays South Africa is known for its progressive legal and policy framework for water, which is based upon the general recognition of the right of access to water declared in South Africa's constitution of 1996 (constitution section 27.1.b). This right to water is specified in a number of legislative and policy documents.

The constitution assigns the national government with the general management of water resources, whereas the local authorities (municipalities) are responsible for the provision of water and sanitation services. In this way the Minister of Water and Sanitation (formerly the Minister of Water and Environmental Affairs (until 2014)) is the public trustee of the nation's water resources meaning that water belongs to the whole nation for the benefit of all people. The government has to ensure that there is water for social and economic development and water for future generations.

Today the two main legal documents are the Water Services Act no. 108 of 1997 and the National Water Act No. 36 of 1998 (DWA 1998). The National Water Act (NWA) provides a legal framework for the protection, use, development, conservation, management and control of South African water resources that is, rivers, streams, dams and ground water. The act promotes an integrated water resources management approach based on the leading principles of sustainability, equity and efficiency. In this context, the establishment of so-called Catchment Management Agencies (CMA) according to the existing WMAs is fostered to enable a decentralised management that takes into account basin specific characteristics and follows a participatory approach for stakeholder involvement. The goal is to have 9 CMAs in total which are responsible to manage water resources at the catchment or watershed level (e.g. DWA 2012). According to the DWS "the establishment of CMAs enables the promotion of equity through more effective water resources management and greater responsiveness to the needs of poor and marginalised communities arising from the closer links with stakeholder groups in the Water Management Area (WMA)" (DWS 2015a). A Catchment Management Agency for the Olifants is envisaged to be implemented until 2016.

With regard to resources protection the National Water Act specifies a series of measures including the definition of quantity and quality aspects. Chapter 3 deals explicitly with the protection of the resources including the prevention of pollution and “in particular the situation where pollution of a water resource occurs or might occur as a result of activities on land.” It states: “the person who owns, controls, occupies or uses the land is responsible for preventing pollution of water resources and is also responsible to remedy the effects of the pollution. If the person responsible does not take measures to prevent pollution, the catchment management agency (or the Minister if there is no catchment management agency in place) may take steps to prevent pollution or to address the effects of pollution. The person or persons responsible for the pollution is also responsible for paying the costs to address the effects of the pollution” (National Water Act 1998, Chapter 3). The counterpart to Chapter 3 is Chapter 4 which deals with the rights of water users and with the licensing of water use that may have, or may potentially have an impact on water quality (Section 40). Also, the General Authorisations are important (middle tier under the act) and also provide general and special effluent standards – 2013 No. 665.

Moreover, there exists a long list of supporting policy documents, such as the White Paper on National Water Policy for South Africa (1997), which complement regulations on water resources management. On the other hand the Water Service Act of 1997 (Act No. 108 of 1997) deals with water services including the following issues:

- The right of access to basic water supply service and sanitation
- Regulation and norms for the provision of water services including standards for tariff setting
- The governance of water service as for example: water services development plans; to provide a regulatory framework for water services institutions and water services intermediaries; to provide for the establishment and disestablishment of water boards and water services committees and their powers and duties
- The establishment of monitoring measures
- Implementation of financial schemes to support water service institutions
- Transparency and accountability
- Information policy including transparency through information access and accountability of water service providers

The main documents underpinning water services are the White paper on a National Water Policy for South Africa (DWAF 1997) and the Strategic Framework for Water Services (DWAF 2003). These documents in accordance with the current legislation are the results of an ongoing reform process to achieve a sustainable water service. In this way the National Water Act and the Water Service Act can be seen as complementary legislation to sustain the water resources of the country and to improve water supply and sanitation services for the people.

Furthermore, the government itself, notably the Ministry of Water and Sanitation is very ambitious in establishing a sustainable water sector, while the DWS - Department of Water Affairs and Sanitation serves as the extended arm of the Ministry and is the main body responsible for determining water policy (the Department was named DWAF until 2009 and DWA from 2009 until 2014).

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The DWS supervises the elaboration of the so-called National Water Resources Strategy (NWRS). This strategy is the legal basis for the implementation of the National Water Act and sets up a comprehensive framework to manage water across all sectors. The first edition (NWRS 1) was published in 2004 by DWAF and replaced by the second edition NWRS 2 published by DWA in 2012 (see references DWAF 2004 and DWA 2012). In line with the current National Water Resources Strategy 2, the DWS publishes annual performance plans and scheduled actions for improved water resources management.

Moreover the DWS carries out the so-called Green Drop and Blue Drop Reports. The “Blue Drop programme” is a certification programme initiated in 2008 by the DWS to accelerate the modernisation of South African supply infrastructure. It includes a “Drinking Water System Performance Rating” of water service institutions with the goal to improve water service quality and compliance with drinking water standards (DWA 2009a). The “Green Drop programme” is the counterpart to the Blue Drop programme and deals with the evaluation of wastewater treatment plants and sanitation services. A report for each programme is published every year, describing the progresses made by municipalities and other water service providers (DWA 2009b).

For the execution of different functions within the water sector, several institutions are assigned via national law:

Water boards (WB): The main goal of the so-called Water boards (WB) is to supply bulk water to municipalities or to the private sector (industries etc.), consequently these entities develop, operate and maintain water infrastructure such as dams, reservoirs and pipelines. In some cases the WB operate drinking water facilities and wastewater treatment facilities due to a lack of different capabilities of the concerned municipality. The NWRS2 (updated in 2013) points out that the 12 existing water boards will be consolidated into nine viable regional water utilities (RWU).

According to the constitution, the municipalities are responsible for water service provision on a local level. Yet, the water service act of 1997 differentiates between so-called water service authorities (WSA) and water service providers (WSP).

Water service authorities (WSAs): are defined as “municipalities responsible for ensuring access to water and wastewater services, either directly or through another entity” (Water Service Act 1997, p. 11). In order to improve water services WSAs have to craft a water service development plan (WSDP), which fits the water management strategy of the concerned CMA.

Water service providers (WSPs): are defined as water service intermediaries who receive the approval by the water service authority to operate water services for a limited period by entering into a contract. “The quality, quantity and sustainability of water services provided, a water services intermediary must meet any minimum standards prescribed by the Minister and 30 any additional minimum standards prescribed by the relevant water services authority” (Water Service Act 1997, p. 22–26).

Water User Associations (WUAs): represent a formation of water users generally representing a special user group such as farmers to pursue sector specific interests; most of the WUAs are set up by former irrigation boards.

Altogether, Figure 2.5-4 below provides an overview of the most important institutions and responsibilities in the South African water sector:

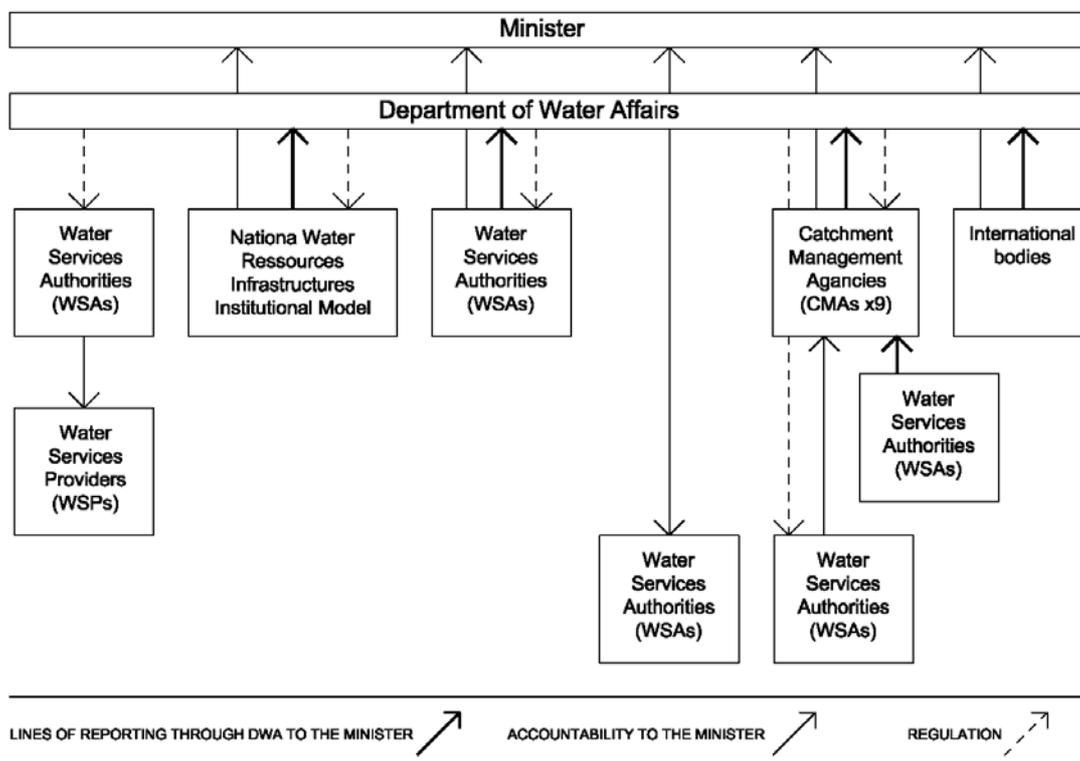


Figure 2.5-4: The Water Sector
(GreenCape 2015, p.11)

However, the responsible local authorities (WSAs and WSPs) often suffer from “a shortage of civil engineers, water scientists and other technically trained personnel available to run the municipal water and wastewater services” (GWI 2014, p. 896). Thus, in many cases the public entities are not able to sufficiently fulfil a range of key functions in water management. According to Wall and Ive, “it is the deficit in asset management, plant operation and maintenance within the public entities that leads to the deviation of the existing water infrastructure and in return to water quality problems and insufficient water services” (Wall & Ive 2013, p. 36.)⁶. In view of that there is a strong need for capacity building ranging from management skills to adequate plant operations and maintenance on the ground. This also includes improved information management and monitoring functions such as data collection and processing on water quality.

However, the capacity gap for adequate asset management, operations and maintenance leads to the fact that existing wastewater plants have already produced high sunk costs⁷ and no benefits for the people. As the report to the WRC confirms, “it is extremely important to note that the ‘market’ in maintenance of infrastructure, particularly

⁶ For the purpose of water service improvement the DWS promotes the so called “Municipal Strategic Self-assessment (MuSSA)” to check the overall business health of a municipality or Water Service Authority (WSA) and to identify key areas of vulnerability (DWS at DHI-SA 2015 Annual conference).

⁷ Costs that have already been incurred and cannot be recovered. In this case the benefits and gains that could have been generated through the adequate operations and maintenance of plants are lost.

maintenance of small scale water and sanitation infrastructure and even more so in the rural districts, is not well developed in South Africa” (ibid., p. 36).

In consequence, there is also a strong need for plant refurbishment in order to meet the necessary legal standards of water quality and improve wastewater services for water users. Especially, in the Middle Olifants regions water for irrigation is a valuable asset for the people.

Another general problem identified is a lack of financial sustainability due to low revenue collections. For the municipalities, it seems almost impossible to cover all O & M costs through existing in-house cash flows. In this regard, a lack of human capacity within the municipalities to undertake necessary key functions in budget planning, funding processes and debt management also hinder improvement (e.g. Hollingworth et. al. 2011).

Therefore, the goal must be to enhance the technical and operational sustainability of the treatment plants and reach financial sustainability of the utilities. This includes a strategy for plant refurbishment and capacity development through private sector involvement and the integration of local ownership models.

2.5.4 Strategies of private sector involvement and Internationalisation

Accordingly, acknowledgement has grown among policy makers, that private sector involvement in emerging water markets can facilitate capacity building and access to financial resources.

Moreover, private sector participation also takes place beyond national boundaries. In economic trade terms such activities are gathered under the term foreign direct investments (FDI)⁸ Companies expand and invest into foreign countries because they expect to engage into new markets, in this case water markets, to maximise their market shares.

Generally, as mentioned previously, private sector participation can occur in various forms in terms of different ownership and management models as, for example, full divesture, partial divesture, concession, lease, BOT-models, management contracts and pure service contracts. Depending on the respective national laws different regulations apply to foreign companies regarding the structure of their participation. Also there might be general regulations in foreign countries, which might impact the original business procedures (e.g. Black Economic Empowerment Act of 2003, foreign companies are also subject to BEE regulations on employment, selection of business partners, suppliers or service providers).

Usually international companies transfer their business models as a whole or partially to a foreign market and a new customer base. In fact, according to Porter’s value chain approach, these companies should be able to gain a competitive advantage through internationalisation by expanding their market shares and investing in innovation.

⁸ United Nations Conference on Trade and Development definition: “FDI refers to an investment made to acquire lasting interest in enterprises operating outside of the economy of the investor.” Thus Foreign Direct Investments can have many forms including any kind of mergers and acquisitions.

In the context of the MOSA research project, IEEM uses the very general term of internationalisation for a broad field of international operations referring to OECD (2009a) definition for internationalisation:

- The export of products via global trade
- The production of products and services abroad via foreign direct investment (FDI) (as for example through founding of a company's own subsidiary)
- The licensing of foreign firms (in terms of contractual arrangements for the sale or even manufacturing of a company's own products and services).

In the past years water companies have developed different strategies for the expansion to foreign markets while the motivations for internationalisation are as manifold as the companies and industries themselves.

To examine the motives and strategies of internationalisation of companies from established water sectors, IEEM carried out a survey in the German water industry. Furthermore, several in-depth interviews with German water companies (including both value chain types) and other experts from the field (consultancies, political institutions, research institutions, NGOs, network organisations, other sector representatives) were conducted to identify potential changes for the distribution of value-chain activities across different regions and countries.

The most significant results, drawn from the quantitative and qualitative analyses, are as follows:

- The share of turnover from international business activities amount to a minimum of 8 % for small and medium sized companies with up to 50 employees. For larger enterprises (> 100 employees) the proportion of internationally generated revenues is an average of 60 %. Internal constraints such as financial, human and technical resources, which are often related to size, play a central role in this discussion.
- It was also shown that the dominant factor for internationalisation was not size alone but is also an issue of business leader preferences. The expansion to a certain foreign market, for example, is often an intuitive entrepreneurial decision which is based on personal networks and other personal experiences of the leadership board.

The reasons named for internationalisation in the survey could be summed up under the following three motives:

- 1) Market seeking (increase market shares and enter new markets)
- 2) Resources and asset/knowledge seeking
(securing access to certain resources and networks),
- 3) Efficiency seeking
(cost efficiency through use of location advantages for example).

With special regard to the water market the intention for internationalisation derives from the fact that the national markets are becoming increasingly saturated and also the dominant position of the public utilities in terms of operating water services (thus especially private water companies follow the market seeking motive).

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Generally these motives are in line with the overall goal to strengthen a firm's competitive advantage in the market. In this context the most important barriers for internationalisation, which could be identified are shown in Figure 2.5-5 below (classified from high to low priority):

Barriers of internationalisation	
Internal barriers/Company	External/Local barriers
Human resources	State despotism, other political risks
Financial resources	Access to qualified staff
Quality assurance	International/local competition
Lack of knowledge (legal framework, market functioning)	Unintended knowledge transfer, lack of patent protection
Lack of control mechanisms	Special regulations for foreign companies

Figure 2.5-5: Barrier of internationalisation
(Compiled by the authors)

- Yet, it is no surprise that the majority of German water companies prefer to enter markets that share the same political system or at least the same cultural background. The reasons for that are simple: the risks involved in the penetration of similar markets are easier to assess than those where they are likely outweighed by the unknown variables (e.g. political instability or despotism, corruption etc.).
- Another important determinant for a company's degree of internationalisation is certainly the business model itself (considering, for example, a company whose core business is the implementation of international tendered water projects). All companies asked have developed a strategy of internationalisation according to their business model.

On this basis three dominant strategies with different degrees of value creation depth of services and goods could be identified (Figure 2.5-6):

Strategies of internationalisation		
Dominant strategy of internationalisation business approach	Classification in regard to value chain adaptation	Type of company according to developed value chain models and motive
Systematic acquiring of international tendered water projects	Value added-depth demand-driven depending on tender proposal and value chain adaptation capability	Type 1 (all operators, especially those focused on public tendered projects as core business) Type 2 (technology and manufacturer who see a benefit in product placement or indirectly subsidised research and development expenditures for optimised technology)
Mergers and acquisition	Value added depth supply-driven depending on penetration strategy for existing and new markets	Type 1 (“only” service operators under private law) for raise of market share, sometimes the only way to enter new market Type 2 (dominantly component and plant manufactures) for the expansion of product range and market access
Organic growth of the core business starting with - Regional sales and marketing activities - Inspection and maintenance - Procurement and assembling - Production - Research and development in terms of a diversified product portfolio, adaption to regional market	Value added depth depending on overriding market force (demand or supply)	Type 1 (with exceptions, service operators under private law) and in cooperation with local subcontractors Type 2 (all companies) in cooperation with local partners ranging from licensed sales to component assembling or even production agreements

Figure 2.5-6: Strategies of internationalisation
(Compiled by the authors)

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For the next step IEEM explored how the identified strategies of internationalisation can match with the integration into the South African water sector. Generally, South Africa fosters to create water markets that require an integration of local businesses (e.g. micro water business development, jobs per drop, black empowered enterprises etc.).

For that purpose IEEM carried out a survey in the South African water sector and conducted several in-depth interviews with South African stakeholders which were represented in the following shares (Table 2.5-1):

Table 2.5-1: Representatives of the South African water sector

Representatives of the water sector in SA	Share
Water Service Provider	40.35 %
Water Technology Manufacturer	8.77 %
Consultancy	22.81 %
Local Political Institution	12.81 %
National Political Institution	8.77 %
Research Institution	10.53 %
Non-governmental Organisation	1.75 %
Other Industry	1.75 %

The majority of the participants confirmed the interest of local South African companies to cooperate with international partners, 30 % already do have business alliances (out of which 30 % are joint ventures and 37 % are based on PPP-models) with foreign companies, only 9 % would not support such a strategy (see Figure 2.5-7 below).

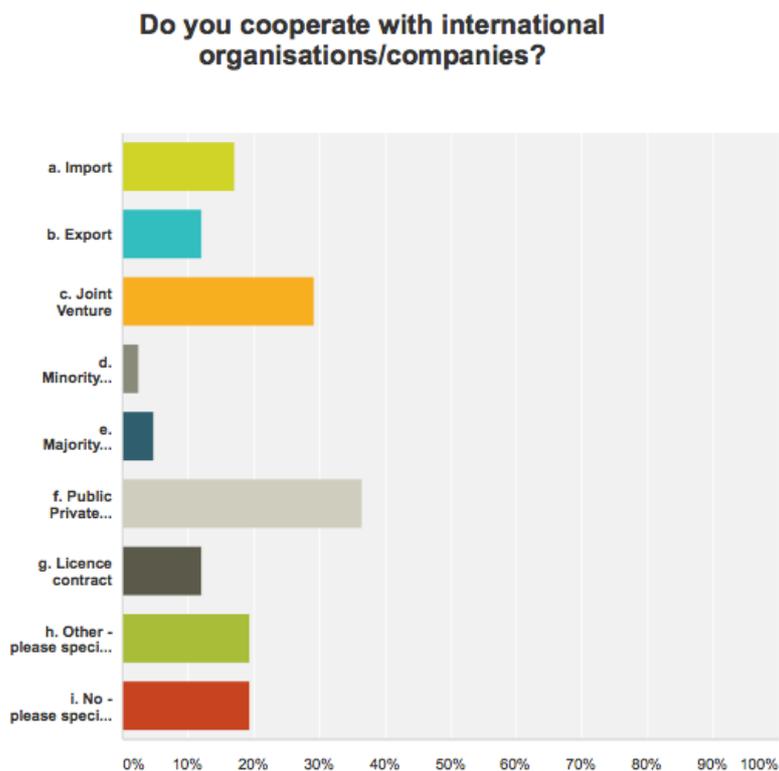


Figure 2.5-7: Different modes of international cooperation.
(Compiled by the authors)

In general 90 % of survey participants see an advantage in cooperating with a German company. Thus there is also a chance of professionalisation of the water management structures in South Africa through the cooperation of local water companies with international companies, who will bring more experience and know-how into the field.

For the cooperation between local water companies from South Africa and international water companies (e.g. from Germany) IEEM promotes a business model that supports local development and improves local water services such as wastewater treatment or drinking water supply (Rudolph 2011). This so-called “water franchise model” can be an effective way to enhance performance structures in the water sector. (e.g. Harbach 2012, pp. 67, 94-95).

The word “Franchise” is derived from the old word “frank”, related to the word “free” (still used with the phrase “frankly speaking...”). “To franchise” means “to set free” the local business from the limitations that have prevented it to develop their local water business as contractor of engineering, technologies or operational services. The franchisor (usually a strong, professional company, internationally established) will “set free” the franchisee (usually a local, small or medium sized regional enterprise) by eliminating restrictions, which would disable the local company to deliver high quality water technologies and services. In other words, the franchisor will enable its franchisee to promote, build, finance and/or to operate ambitious water facilities (see Rudolph 2007).

The developed business approach also accounts for the fact that “there is a shortage of the necessary skills and experience at the artisan, technical, engineering and

management levels to operate, maintain and manage water services appropriately in many municipalities. There has been a serious reduction in the number of engineers active in municipalities to manage large infrastructure investment programmes and many managers lack the necessary skills and experience” (AMCOW 2011, p.3).

A water franchise business model is a contractual agreement between two independent business parties with the purpose to provide technology and services to a public (e.g. municipality) or private client (e.g. industry) in the water sector (Wall 2005; Rudolph 2007; Harbach 2012).

The franchisor: a larger and experienced (international) water company that supports the franchisee through the provision of its technology, expertise and references. The franchisor ensures quality levels are strictly maintained in terms of a “conditioned performance warranty”, improving the credibility and bankability of the franchisee – typically a local contractor. In this way the franchisee and client, both benefit from the franchisor’s experience and immense track record in realising water projects worldwide. If necessary, the franchisor also provides training and coaching in operational activities as well as support in negotiations with banks and the development of individual tailor made financing concepts.

The franchisee: a local service provider who wants to run his/her own water business to provide local water services (e.g. operation and maintenance of WWTP⁹), but lacks a track record and/or operational capacity to access the market. With the support of the franchisor he/she gets the opportunity to reach out to the client, get access to financing resources and built capacity in all related business skills.

One of the most important elements of the franchise concept is the **franchise contract**, also referred to as a franchise agreement. This contract specifies all the terms on which the relationship between the franchisor and the franchisee is based. It also specifies all rights and obligations of the two parties and how the franchise is to be operated.

In all cases the franchisor receives a turnover related fee, the so-called **royalty fee** and an **initial fee**, which is subject to negotiation. The initial fee is a one-off payment to compensate the franchisor’s expenses in the initial phase of contracts and projects. The royalty fee is paid from the franchisee to the franchisor on a monthly or annual basis.

In return, the franchisee receives the contractually agreed support services by the franchisor. In this way, the franchisee benefits from the experience and expertise of a strong international player, enjoys the best possible degree of business security and can work effectively right from the start, thus saving considerable time and expense. Moreover, the franchisee is the direct contract partner to the client (e.g. municipality) and therefore gets paid by the client or the water customers directly. The franchisee follows an entrepreneurial approach and can maximise his/her profits through continuous service improvement and/or the expansion of his/her own business to other sectors and new clients. This is an important aspect in order to improve water services through a professionalised asset management. In this way the municipality and its water customers (water users) benefit from the franchise model. In the end this business model should enable access to new funding opportunities, knowledge transfer and local

⁹ WWTP= wastewater treatment plant

capacity building, improved infrastructure and optimised technology, economic and social development as well as ecological sustainability.

Thus franchise may be understood as a capacity buy-in concept, or as a specific form of a twinning approach, or even as a local ownership scheme, or a micro-PSP, but always within a professional, sustainable structure and a performance guarantee through a strong partner accounting for different aspects of risk related to water services.

According to the MOSA survey and interviews there is a great interest in empowering local business through private sector involvement in the water sector in South Africa, also to reduce the risk of malfunctioning and mismanagement as shown below (Figure 2.5-8).

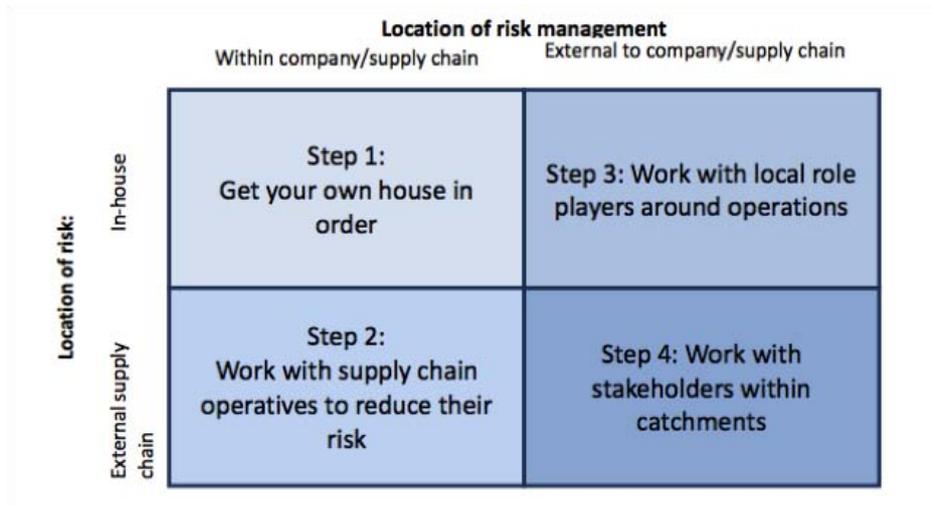


Figure 2.5-8: Location of risk management (DWA 2012, p. 45)

2.5.5 Sustainable water finance

Financing mechanisms have a great impact on the design, construction and operation of water and wastewater facilities. Especially in developing or emerging countries with poor enforcement of water quality and environmental standards, the “bottleneck of success” is often operations and maintenance (O & M). The “investment-only-finance strategy” based on a state guarantee does not set any incentives for O & M. Output-based elements in financing are needed to avoid malfunctioning facilities and improve the performance levels in water and sanitation. “Service providers need better support from government institutions through improved subsidy targeting, more strategic planning, better budget execution, guarantees and risk sharing that can help them access private funds” (Rodriguez et al. 2012, p. 38).

With regard to South Africa “capital investment in new water infrastructure and in the refurbishment of existing infrastructure is projected to require an estimated R670 billion over the next 10 years. Based on industry norms, additional investment of approximately R30 billion will be required for sustainable water management programmes. In total, an amount of R700 billion will be required to be invested by the water sector over the next 10 years, or an equivalent of R70 billion per year. While a portion of the required investment will be provided by the public sector, the private sector will have to contribute substantially. The public sector alone will not have sufficient funds to enable full value chain financial management in the sector” (DWA 2012, p.84).

2.5.5.1 Challenges of Financing in the Water Sector

Simplified, there are three different sources of financing available in the water sector. These are (1) public (national, provincial, municipal) loans and grants, (2) DFI loans (from Development Financing Institutions), mostly national (USAID, JICA, KfW...), regional (EIB, ADB, AfDB, IDB...) or multilateral donor banks (such as the Worldbank) and (3) commercial and private loans.

The sector-specific challenges of financing are:

- 1) Few countries in the world have a budget sufficient to pay for all water infrastructure investments necessary under the SDG (Sustainable Development Goals, UNEP 2015). Therefore, public funds (loans, soft-loans and grants) have to be supplemented with other financing sources, including private investment.
- 2) Funds from donor banks (soft-loans and grants), available for developing and transition countries, are usually based on sovereign state guarantee and disbursed exclusively to public entities.
- 3) Private investors and banks have to calculate the specific risks of the water sector: The political environment generating uncertainties and risks for payback and the difficulty to manage (mitigate) such risks over long repay periods as being typical for investments in water infrastructure.
- 4) All financing institutions prefer large project investments. Especially project finance needs a volume of, say, €30m or more to cover the expenses for the bank’s project development and administration, including the technical, commercial/financial and legal due diligence.

The financing mechanisms for the water sector should allow for small and medium size investments, such as for water loss reduction programs and for rural areas; incentives to drive appropriate O & M and avoid sunk investments, mal-functioning facilities; innovative solutions, like for water reuse, against micro-pollutants and others.

2.5.5.2 Forfeiting to Finance Water Infrastructure Project Investments

The basic idea of forfeiting is that the borrower “sells” future revenues from water tariffs to the financing bank. If the borrower is a private service contractor under a public private partnership (PPP) the employing public water management authority (in most countries a municipality or municipal association) would be involved as third party under the forfeiting finance contract (e.g. Hermann 2015).

After the reunification of Germany in 1989, when money was scarce in public pockets, more than €2.5bn was financed through private investors under the forfeiting mechanism (Hermann 2015). This mechanism is presented in detail emphasising that forfeiting can include re-investments and operational cash flow, to cover the scheduled cash deficits in the first years until the break-even point under the PPP contract is reached.

2.5.5.3 A Vision of Sustainable Water Finance

The lack of incentives for sustainable operations and maintenance has often led to malfunctioning facilities and sunk investments (e.g. Rodriguez 2012; Hilbig & Rudolph 2016; OECD 2009b; Rudolph et. al 2010). An example from South Africa is the case of a wastewater treatment plant in the Olifants basin, which did not function well. A professional study showed how to improve the current condition with affordable repairs and O & M improvements. Still, the political decision was to build a new plant next to the old one at much higher costs because public funding and non-transparent advantages of a new construction-contract were obviously stronger than cost-efficiency concerns.

In this context, a “vision” for sustainable water finance was determined and discussed with experts from water industry, researchers and banks (Rudolph 2015; GWSP 2015).

2.5.5.4 Hybrid Finance with a Forfeiting Component as Pragmatic Approach

To implement innovative financing will take much time, since it requires changing principles from banks and bank regulators.

The following pragmatic solution for hybrid finance has been decided by a city in Southern Africa:

- Establish a “ring fenced” SPV (special purpose vehicle) under the municipality, which is acting like an autonomous enterprise with its own financial and technical responsibilities (tariff collection, expenses for construction works, repairs, operations, staff management, ...);
- Tender the investment project, a wastewater treatment plant, under a DBO (design, build, operate) concept (because this allows for full competition and “open-technology-tender” incorporating construction and operational costs);

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- Some of the total investment shall be financed under a forfeiting-mechanism, protected with a default guarantee from the city.

Forfeiting may not be the biggest portion of hybrid financing in this case, but it is the strongest driver towards sustainable O & M and towards transparency in re-financing with tariffs, taxes and transfers (TTT). Council members and stakeholders shall make up their opinion and take their decision being aware of financial figures which clearly indicate the consequences of higher/lower tariff decisions on the amount to be compensated through the municipal budget. The discussion and working atmosphere is very different from those cities, which decide for lower water tariffs before election and are trapped to subsidise more (and/or accept degradation and devaluation of assets) after election.

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