

Organisational models in rural areas of developing and transition countries

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Keywords

Developing and transition country, operating company, organisational model, system's approach of organisations, wastewater treatment

ABSTRACT

The United Nations have announced the Millennium Development Goals and their achievement by 2015. Goal 7 strives for improving access to safe potable water and basic sanitation. By now it is acknowledged that latter aim will not be attained. Especially operation and maintenance (O&M) of wastewater treatment facilities have been the bottlenecks in the past. Against this background the present research turns towards the question of how it is ensured that wastewater treatment facilities are operated in a sustainable way. It seems that organisational models are differently well suited to secure sustainable O&M. For this reason the tasks that are necessary to sustainably operate a wastewater treatment facility are examined. In addition, criteria are identified that influence company's tasks and consequently its operations. In order to solve the complexity of this job and to give it a proper structure the system's approach of organisations is applied as theoretical framework. The operating company is regarded as an open system. The tasks of the operating company and the identified criteria are then allocated to the system's model. Therewith organisation's interrelations with its task and external environment can be studied. Consequently, environmental influences on the operating company are indicated and thus the feasibility of organisational models can be revealed.

INTRODUCTION

The United Nations have formulated an ambitious aim with the achievement of the Millennium Development Goals by 2015. Within Goal 7 it is strived for halving the population that still lacks sustainable access to safe potable water and basic sanitation. It is estimated that seven out of ten people that still use unimproved sanitation¹ facilities live in rural regions (JMP 2010). By now it is acknowledged that the target to improved sanitation access will not be reached. In this context the present research turns towards the question of how it is ensured that improved wastewater treatment facilities in developing and transition countries are operated in a sustainable way taking existing institutional circumstances into consideration.

According to Posch (1999) wastewater treatment systems are defined in a three dimensional way: the selection of technology, the (physical) structure of the system and the organisational model. While for the

¹ For the sake of simplicity sanitation and wastewater treatment are regarded as synonyms.

first two dimensions there is an on-going debate among scientists, the latter still faces room for research. In the past operation and maintenance (O&M) have been the bottlenecks to sustainable services in water (Rudolph and Harbach 2006) and sanitation – often leading to a malfunctioning of services and thus unsustainable investments (Brikké 2000). Even though there is vast information about organisational models available it is fragmented and only focuses on specific aspects according to objectives of the publishing institution.

Consequently, a comprehensive analysis is required that considers all possible organisational models. Obviously models are – in relation to the existing legal context of the specific country – differently well suited to secure the sustainable O&M of wastewater treatment facilities. Criteria need to be defined that help in the process of deciding on an organisational model. Thus, the main objective of this study is (i) to determine the tasks a company actually has to fulfil in order to sustainably operate a wastewater treatment facility and (ii) to evaluate criteria that might have an influence on these tasks and consequently on the operations. In this way the basis is provided to study influences and dependencies between the organisation and the prevailing situation, revealing the feasibility of organisational models.

METHODS

Operating companies in the water or wastewater sector especially in developing and transition countries face a complex and sometimes rapidly changing environment. Rural regions with their social particularities even tighten this problem.

Due to the complexity that inheres in the task of finding a suitable organisational model it is found remedy by applying the system's approach of organisations as theoretical framework. Thereby the responsible operating company is regarded as an open system. Hence, the organisation's interrelations with its environment can be described.

To understand the meaning of a sustainably working wastewater treatment facility, it is not only necessary to ask for the sustainability of the technology itself, but the operation and maintenance of the system. This again seems only possible if the operating company adopts certain tasks. Therefore in the first step of the analysis main operating tasks of the responsible wastewater treating company are determined.

In a second step, criteria that are typical for the developing and transition country context and that may have an influence on the performance of the operating company are identified and compiled. For this, a literature review on organisational models has been carried out to investigate worldwide practical experience, scientific knowledge and international organisations' suggestions. These criteria not only influence the tasks of the operating company but also the sustainability of services.

Both the tasks of the operating company and the identified criteria are then allocated to the theoretical framework – the system's approach of organisations.

1.) System's approach of organisations

By applying system's theory complex phenomena can be described and explained. System's theory is based on Bertalanffy's findings of the self-regulating ability of open biological systems (Pischon 1999) and serves as clarification of an actual problem by investigating system's elements and influencing factors. Consequently, phenomena may be described in their interconnectedness (Kuster et al. 2008, Sedlacek et al. 2010). Due to this, system's theory is successfully applied in complex decision problems (Krallmann et al. 2007).

It was Luhmann, who first applied system's theory to social systems (= organisations). Application of system's theory is exceptionally popular in enterprises since they often face extremely unstable environmental conditions. Thus, the organisation is defined as an open, socio-technical system that adapts to a changing environment (Pischon 1999).

In organisational theory there are different perspectives of organisations. In this study the institutional perspective of organisations is chosen: it describes the organisation in its entirety. The organisation has boundaries that separate it from the outside world (environment) (Laske et al. 2006, Schreyögg 2008). According to Schreyögg (2008) three aspects are attributed to the institutional perspective of organisations: (i) the specific orientation on a purpose (wastewater treatment), (ii) the organisations consist of activities of various people (conversion) and (iii) there are borders that distinguish between the organisational inner world and the outer environment. Kew and Stredwick (2005) further subdivide the outer environment into (i) the task environment that consists of elements such as specific technology, customer, regulation, local labour market, supplier, competitor and its (ii) external environment to which belong macro-economic, political-legal, technological, socio-cultural and ecological elements of the according country (Schreyögg, 2008). Basically the open system, or in this case the operating company, (i) obtains their inputs (people, finance, technology, materials, information) from the task environment, (ii) converts inputs into outputs (products, services, information, waste) in order to (iii) release them again into the task environment (Cole 2001) (see Figure 1). As with any other organisation, typical in- and outputs of the wastewater treating company can be ascribed to the system's model (see Table 2).

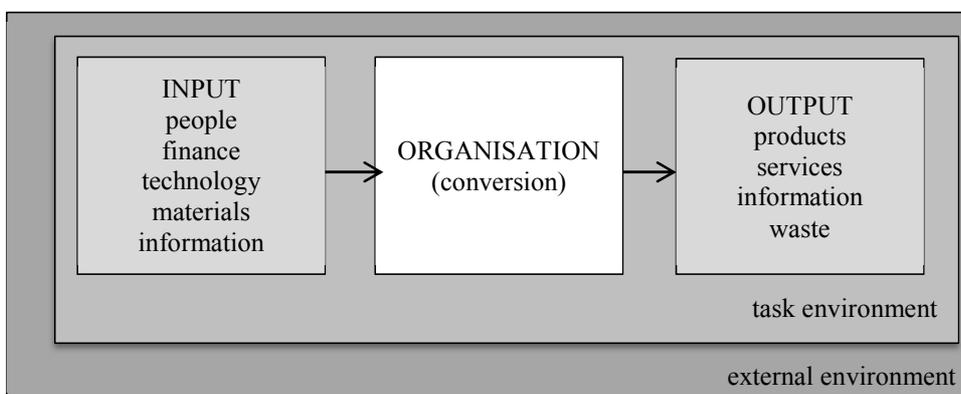


Figure 1: A system's model of an open system (based on Cole 2001 and Kew and Stredwick 2005)

2.) Sustainability of wastewater treatment and operations

There is plenty of literature that focuses on sustainability aspects of wastewater treatment systems respectively technologies. Van der Vleuten-Balkema (2003) defines wastewater treatment systems using (i) functional, (ii) economic, (iii) environmental and (iv) social-cultural aspects. There are also other concepts in literature that extend these aspects by institutional considerations (SuSanA 2008) or management factors (Musonda 2004). Yet, Lennartsson et al. (2009) stress that sustainability should not solely focus on the technology itself but also on services provided by it. For instance, not functioning O&M or inadequate division of responsibilities and tasks between the service provider and the household make an environmentally sustainable technology "...a health hazard" (ibid.). Only by guaranteeing a sustainable O&M of the wastewater treatment plant the service itself becomes sustainable.

3.) Main tasks of an operating company

Resulting from numerous wastewater treatment technologies and handling approaches different requirements for O&M necessitate. The main tasks of an operating company are summarized by the German DWA (2005 and 2006a) rules and standards. Both DWAs define typical tasks for operating wastewater systems as shown in Table 1.

Table 1: Main tasks of an operating company (DWA 2005, DWA 2006a)

Main tasks	Field	Example
Tasks resulting from the operating system	business and core processes	O&M, rehabilitation...
	supporting processes	information technology, procurement...
Tasks resulting from the managing system	leadership	concepts, laws, communication...
	human resources and financial management	finance, accounting, human resources...

RESULTS

Based on the above the system's model of an organisation treating wastewater can be set up as shown in Table 2. This overview demonstrates how the organisation interacts with its task environment by in- and output and which processes are essential to achieve the desired service. Depending on the existing situation in the respective country the input or the organisation's operational processes may be hampered leading to a malfunctioning of service.

Table 2: Allocation of operating company's tasks to the system's model (own compilation, based on Cole 2001, Kew and Stredwick 2005, DWA 2006a, Slack et al. 2007)

Operation's input		Operation's processes (conversion)		Operation's output			
People	Capability of personnel	Tasks (operating the system)	Wastewater operations, maintenance, repair	Products	Reused wastewater		
Finance	Self-funding		Inspection, monitoring	Service	Wastewater treatment		
	Revenues from service		Residual management			Waste	Sludge, residual waste
	Other funding		Material management				
Wastewater technology	documented by investment and O&M costs	Information, documentation					
Material	Spare parts, chemicals etc.	Tasks (managing the system)	Financial management				
Information	Information effort and sharing by stakeholders, information asymmetry		HR development and support				
			Safety and health protection				

After having identified influencing criteria from literature they are allocated to the task and external environment (see Table 3) of the system's model. All displayed criteria – whether originating from the task or external environment – may have a certain influence on the operating company. In a decision process it is recommended to analyse the situation thoroughly upfront. Therefore criteria are understood and can be weighted and thus prioritised according to the specific project and country context. This should be executed in collaboration with relevant stakeholders.

Table 3: Identified criteria allocated to the task and external environment of the system's model (own compilation using various references)

	Identified criteria	Example references
Task environment		
Competitor	Number of service providers, alternative service providers co-existence or partnership	ADB (2008), OECD (2008)
Customer	Willingness to pay, affordability, customer groups (market potential), public acceptance of organisational model, remoteness of area, land tenure, community participation, in-kind donation of time, labour etc.	ADB (2002), Fonseca and Bolt (2002), Sohail (2003a), PPIAF (2002)
Local labour market	Availability of skilled labour	ADB (2002)
Regulator (water related)	Information asymmetry with operator, legal framework and regulations, degree of decentralisation of water sector, independence of local government institutions	Edwards et al. (1993), ADB (2002), PPIAF (2002)
Specific technology (pre-defined)	Physical system structure, selected technology	Posch (1999)

Supplier	Local availability of spare parts, local creditworthiness, local market diversification	Oyo (2002), Musonda (2004)
External environment		
Ecological	Pollution control	Edwards et al. (1993)
Macro-economic	Tax composition, transfer payments from official development assistance, dependence of governmental funding, financial flow from central to local government, inflation, experience of private-sector-participation, subsidy design	Bult-Spiering and Dewulf (2006) EUWI (2008), Tecco (2008)
Political-legal	Strength of government authorities and leadership, transparency, official registration of community following national legislation	Brikké (2000); PPIAF (2002), Sohail (2003), EPA (2007), Tecco (2008)
Socio-cultural	Constraints concerning wastewater and its reuse, demographic influences	UNEP et al. (2004)
Technological	Service levels and standards	PPIAF (2002), Musonda (2004)

CONCLUSION

Due to the theoretical framework – where an organisation is regarded as an open system – operating tasks and influencing criteria can be allocated to the system's model of organisations. Consequently, environmental influences on the operating company and thus the feasibility of the organisational model can be studied. In doing so, decision-makers are enabled to better reflect on them. Thus, unsustainable operations and hence waste of funds for wastewater treatment systems may be delimited. In a next step relevance and impact of identified criteria on O&M and management of operating companies are studied.

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