Integrated Water Resources Management in the Lower Jordan Rift Valley

Sustainable Management of Available Water Resources with Innovative Technologies

Working package 7:
Socio-economic aspects

Deliverable D703, Part I:

The Role of the Institutional Setting for Decentralized Wastewater Treatment and Reuse – A Case Study of Jordan

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ACRONYMS AND ABBREVIATIONS

ASEZA	Aqaba Special Economic Zone Authority
AWC	Aqaba Water Company
BMBF	German Minstry of Education and Research
BOT	build-operate-transfer
COM	Council of Ministers
CVDB	Cities and Villages Development Bank
CW	Constructed Wetlands
GIS	geographic information system
GOJ	Government of Jordan
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (GTZ)
GWA	Governorates Water Administration
HQ	Head Quarter
JBRDM	Jordan Badia Research and Development Program
JD	Jordanian Dinar
JISM	Jordan Institute for Standardization and Metrology
JS	Jordanian Standard
JVA	Jordan Valley Authority
KfW	German Development Bank
LEMA	consortium of Lyonnaise des Eaux, Montomery Watson and Arabtech
m^3	Cubic meter
MEDA	Financial instrument of the European Union for the implementation of the Euro-Mediterranean Partnership
MOA	Ministry of Agriculture
MOE	Ministry of Environment
MOF	Ministry of Finance
MOH	Ministry of Health
MOMA	Ministry of Municipalities
MOPIC	Ministry of Planning and International Cooperation
MWI	Ministry of Water and Irrigation
NGO	non governmental organization
NGWA	Northern Governorates Water Administration
NWRCC	National Water Reuse Coordination Committee
O&M	Operation and maintenance
OMS	Operation and Management Support (a GTZ project)
PMU	Program Management Unit
PSP	Private Sector Participation
SBR	Sequencing Batch Reactors
SMART	Integrated Water Resources Management in the Lower Jordan Rift Valley - Sustainable Management of Available Water Resources with Innovative Technologies
UASB	Upflow Anaerobic Sludge Blanket
UNDP	United Nations Development Programme
USAID	United States Agency for Development
WAJ	Water Authority of Jordan
WWT&R	wastewater treatment and reuse
WWTP	Wastewater treatment plant

FOREWORD

This report has been prepared in the context of the research project “Integrated Water Resources Management in the Lower Jordan Rift Valley - Sustainable Management of Available Water Resources with Innovative Technologies” (SMART) funded by the German Ministry of Education and Research (BMBF). Within this multi-country, multi-disciplinary project, one component deals with research on opportunities for the mobilization of additional water through decentralized wastewater treatment and reuse (WWT&R). This topic is being addressed in a multi-disciplinary way, taking technological, economic, social and institutional aspects into account. This report focuses on the institutional framework conditions and prerequisites for a decentralized WWT&R. As such, it represents Part I of Deliverable 703: “Report on institutional prerequisites and market potential of decentralized wastewater treatment plants”. Part II of D 703 is presented in a separate report entitled: “Demand for and interest in Decentralised Wastewater Treatment and Re-use: An empirical analysis of stakeholder views” (Lienhoop and others 2008). Research leading up to this report was conducted between March 2007 and July 2009.

1 INTRODUCTION: DECENTRALIZED WWT&R AND THE ROLE OF INSTITUTIONAL ASPECTS

Since the mid 1990s a paradigm shift has been advocated to move from centralized to a decentralized wastewater management (Venhuizen 1997). Instead of a “linear” model where freshwater is used to flush wastewater and the treated wastewater is disposed into rivers, it is suggested to close cycles of fluid and solid waste flows at a local level. A frequently quoted definition defines decentralized wastewater management as the collection, treatment and reuse or disposal of wastewater at or near its point of generation (Crites and Tchobanoglous 1998). Such decentralized approaches are expected to serve certain, in particular remote, areas at less cost and to provide additional benefits in the form of additional locally available sources of water and biomass (Hamilton and others 2004, Wilderer and Schreff 2000). It is also argued that these solutions are more flexible under conditions of demographic and global change and reduce the risks of large infrastructures investments (Hamilton and others 2004).

Obviously, this concept is principally of great relevance for (semi)-arid countries, such as in the Middle East (Bakir 2001). However, experience worldwide indicates that it proves difficult to implement appropriate technologies for wastewater re-use due to institutional barriers and public opposition (Dolnicar and Saunders 2006, Hurlimann and McKay 2006, Steenvoorden 2004). Furthermore it is even less clear what the specific institutional prerequisites for decentralized approaches are. Do ‘decentralized’ physical solutions also require a decentralized decision-making and management approach? In principle it is possible to distinguish different institutional settings or regulatory frameworks on the one hand and different operators for wastewater treatment and reuse (WWT&R) on the other as indicated in Table 1. Alternative institutional settings could be that the decision-making and oversight responsibility is with the municipality, a regional water authority or a central authority. In terms of operation, the responsibility could be with the respective property owner, a group of owners (community-based initiative), a municipality, a utility owned by the municipality, a private company, a non governmental organization (NGO), a regional utility or the water authority. This raises two questions: (1) How do the alternative institutional settings compare with respect to the feasibility of small-scale WWT&R and is one particular setting more conducive towards these solutions than another? (2) How do alternative operators compare with respect to the sustainable operation of small-scale WWT&R facilities?

With respect to the choice of alternative institutional settings, at a first glance it might seem that a decentralized regulation is more conducive towards ‘decentralized’ physical solutions and their management. But, of course, this does not need to be the case. Therefore, it was

decided to study a case where the main decision-making is with the central government level and to analyze to what extent such a centralized institutional setting is conducive towards the implementation of decentralized WWT&R.

Table 1 Possible Institutional Settings & Operating Models for Decentralized WWT&R

	Possible institutional settings/ regulators		
Possible operators	Municipality	Regional water authority	Central water authority
Property owner			
Group of owners			
Municipality			
Utility (owned by municipality)			
Private company			
NGO			
Regional utility			
Water authority			

Source: Own compilation

Against this background in the following an investigation of the institutional framework conditions for the implementation of decentralized WWT&R solutions in Jordan will be presented. This included (1) an assessment of the formal institutional framework conditions (policy and legal documents), (2) the identification of existing operators for wastewater treatment plants (WWTPs) and (3) an analysis of perceptions on the respective institutional framework conditions and alternative operators among government representatives at different levels of administration. Section 2 will introduce into the case study and present the methodology. Section 3 will introduce into Jordan's wastewater policy. Section 4 will identify the institutional actors responsible for WWT&R and their legal competences in Jordan. Section 5 will present the range of existing types of operators of public and private wastewater treatment plants in Jordan. Section 6 will present perceptions on decentralized WWT&R and related competences and potential operators among government representatives at different levels of administration. Building upon these analyses, Section 7 will draw conclusions on the question whether decentralized WWT&R is institutionally feasible in centralized institutional settings. It will also provide an initial discussion of the advantages and disadvantages of alternative operators for decentralized WWT&R. From a practical perspective, this study provides a collation of the institutional framework conditions under which any decentralized WWT&R project would have to be implemented in the Jordanian context and an initial assessment of stakeholder views.

2 CASE STUDY AND METHODOLOGY

Jordan is one of the water scarcest countries in the world, featuring an average water availability of about 145 cubic meters per capita and year (m^3/c/a) (GOJ 2009). The Jordanian government first endorsed the reuse of treated wastewater in 1978 (Haddadin and Shteiwi 2006). In terms of the institutional setting in Jordan the main decision-making powers in the water sector are with the central government. Furthermore, so far, mainly a centralized approach towards WWT&R has been pursued. In 2008, there were 21 public WWTPs in the country, connecting nearly 62 % of the population and treating about 100 MCM/a (GOJ 2009). While these plants differ considerably in size, they are commonly characterized as centralized plants. Furthermore, about 70% of all treated wastewater is being treated in one plant (Khirbet As-Samra), and the large majority of the treated wastewater is being reused for irrigation in the Jordan Valley (blended with surface water), implying a centralized approach towards wastewater reuse.[1] In addition, there are about 40 private WWTPs in Jordan, run by industries, hotels, universities and hospitals. About 90% of the treated wastewater is being reused (GOJ 2009).

At the same time, a study on the identification of possible sites for decentralized WWT&R within the SMART project shows that in total there is a rural population of about 660,000 in the Jordanian part of the Jordan Basin that are either not connected to centralized plants or that are not expected to be connected in future (Afferden and others 2009). These 660,000 people produce about 20 MCM/yr of wastewater that could be treated and reused in a decentralized manner. Additional potential exists in semi-urban areas (ibid.).

In order to explore factors promoting and inhibiting a decentralized WWT&R in a first step the relevant actors in the wastewater sector were identified and the allocation of competences to make decisions, own, operate and finance decentralized WWT&R was analyzed. This analysis of the formal institutional framework conditions was based on a comprehensive analysis of legal and policy documents and a set of exploratory interviews (for interview partners see Section 8.4).

In addition the perceptions of government representatives at different levels of administration on institutional prerequisites were enquired. In order to do so semi-structured interviews were carried out at the central government level, the governorate level and with representatives of municipalities not yet connected to wastewater systems (Table 2 and Section 8.4). At the village level, data collection focused on three villages that had previously been selected

[1] In the SMART project, for pragmatic reasons it is assumed that any plant serving less than 5000 person equivalents can be considered as a decentralized solution.

within the SMART project as potential test sites for decentralized WWT&R, the villages Ira, Yarqa and Al-Ramah. In addition, interviews were carried out with four development experts. Qualitative interviews were used as they are particularly suited to describe individual perceptions. The questionnaire for these interviews is presented in Section 8.5. All interviews and focus groups were tape-recorded and transcribed. Arabic transcripts were translated into English.

Table 2 Semi-structured Interviews Carried Out

Stakeholder group	Institution	Number of interviews	Language	Date
Central Government	MWI & WAJ	3 face-to-face interviews	English	January 2008
Governorate	Irbid & Balqa	5 face-to-face interviews	English	January 2008
Municipal councils	Ira, Yarqa & Al-Ramah	2 face-to-face interviews	Arabic	April 2008
Development experts	KfW, GTZ, Consulting	4 face-to-face interviews	German, English	February & June 2008

3 JORDAN'S WASTEWATER POLICY

Starting from the late 1990s, Jordan's water and wastewater policy was guided by a set of policy papers prepared in 1997 and 1998. This included the *Water Strategy for Jordan* (MWI 1997), the *Wastewater Management Policy* (MWI 1998d), the *Water Utility Policy* (MWI 1998c), the *Irrigation Water Policy* (MWI 1998a), and the *Groundwater Management Policy* (MWI 1998b). These policies provided overall guidance on resource development and management, private sector participation and financing. In 2008 the "Royal Commission on Water" prepared a new Water Strategy entitled "Water for Life. Jordan's Water Strategy 2008-2022" that was adopted in April 2009 (GOJ 2009). This new strategy builds upon many aspects outlined in the previous strategy and policies, but it also takes some aspects significantly forward. In some areas, such as the policy for wastewater treatment in semi-urban and rural areas, it even reflects a radical policy shift from centralized to decentralized treatment. The 2009 Water Strategy also foresees are fairly radical reform of Jordan's water governance structures (see Section 4.1.4).

Already the 1997/1998 strategy and policies had stated that treated wastewater is not being considered as waste, but as an *integral part* of the overall water budget. This is reiterated by the 2009 strategy (p. 6-3).

With respect to *wastewater treatment*, the 2009 Water Strategy sets the ambitious goal that adequate wastewater collection and treatment facilities shall be provided for all major cities and small towns by 2022 (p. 6-2). In addition, all major industries and mines shall have

treatment plants (p. 6-2). A Wastewater Master Plan shall establish targets for providing collection and treatment systems throughout the country (p. 6-4).[2] Priority shall be given "to situations and locations where wastewater disposal practices threaten the environmental integrity of freshwater resources and where performance of cesspools and percolation pits pollute underground water aquifers." (p. 6-5).[3] For rural areas the strategy explicitly specifies that "[d]ecentralized treatment plants shall be built to serve semi-urban and rural communities" (p. 6-3). Furthermore, decentralized treatment plants shall also be explored for new urban settlements (p. 6-2). The exploration of decentralized treatment represents a radical shift compared to the 1998 Wastewater Management Policy. The latter had stated that "*central* treatment plants shall be built to serve semi-urban and rural communities" (§ 6).[4]

Similar to statements in the 1997 strategy (§12), the 2009 strategy states that *technologies* shall be selected with due consideration to sustainability, energy consumption and quality assurance of the effluent (p. 6-4). It is also reiterated from the previous policies that innovative approaches shall be established with respect to wastewater treatment for the small municipal systems (GOJ 2009: 6-4, MWI 1998a: § 19). A new aspect mentioned in the 2009 Water Strategy is that new high-rise building shall use greywater for non drinking purposes (p. 6-2) and the concept of the use of greywater shall be embedded in building and plumbing codes (p. 3-3). Another new aspect is that all new wastewater projects will require an Environmental Impact Assessment study (p. 6-3) and an Environmental Management Plan (p. 3-6).

In terms of *wastewater reuse*, the 2009 strategy puts forward that treated wastewater shall be fully reused by 2022 (p. 1-2). In doing so it is being emphasized that the whole range of possible applications of treated wastewater shall be considered, including reuse in irrigation, industry, landscaping and groundwater recharge (p. 2-5, 6-3). While all these applications had already been mentioned in the 1997/1998 policy set, it can be argued that the former policies still had put greater emphasis on wastewater reuse in agriculture. Instead the 2009

[2] This had previously been mentioned in the Water Utility Policy (MWI 1998b, Section 6).

[3] This had previously been stated in § 39 of the Wastewater Management Policy (MWI 1998a).

[4] Upon the question, whether decentralized WWTP would be useful for Jordan, a governorate level WAJ employee explicitly stated: "The Water Authority has a policy to use centralised plants." Hence, this policy was not just a statement on paper but well known. It was also reflected in Jordan's Investment Plan for the water sector for the period 1998-2010.

strategy stresses that treated wastewater shall be used for activities that provide the highest return to the economy (p. 6-2, 6-3).[5]

The 2009 strategy also puts great emphasis on the *enforcement* of wastewater related regulation, an issue that had practically been absent in the 1998 Wastewater Management Policy. Standards for wastewater and sludge treatment and reuse for different users shall be updated (p. 3-5) and standards for the use of septic tanks in rural areas shall be issued (p. 6-3). Effluent quality from WWTPs shall be regularly monitored (p. 6-3). Monitoring is also foreseen for crops irrigated with treated wastewater (p. 6-6) and the groundwater quality near plants shall be observed (p. 6-6). The institutional capacity for enforcing wastewater regulations shall be established (p. 6-5). For industries, incentives shall be provided to meet the standards set for wastewater reuse (p. 6-3). Water quality laboratories shall be upgraded and staff be trained (p. 6-6).

A key element of the 1997 strategy and 1998 set of policies was the promotion of *private sector participation* (PSP). The idea was to enhance performance through management contracts or concessions and provide additional investment funds, for instance through build-operate-transfer (BOT) schemes (e.g. MWI 1998b: Section 3). At the same it was emphasized that private sector participation shall take place within the government's objectives and priorities, and that the impacts of private sector participation shall be assessed and negative impacts be mitigated (e.g. MWI 1998a: § 59). These concepts were also explicitly promoted in 1998 Wastewater Management Policy, and BOT was also considered for new wastewater treatment plants (MWI 1998b: Section 2). The 2009 strategy still builds strongly upon private sector participation, but the concept is not being pushed any more as vigorously: "We will expand the role of the private sector. Management contracts, concessions and other forms of private sector participation in water utilities shall be considered and adopted as appropriate. Micro-PSPs … will be used for performance-based outsourcing of operational tasks... We will encourage and expand the private sector's role in the distribution of retail water, wastewater, treated effluent and irrigated water." (p. 4-6).

In terms of *pricing* for wastewater treatment and reuse, the 1998 Wastewater Management Policy had laid out the following principles: (1) cover at least operation and maintenance (O&M) costs of treatment and aim at the recovery of capital cost for treatment, (2) account for the polluter-pays principle, (3) differentiated charges are possible, and (4) the price of

[5] For instance, the *Irrigation Water Policy* (1998) had stated that treated wastewater will constitute a "substantial percentage" (Background) of the irrigation water stock. The 2009 strategy reiterates the importance of treated wastewater for agriculture, but qualifies this statement by emphasizing that "other uses of treated wastewater that demonstrate adequate social and economic returns will also be vigorously pursued." (MWI 2009: 5-1).

treated wastewater should at least cover O&M costs of delivery (§33-36). These principles are repeated, but partially also considerably sharpened in the 2009 Water Strategy. With respect to cost recovery, it states: "Jordan will set wastewater charges, connection fees, sewerage taxes and treatment fees to cover at least the operation and maintenance costs plus part of the investment cost. The ultimate aim is for a full cost recovery to be achieved within five years." (p. 4-7). As such, the water strategy now provides an ambitious time-frame until when full cost recovery shall be achieved.[6] In terms of the differentiation of charges, the new strategy explicitly states that different fees will be structured for different geographical areas: "This shall be assessed for each geographical area as a function of the cost to deliver water to the area, end uses and effluent quality and will be subject to economic and social considerations." (p. 4-7). It is being acknowledged that "all private and public operators need to be able to set tariffs for their customers, approved by a regulatory authority, while ensuring that the poor receive water for basic needs." (p. 4-6). Furthermore, it is explicitly said that users willing to contribute to the cost of the services in addition to fees and charges set by laws and regulations shall be given priority." (p. 6-5).[7] With respect to the pricing of treated wastewater, the old objective is being repeated in the 2009 strategy: "We will sell treated effluent at a price covering at least the operation and maintenance costs of delivery." (p. 4-7).

4 INSTITUTIONAL ACTORS AND THEIR LEGAL COMPETENCES IN THE PROVISION OF DECENTRALIZED WASTEWATER SERVICES

Jordan, according to its constitution of 1952, is a hereditary monarchy with a parliamentary system. It is characterized by a three-tiered government system at present consisting of a central government, 12 governorates and 99 municipalities. Overall, the main decision-making power lies with the central government, and important public services such as health care, education as well as water supply and sanitation are being provided by the respective line ministries through their regional branches within the governorates. Furthermore, since the mid 1990s, the government promotes the participation of the private sector in the provision of these services. In addition, the new 2009 Water Strategy mandates a comprehensive institutional reform of the water sector. In parallel, there have also been moves towards a greater decentralization and delegation of powers to the governorate and

[6] According to the Water Utility Policy (1998) the plan had been that the Ministry would set municipal wastewater charges at a level which will cover at least the cost of operation and maintenance by the first quarter of 1998. However, to date this target has not yet been achieved (see below).

[7] This had also previously been stated in § 39 of the Wastewater Management Policy (MWI 1998a).

municipal levels with a reform of the Civil Service Bylaw in 1998 (Work 2002), a municipalities' reform in 2001/2002 and a new Municipalities Law in 2007. In the following, the current decision-making powers with respect to WWT&R projects (Section 4.1), financing powers (Section 4.2) and responsibilities for monitoring (Section 4.3) will be analyzed.

4.1 Competences to make decisions

The main actors in the Jordanian water sector and their responsibilities are laid out in Figure 1. The Ministry of Water and Irrigation (MWI) sets policies which are implemented by the Water Authority of Jordan (WAJ). All decisions with respect to public wastewater projects are taken at the central WAJ level, and implemented through the regional branches of WAJ in the governorates. Furthermore, since 2001, WAJ may transfer the operation and ownership of wastewater projects to other entities, such as the private sector, municipalities or non-governmental organizations. Any decision on such management transfers needs to be approved by the Council of Ministers (COM). In addition to WAJ, the Jordan Valley Authority (JVA) is responsible for all aspects related to socio-economic development in the Lower Jordan Valley below the 300 meters contour line (not indicated on Figure 1). In order get a more thorough understanding of these decision-making powers, the powers and responsibilities will be discussed for the central government level (Section 4.1.1), the governorate level (Section 4.1.2) and the municipal level (Section 4.1.3) separately. In Section 4.1.4 the envisioned institutional reforms will be summarized.

4.1.1 Central government level

In Jordan the most important institutions responsible for decision-making on wastewater treatment and reuse are the Ministry of Water and Irrigation (MWI) and the Water Authority of Jordan (WAJ) at the central government level. In addition, the Jordan Valley Authority (JVA) is responsible for water resource projects in the Jordan Valley.

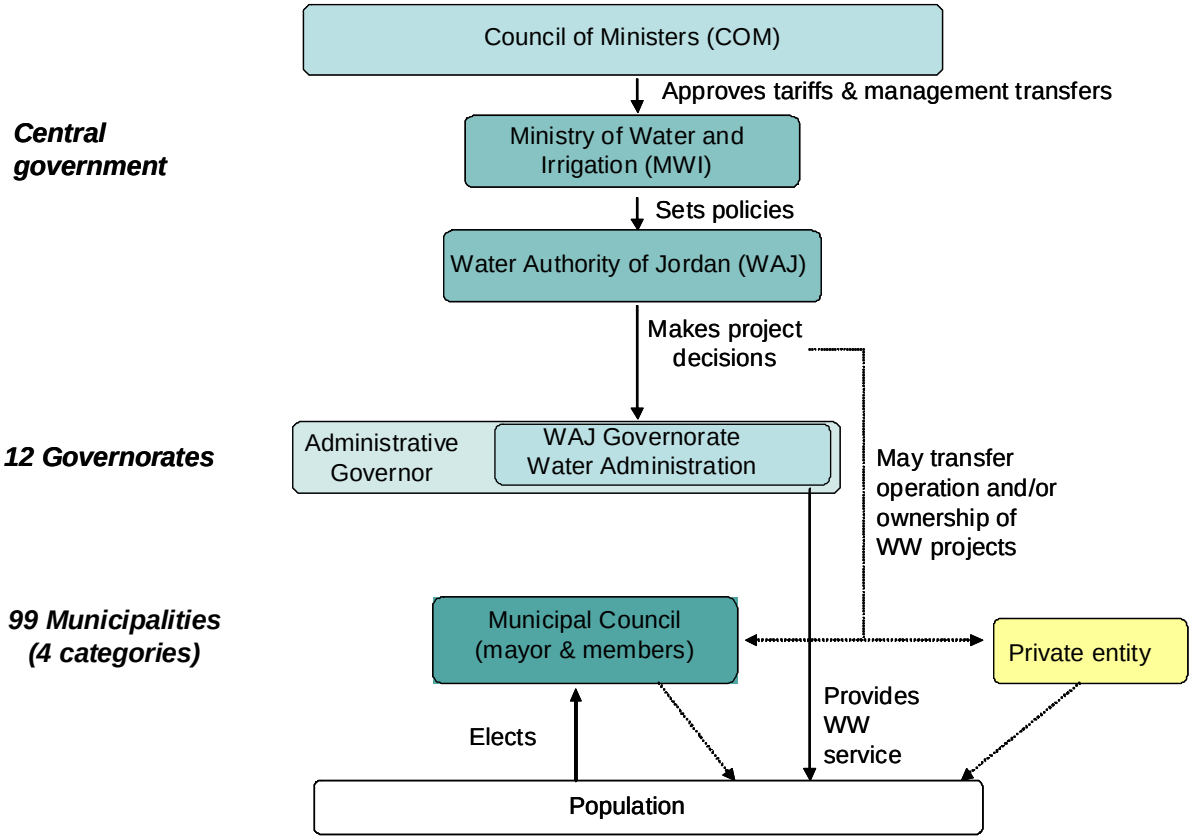
The *Ministry of Water and Irrigation* was established in 1988/1992 on the basis of By-Law No. 54 for 1992. The Ministry carries the responsibility for all water and wastewater systems and projects and sets forth a water policy (MWI By-Law Art. 4 – see Box 1, WAJ Law article 5). It is also responsible for centralized data management and the procurement of financial resources. The Minister approves policy decisions, including tariff changes and the transfer of responsibility for the management of wastewater services, and submits its recommendations the Council of Ministers for approval. The MWI "embraces" the Water

Authority of Jordan (WAJ) and Jordan Valley Authority (JVA) as the two most important entities dealing with water in Jordan.[8]

Box 1: Excerpt from MWI By Law No. 54 for 1992

Art. 4: … the Ministry shall assume full responsibility for water and public sewage in the Kingdom as well as the projects pertaining thereto, formulation and transmission of the water policy to the Council of Ministers for adoption.

For the wastewater sector the Ministry is responsible for the development of a wastewater master plan, which establishes targets for providing wastewater collection systems and treatment facilities to unserved areas throughout the country (MWI 1998b and GOJ 2009).[9]



Source: own compilation.

Figure 1 Responsibilities for the Provision of Public Wastewater Services in Jordan

[8] http://www.mwi.gov.jo/mwi/role.aspx, accessed Jan. 17, 2008.

[9] While WAJ is involved in an ongoing planning process for the construction of new wastewater treatment plants, so far no formal Wastewater Master Plan has been issued (Kilani 2009).

As a special task force within the MWI in 1997 the *Program Management Unit* (PMU) was established for the purpose of administering projects with private sector participation (PSP). Its first responsibility was a management contract for the water and wastewater services in Jordan's capital in 1999, as well as for the execution of a large capital investment programme for Greater Amman's water supply facilities. Building up on these tasks and also being the counterpart of the GTZ OMS project[10], the PMU subsequently took over other PSP assignments, including administering the As-Samra BOT project (see Section 5).[11] Current activities centre on promoting the commercialization of the sector and advancing PSP and developing and promoting performance monitoring practices of water utilities as a foundation for the creation of an independent regulator for the water sector.[12] It operates under the supervision of an Executive Management Board, which is headed by the Water Minister (GTZ 2006)

The *Water Authority of Jordan* is a semi-autonomous body within the MWI (GTZ 2006) that was first established in 1983 and whose duties were put on a permanent basis in 1988 through the Water Authority Law No. 18 for 1988 last amended in 2001 (see excerpts in Box 2). With the establishment of WAJ, the responsibility for the planning and the implementation of public wastewater projects was transferred from the planning divisions of the municipalities to WAJ (WAJ Law Art. 23 & Art. 6). WAJ is responsible for the collection, treatment and disposal or reuse of wastewater. While the planning takes place at the central government level (the head quarter (HQ) of WAJ), implementation and O&M is usually carried out through the Governorate water administrations of WAJ (see Section 4.1.2). The WAJ Planning and Studies Directorate is responsible for new wastewater projects. The Water Reuse and Environment Unit, established in 2003, coordinates reuse activities and is responsible for the signing of agreements between WAJ and re-users.[13] The Water Reuse Unit is supported by the National Water Reuse Coordination Committee (NWRCC) with broad representation to eliminate overlaps between ministries.[14]

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[10] The objective of the Operations Management Support (OMS) project is to increase the efficiency of drinking water supply and wastewater services through business process re-engineering, decentralisation and commercialisation of utilities and introduction of private sector participation (Rothenberger and others 2009).

[11] http://www.pmu.gov.jo/Home/AboutUs/PMUHistory/tabid/61/Default.aspx, accessed July 14, 2009.

[12] http://www.pmu.gov.jo/Home/AboutUs/Organization/tabid/62/Default.aspx, accessed July 14, 2009.

[13] http://www.waj.gov.jo/English/reuse/reuse.htm, accessed June 17, 2009.

[14] http://www.waj.gov.jo/English/reuse/national_committee.html, accessed May 8, 2009. The NWRCC comprises representatives of the Royal Court, Ministry of Environment, Ministry of Health, Ministry of Agriculture, Jordan

Box 2: Excerpts from WAJ Law No. 18 for 1988, last amended in 2001

Art 6.d. … the Authority shall… [s]tudy, design, construct, operate, maintain, and administer water and public wastewater projects including collecting, purifying, treating, disposing of water and wastewater, and the methods of dealing with water.

Art. 23.A): … all duties… related to … public sewerage, which were previously the responsibility of any governmental department… or municipality, shall be transferred to the Authority.

Art. 23.A).2… Each [Water] Department shall have a Water Council composed of representatives from the governmental and private sectors concerned with water and public sewerage. This is to allow citizens and local authorities to participate in deciding priorities regarding water and wastewater projects and plan for their implementation.

Art. 27. No official or local person or party is permitted to carry out any works related to water and wastewater of any nature, if these works are considered to be within the sole responsibility of the Authority under this Law and the regulations issued in accordance with it, except after obtaining the Minister's written approval.

Art. 28. The Council of Ministers, upon the recommendation of the Minister, may assign any of the Authority's duties or projects or the execution of any stage or part thereof to any other body from the public or private sector, or to a public shareholders company, or to a limited-liability company owned totally by the Authority or in which the Authority contributed to the capital. Such assignment may include the transfer of the management of these projects or the lease thereof, or the transfer of ownership to any of these bodies, in accordance with the conditions and for the durations to be set in the contracts that shall be concluded for this purpose, provided that they abide with the legal provisions in force relating to leases and transfer of ownership.

Since 2001 the management and also the ownership of wastewater projects or parts thereof may also be transferred to any other body from the public or private sector (WAJ Law Art. 28). The decision has to be taken by the Council of Ministers, upon the recommendation of the Water Minister. Different types of existing operators are described in Section 5.

The WAJ also registers private WWTPs if they discharge into public watercourses or in the public sewer system.

According to USAID (2005b) a Wastewater Committee comprising MWI and WAJ officials as well as experts from the private sector, universities or the donor community used to provide guidance on planning and policies, however, according to Kilani (2009) the wastewater committee is not active any more.

In order to allow citizens and local authorities to participate in deciding priorities regarding water and wastewater projects according to WAJ Law Art. 23 Water Councils shall be established within the Water Departments (Governorate Water Administrations). The Water

Valley Authority, National Centre for Agricultural Research and Technology Transfer, Royal Scientific Society, Farmers Union, universities and the private sector.

Council shall be composed of representatives from the governmental and private sectors concerned with water and public sewerage. However, according to Kilani (2009) Water Councils have never been established. Still, in the planning process of new WWTPs, WAJ typically consults with local stakeholders on the location of plants (USAID 2005a, Kilani 2009).

The *Jordan Valley Authority* was established in 1977. Its current duties are reflected in JVA Law No. 19 for 1988, last amended in 2001 (for excerpts see Box 3). JVA is responsible for socio-economic development including the management of water resources and the development, operation and maintenance of irrigation facilities in the Jordan Valley below the 300 meters above mean sea level contour line north of the Dead Sea and below the 500 meters contour line south of the Dead Sea. Wastewater services are not explicitly mentioned in the JVA Law, however, Art. 3.a mentions the protection of water resources.

Box 3: Excerpts from JVA Law 19 for 1988, last amended in 2001

Art. 3. The… Jordan Valley Authority … shall carry out the social and economical development of the Valley…

> a. The development of the water resources of the Valley and utilizing them for purposes of irrigated farming, domestic and municipal uses, industry, generating hydroelectric power and other beneficial uses; also their protection and conservation and the carrying out of all the works related to the development, utilization, protection and conservation of these resources,…
>
> e.2. The Authority may by a decision of the Cabinet of Ministers upon recommendation from the [JVA] Board, entrust any of the projects it has implemented or implementing or is managing, to any entity from the private sector whether by leasing, management or operation, in accordance with the effective laws and regulations. As for property transfer, irrigation projects and water resources development projects are excluded from such transfer.

Art. 6. It is possible that the authority upon a resolution to be issued by the Cabinet of Ministers and recommendation from the [JVA] Board handover any project … to any Ministry or Governmental Department or Public Agency or Municipality, that is excluding Water Resources Development Projects and Irrigation Projects in the Valley.

In fact there appears to be some uncertainty with respect to the allocation of competences for wastewater projects in the Jordan Valley between WAJ and JVA (USAID 2005a: 10). In the past, this had not been an issue as the first wastewater treatment plant in the Jordan Valley serving residential users only became operational in Tel Al Mantah in November 2004. In this case JVA and WAJ jointly control the project. While WAJ manages the WWTP itself, a local cooperative under the authority of JVA manages the reuse activity (USAID 2005a). Hence, JVA would have to be consulted for any decentralized WWT&R project in its area of mandate.

A potential problem with private sector or municipal participation in reuse projects in the Jordan Valley is that the private sector can not attain control of JVA property and that municipalities appear to be excluded from transfer activities: According to the 2001 amendment of the JVA law JVA may transfer, upon a decision by the Cabinet of Minsters, the management and operation of water resources projects to private sector entities, but it does not allow the transfer of ownership of these projects (Art. 3.e.2). Furthermore a transfer of a JVA water resources project to another government agency or municipality apparently is not allowed either (Art. 6). Hence, in this case the opportunities for certain operational models would be limited.

4.1.2 Regional/governorate level

In Jordan, the regional level comprises the governorate, the districts and sub-districts (UNDP 2003). The main decision-making instance at the level of the twelve governorates is the Administrative Governor (Mutassarif) who represents the King at the governorate level. The governor is appointed by the King and the Royal Court and reports to the Ministry of Interior. The governor is responsible for security and for controlling service delivery in cooperation with concerned line ministries (USAID 2005a). The governor is assisted by two councils (UNDP 2003). The Executive Council comprises local representatives of different ministries. It is responsible for the implementation of decisions by the ministries at the regional level (UNDP 2003). It also proposes lists of priority projects and associated costs to the central government which, in turn, decides on plans and projects and on the allocation of funds required. The Advisory Council comprises Parliament members, mayors of municipalities, NGOs and trade unions, as such allowing for input by local leaders, but does not have decision-making power (USAID 2005b: 6).

At least in the past, service delivery was dealt with in the regional branches of the line ministries. In the case of wastewater these were and are the regional branches of WAJ or the so called Governorate water administrations. However, the decision making powers of these Governorate water administrations are limited as they are fully dependent on WAJ HQ with respect to human resources management, budget disbursement, financial management, workshop services, billing and revenue collection (Rothenberger and others 2009).[15]

In 1998 WAJ started a process to separate governance and operational functions in water and wastewater service delivery on the one hand, and bulk and retail service delivery on the other and to promote private sector participation (see Section 4.1.4). The vision is to transform the Governorate water administrations into utilities operating on a commercial

[15] See also http://www.mwi.gov.jo/mwi/(WAJ)%20Role.aspx., accessed May 8, 2009.

basis. In consequence a process of decentralization and commercialization started and at present different forms of operating models exist in parallel (see Section 5).

4.1.3 Municipal level

Municipalities represent the lowest level of government. The competences of municipalities are regulated in the Municipalities Law No. 14 for 2007. The municipality is a civil institution with administrative and financial independence. Its aim is "to draft, implement and follow-up plans and programmes to achieve sustainable development with the participation of the local communities and to … manage all local services, facilities and projects assigned to it by itself or through participation with the private sector and/ or civil society organizations" (Municipalities Law 2007, Art. 3.A).

While at least some larger municipalities (such as the city of Salt) historically used to play an important role in service provision (Kadhim 2008), in the second half of the 20th century many of these functions, such as provision of water, education and health services were taken over by the respective line ministries. For instance, according to the Municipalities Law No. 29 for 1955 the municipalities had been responsible for the provision of water services. However, with the establishment of WAJ in the 1980s these functions were transferred to WAJ. Still, as mentioned above, since 2001 WAJ may transfer management responsibilities for the operation or the ownership of water and wastewater projects to other entities including municipalities. This option is being used in two USAID projects (see Section 5.1.4).

Beyond these changes in the WAJ Law, in the last decade there have been some further moves towards decentralization and the strengthening of the role of municipalities. In 2002, the total number of municipalities was reduced from 323 to 99, as such giving more clout to municipalities by merging smaller municipalities.

Municipalities are classified into four categories:

Category 1: Municipalities of governorate centers and any other municipality whose population exceeds one hundred thousand

Category 2: Municipalities of district centers and municipalities whose population exceeds fifteen thousand and does not exceed a hundred thousand

Category 3: Municipalities of sub-district centers and municipalities whose population exceeds five thousand and does not exceed fifteen thousand

Category 4: Other municipalities not mentioned in categories one, two and three (Municipalities Law, Art. 4).

With the exception of the capital city of Amman, the administration of the municipality is assumed by the Municipal Council consisting of the mayor and the council members (Art.

3.B.1). Since the reform of the Municipalities Law in 2007 the mayor and the council members are directly elected for a four-year term (Art. 3.B.2).[16] Previously only 50% of the council members were elected, and the remaining 50% and the mayor were appointed. The Municipalities Law of 2007 furthermore lists specific functions of the Municipal Council, "subject to the terms of any other legislation". These include "Sewage system: Drain storm water, construct, manage and monitor public toilets and sanitary utilities", "Janitorial services", "Street planning, including street sanitation", and "Building licenses: ensure satisfying sanitary conditions" (Art. 40). Wastewater services are not mentioned as function.

The performance and activities of the municipalities are supervised, monitored and guided by the Ministry of Municipal Affairs.[17]

Since 1983, several municipalities may establish so called Joint Service Councils for the performance of specific tasks. The decision to establish a Joint Service Council is taken by the Minister of Municipal Affairs upon the Governor's recommendation (Art. 40.H). At present, there are 22 Joint Service Councils in Jordan, 16 of them are responsible for the supervision of waste dump sites.[18]

According to the Municipalities Law the municipality's revenues consist of "taxes, fees and other monies imposed, contracted or accrued under the terms of this law … or any other law or regulations that provide for levy of municipality taxes or fees (Art. 45). These local taxes and fees include for instance property tax, education tax, vocation, craft and industries license fees or garbage collection fees (Art. 12 A.3). Further sources of income include: 6 % of fees levied on petroleum (Art. 48), 40 % of fees levied on vehicle acquisitions (Art. 49), and 3 % of the value of auctioned movable assets within the municipality (Art. 47), and fines levied on violations against the traffic law and health and municipality violations (Art. 50).

Furthermore, the municipal council may borrow money "from any agency after taking the Minister's approval on the agency giving the loan" (Art. 44). The main credit institution for municipalities is the Cities and Villages Development Bank (CVDB). The CVDB also collects government revenues such as fuel taxes, motor licensing fees and penalties and violation returns and distributes them to the municipalities as provided by the Council of Ministers.[19]

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[16] http://ajloun.blogspot.com/2007/02/new-municipalities-law.html, accessed May 27, 2009.

[17] http://www.moma.gov.jo/Eng/Ministry/Strategy.aspx, accessed May 27, 2009.

[18] http://www.moma.gov.jo/Eng/Council/About.aspx, accessed May 27, 2009.

[19] http://www.moma.gov.jo/Eng/Bank.aspx, accessed May 26, 2009.

Overall the administrative and financial capacity of Jordanian municipalities is said to be low. A 1995 World Bank study found that Jordanian municipalities only had access to 5.5 % of public budget compared to 20-30 % in other developing countries (USAID 2005a). According to Kadhim (2008) the weakness of the local governance structures in Jordan is not a legislative problem, but a human resource and financial problem.[20] For instance, on average municipalities only collect 20-30% of the local taxes, such as property tax and professional licensing fees, they should collect. According to his assessment municipalities lack both the capacity to follow up and the will to collect these local taxes, as they may not want to upset those who elected them. In contrast, the ministries in the capital and the main cities tend to have more qualified people and are better funded in terms of public sector funding and tend to be reluctant to relinquish power. At the same time, according to Kadhim (2008) at the highest level, the political will exists to strengthen local governance, and the Ministry of Municipal Affairs is pushing strongly towards the idea that municipalities should play a role in development and the in the provision of services.[21] The Ministry of Planning and International Cooperation (MOPIC) also sought to build capacity and to strengthen local governance institutions through its Enhanced Productivity Program (USAID 2005a: 12).

4.1.4 Envisioned institutional reforms

In Jordan, there is an ongoing discourse on adequate institutional reforms in the water sector, and the sector is being involved in an ongoing process of reform. A number of key aspects for reform were put forward in the 1998 Water Utility Policy. It stated that the Ministry of Water and Irrigation would remain as a government entity responsible for sector governance. Furthermore WAJ and JVA were supposed to become smaller organizations responsible for service delivery, financially separating their bulk and retail water delivery functions, and introducing cost accounting methods based on generally accepted accounting principles. The main role of WAJ would then be to manage the existing bulk supplies and to sell the water to retail utilities and to monitor the respective contracts. With respect to JVA it was mentioned that the development of the Jordan Valley would be re-assessed, and the

[20] A representative of the Ministry of Municipal Affairs confirmed that municipalities have not the mandate to invest in wastewater, and that even if they wished to do so their revenues were too limited (Zivadat 2007).

[21] For instance, in January 2005, King Abdullah announced an initiative to decentralize political and fiscal authority and to transfer service delivery from the parliament and central ministries to directly elected local councils http://carnegieendowment.org/files/Jordan_APS.doc**,** accessed in January 2008. However, according to Article 55 A of the 2007 Municipalities Law, the budget of municipalities still needs to be endorsed by the Minister of Municipal Affairs.

role of the JVA be defined accordingly. At the same time, the private sector was supposed to assume a greater role.

The 2009 Water Strategy incorporates many of these points, but all in all presents a more radical plan for an institutional reform of the water and wastewater sector. It criticizes that the three water sector institutions MWI, WAJ and JVA function in near isolation from each other, that communication among them is limited and that they even face conflicts of interests. Other problems include the overstaffing and exodus of talent to the private sector. The strategy also acknowledges overlapping responsibilities with other ministries. It is also mentioned that a "top-down approach is applied and stakeholders are normally not involved in the decision making process" (p. 4-1). Major challenges are that tariffs do not cover total costs, and the sector requires significant additional investment (p. 4-1).

Against this background, the main idea is to prepare a new Water Law that redefines the structure and the functions of the institutions governing the water sector and that clarifies the responsibilities of the different water-related ministries. The new water sector institutions are supposed to operate in a way that separates governance and operational functions on the one hand, and 'wholesale' and 'retail' operations on the other. The future institutions shall include a water ministry, a water regulatory commission, a water council, a water authority, utilities for distribution and agricultural water user associations. The reform shall take place within the next two to five years.

A future water ministry will be responsible for sector governance including policy formulation, monitoring of sector performance and maintaining a dynamic National Water Master Plan. It will run a geographic information system (GIS) based centralized water data base and a Water Information System (p. 4-3 f.).

The proposed Water Council is supposed to provide a forum for input from various water-using sectors (including public and private sector representatives) and other water-related ministries. It shall analyze and endorse policies and regulations for the water sector. Its members would be appointed by the Council of Ministers (p. 4-4 f.).

The Water Regulatory Commission is supposed to be a body independent from the government that monitors private sector involvement and ensures compliance with policies, laws and regulations. The Project Management Unit (PMU) shall transform into this function (p. 4-4).

Bulk water supply shall be developed by private consortia or companies that are moving towards privatization. WAJ will be responsible for the transmission of bulk water supply, both to major water treatment plants for urban water supply and to agricultural water user associations at head units (p. 4-4).

Water utilities would be responsible for distribution. For that purpose at least three utilities shall be established (North, Middle, South). Water user associations would organize retail distribution in agriculture (p. 4-4).

In a transition period the current processes of separating bulk and retail operations, of commercialization and private sector participation, of JVA's disengagement from all non-water functions and of the establishment of water user groups in agriculture shall be continued (p. 4-5).

4.2 Competences to finance wastewater services

The main sources of income for WAJ for investments in the water and wastewater sector are: (1) water tariffs and wastewater charges; (2) incomes from assets owned by WAJ, (3) donor grants, loans and subsidies, and (4) a portion of property taxes on net rent transferred from the Ministry of Finance to the MWI (see Box 4).

Box 4: Financing Related Articles in the WAJ Law

Article 15

The Financial Resources of the Authority shall consist of:

a. Revenues from water prices, subscriptions, deposits and other fees the Authority may collect for its services.

b. The income from movables and real estate owned by the Authority and the income of its investment projects.

c. Loans, donations and subsidies to the Authority agreed by the Council of Ministers.

d. Any Other sources of income of the Authority.

Article 21

A. All existing buildings in the kingdom... are subject to an annual contribution of 3% three percent on the net rent as evaluated in accordance with the tax on buildings and lands Law …. This contribution shall be levied together with the tax on buildings and lands, by the Ministry of Finance or any authorized official body or municipality delegated by the Minister of Finance within the municipality areas, and shall be transferred to the Water Authority as part of its financial revenues.

In setting wastewater charges, the WAJ Board makes recommendations to the Council of Ministers (WAJ Law Art. 10 f.): "f. Recommend to the Council of Ministers tariffs for connections, subscriptions, price rates and deposit fees that should be collected for various water and public wastewater uses."

Collection of wastewater fees and charges is performed by the water utilities in the governorates through the electricity bill (Sorge and others 2007). In addition, WAJ collects a

one-time connection fee to sewerage systems. Furthermore, the Ministry of Finance (MOF) collects the property tax of which 3% is earmarked for wastewater projects and conveys the earmarked amount to WAJ (irrespectively of whether the household is connected to the sewerage system or not).[22] The Ministry of Finance may also authorize any other official body or the municipality to carry out the collection of the property tax on its behalf (see WAJ Law Art. 21).[23]

As mentioned above, so far the principles for wastewater pricing were laid out in the Wastewater Management Policy (MWI 1998a) as follows: (1) cover at least O&M costs of treatment and aim at the recovery of capital cost for treatment, (2) account for the polluter-pays principle, (3) differentiated charges are possible, and (4) the price of treated wastewater should at least cover O&M costs of delivery. The 2009 Water Strategy reinforces these principles, but pushes for the implementation of full cost recovery within the next five years and for regionally differentiated prices.

With respect to the incentives to use treated wastewater for irrigation, the policies for irrigation water pricing are also of relevance. The reason is that the price of treated wastewater competes with the respective prices for irrigation water. According to the Irrigation Water Policy (1998) the price for irrigation water was to cover operation and maintenance costs at least. Full cost recovery was the ultimate objective subject to economic, social and political constraints. Due consideration was to be made of any water rights as established by law. The 2009 Water Strategy states: “We will establish the real cost of operation and maintenance and charge for irrigation water accordingly. Depreciation of assets on a yearly basis shall be added in calculating the irrigation water tariff“ (p. 4-6 f.).

In terms of the current practice on cost recovery, it is not so straight forward to get a comprehensive picture. According to MWI (2009) tariffs do not cover total costs so far. Furthermore, it is likely that in many instances even full recovery of operation and maintenance cost of wastewater treatment has not yet been achieved to date (Sorge and others 2007, USAID 2005a) – despite the plan to do so by the first quarter of 1998. According to the German Development Bank (KfW) in the Northern Governorates Water Administration (NGWA) the recovery of the O&M costs is slightly above 80% (Gramel 2008).

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[22] According to Sorge (2009) 10% of the property tax is retained by the MOF and the rest is re-distributed to municipalities. Out of this amount 20% goes to the Ministry of Water and Irrigation (MWI) in order to support the maintenance of the sewerage system (UNDP 2003). According to UNDP (2003) there were plans to change the tax paying system until 2009.

[23] According to USAID (2005b: 6) the MOF may also transfer the collection of water and wastewater tariffs to the municipality, however, it is unclear at this point whether this is really the case.

O&M recovery is also not attained with respect to treated wastewater for reuse as the price of treated wastewater is currently fixed at 0.010 JD/m³ for irrigation and at 0.050 JD/m³ in industry.[24] Any higher prices would compete with subsidized water for irrigation the price which varies between 0.008-0.035 JD/m³ in the Jordan Valley and 0-0.070 JD/m³ for agricultural water extracted from groundwater wells (Sorge and others 2007). This also implies that treated wastewater is mainly attractive in areas, where agricultural water demand exceeds supply.

With respect to the idea to differentiate tariffs, at present prices are set at the central level and increasing volumetric block pricing systems are in place for domestic water and wastewater services, with different price levels for Amman, Zarqa and other governorates respectively. In addition, a separate pricing system exists for irrigation water in the Jordan Valley. Hence, transitioning to a model in which individual service providers set own prices in cooperation with a regulating agency would represent a fairly drastic shift.

4.3 Competences to set and monitor wastewater standards

In Jordan the relevant standard for the treatment and reuse of domestic wastewater is the Reclaimed Domestic Water Standard – JS No. 893/2006.[25] This standard outlines five levels of use of treated wastewater:

1- Discharge of water to streams or wadis or water bodies

2- Artificial recharge of groundwater aquifers (used for irrigation purposes)

3- Irrigation of vegetables that are cooked prior to consumption; applies also to parks, playgrounds and roadside vegetation within city limits

4- Irrigation of fruit tree, landscapes and roadside vegetation outside of city limits

5- Irrigation of field crops, industrial crops and forest trees.

It is prohibited to use reclaimed water for irrigating vegetables that are eaten uncooked. The Reclaimed Domestic Standards distinguishes required sampling frequency for the operating and the monitoring party. The party owning the wastewater treatment plant must ensure that

[24] http://www.waj.gov.jo/English/reuse/Tariffs.htm, accessed July 13, 2009. In Aqaba, the Phosphate company pays 0.700 JD per m³ of treated wastewater.

[25] http://www.mwi.gov.jo/mwi/JS-893.aspx, accessed May 19, 2009.

the reclaimed water quality complies with the standards and carry out the required laboratory tests and document the results in official logbooks (JS 893, 6-1).[26]

The responsible institution for the setting of standards is the Jordan Institute for Standardization and Metrology (JISM). The JISM is responsible for the preparation, approval, revision, amendment of standards and technical regulations and monitors their implementation.[27] However, several ministries and institutions are involved and consulted in the process of setting standards for wastewater treatment plants and reuse activities, including the WAJ, the Ministry of Health, the Ministry of Agriculture, and the Ministry of Environment. Furthermore, these different institutions play different roles in the monitoring of standards.

WAJ which is concerned with the protection of water resources and of public health is supposed to take the necessary actions to ascertain the safety of wastewater structures as well as public and private distribution disposal networks, including the definition of standards and their monitoring (WAJ Law Art. 6, see Box 5).

Box 5: Monitoring Related Articles in the WAJ Law

Art. 4. e: Draw terms, standards and special requirements in relation to the preservation of water and water basins, protect them from pollution, and ascertain the safety of water and wastewater structures, public and private distribution and disposal networks, and take the necessary action to ensure technical control and supervision, including, all necessary tests.

The *Ministry of Health* (MOH) is concerned with the protection and safety of public health (see Box 6). In coordination with relevant authorities it is supposed to control the sewage water, the sewage networks and wastewater treatment plants. The ministry is also concerned with crop quality, and the protection of agricultural workers and the people living near reuse areas. According to Abadi (2007) the MOH monitors all public and some 18 private WWTPs, while the Ministry of Environment monitors industrial WWTPs. In order to do so there are 21 Health Directorates in the countries, the water sections of which are staffed with five to six persons. In addition, the MOH staff also inspects the use of treated wastewater at farm level. However, apparently the unit is overloaded with work, has poor logistics and transportation facilities and therefore tends to give priority to large public treatment plants. According to MWI and GTZ (2004) MOH has also a role in monitoring when there are reports of

[26] According to USAID (2005b: 9) one problem at least with JS 893/2002 was that it set very ambitious Nitrate standards of 10 mg/l for restricted irrigation.

[27] http://www.jism.gov.jo/, accessed July 14, 2009.

uncontrolled use of wastewater for irrigation of crops. The MOH can also shut down any public or private wastewater treatment plant it considers a public health risk (USAID 2005a: 16). MOH representatives sit on various committees responsible for WWT&R. In each Governorate, there is a Committee on Public Health and Water Safety, comprising representatives from all concerned ministries (Abadi 2007).

Box 6: Excerpts from the Temporary Public Health Law No. 54 for 2002

Article (34): The Ministry [of Health] shall be entitled to supervise all wastewater networks in accordance with the regulations enacted for that purpose, and to issue orders for the preservation of health.

Article (53):

A- The ministry shall, in coordination with the relevant authorities and in conformity with its own legislations, control the Sewage water, the Sewage networks, the internal installation, and the treatment stations, in order to ensure the availability of health conditions therein and guarantee that no harm would thereby be caused to the public health.

B- If it becomes evident to the Ministry that the Sewage water, the networks, the installations, or the treatment station constitute or may constitute a threat to public health, then it must take all the necessary measures to prevent the occurrence of the anticipated detriment to health.

The *Ministry of Agriculture* (MOA) is responsible for issuing directives on agricultural products that can be irrigated with treated wastewater (see Provisional Law of Agriculture No. 44 for 2002, Art. 15 and Box 7) and for ensuring compliance with standards and rules in agricultural production (Art. 8 and Art. 11). The Directorate of Land and Irrigation is responsible for inspection (Naimat 2007). In each governorate up to three engineers inspect the cropping pattern actually planted and investigate whether farmers plant the kind of crops permitted under restricted irrigation. Violations against the regulations are reported to the Governorate's Safety Committee that may impose fines on farmers and may require destruction of the respective products. Still, according to Naimat (2007) overall inspection remains inadequate.

The *Ministry of Environment* (MOE) was only established in 2003 and is concerned with environmental protection. According to Article 4 of the Temporary Environment Protection Law No. 1 for 2003 (see Box 8), the ministry may issue environment instructions, may control the environmental elements (including water) and may monitor the compliance with environmental standards. The Monitoring Department takes samples from all public WWTPs. The interval depends on the parameter and the purpose of reuse. However, overall the budget for the respective analyses is limited. The MOE and MWI cooperate on these matters and exchange their evaluation reports (Daradkeh 2007). The MOE also monitors the implementation of the Environmental Management Plan that is being developed on the basis

of the Environmental Impact Assessment for WWTPs (Qatarneh 2007). According to Khashashneh (2007), the MOE can be considered as an external watch dog of other ministries. In 2007 the MOE was also in the process of establishing an environmental police as inspection force to detect violations, announce warnings and levy penalties.

Box 7: Excerpts from Provisional Law of Agriculture No. 44 for 2002

Article (5)

Two- In participation with the specialized parties, the Ministry shall also contribute to the preparation and application of the sanitary and phytosanitary measures that prevent disease or injury transmission to humans through plant and animal products and agricultural production inputs. …

Article (7)

… [T]he Ministry shall take the sanitary and phytosanitary measures that are necessary and appropriate to achieve the following objectives:

Two- Protect the human and animal health in the Kingdom against the risks resulting from additives, contaminants, toxins, or organisms that cause diseases and are found in the agricultural products or in the agricultural production inputs.

Article (8)

One- … [T]he Ministry shall take, as per directives issued by the Minister, the measures necessary to assure compliance of the agricultural products and agricultural production inputs with the health and technical conditions including the inspection, testing and control procedures…

Article (11)

Three- The Ministry shall be responsible for verifying compliance of the agricultural products and agricultural production inputs with the technical rules issued thereby. In addition, the Ministry shall participate, along with the competent parties, in assuring compliance of the agricultural products and agricultural production inputs with all technical rules issued by the other parties….

Article (15)

Three- The Minister shall issue the directives that specify the conditions for use of waste, treated, saline and brackish water in irrigating plant crops. In these directives, he shall specify the kinds of crops that may be irrigated and with which kind of this water.

Five- Any one who uses the waste water or treated water in irrigating plant crops in violation of the directives issued pursuant to Paragraph (c) of this Article shall be penalized with a fine of (fifty JD) for each dunum, or fraction thereof, that has been irrigated with such water. In addition, the violator shall be committed to remove the planted crops and destroy them under the supervision of the Ministry's cadres.…

In the Jordan Valley, JVA is the main irrigation water monitoring agency.

A compilation of monitoring and surveillance concerns prepared by USAID (2005b) is provided in Box 9.

Box 8: Excerpts from the Temporary Environment Protection Law No. 1 for 2003 (unofficial translation)

Art. 4: To achieve the goals of the environment protection, and improve its various elements in a sustainable way, the ministry shall assume, in cooperation and coordination with the relevant parties, the following functions :

C- Control and measure the environment elements and components, and follow them up through the scientific centers approved by the Ministry according to specified standards.

D- Issue the necessary environment instructions for the protection of environment and its elements, and the conditions for the setting up of agricultural, development, … and other projects, and their related services…

E- Monitor and supervise the public and private establishments and bodies… in order to verify whether they comply with the environment standards and the approved technical norms and principles.

Box 9: Monitoring and Surveillance Concerns of Various Institutions

Effluent quality monitoring:

- MWI – has central database of all water/wastewater quality monitoring
- WAJ laboratories
- LEMA, AWC, NGWA
- WWTP Operators do regular testing of basic parameters
- MOH (public and private WWTP)
- MOE

Irrigation water:

- JVA has general responsibility for quality of Irrigation water in the JV
- MOA – Suitability of TWW for certain crops
- MOE – Environmental control

Groundwater monitoring:

- WAJ – General monitoring
- MOH – Safe potable water sources
- MOE – Environmental protection

Soil monitoring:

- JVA – Protection of soil in the JV
- MOA – Field lab analysis related to agricultural production
- MOE – Environmental protection

Crop monitoring:

- MOH – Protection from disease caused by wastewater
- MOA – Protection of human and animal health
- MOTI – Crop quality for export

Source: USAID (2005b: Sect. 6.2) adapted from Ziegelmayer and Jaber (2003)

In summary, WAJ and MOH monitor public and private WWTPs connected to the sewage system and MOE takes responsibility for industrial plants not connected to the sewer system (Abadi 2007, MWI and GTZ 2004, USAID 2005b). MOA, to the extent possible, focuses on the inspection of cropping patterns and whether they comply with the rules for irrigation with treated wastewater.[28] Various interview partners conceded that the resources for monitoring are limited and that inspection is far from complete. With respect to potential decentralized WWT&R this raises the question who should be involved in the monitoring of such plants (e.g. MOH or MOE) and how monitoring can practicably be realized, in particular if a larger number of small-scale facilities were realized.

In the past, several initiatives recommended the development of a unified regulatory framework for the water sector, including the USAID funded Water Resources Policy Support Project in 2001, the GTZ funded Reclaimed Water Project (Ziegelmayer and Jaber 2003) and a report by GITEC and AHT-Group (2004). In 2004, the MWI also completed a study on regulatory issues in the water sector, but at least by the end of 2005, the result had not yet been published (USAID 2005b: 10).

According to the 2009 Water Strategy the institutional capabilities for monitoring, regulating and enforcing wastewater regulations shall be strengthened (p. 6-6) and overlapping responsibilities among different ministries shall be reduced (p. 4-4).

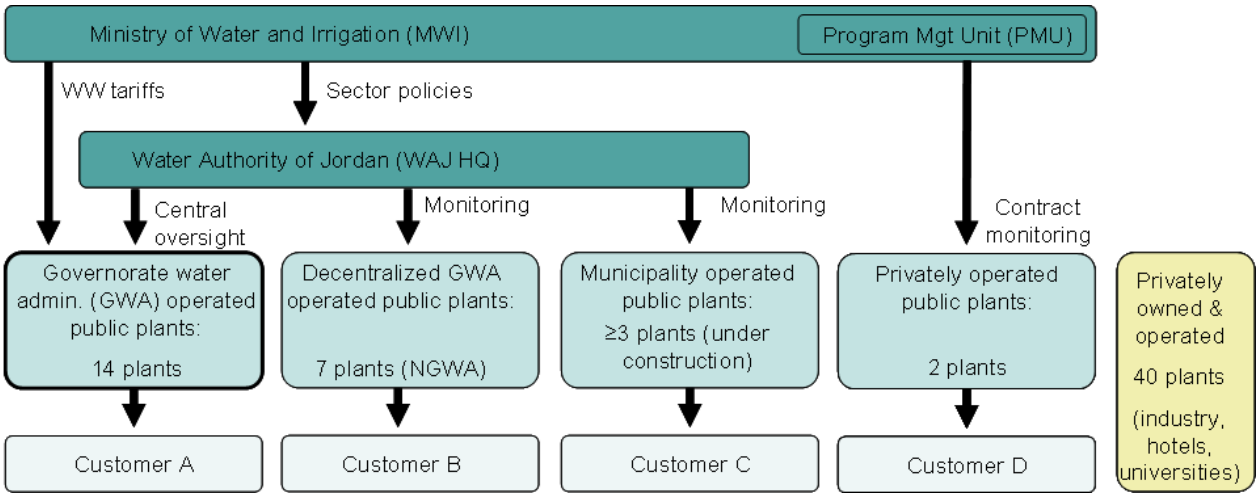
5 OPERATORS OF EXISTING WASTEWATER TREATMENT PLANTS

Given the overall institutional framework conditions described in Section 4, at present different operators are engaged in the operation of public and private WWTPs in Jordan as summarized in Figure 2.

5.1 Public WWTPs

In 2008 there were 21 public WWTPs in Jordan (see Table 3). These public WWTPs are currently operated by (1) the Governorate water administrations (GWA) (Section 5.1.1), (2) decentralized Governorate water administrations such as the Northern Water Governorate Administration (NGWA) (Section 5.1.2), and (3) private operators (Section 5.1.3). In addition, in future a number of plants will be operated by municipalities (Section 5.1.4).

[28] According to (USAID 2005a), the Ministry of Agriculture does not do extensive testing of wastewater quality, although it does some soil testing.



Source: Own compilation based on GTZ 2006

Figure 2 Jordanian Wastewater Sector: Regulatory functions, operating systems and WWTPs

Table 3 Public WWTPs in Jordan

No.	Name	Type	Hydraulic capacity (load design) m³/d	Person equivalent pe	Operator
1	Khirbet As-Samra	AS	276000		Private
2	Irbid	AS+TF	11000	146667	NGWA
3	Aqaba	AS	21000	147000	Private
4	Salt	AS	7700	139883	GWA
5	Baqa	TF	14900	198667	GWA
6	Wadi Araba	AS	22000	364883	NGWA
7	Madaba	AS	7600	120333	GWA
8	Ramtha	AS	5400	90000	NGWA
9	Abu Nusir	AS	4000	73333	GWA
10	Wadi Essir	Aeration tank	4000	52000	GWA
11	Tafielah	TF	1600	28000	GWA
12	Karak	TF	785	14130	GWA
13	Ma'an	SP	1600	25867	GWA
14	Kufranja	TF	1900	26917	NGWA
15	Jerash	AS	3500	63583	NGWA
16	Mafraq	SP	1800	24750	NGWA
17	Fuheis & Mahis	AS	2400	39800	GWA
18	Wadi Musa	AS	3400	28333	GWA
19	Wadi Hassan	AS	1600	21333	NGWA
20	Tel Al Mantah	AS	400	13333	GWA
21	El Lajjun (Karak)	SP	1000	25000	GWA

AS: activated sludge, SP: stabilization pond; TF: trickling filter

Source: Own compilation based on Afferden and others (2009) and other Government sources

5.1.1 Governorate Water Administrations

In about half of the governorates, the operation of public WWTPs is performed by the Governorate water administrations. Experience shows that in these cases due to civil service constraints and lack of financial autonomy WAJ has neither been able to recover O&M costs nor to generate a surplus for investments (Salman and others 2006). In addition, technical benchmarks, such as non-revenue water stayed at average levels of almost 50% despite high levels of investment. Other factors included the absence of information systems on customers or cumbersome staffing procedures (Rothenberger and others 2009).

5.1.2 Decentralized Governorate Water Administrations

In the four northern Governorates Irbid, Jerash, Aijloun and Mafraq, in 2000 the Northern Governorates Water Administration (NGWA) was established as a decentralized entity which is responsible for water and wastewater services. This included delegation of authorities such as financial planning, human resource development, procurement and the establishment of capital investment programmes from HQ to the governorate level (GTZ 2006). In 2006 a 3-year contract was awarded to a consortium led by Severn Trend Water International as Managing Consultant for NGWA. The Managing Consultant is integral part of the NGWA Executive Management Board and shares responsibility for the management of the NGWA staff. The aim was inter alia to improve water and wastewater services and the financial position of NGWA and to prepare for the establishment of an autonomous public water company.[29] As such NGWA can be characterized as decentralized form of water and wastewater administration (GTZ 2006, Rothenberger and others 2009). The plan is that by January 2010 NGWA shall be established as public-private operating company for which a management contract will be tendered.[30] Since 2006 private sector participation is also promoted in the Middle Governorates (Balqa, Zarqa and Madaba), supported by the GTZ OMS project (Rothenberger and others 2009).[31] In addition, Micro-PSP options are pursued for selected business activities such as meter reading, billing, revenue collection or leakage repair services. Micro-PSP was first tested in the Northern Governorates and the first Micro-PSP contract with a local company was awarded for billing and revenue collection in the Madaba Governorate (ibid.).

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[29] http://www.pmu.gov.jo/LinkClick.aspx?fileticket=zkrmE9qsMQU%3d&tabid=93&mid=506, accessed July 14, 2009.

[30] See also http://www.waj.gov.jo/English/Top/Vacancy/old/vacancy.htm, accessed May 8, 2009.

[31] http://www.mwi.gov.jo/mwi/PSPMiddleGovernorates.aspx, accessed June 17, 2009.

5.1.3 Private operators

For the Greater Amman area and in the city of Aqaba, private operators are now in charge of wastewater services and the operation of the respective public WWTPs. These activities are supervised by the Program Management Unit (PMU) within the MWI. For the water supply and sewage system of the city of Amman a first management contract was awarded in 1999 to LEMA, a consortium of Lyonnaise des Eaux, Montomery Watson and Arabtech (later Suez Environment and Arabtech Jardaneh[32]). In 2007 LEMA was replaced by the Jordanian water company Miyahuna. In contrast to LEMA, which was a privately owned private consortium, Miyahuna is a Jordanian limited liability company fully owned by WAJ. It operates on a commercial basis under private sector law with financial and administrative independence.[33] WAJ granted Miyahuna the right to manage the services in Amman with full ownership of revenues. Miyahuna also receives the MOF allocation of 3% of the property tax earmarked for sewage.

Furthermore, for the rehabilitation and operation of the As-Samra wastewater treatment plant, the by far largest treatment plant in the country which treats most of the sewage water in the Amman and Zarqa area, a BOT contract was awarded in 2003 for the design, construction and operation of the plant for a period of 25 years. The As-Samra BOT scheme was the first BOT project in Jordan. It is carried out by the Samra Wastewater Treatment Plant Consortium, whose partners are the US-based Morganti (50% of shares) and Ondeo Degremont (30% of shares) in conjunction with the France-based Suez Environment (20% of shares). Sources of funding include a USAID grant of US$78 million, US$17 million in equity put up by the As-Samra Wastewater Treatment Plant Consortium, US$60 million borrowed from a consortium of lending banks to be repaid in 15 years, and the outstanding US$14 million is financed by Jordan's central treasury (Hall and others 2002).[34] The new plant with a capacity of 276,000 m³/d started operation in August 2008.[35]

In the Aqaba governorate, in 2004 the Aqaba Water Company (AWC) was established as an autonomous public company under private law responsible for the operation of the water and sewage systems and the Aqaba WWTP. When Aqaba was declared Aqaba Special

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[32] http://www.lema.com.jo/?ID=64, accessed July 14, 2009.

[33] http://www.miyahuna.com.jo/public/English.aspx?Lang=3&Page_Id=2289&Menu_ID=307, accessed July 16, 2009.

[34] http://www.usaid.gov/our_work/environment/water/as_samra.html, accessed in June 2007.

[35] http://jordanscience.wordpress.com/2008/08/23/as-samra-waste-water-treatment-plant/, accessed July 21, 2009.

Economic Zone in 2001, ambitious development targets were formulated. In this context the MWI restructured the Aqaba Governorate Water Administration and established AWC. It is owned by WAJ (85%) and the Aqaba Special Economic Zone Authority (ASEZA) (15%), and operates on a commercial basis. The treated effluents are sold to the phosphate industry (the agreed price is 0.700 JD/m³ (USAID 2005b: Sect. 5.2)). Even before the establishment of the AWC, the Aqaba Governorate Water Administration had been the best performing governorate water administration in Jordan. The reason is that Aqaba receives water of high quality from the Disi-Aqaba pipeline and more than half of the water is consumed by industries and tourism facilities that are able to pay higher tariffs (Haddadin and others 2006, Rothenberger and others 2009).

GTZ (2006) observes that while initially, there was a strong drive towards PSP, due to changing markets it became apparent that complex PSP models would not necessarily be sought anymore and that alternative approaches, such as the concept of a public company and Micro-PSP would be promoted.

5.1.4 Municipalities

In addition, a number of initiatives are underway in Jordan to strengthen the role of municipalities in the operation and maintenance of WWTPs. In the context of the USAID funded project “Wastewater Treatment Facilities for Small Communities in Jordan”, the municipalities of Mu’ath Bin Jabal in North Shouneh and of Shobak Al Jadideh will each be responsible for the operation and maintenance of a low-maintenance proven-technology septage treatment plant of 1,200 m³/d (USAID 2005c) and 200-450 m³/d (USAID 2005d) capacities respectively. Encouraging community-based management of WWT&R facilities and developing local capacity to operate and maintain them had been an explicit overriding objective of the project from the beginning.

In this case, WAJ will own the land and the facilities and will be responsible for construction. Upon commissioning of the plants, O&M of the plants and of the reuse activities will be transferred to the municipalities. The municipalities will at least initially operate the plant by themselves, but they will be allowed to sub-contract certain activities to other entities. Over time, they may transfer the management of the plant or the reuse activities to a third party (e.g. a municipality owned public utility or limited liability company, a private sector company or NGO). WAJ will monitor performance and extend technical guidance as necessary. An operational manual will clarify the detailed roles and responsibilities in operation and quality monitoring and the future staff will be trained during the first year of operation (USAID 2005b). USAID will cover 85% and WAJ 15% of investment costs. There will be no subsidized operation, but O&M costs shall be recovered through tipping fees paid by

households and by reuse activities (sale of treated wastewater, sale of products grown with treated wastewater etc.). The tipping fees will be charged in addition to the usual fees for septage collection by tankers, however due to shorter transportation distances the latter are expected to be lower than before (USAID 2005b). Each municipality will establish two advisory councils, one for plant operation and one for the reuse activities in order to ensure stakeholder participation. General agreements between WAJ and the respective municipalities were signed in late 2007 (Abu-Rayyan 2008). Construction of the WWTP in North Shouneh was launched in July 2009, and construction is expected to be terminated by September 2010.[36] There were several reasons for choosing municipalities as operators: The municipality is a permanent institution accountable to its constituencies. It has access to external grants and does not strive for profit. Also in Jordan municipalities can pay market-based salaries when conditions require (USAID 2005b).

Furthermore, the municipality of Ghor Safi is building and will own and operate a small septage treatment in the context of the EU MEDA Water Project with funding from Austrian Development Cooperation (see also USAID 2005b).[37] Construction of the plant with a capacity of 50 m³/d started in August 2007.

WAJ has also given permission to Shobak municipality to build a sewage collection and treatment system for a small town, Mansourah, in the Shobak district. WAJ will retain ownership of the WWTP (USAID 2005b: 9, 11).

5.2 Private WWTPs

Next to these public WWTPs there are about 40 private WWTPs in Jordan that are not connected to the public sewer system, and that are owned, financed and operated by private entities, such as industry, hotels and universities. Often the treated wastewater is reused on the respective compound itself, e.g. for landscape irrigation or groundwater recharge. Permission for the reuse component is granted by the MWI and the MOE. The private operators carry out their own routine effluent monitoring programs. In addition, WAJ or other public entities do controls at the expense of the private operator. Examples of private WWTPs are presented in Box 10.

[36] http://jordan.usembassy.gov/pr_shouneh_070609.html, accessed July 14, 2009.

[37] http://hispagua.cedex.es/documentacion/especiales/proyectos/medwa_docs/fact_sheet_wastewater_treatment_plants.pdf, accessed July 21, 2009.

Box 10: Experiences with the Operation of Private WWTPs

Private wastewater treatment plant of the Jordanian Pharmaceutical Manufacturing Co. plc (JPM)

The technology of the treatment plant (secondary level) was locally developed by AQUATREAT and constructed by ARABTECH. Capital costs amounted to 116,000 JD in the 1990s. The WWTP started operation in 1997 with a daily capacity of 123 m³, and it produces a daily output of 70 m³ which is used for landscape irrigation in summer. In winter, the treated water is disposed onto a field owned by the company.

The Head of the Maintenance Unit supervises among other duties the WWTP; next to him are one technician and two stand-bys for operation and maintenance. Major cost components are electricity, chlorination and sludge removal. The sludge is transported to an official municipal site. The cost for transporting and disposing 15 cubic meters of sludge are about 25 JD.

The company has its own system for the monitoring of effluent quality. This is required to get credited by the Food and Drug Association under the Ministry of Health. In addition, the MWI (or in the meantime the MOE) carries out yearly controls at the expense of the company.

Private wastewater treatment plant of the Dead Sea Spa Hotel

The Dead Sea Hotel operates a WWTP with a daily capacity of 100 m³. It uses treated wastewater all the year around for landscape irrigation inside and outside the hotel site. The treated wastewater is chlorinated with low doses to avoid odour. The plant is operated by the hotel's maintenance team (two employees) according to its own operation schedule. The highest cost components are electricity, since they operate the pump(s) 24 hours, and the repair of pumps. Regular inspections of effluent water quality are carried out by the Royal Scientific Society at the hotel's expense.

Private wastewater treatment plant of a private university

The WWTP provides services for the university, the female houses and some laboratories in the order of 6,000 person equivalents or 140 m³/day. The plant was installed in 2005 by a Turkish company which checks the operation twice a year.

The treated wastewater is chlorinated before it is being used for irrigating the forests and the landscape on the campus. In winter when the water is not needed for irrigation, it is used for groundwater recharge. The sludge is transported to a central place where all sludge from municipalities is deposited.

The staff comprises the technical director and one worker. The technology is robust. It could easily be upgraded by adding new units. However, electricity need is relatively high. Still, O&M costs per cubic meter for treating wastewater are assumed to be lower under private than under public operating system (0.500 JD).

After a pilot phase, the university got the licence to operate the plant from WAJ after WAJ had checked potential negative impacts on groundwater. WAJ regularly inspect chemical parameters of the effluent quality and the MOH inspects biological parameters. The MOE had to agree on the reuse activities.

Sources: Interviews made in 2007

6 STAKEHOLDER PERCEPTIONS ON DECENTRALIZED WWT&R AND RELATED INSTITUTIONAL ISSUES

In addition to the review of the formal policies and laws and the existing operating models, the perceptions on decentralized WWT&R and related competences among different stakeholder groups were assessed. Interviews were conducted in 2008 with selected representatives at the central government, the governorate and the municipal level. In addition, experts of German development and consulting agencies active in the Jordanian water sector were interviewed, providing an outsider development expert perspective. First, the respondents were asked what they perceived as the advantages and disadvantages of decentralized WWT&R (Section 5.1). Then, their ideas on decision-making competences (Section 5.2) and on potential operators were solicited (Section 5.3). In a last step, financing opportunities were discussed (Section 5.4). The findings are summarized in Table 4 at the end of the section. It should be noted that these interviews were conducted before the 2009 Water Strategy was adopted.

6.1 Perceived advantages and disadvantages of decentralized WWT&R[38]

Both central government and governorate representatives argued that decentralized WWT&R could be beneficial in remote and hilly areas. The reason is that decentralized solutions would save investment and pumping costs as there would be less need to install sewerage pipes along long distances and to pump the sewage over high gradients later on. A further advantage perceived by both groups is that by avoiding longer sewage pipelines leakage and potential groundwater pollution along these pipes could be avoided. Both groups also mentioned that a disadvantage of decentralized plants could be that they require more manpower than centralized plants, first for O&M, in particular if a sophisticated technology was chosen (both groups), and second for monitoring (governorate level).

An additional argument for decentralized plants mentioned by central government representatives was that they were assumed to be more flexible than centralized plants under conditions of high population growth and fast urbanization. It was furthermore argued that small plants had higher O&M costs than larger plants. Given that international donors usually only cover investment, but not O&M costs, this would be a disadvantage of decentralized solutions (although it was also mentioned that part of the O&M costs could be

[38] A more detailed presentation of stakeholder views on decentralized WWT&R in Jordan is presented in Lienhoop and others (2008).

recovered by selling the treated wastewater to end-users). It was also argued that the technology is not yet proven in Jordan and the technical feasibility has to be tested first (e.g. in Fuheis). Hence this can be considered as another disadvantage of decentralized plants.

At the governorate level, it was furthermore explicitly mentioned that a major advantage of having decentralized plants in localities without sewage system in place was that it avoided the leakage from septic tanks and at the same time provided additional water, e.g. for irrigation.

Both groups argued that eventually the choice between centralized and decentralized wastewater treatment was an economic question. It was also argued that it is important to select sites for plants in a way that leakage from plants and pipes does not pollute freshwater aquifers (central government level) and to avoid odour and flies (governorate and municipal level). Whether opportunities for reuse exist was mentioned as a further criterion for the selection of decentralized compared to centralized solutions by governorate level representatives.[39]

At the municipal level, the question of centralized versus decentralized treatment was not addressed at a general level, but it was discussed whether it was desirable to have one or several treatment plants in the respective villages compared to the current situation, where sewage is collected in septic tanks. Interviewees were told that in the context of the SMART project, any plant serving less than 5000 person equivalents is considered a decentralized solution. The representative of Rama municipality was positive of having a treatment plant as the village would benefit from the treated wastewater for irrigation purposes and maybe even for drinking purposes and thought that it was more practical to have one than several plants.[40] In Ira and Yarqa the representatives did not explicitly stress potential advantages of such plants when prompted to do so. Still in other parts of the conversation they mentioned that treatment could avoid environmental problems and pollution and treated water could be reused “if this … plant lies near the farms or the lands needed to be irrigated”. But overall they were relative cautious in their argumentation. First, they thought that it was a good idea to have a treatment plant if it was professionally supervised and monitored. Second, they also were quite concerned with respect to the financial implications of wastewater treatment: “Our main concern is that related to the financial sector.” They also mentioned that it would be difficult to control individual plants or plants that connect only two or three households as

[39] Furthermore it was mentioned that in the highlands, in winter there is the need for storage of treated wastewater.

[40] In other parts of the interview treated wastewater is not considered adequate for drinking purposes, but for irrigation, other household uses and maybe for construction.

they believed that plants were likely to create nuisance such as odours and flies and that any plant therefore should be located away from houses.

Overall, the interviews provide a fairly broad range of advantages and disadvantages of decentralized WWT&R. They also show that there are differences in perspective between the central and the local level. While central level government representatives are more concerned with economic questions and the protection of aquifers, local level representatives are concerned with potential nuisances and managerial problems going along with such plants. Financing is a common concern. Whether decentralized solutions really entail the nuisances assumed would have to be tested.

Development experts had a similar perspective as central government representatives, stressing the general need for treatment in remote areas in order to protect aquifers and emphasizing that the choice of the size of the system was an economic question. However, it was also confirmed that decentralized solutions are likely to make more sense in remote areas than centralized solutions. It was also stressed that funding might be a problem, because WAJ is likely to give priority towards the solution of pressing problems in urban and semi-urban areas and thus towards centralized solutions.

6.2 Perceptions on decision-making competences

In order to solicit perceptions on decision-making competences, representatives at the three levels of jurisdiction were asked what a municipality would need to do in order to obtain the right to install a decentralized wastewater treatment plant.

Central level administrators pointed out that MWI and WAJ were responsible for the selection of sites, the organisation of (donor) money and construction. They stressed that municipalities by law were not responsible for these issues. Others mentioned that the municipalities of North Shouneh and Shobak will be responsible for the operation of WWTPs. Governorate level stated that the responsibility lies with WAJ, and that municipalities have no mandate. And the representative of the municipalities reiterated that WAJ was the responsible party. Thus, overall there was great convergence on this issue and the parties confirmed the legal status quo (although it is unclear whether the representatives of municipalities were aware that WAJ could transfer the responsibility for operation to them).

Furthermore, all three groups mentioned that in practice municipalities indeed tend to request wastewater treatment from government. According to the interviewees at the municipal level smaller municipalities refer to the main municipality, however, “which often can not provide the lowest kind of service asked for.” “All what a municipality can do is choose a location for the treatment plant and submit a letter requesting a treatment plant.” Interestingly, these requests seem to be made to the higher level municipality, and not directly to the MWI or

WAJ. In one case, it was argued that the request would then be submitted to and studied by the Ministry of Municipal Affairs. It is unclear at this point whether the Ministry of Municipal Affairs indeed plays a role in this context although it does not have a formal role or whether this was a misunderstanding on behalf of the interviewee. MWI and WAJ representatives on the other stated that they do take up these requests, consult with governors or mayors upon their request and study the opportunities. However, it was also mentioned that funding is a constraint: "As WAJ we tend to study the area we see the possibilities. Once we find the financing agency we go and build the plant for them and make a network for them. But the money is the main factor disabling us to make such networks for the whole country".[41]

In addition, a governorate level WAJ administrator explicitly mentioned that it was desirable to increase the involvement of municipalities in the decision making process: "all wastewater and water issue lie in the responsibility of the Water Authority; most decisions are made by them. Yet, it is good to inform municipalities to be involved in the decision making process and get more involved."

Development experts pointed out that experience in the governorates shows that it is very important that a lower level administrative units gets sufficient discretionary decision power if it is supposed to make an own contribution. For instance, WAJ in the governorates suffers from the fact that decisions on staffing or procurement are made at the central WAJ level. It was also mentioned that experience shows that in practice obtaining the permission for the construction and operation of a wastewater treatment plant can become very cumbersome as different institutions are involved in this process.

6.3 Perceptions on potential operators

When being asked for potential operators for decentralized WWTPs, opinions differed among groups and individuals. At the central government level, the dominant idea appears to be that that the private sector should operate, maintain and monitor decentralized WWTPs. The argument is that they do have the adequate expertise and incentive-compatible salaries. This has also to be seen in connection with the plans to transform WAJ into a body responsible for bulk water transmission. At the same time, it was stated that WAJ is not against involving municipalities to minimise the burden on WAJ. One WAJ representative stated that decentralised WWTP should be operated by the municipalities controlling those areas with WAJ in a supervisory role, however, that this was only possible if the municipalities could recover the O&M costs: "The municipalities themselves will not accept to take over these

[41] In a separate conversation on the selection of potential sites it was also mentioned that it would be difficult to justify in Parliament why a particular municipality would get a WWTP and others not.

plants and operate them unless they make sure that the revenues can cover the operational and maintenance cost."

At the governorate level, again different options were aired by different interviewees. One interviewee mentioned that operation could be through a society, an NGO or a municipality, but should be under the supervision of the MWI. Others mentioned that the example of North Shouneh shows that operation by municipalities is possible: "This could hopefully be a more common approach, but monitoring of the water quality should remain with WAJ." Others thought that operation could either be done by the municipalities or the private sector. A representative of an environment department at governorate level thought that these plants should be operated by WAJ, or under JVA if in the Jordan Valley. This notwithstanding, most interviewees did not suggest that small decentralized plants should be operated by WAJ itself, although many (albeit not all) argued that WAJ should continue to play a role in monitoring.

Interestingly, at the municipal level, the question of operation was a very touchy issue. While one might have expected that the representatives of the municipal councils would be quite keen on gaining greater control of wastewater issues, they were very cautious and even reluctant to take any responsibility. In Ira and Yarqa they clearly stated that WAJ should operate such plants, both, due to lack of qualified personnel and due to the lack of financing within the municipalities: "The municipality can't even take responsibility of the simplest tasks it's required to do. There has to be a governmental area that is responsible for supervising, monitoring and operating the treatment plant. There should be a governmental sector with professional technicians. Any project has to have a funding area and a governmental institution for monitoring and supervising." In Rama it was argued that WAJ or maybe the municipality should be responsible for operating the decentralised wastewater treatment plant: "We don't have a private sector in this area at all."

Hence, while the majority of central government and governorate representatives suggested that decentralized WWTPs could be operated by either the private sector or the municipality, the representatives of municipalities rather thought that this should be done by WAJ itself or maybe the municipality, but did not see how the private sector could become involved. This may at least partially be due to a misconception that the private sector would have to be mobilized at the local level.

Development experts pointed at the fact that the choice of the operational model is also a question of the technology involved. If a more sophisticated technology is chosen, and if this technology can be implemented at several locations in parallel, it might be more appropriate to have it operated by the private sector. If the technology is very simple, it might be possible

to transfer the responsibility for operation to the municipalities. Another interviewee was fairly sceptical that either municipalities or the private sector would be ready to engage in operation. It was argued that municipalities would rather leave responsibility with WAJ given that treatment is also related to health issues. He furthermore questioned that at this point the private sector in Jordan would have the technical and managerial capacity and the necessary financial incentives to engage in decentralized wastewater systems. It was also mentioned that there are considerable problems with the small size wastewater treatment plant in Tel el Mantah in the Jordan Valley operated by WAJ.[42]

6.4 Perceptions on financing opportunities

In addition, initial reactions to the question of financing were solicited. According to central government representatives, besides a limited budget by WAJ, MWI and WAJ explore opportunities for donor financing. While the Jordanian water sector gets considerable support by various donors, still this is not sufficient to cover all areas. In addition, in this context it is important to note that donors do not pay for O&M costs but that these should be recovered from users. In addition it was argued that private sector participation in the form of BOT schemes may help overcoming problems of shortage of capital, however, this requires prior agreement on the tariff structure. It was confirmed that increasing the tariff is not a matter of WAJ only, it needs the permission of the cabinet: It was also stressed that "[t]ariffs can not be increased unless we have the acceptance of the people."

At the governorate level it was argued that either WAJ (through the assistant secretary for wastewater) would provide a fund or it would be funded by the governorates if it was a small scale plant. Hence, there seems to be also some, albeit very limited, governorate level funding. It was furthermore mentioned that all revenues, including 3% of the property tax and all water and wastewater fees go to WAJ. It was argued that if municipalities should operate the plants, they would have to be able to retrieve the respective revenues directly.

At the municipal level, the topic was only briefly addressed. However, the representatives of the municipal councils seemed to believe that there might be some willingness to contribute towards the provision of such services, in particular given some people are now paying considerable amounts each month for pumping their cesspit tanks.

[42] Consideration was furthermore given towards the possibility of establishing specific purpose associations among different municipalities following the German model of *Zweckverbände*. However, in this context it was mentioned that the Jordanian society is rather individualistic and certain families or clans do not want to become dependent on others.

Table 4 Selected Stakeholder Perceptions on Decentralized WWT&R and Institutional Issues

	Central government (MWI, WAJ) N=3	Governorate (Irbid, Balqa) N=5	Municipalities/Mayors (Ira, Yarqa, Ramah) N=3
Perceived advantages of decentralized WWT&R	Beneficial in remote and hilly areas; may avoid leakage of sewer pipes; more flexible than centralized plants. Decision depends on costs and the vulnerability of aquifers.	Beneficial in remote and hilly areas in order to save pumping costs. Avoids leakage of septic tanks. Decision depends on size of the village/city and topography.	Ira/Yarqa: Good idea if it was professionally supervised and monitored. Rama: It could benefit the village in irrigation purposes and maybe for drinking purposes.
Concerns	Relatively high treatment O&M costs (not covered by donors). Possibly leakage of plants. High tech requires many experts.	Higher monitoring costs than centralized WWTP. It is the WAJ policy to use centralized WWTP.	It would be difficult to control plants that connect only two or three households. Plants are likely to create nuisance (odors, flies). Our main concern is that related to the financial sector.
Decision-making competences	MWI/WAJ is responsible for selection of sites, organisation of (donor) money and construction. They consult with governors or mayors upon their requests. Municipalities by law are not responsible for these issues.	Responsibility lies with WAJ, municipalities have no mandate. Yet, it is good to inform and to involve municipalities in the decision making process. Ministry of Planning to be included as all loans go through it.	The responsible party is WAJ. We refer to the main municipality which often can not provide the lowest kind of service asked for. All what a municipality can do is choose a location and request a treatment plant.
Potential operators	Interviewee A: Go for private sector to operate, maintain and monitor: adequate expertise and incentive-compatible salaries. Not against involving the municipality to minimise the burden on WAJ. Interviewee B: Decentralised WWTP should be operated by the municipalities, WAJ only supervisory role.	A society or NGO or municipality, but under MWI supervision. Operation by municipalities is possible, see North Shouneh, but monitoring of the water quality should remain with WAJ. We are trying to include the participation of the private sector. WAJ or JVA in the Jordan Valley.	Ira/Yarqa: WAJ should be responsible for operating. Qualified personnel can't be found at the municipalities. Rama: Only WAJ or the municipality should be responsible for operating the decentralised wastewater treatment plant. We don't have a private sector in this area.
Potential sources of financing	MWI/WAJ explores donor financing opportunities. BOT may overcome problems of shortage of capital – requires prior agreement on tariff structure. Donors do not pay for O&M costs; should be recovered from users. Tariffs can not be increased unless we have the acceptance of the people.	All revenues, including 3% of property tax and water and wastewater fees go to WAJ. In the future all revenues might go directly for municipalities so that they can operate the plants.	Ira/Yarqa: We do not really care about paying 1-1.5 JD/month for the network service but we are looking for terminate solutions for this problem. Rama: We pay although we do not have such connections. We can pay for the water coming from decentralised WWTP.

Furthermore, it was stressed that people already pay service fees without getting the service: "We do not really care about paying 1-1.5 JD/month for the network service but we are looking for terminate solutions for this problem as some people now are paying around 50-60

JD each month for pumping their cesspit tanks." "We pay an amount of money for having pipeline connections although we do not have such connections. We can pay for the water coming from decentralised treatment plants around 50 - 60 JD/month as people here are paying 10 JD each day for pumping the artesian wells."[43]

Thus, while at least a certain portion of the investment costs could possibly be financed by donors, solutions would have to be found to retrieve the O&M costs from those being connected to decentralized WWTPs and from the users of the treated wastewater. Furthermore, whatever party would operate these plants, they would also need to have the right to recover the respective fees. While this is, in principle, in line with the 2009 Water Strategy, it would require changing the status quo in terms of the resource flows if the systems were to be operated by either the private sector or a municipality. This might not be straight forward.

Development experts also pointed out that sustainable financing solutions would require the establishment of individual tariff systems for specific circumstances. This, however, would constitute a fairly radical departure from the status quo, given that at present tariffs are decided at the central level.[44]

7 DISCUSSION AND CONCLUSIONS

The overriding research question addressed in this study was whether the implementation of decentralized WWT&R is institutionally feasible in a centralized institutional setting. In order to analyze this question, an analysis of the Jordanian water sector was carried out. The main findings terms of the types of actors which have the legal competences to initiate and operate decentralized WWT&R in Jordan and in terms of the incentives to do so are summarized in Section 7.1. With this analysis the study also sought to provide a basis for the comparative analysis of alternative operators for decentralized WWT&R within the SMART project. Initial considerations towards such a comparison are presented in Section 7.2.

[43] Focus groups with selected inhabitants of the respective villages indicated that the willingness-to-pay may be lower than suggested by the representatives of the municipal councils (see Lienhoop and others 2009).

[44] Interestingly, according the 2009 Water Strategy this is now possible.

7.1 Is decentralized WWT&R feasible in a centralized institutional setting such as Jordan?

In the following it will be argued that decentralized WWT&R is principally feasible in Jordan, but that this is particularly so, because the Jordanian institutional setting is not as centralized any more as it used to be. At the same time, even in the current stetting decision-making on small-scale WWT&R facilities remains relatively cumbersome. If the envisioned reforms of the water sector will be implemented as outlined in the 2009 Water Strategy, they will significantly contribute towards a simplification of procedures.

In principle, from an institutional point of view, it is and has always been possible to operate small-scale WWT&R facilities in Jordan. Before the last amendment of the Water Authority of Jordan (WAJ) Law in the year 2001, such facilities would have had to be planned by WAJ and implemented and operated through the regional branches of WAJ in the Governorates (the Governorate Water Administrations). This, however, did not take place. A potential explanation is that from an economic point of view it was rational to connect large urban conglomerations first, and to do so in a centralized manner. But it should also be noted that Jordan's Wastewater Management Policy of 1998 explicitly stated that centralized WWTPs would be pursued, even in rural areas.

With the amendment of the WAJ Law in the year 2001, the institutional setting changed in the sense that WAJ is still responsible for the overall planning and decision-making, but that the plants may now be operated by different types of operators. More specifically since 2001 WAJ may transfer the operation and/or ownership of a WWTP to a municipality or a private entity. However, any decision on the transfer of management and ownership ultimately relies on a decision by the Council of Ministers. The main advantage of this institutional reform seems to be that for a municipality or the private sector, the transaction cost for the operation of small plants may potentially be lower than for a central water authority. In addition, a municipality may be more responsive to local concerns. As a consequence of this change in the law, the operation of two large scale WWT&R schemes has been transferred to private companies (As-Samra BOT and Aqaba Water Company). Also, at least two donor-supported projects have initiated smaller-scale low-maintenance WWT&R facilities that are putting the municipalities in the driving seat for operation.

In this context, it should also be mentioned that it is possible in Jordan to establish private WWTPs as long as they are fully funded by the private owner. Private plants require WAJ permission if they discharge into a public sewage network or into a water body. This option is used by industrial firms, hotels or universities with some 40 private plants in place.

In terms of the opportunities for the financing of small-scale public WWT&R facilities, there appears to be a certain discrepancy between policy declarations and de facto political reality of tariffication. The 1998 Wastewater Management Policy stated that (1) cost recovery of at least O&M costs of wastewater treatment and of the O&M costs of the delivery of the treated wastewater to end-users was aimed at, (2) that differentiated tariffs were possible and (3) that priority shall be given to projects in which users are willing to pay a higher share of the costs than set by the official tariffs. In reality, for wastewater treatment an increasing volumetric block pricing system exists for the entire country, with three different price levels for Amman, Zarqa and all other regions. The price for treated wastewater is fixed at 0.010 JD/m³ for agriculture and 0.050 JD/m³ for industry. The former price competes with highly subsidized prices for irrigation water. Overall, with the current tariff structure full cost recovery of O&M costs is not yet achieved, and so far to our knowledge no use has been made of the provisions allowing for differentiated prices beyond the distinction of Amman, Zarqa and other regions. Furthermore, any changes in the tariff system hinges on a Council of Ministers' decision. Hence, coming up with individual pricing arrangements for a decentralized WWT&R facility seems to be principally possible, but politically certainly not easy and it would need to be tested whether an individual solution could be found.

The practical implementation of decentralized WWT&R is further complicated by the procedures for environmental management and effluent quality monitoring and the range of involved institutions. The Ministry of Environment approves the Environmental Impact Assessment and Environmental Management Plan. In addition to WAJ the Ministry of Health and/or the Ministry of Environment are involved in the monitoring of the WWTP. Furthermore the Ministry of Agriculture monitors crops grown with treated wastewater. Reuse projects in the Jordan Valley also involve the Jordan Valley Authority. There have been different proposals and initiatives in the past to simplify these procedures by the establishment of a unified regulatory framework, but at present the old setting still persists. With respect to potential decentralized WWT&R this raises the question who should be involved in the monitoring of such plants (e.g. MOH or MOE) and how monitoring can logistically be realized, in particular if a larger number of small-scale facilities were realized.

The main implication of the current setting is that the realization of such small-scale plants hinges on the central water authority, and in case of a management transfer and individually adapted tariffs even on a Council of Ministers' decision. In addition, many more parties are involved in the monitoring of standards and regulation. This makes the whole decision-making process quite cumbersome, as also experienced in the USAID Small Communities project. On the other hand, bottom-up planning and initiatives by those who know best the local conditions are not encouraged. The interviews conducted showed that municipalities do

not perceive WWTPs as their business, at least when prompted spontaneously. While municipalities sometimes request WWTPs, the procedure is that they address their request to the main Municipality and as such to the Governor and the Ministry of Municipalities (MOMA) and not directly to WAJ, which seems to make the process even more cumbersome. It should also be noted that in the USAID Small Communities project, the two municipalities involved appear to be very positive and engaged.

At the same time, most recently further policy changes were initiated through the 2009 Water Strategy. Most noteworthy, the strategy reflects a drastic policy shift, as it states that in future decentralized wastewater treatment shall be pursued in semi-urban and rural areas and that it encourages their exploration in new urban areas.

Furthermore, the strategy does not only reinforce the 1998 pricing principles, but pushes for the implementation of full cost recovery within the next five years and for regionally differentiated prices. It emphasizes that “all private and public operators need to be able to set tariffs for their customers, approved by a regulatory authority, while ensuring that the poor receive water for basic needs.” This may make individual pricing strategies aimed at cost recovery easier, in particular once the future regulatory authority is firmly in place.

Last, but not least, the strategy envisions significant changes of the institutional structure of the Jordanian water sector: The Project Management Unit (PMU) shall be transformed into a regulatory agency for the water sector that monitors private sector involvement and ensures compliance with policies, laws and regulations. The future water authority shall solely be responsible for the transmission of bulk water supply for domestic and agricultural purposes (and presumable large scale transmission of treated wastewater). Utilities shall be responsible for water distribution, and there shall be at least three regional utilities, north, middle and south. So the question is what the implication of these changes would be for the implementation of small-scale WWT&R facilities. Who would set priorities, who would initiate, who regulate and who would operate them? Priorities would supposedly be set by the Ministry. In this context it would be of interest to identify areas in which small-scale WWT&R facilities could make particular contributions to groundwater protection. Projects on the ground would presumably be either initiated by the regional utilities or, possibly, by the private sector, although that seems to be less evident. Permission would be provided by the regulatory authority which would also approve tariffs and monitor compliance with standards. If this interpretation is correct, the envisioned reforms of the water sector could contribute towards a significant simplification of procedures.

One question is whether and to what extend municipalities would be able to initiate projects for decentralized WWT&R. An advantage of providing them the opportunity to do so would

be that they usually have the most intimate knowledge of the local conditions. Possibly they would have to do this in consultation with the regional utilities. However, a further idea could possibly be that municipalities could also act as 'utility'. This would, however, of course also imply that they would have to be able to set their own tariffs (to be approved by the regulatory agency) and to collect them. At present, one problem is that municipalities are fiscally extremely weak in Jordan. Hence, any further moves to strengthen the fiscal status of municipalities and build capacity would also be helpful – however, this is of course, beyond the scope of this report

7.2 Towards a comparative analysis of alternative operators

While this report mainly dealt with the role of the institutional setting for decentralized WWT&R, building upon the insights gained in the context of this study, in this last section some first arguments towards a comparative analysis of possible alternative operating entities for decentralized WWT&R shall be presented as an input for discussion within the SMART project.

As argued in the introduction, small WWT&R facilities for more than one household may be operated by a:

- Water authority
- Regional utility/publicly owned private company
- Privately owned private company (Jordanian or international)
- Municipality
- Utility or limited liability company owned by a municipality
- NGO
- Community-based initiatives.

The entity operating the plant again can reuse the treated wastewater itself (and potentially sell certain products grown with treated wastewater) or sell the treated wastewater to a third party, which could be individual farmers, a cooperative, the municipality etc.

Criteria for the evaluation of different operators may include (see also USAID 2005b: Sect. 4.1):

- Availability, legal basis and long-term viability
- Readiness and interest to engage in operation of small-scale WWT&R facilities

- Necessary technological know-how and capabilities or ability to build capacity with reasonable input (with respect to technical operation, maintenance & effluent monitoring)
- General administrative, human resource management and financial capabilities
- Commitment and responsiveness to concerns of the local community (and accountability)
- Access to financing/proven financial autonomy (not totally reliant on project revenue)
- Incentives to achieve efficient and effective outcomes

In the following a first discussion of the main strengths and weaknesses of the alternative operators will be presented (see also Table 5). Any of the following technologies examined in the SMART project will be assumed: constructed wetlands (CW), activated sludge in the form of sequencing batch reactors (SBR) or anaerobic technologies in the form of upflow anaerobic sludge blanket (UASB) (Afferden 2007). Hence, the respective technologies would require at least a medium level of technological sophistication. It is conceivable that the respective operators take care of several small facilities in parallel, either within one municipality or spread over several municipalities.

Water authority. As explained above, it is envisioned that in future WAJ or its successor will solely be responsible for bulk water transmission. Hence, in Jordan the operation of a small-scale WWTP would probably not be in the mandate of the future water authority any more. For the interim period, most of the arguments presented for a regional utility would also apply to a potential operation by WAJ.

Regional utility/publicly owned private company. It is likely that in Jordan many tasks with respect to the planning and implementation of wastewater projects that are currently be carried out by WAJ and the Governorate Water Administrations, would in future be carried out by regional utilities. Presumably these will be companies under private law but state/water authority owned (such as the Aqaba Water Company). Once established, these regional utilities can be expected to exist in the long-term, and to have the required technological, administrative and financial capabilities and financial autonomy. It can be expected to deliver a satisfactory outcome at reasonable costs and to have some leeway in terms of financing. However, the question is how interested and committed they would be to engage in small-scale WWT&R facilities. The reason is that it is logistically easier for regional utilities (or WAJ) to operate a small number of large plants than a high number of small plants. This pertains to operation, maintenance and effluent monitoring, as all these activities require a higher number of staff and more logistics. Therefore, for a regional utility (or WAJ) small-scale facilities may not have first priority and may only be established in the longer-

term. Furthermore, regional level (or WAJ) staff is usually less acquainted with local conditions. A regional utility (or WAJ) is also not directly accountable to local populations.

Privately owned private company. A private company owned by a private owner can be expected to have the technological capabilities to operate more or less sophisticated WWT&R technologies as well as the necessary administrative and financial capacities. At least an international firm may also have some financial autonomy. If the respective management contract is properly designed it can be expected to achieve (technologically) satisfactory outcomes at reasonable costs. A main disadvantage of private firms is that they are not directly accountable to local constituents and that are likely to have little knowledge of local conditions. In consequence they may be less responsive to local concerns than for instance municipalities. They may also not have a long-term perspective. In terms of availability, we can not expect privately owned firms to be readily available within small municipalities (see interviews). However, there may be firms in Amman (such as AquaTreat) that would be able to engage in respective operations. However, further research is needed in order to examine whether Jordanian firms would be interested to do so. The problem with wastewater services is that the risks are relatively high and profit perspectives are low. The question is whether it is possible to find a company that is willing to accept the technical and financial risk immediately after commissioning. In contrast, international firms seeking to export decentralized WWT&R technology may be more interested to engage in operation. However, obviously, for them this may come at high transaction costs. Also the remuneration of their staff may not be competitive. They may, however, be interested to train a Jordanian operator.

Municipality. While municipalities in Jordan have not been engaged in operating WWTPs in the past, it looks as if they will play at least a role at a few locations in the near future. Municipalities have the advantage that they are readily existing, permanent institutions. Furthermore they are well aware of the local conditions and are directly accountable to their local constituents. Hence, a municipality can be expected to be committed and responsive to local concerns. Municipalities have at least some administrative and financial capacities, even if they are not high in the Jordanian context compared with international standards and if a further strengthening of their fiscal status would be desirable. One advantage is that for Jordanian municipalities, civil service rules do not apply; hence in principle municipalities are able to hire staff at competitive salaries. While it is unlikely that respective municipalities have specialist technical staff readily available, still they may have some staff with basic technical qualifications to build on. Still, this is of course a disadvantage compared to specialized private companies. While the representatives of municipalities in Ira and Yarqa were hesitant in the interviews, the Rama representative showed some interest. The

municipalities of Mu'ath Bin Jabal in North Shouneh and of Shobak Al Jadideh will engage in O&M of septage treatment plants; however, these rely on simpler technologies (see Section 5.1.4). Hence, the interest of municipalities to engage in the operation of plants with some level of sophistication would have to be further explored for specific cases. If the responsibility for operation was transferred to a municipality, it should be permitted to sub-contract specific tasks to the private sector.

Utility/company owned by municipality. A utility or limited liability company owned by the municipality could combine many advantages of municipal and private operators, and eliminate some disadvantages. However, so far in the Jordanian water sector this construct only exists at WAJ or governorate, but not at municipal level. The creation of such utilities or companies at municipal level would presuppose that the responsibility for the operation of WWT&R facilities would first be transferred to the municipality and that the municipality is allowed to establish such a company. While this model is not a short-term solution, it could potentially be pursued in the medium-term.

NGOs. In Jordan, numerous non governmental organizations NGOs play a role in local development. NGOs exist in the legal forms of societies, cooperatives and associations. However, according to USAID (2005b) NGOs have not taken on complex WWT&R projects to date. Furthermore, they may not have the motivation for long-term operation and are less likely to have the necessary technical, administrative and financial capabilities. While they may be able to be relatively responsive to local concerns, they are likely to be financially less autonomous. Therefore, NGOs do not appear to be among the primary candidates for the operation of small-scale WWT&R facilities. However, instead they may be a useful interlocutor between the operator and the communities affected by WWTP operation and reuse activities, mirroring community interests and raising community awareness. It is certainly useful to identify relevant local NGOs and to include them in respective advisory councils and processes for stakeholder participation. For instance, the Jordan Badia Research and Development Program (JBRDP) was involved in a wastewater reuse pilot project in Wadi Musa (USAID 2005a: 13 f.). The Jordan Farmers' Union is the counterpart for the water reuse component in the Tel Al Mantah WWTP.

Community-based initiatives. It is principally also conceivable that very small-scale facilities that only connect few households be operated by a voluntary association of these households. However, it is unlikely that private persons would have the technical capacities to operate more sophisticated plants. In focus groups discussions carried out within the SMART project most villagers resented the idea of small cluster solutions, because they feared that the plants would be too close to their houses and could smell, but also because they thought that it might be complicated to manage them (Lienhoop and others 2008).

According to USAID (2005b) in the context of the Small Communities projects also fears were raised that such plants could be dominated by powerful families and not necessarily serve the common interest. Hence, it appears as if community-based initiatives would probably not be a first choice option, but this would also have to be further explored.

While some strengths and weaknesses of potential operators of small-scale WWT&R facilities have been listed, it is still too early to come up with a recommendation at this point. In general, different solutions are principally possible in a given case and the specific choice very much depends on the specific circumstances at hand. However, these specifics still have to be further clarified in the next phase of the SMART project. At the same time, more research is still needed on the potential readiness of alternative operators in Jordan to engage in this field.

Table 5 Comparison of Alternative Operators of Decentralized WWT&R Facilities (draft for discussion)

Operating model	Availability, legal basis and long-term viability	Interest to engage	Technological capabilities or ability to build capacity with reasonable input	Administrative, human resource and financial capabilities	Local knowledge, commitment & responsiveness to local concerns	Access to finance/proven financial autonomy	Incentives and ability to achieve good outcomes at reasonable costs
WAJ or regional utility (publicly owned private company)	Yes, subject to outcome of the current reform process	Principally yes, but might give priority to large-scale WWTPs first	Yes, potentially some specific training necessary	Yes	Limited Medium to high logistical costs (e.g. for spare parts, monitoring, serving customer complaints)	Yes	Utility: yes
Jordanian privately owned private company	More likely in Amman, not locally (e.g. AquaTreat) Not necessarily long-term	Unclear	Yes, potentially some specific training necessary	Yes	Limited. Focus on profit rather than local concerns? Medium to high logistical costs	No	Yes
International privately owned private company	Yes (firms providing technology) Not necessarily long-term	Rather interest to train a local operator	Yes	Yes	No. Focus on profit rather than local concerns? Very high logistical costs	Some	??
Municipality	Yes	Unclear. Some see WAJ as responsible, some appear interested	Likely to be limited and to require at specific training	Administrative & financial capabilities limited, but slowly improving.	Yes. Formally accountable	Yes (e.g. loans by CVDB, aid grants)	May be limited
Utility owned by municipality	No. Creation presupposes that responsibility is with municipality.	Yes, if created	Yes, potentially some specific training necessary	Yes	Yes	No	Yes
NGO	Specific availability to be examined. Not necessarily long-term perspective	Likely to be interested to be involved in process, but not necessarily to assume responsibility for operation	No, likely to require significant training	Unclear	Yes	No	No
Community-based initiative	Informal arrangement	Unclear	No, likely to require significant training	No	Yes	No	??

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- Temporary Public Health Law No. 54 for 2002
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8.4 Interviews Partners

Semi-structured Interviews conducted by Ines Dombrowsky and Nele Lienhoop

Central Government			
Ministry of Water and Irrigation (MWI), Amman	Mr. Ali Subah, Eng.	Director of National Water Master Plans, Director of Planning and Water Resources Studies (? pls. confirm!)	Jan. 24, 2008
Water Authority of Jordan (WAJ), Amman	Mr. Zaid Kilani, Eng.	Assistant Secretary General for Sewage Affairs	Jan. 21, 2008
	Mr. Ahmed Al-Rashaydeh, Eng.	Director for Sewage Operation	Jan. 21, 2008
Governorate level			
Northern Governorates Water Administration (NGWA), Irbid	Mr. Hisham Al Khatib, Eng.	Director of O&M of Wastewater Treatment Plants & Sewerage Network Directorate	Jan. 23, 2008
Environment Department, Irbid	Mr. Khalaf Al Ogla, Eng. in presence of Mr. Burhan Al Gharaibeh, Eng. and Mr. Fawzi Akour, Eng.	Director of Environment Department	Jan. 23, 2008
Balqa Governorate	HE Mr. Sameh Majali, in presence of Mr. Da'oud Al Khatib (WAJ Balqa) and N.N. CARE project	Governor	Jan. 24, 2008
WAJ Balqa Water Governorate	Mr. Ahmad Abu Househ and Mr. Da'oud Al Khatib, Eng.	Director of Balqa Water Governorate Engineer in Balqa Water Governorate	Jan. 24, 2008
Municipal level			
Municipality of Ira Municipality of Yarqa	Mr. Mohammed Adwan and Mr. Abu Anas	Representative of Ira Municipal Council Representative of Yarqa Municipal Council	April 7, 2008
Municipality of Rama	Mr. Awad Adwan in the presence of others	Representative of Rama Municipal Council	April 9, 2008
Development experts			
Kreditanstalt für Wiederaufbau (Kfw), Frankfurt	Mr. Stefan Gramel, Dr.	Engineer, Water Resources and Solid Waste Middle East, Water Sector Policy Division	Feb. 6, 2008
Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), Eschborn	Mr. Artur Vallentin	Former team leader for the GTZ Reclaimed Water Project	Feb. 6, 2008
	Mr. Muhammad Kadhim, Dr.	Consultant and former team leader for the GTZ project Poverty Alleviation through Municipal Development	June 24, 2008
DorschConsult GmbH, Amman	Mr. Udo Kachel	Director	June 23, 2008

Further Exploratory Interviews conducted by Waltina Scheumann (selection)

Central Government			
Ministry of Agriculture	Mr. Abdullah Hasan Naimat, Eng.	Director of Land and Irrigation Directorate	May 2007
	Mr. Falah Ibrahim Salah	Director of Agricultural Economic Policies & International Cooperation	May 2007
Ministry of Environment	Mr. Mohammad Khashashneh, Dr.	Director of Hazardous Substances and Waste Management	May 2007
	Mr. Jabur Daradkeh, Eng.	Water and Air Protection Directorate	May 2007
	Mr. Ahmad Qatarneh, Eng.	Assistant Secretary General & Director of Environmental Impact Assessment Directorate	May 2007
Ministry of Health	Mr. Mohammad Abadi	Director of Water Monitoring	May 2007
Ministry of Municipal Affairs	Mr. Ahed Ziyadat	Director of Local Councils	May 2007
Municipal level			
Dayr'Alla	Mr. Nsour		May 2007
Middle Shouneh	Staff		May 2007
Al Shona	Mr. Hassan Hassoneh Yousef	PR, Journalist	May 2007
Suwaya	Mr. Tahsin Jarat Abu Anas		May 2007
Operators of public and private WWTPs			
Miyahuna	Ms. Joumana Al-Ayed, Eng.	Communication and Marketing Director Manager	May 2007
Dead Sea Spa Hotel	N.N.	Technical Director	May 2007
Jordanian Pharmaceutical Manufacturing Co.	Mr. Shukri Khalil Mannaun	Head of Maintenance Department	May 2007
Private university (Al Ali...)	Mr. Ahmed Ali Ismail Hiyari	Technical Director	May 2007

8.5 Questionnaire

The following questionnaire was used in the semi-structured interviews with government representatives at different levels of administration.

1) What is your involvement with wastewater treatment and reuse?

2) Wastewater can be treated in central and decentralized systems. We assume that decentralized systems serve less than 5000 residents and allow for a local reuse of the treated WW. Let's assume a municipality without central plant and sewerage system in place.

   a. Do you think decentralised WWTP are a good idea?
   b. Assuming same overall unit cost for centralized and decentralized WWTP, under which conditions would you go for a decentralized solution?
   c. Would there be reasons not to go for decentralized solutions if overall costs were lower than for centralized solutions? If so, what are they?

3) We understand that currently the decision-making powers of municipalities towards the set up of decentralized WWT&R systems are limited.

   a. What would a municipality need to do in order to obtain the right to install and operate a decentralized WWTP?
   b. Which government institutions would be involved in the decision-making process?
   c. Are there any ongoing reform processes that are important in this context?

4) Financing

   a. What opportunities does WAJ [do municipalities] have to set up decentralised WWT&R reuse systems in terms financing?
   b. What, in your view, might be a likely financing model in the future?
   c. We understand that treated WW is currently priced at 10 Fils/m^3 for irrigation and 50 Fils/m^3 for industrial uses. Are there plans to change the tariff structure in future and if so what are they?

5) Is there something important you would like to mention that has not been addressed?