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Technical report on the training courses for
Professionals on Decentralized WWT&R technologies and
management



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Foreword

This document presents the results obtained within the framework of the SMART II - **Sustainable Management of Available Water Resources with Innovative Technologies** project funded by the German Ministry of Research and Education (BMBF). The report fulfils the requirements of Work Package 9, deliverable D908 of the project: **Technical report on the training courses for professionals on decentralized WWT&R technologies and management**. The Helmholtz Centre for Environmental Research – UFZ prepared the present study in cooperation with the Training and Demonstration Centre for Decentralized Sewage Treatment BDZ e.V. The main findings of the report are expected to improve human development capacities for the future implementation of decentralized wastewater treatment and reuse solutions in Jordan.

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List of Abbreviations

BMBF	German Federal Ministry of Education and Research
CD	Capacity Development
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
Du	Dunam (~1000 m ²)
DWM	Decentralized Wastewater Management
DWWT&R	Decentralized Wastewater Treatment and Reuse
GIS	Geographic Information Systems
JD	Jordanian Dinar
JVA	Jordan Valley Authority (JVA)
l.p.c.d	Litres Per Capita per Day
MWI	Jordanian Ministry of Water and Irrigation
NAW	Nabil Ayoub Wakileh & Co.
NICE	National Implementation Committee
NWS	National Water Strategy
O&M	Operation and Maintenance
PE	Person Equivalent
SBR	Sequencing Batch Reactor
SMART	Sustainable Management of Available Water Resources with Innovative Technologies
TN	Total Nitrogen
TSS	Total Suspended Solids
WAJ	Water Authority Jordan

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1 INTRODUCTION

In recent years, the topic of decentralization in the wastewater sector in Jordan has become the focus of increasing attention. The Jordanian **National Water Strategy (NWS)** for 2008-2022 included decentralized solutions as part of the approaches outlined to achieve its strategic wastewater treatment goals. The NWS provides an excellent basis for consideration of the decentralized wastewater approach and it has paved the way for future investments in the decentralized sector in Jordan. However, stakeholders such as policy-makers, water companies and academic institutions lack the capacity to translate the national visions and strategies associated with **Decentralized Wastewater Treatment (DWT)** into concrete measures for future implementation in Jordan. Thus, a fundamental prerequisite in order to guarantee the participation of stakeholders in decentralized approaches in the wastewater sector is the building of local capacities in this field [1-3]. For this reason, **Capacity Development (CD)** activities are clearly needed in order to BRIDGE THE KNOWLEDGE GAP IN DECENTRALIZED WASTEWATER MANAGEMENT in Jordan.

In this context, the BDZ, in cooperation with the Helmholtz Centre for Environmental Research – UFZ, has developed a CD concept to bridge knowledge gaps in decentralized wastewater management in Jordan within the framework of the SMART II project. The developed programme – supported by technical training measures, internships and workshops (see Fig 1|**Error! No se encuentra el origen de la referencia.**) – gave the opportunity to relevant Jordanian stakeholders to benefit from an international exchange of ideas and to share background information and expertise for the implementation of **Decentralized Wastewater Treatment and Reuse (DWWT&R)** solutions in Jordan. Additionally, the CD programme provided participants with hands-on experience in wastewater treatment and reuse technologies with the support of the SMART Research, Demonstration and Training Facility located in Fuheis, Jordan, as well as the BDZ e.V. demonstration facilities located in Leipzig, Germany.

The developed CD programme also enhanced knowledge exchange and sustainability by involving strategic partners. For example, by integrating the NICE¹ committee as an initiative designed to co-ordinate the development of an implementation strategy for decentralized wastewater treatment scenarios in rural and peri-urban areas in Jordan, the main strategic players related to the water management sector in Jordan were targeted and involved.

The main objectives of the programme were to:

- Support Jordanian partners with general understanding about decentralized wastewater treatment and reuse solutions proposed within the SMART II project
- Introduce decentralized wastewater and reuse systems as an alternative solution for future funding provided by development banks such as the German Reconstruction Loan Corporation (KfW).
- Introduce the potential and challenges associated with the future implementation of decentralized wastewater treatment and reuse solutions in Jordan to relevant stakeholders within in the National Implementation Committee (NICE).
- Provide engineering skills for adequate operation and maintenance of German wastewater treatment technologies installed at the Fuheis Demonstration and Research Centre in Jordan.
- Improve wastewater monitoring procedures and techniques by enhancing basic knowledge in the field of local wastewater treatment with German expertise and innovative techniques.
- Provide decision-support skills to support the technical and economic evaluation of future deployments in the field of decentralized wastewater treatment and reuse.

¹ More information about the NICE Committee is available at: <http://www.ufz.de/index.php?en=30908>

2 TRAINING CONCEPT

2.1 CD Instruments

Hands-on **technical training, internships and workshops** were organized as capacity development instruments within the SMART II project in order to address the existing gaps in decentralized wastewater management. These instruments were applied during the timeframe of the project – 2011 to 2013 – and have been summarized in Fig 1. Based on a participatory process, the CD instruments provided the framework for introducing the participants to relevant decentralized wastewater management topics such as (i) Wastewater Monitoring, (ii) Available Technologies for Decentralized Wastewater Treatment, (iii) Decision-Support Tools and Geographic Information Systems Integration, as well as to the challenges for future implementation of decentralized wastewater treatment and reuse solutions in Jordan.

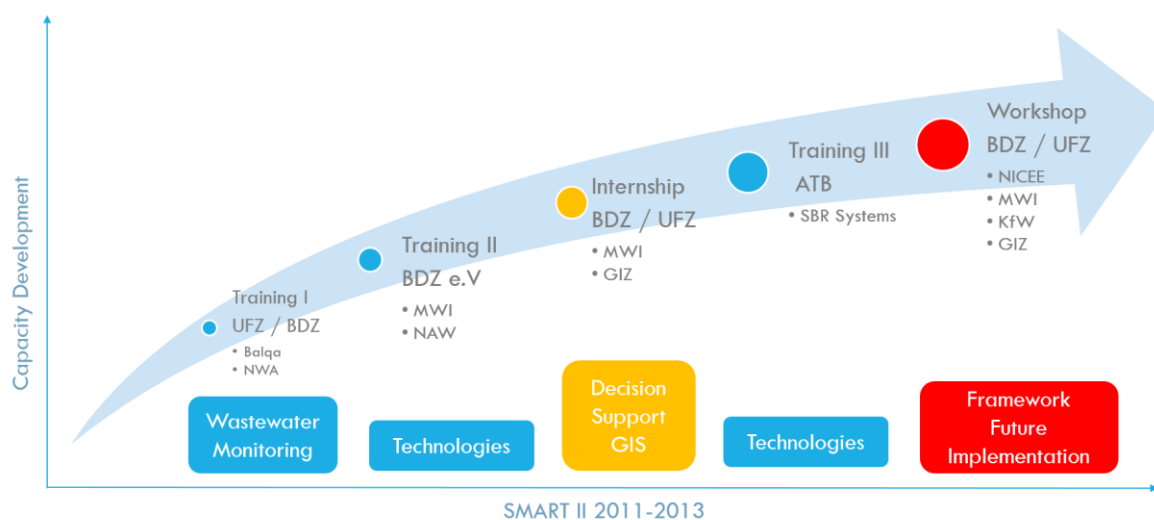


Fig 1 Technical training instruments and target groups

2.2 CD Target Groups

The CD activities were planned to benefit target groups from governmental, academic and international financial institutions as well as international cooperation institutions as follows:

- Governmental Sector: Represented mainly by the members of the NICE committee, with representation of 14 different public stakeholders relevant to the future

implementation of decentralized wastewater treatment and reuse solutions in Jordan (see ¡Error! No se encuentra el origen de la referencia.).

- Academic Sector: Represented by scientific staff at Al-Balqa Applied University, and also the Royal Scientific Society.
- International Financial Institutions: Represented by the German Reconstruction Loan Corporation (KfW)
- German Technical Cooperation: Represented by the German Society for International Cooperation (GIZ).
- Private Sector: Jordanian water companies represented by Nabil Ayoub Wakileh & Co. NWA, ECONSULT and ENGICON

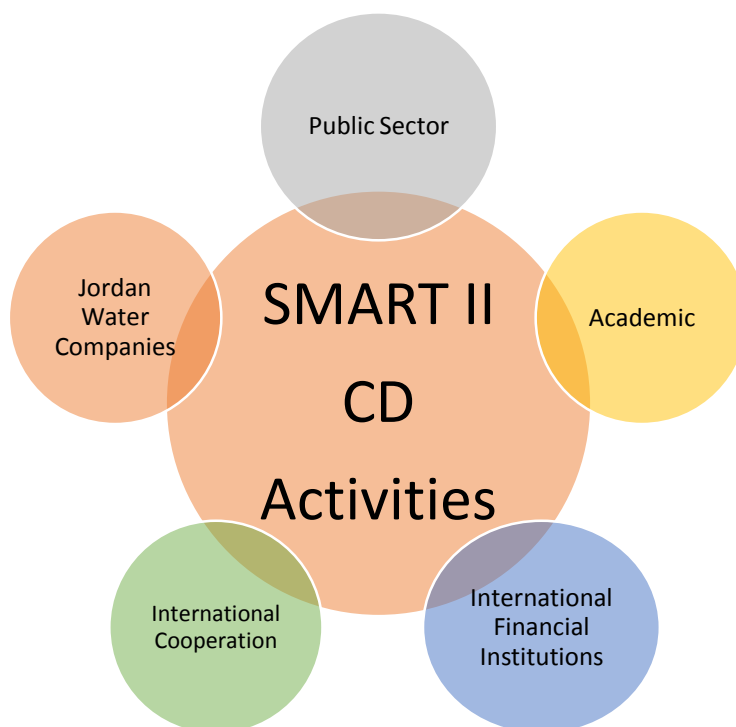


Fig 2 Target groups covered by the CD technical training activities

3 TECHNICAL TRAINING MEASURES

3.1 Training I: Improvement of Wastewater Quality Monitoring

Accurate wastewater quality monitoring is a clear need in order to ensure appropriate operation and maintenance of decentralized wastewater treatment plants. Thus, within the framework of the CD activities a training course on Wastewater Quality Monitoring was conducted. As part of this training course, the participants were introduced to **Hach-Lange test kits** and the **spectrophotometer**. Additionally, all conventional wastewater treatment parameters (except BOD₅ and E. coli) were analyzed on-site from the inflow and outflow samples of the treatment plants installed at the Fuheis site. The training course mainly focused on how the monitoring programme should operate on a routine weekly basis in an efficient, time-saving manner.

3.1.1 Programme

The training course also provided an opportunity to obtain a better understanding about the role of monitoring in ensuring the achievement of the required wastewater quality in the light of the current Jordanian Wastewater and Reuse Standards. In this context, a four-day training course was organized from the 24th to the 28th of January 2011 at the SMART Demonstration and Research Centre in Fuheis. This training course was prepared and carried out by personnel from the **Helmholtz Centre for Environmental Research** – UFZ, with assistance from the staff of the company **NAW** - Nabil Ayoub Wakileh & Co.

The activities conducted here included:

- Introduction to Hach-Lange test kits
- Correct wastewater sample dilution
- Correction of samples with the dilution factor
- Data analysis and data recording using Excel

3.1.2 Participants

This training course was attended by Eng. E. Zraigat from Al-Balqa Applied University and Mr. A. Qusey from NAW - Nabil Ayoub Wakileh & Co., the operator and manager of the Fuheis demonstration site, respectively.

Table 1 Training course participants

Name	Position	Partner
Eng. E. Zraigat	Manager of Treatment Plant	Al-Balqa Applied University
Mr. A Qusey	Operator	NAW - Nabil Ayoub Wakileh & Co.



Fig 3 Wastewater quality analysis conducted by training course participants from Al-Balqa Applied University and the operator of the Fuheis treatment plant from the NWA company.



Fig 4 UFZ trainers (Eng. Grit Weichert and Eng. Petra Hoffmann) and Fuheis treatment plants operators Mr. final user at the Fuheis treatment plant.

3.2 Training II: Introductory Background on Decentralized Wastewater Management

The BDZ staff prepared an introductory training course on Decentralized Wastewater Management (DWM) and the relevant technologies available in Germany. This training course provided an overview of decentralized wastewater treatment technologies to governmental



Fig 5 Delegates from the Ministry of Water and Irrigation (MWI) and the Water Authority Jordan (WAJ) visiting the training and demonstration centre for decentralized sewage treatment in Leipzig

delegates from the Jordanian water/wastewater sector. Over the course of a single day, lectures and practical exercises with 20 different wastewater treatment technologies were held at the demonstration site facilities in Leipzig. The programme provided a comprehensive training package, tailored to the Jordanian water and sanitation situation based on the current water strategy [4]. In addition, the training course provided a unique opportunity for participants to experience at first hand a wide range of decentralized systems in the one location. The participants also had the opportunity to learn about, discuss and exchange ideas with experts and professionals involved in decentralized wastewater management programmes from Germany and across the globe.

3.2.1 Objectives

The aim of this training measure was to provide information on the decentralized wastewater treatment technologies applied in Germany to Jordanian stakeholders from the public and private water/wastewater sectors. The programme covered onsite and decentralized wastewater technologies, operation and maintenance procedures, German regulatory frameworks and policy, and management and economics.

3.2.2 Participants

The following delegates attended the training course at the BDZ on the 8th of October 2011:

Table 2 BDZ Germany Training participants

Name	Institution
Eng. Ali Subah	Ministry of Water and Irrigation (MWI)
Dr. Khair Al Hadidi	Water Authority Jordan (WAJ)
Eng. Nayef Seder	Jordan Valley Authority (JVA)
Eng. Ahmad Olimat	Ministry of Water and Irrigation (MWI)
Eng. Nabil Wakileh	Nabil Ayoub Wakileh & Co.



Fig 6 Delegates from governmental institutions from Jordan. From the left: Eng. Ali Subah/MWI, Dr. Khair Al Hadidi/WAJ - Eng. Nayef Seder/JVA - Eng. Ahmad Olimat/WAJ.



Fig 7 Delegates from Jordan from the Ministry of Water and Irrigation, Water Authority Jordan, Jordan Valley Authority and Nawil Wakile Water Company NWA

3.2.3 Training Topics and Dates

This training course provided the opportunity to observe 12 different wastewater treatment technologies for decentralized systems in full operation at the BDZ² training and demonstration facilities.

The programme provides participants with the following opportunities:

- Understanding of DWWT and its implications for sustainable development and poverty reduction
- Increasing of knowledge about the establishment and operation of decentralized wastewater treatment technologies
- Determination of strategies to apply the knowledge acquired during the programme
- Developing networks with programme participants and trainers from the BDZ

² Twelve different small treatment plants, which are working and integrated into a wastewater treatment cycle, are in operation for research and demonstration purposes at the BDZ demonstration centre located in Leipzig-Leutzsch.

Table 3 Lectures and trainers

Trainer	Institution	Topic	Date
Eng. Thomas Gester	ATB Umwelttechnologien GmbH	Principles and Operation of Sequential Batch Reactor (SBR) Technologies	08.10.2011
Dr. Manfred van Afferden	Helmholtz Centre for Environmental Research – UFZ	Introduction to Decentralized Wastewater Management	
Dr. Roland Müller	Helmholtz Centre for Environmental Research – UFZ	The role of decentralized wastewater management in arid and semi-arid regions: Case study Jordan	
Jaime A. Cardona	Training and Demonstration Centre for Decentralized Sewage Treatment BDZ	- Decision-making tools for decentralized wastewater management. - Introduction to decentralized wastewater treatment technologies at the BDZ	

Table 4 Decentralized wastewater treatment technologies presented during the training course

Technology	Description
Sequential Batch Reactors (SBR)	SBR plants constitute a special type of activated sludge plant in which biological wastewater purification is based on the activated sludge process. Biological wastewater purification is accomplished here by microorganisms which float in the activation tank and form activated sludge flocs. The bacteria require oxygen for the degradation of the organic contaminants in the wastewater. This oxygen is added through aeration systems that also provide the physical mechanism for mixing the sewage and sludge.
Fixed bed reactors	Fixed bed reactors are based on the biofilm technology. In the biofilm process, biological wastewater treatment is accomplished by microorganisms that are attached to a carrier material and form a biofilm. In fixed bed reactors, the carrier material usually consists of plastic particles. These are permanently installed in the reactor and permanently covered with the water. The bacteria require oxygen for the degradation of the organic contaminants in the wastewater. This oxygen is provided through high pressure aeration systems which are installed under the fixed bed.
Trickling filters	Trickling filters are based on the biofilm technology. In the biofilm process, biological wastewater treatment is accomplished by microorganisms that are attached to a carrier material and form a biofilm. The carrier material in trickling filters consists of lava rock, shaped plastic forms or fixed bed particles. Pretreated wastewater is applied evenly to the trickling filter surface and percolates vertically through the trickling filter. The bacteria require oxygen for the degradation of the organic contaminants in the wastewater.
Moving/fluidized bed filters	Moving and fluidized bed filters are based on a combination of the activated sludge and the fixed bed technologies. Biological wastewater purification is accomplished by microorganisms which float in the activation tank and form activated sludge flocs. The microorganisms are also attached to small moving plastic particles which function as carrier material. The bacteria require oxygen for the degradation of the organic contaminants in the wastewater. This oxygen is provided through high pressure aeration systems which are fixed to the bottom of the bed.
Rotating disk filters	Rotating disk filters are based on a combination of the activated sludge and the fixed bed technologies. Biological wastewater purification is accomplished by microorganisms which float in the activation tank and form activated sludge flocs. They are also attached to plastic disks, where they form a biofilm. The disks are fixed onto a shaft. The lower half is immersed in pretreated wastewater which flows horizontally through a container and the upper half is surrounded by air. The bacteria require oxygen for the degradation of the organic contaminants in the wastewater.
Activated sludge systems	Activated sludge plants are based on the activated sludge process. Biological wastewater purification is accomplished here by microorganisms which float in the activation tank and form activated sludge flocs. The bacteria require oxygen for the degradation of the organic contaminants in the wastewater. The oxygen is added through aeration systems that also provide the physical mechanism for mixing the sewage and sludge.
Constructed wetlands	Constructed wetlands are planted soil filters. The soil body consists of a sand and gravel mixture, which must guarantee a sufficient permeability for the water, and is isolated from the natural subsoil. Biological purification of the wastewater is accomplished by the microorganisms living in the soil, which form a biofilm in the soil body. Depending on the type of construction, the pretreated wastewater flows horizontally or vertically through the filter. The bacteria require oxygen for the degradation of the organic contaminants in the wastewater.

3.3 Technical Training on Sequential Batch Reactor (SBR) Technologies

The installation of SBR systems at the research and demonstration centre in Fuheis, Jordan, required training of the local personnel responsible for operation and maintenance in order to ensure proper operation of the technology. For this reason, the company ATB Umwelttechnologien GmbH conducted a number of technical training courses in order to enhance the capacity of local partners for adapting, monitoring and operating SBR technologies under the local conditions that predominate in Jordan. The efficiency of the systems under local conditions, which are characterized by wastewater with high BOD concentration, was evaluated in these training courses. These parameters were considered so as to ensure the functioning and adaptability of the technology in Jordan.

3.4 Training Topics and Dates

Table 5 Training topics conducted by ATB Umwelttechnologien GmbH

Trainers	Institution	Topic	Dates	Participants
Eng. Thomas Gester	ATB Umwelttechnologien GmbH	Principles and operation of sequential batch reactor (SBR) technologies	March 2011	Personnel from Al-Balqa Applied University designated for systems operation at Fuheis Personnel from NWA and operators from Fuheis
Eng. Thomas Gester Eng. Thomas Vogt	ATB Umwelttechnologien GmbH	Construction and installation of SBR technologies	March 2011	Personnel from Nabil Ayoub Wakileh & Co.
Eng. Thomas Gester Eng. Thomas Vogt	ATB Umwelttechnologien GmbH	Sampling and monitoring SBR technologies	14.05.2013	Personnel from Al-Balqa Applied University designated for systems operation at Fuheis Personnel from NWA and operators from Fuheis
Eng. Thomas Gester Eng. Thomas Vogt	ATB Umwelttechnologien GmbH	Operation of SBR controlling electronic console	13.11.2013	Personnel from Al-Balqa Applied University designated for systems operation at Fuheis Personnel from NWA and operators from Fuheis



Fig 8 ATB Umwelttechnologien's technical training on SBR systems at the Fuheis demonstration plant



Fig 9 ATB Umwelttechnologien's technical training on SBR systems. Operation of electronic control devices at the Fuheis demonstration plant.

4 INTERNSHIPS

4.1 Description

The BDZ e.V. and the Helmholtz Centre for Environmental Research – UFZ organized an internship for employees from the Jordanian Ministry of Water and Irrigation (MWI) in cooperation with the **German Society for International Cooperation (GIZ)**³. The BDZ e.V. hosted one employee from the Ministry of Water and Irrigation (MWI) from January to April 2013. This internship was focussed on enhancing capacities in the field of **Geographic Information Systems (GIS)** and introducing MWI personnel to the **Assessment of Decentralized Wastewater Solutions (ADEWS)** methodology. The aim of the internship was to provide training on planning tools for decentralized wastewater management. ADEWS provides an integrated assessment using a

³ The internship was organized within the framework of the GIZ's "Praxisvermittlung für Internationale Fach- und Führungskräfte (PIFF)" programme.

Geographic Information System (GIS) for the creation and visualization of several layers of various relevant variables and criteria. It allows for the production of a set of resulting thematic maps that present the most cost-effective management scheme.

The main activities conducted during the internship for the MWI employee Eng. Ali Al-Brazat were targeted at transferring knowledge on the Assessment of Decentralized Wastewater Solutions

(ADEWS) methodology. This analysis presents a comparison between centralized treatment options and identifies the economic requirements of decentralized wastewater infrastructure. While centralized treatment in Jordan is an option available to serve currently unconnected settlements, it requires significant capacity since most Jordanian treatment plants are operating at or over full capacity. The connection of more settlements therefore requires additional investment in treatment capacities, sewer infrastructure and pumping requirements in order to overcome spatial distances across uneven terrain. ADEWS therefore assesses the economic requirements associated with decentralized treatment technologies and those required for connection to the nearest centralized treatment facility.



Fig 10 Sample GIS maps prepared by BDZ e.V. in collaboration with MWI staff during the internship

4.2 Participants

Table 6 Internship participant

Name	Position	Institution	Time
Eng. Ali Al-Brezat	Geographic Information specialist	Ministry of Water and Irrigation	January to April 2013

4.3 Internship Programme

The programme was divided into a theoretical part conducted in Germany at the UFZ site and a practical part conducted in Jordan during March- April 2013.

4.4 Topics Covered by the Internship

4.4.1 Module: GIS Basics

- Module 1 Basics of Geographic Information Systems
- Module 2 Geo-referencing and satellite image manipulation
- Module 3 Digitalization and feature extraction methodologies
- Module 4 Digital elevation models – manipulation and interpretation

4.4.2 Module: ADEWS Toolboxes

- Module 5 Introduction to the ADEWS methodology
- Module 6 Clusters conformation on decentralized wastewater treatment facilities
- Module 7 Kernel density tool box and application cluster definitions for decentralized wastewater treatment
- Module 8 Sewer network delineation and cost estimation
- Module 9 Land use and remote sensing techniques

4.4.3 Module: Clusters for Decentralized Wastewater Treatment & Financial Assessment

- Module 9 Spatial analysis and application to water resources management
- Module 10 Arc Hydro Toolbox basics
- Module 11 Catchment area calculation
- Module 12 Selection of suitable sites for treatment plant installation
- Module 13 Financial assessment of cluster solutions

5 WORKSHOP FOR FUTURE IMPLEMENTATION

5.1 Introduction

In order to contribute to the development of decentralized wastewater management solutions for Jordan, the Helmholtz Centre for Environmental Research – UFZ organized the “TECHNICAL WORKSHOP ON DECENTRALIZED WASTEWATER MANAGEMENT IN JORDAN” workshop in association with the Training and Demonstration Centre for Decentralized Sewage Treatment – BDZ e.V. This was held in Amman from the 29th to 30th of April 2013. This event provided an up-to-date perspective on the challenges associated with the effective implementation of decentralized wastewater management solutions in Jordan (see Annex I Workshop Programme and Concept)

The aim of the technical workshop on decentralized wastewater management was to assist the “National Implementation Committee for Effective Decentralized Wastewater Management in Jordan” (NICE) in dealing with management and technical issues associated with the implementation of decentralized wastewater solutions.

5.2 Workshop Participation and Organization

The workshop was coordinated and organized in cooperation with the NICE office in Amman, the companies ENGICON and ECOCONSUL and Al-Balqa Applied University. It was initially anticipated that only twenty participants would attend the workshop, i.e. one participant each from the members of the National Implementation Committee. However, close to 50 participants came to the workshop, thus reflecting the great interest in the field of decentralized wastewater management. The complete list of registered participants is given in Annex II.

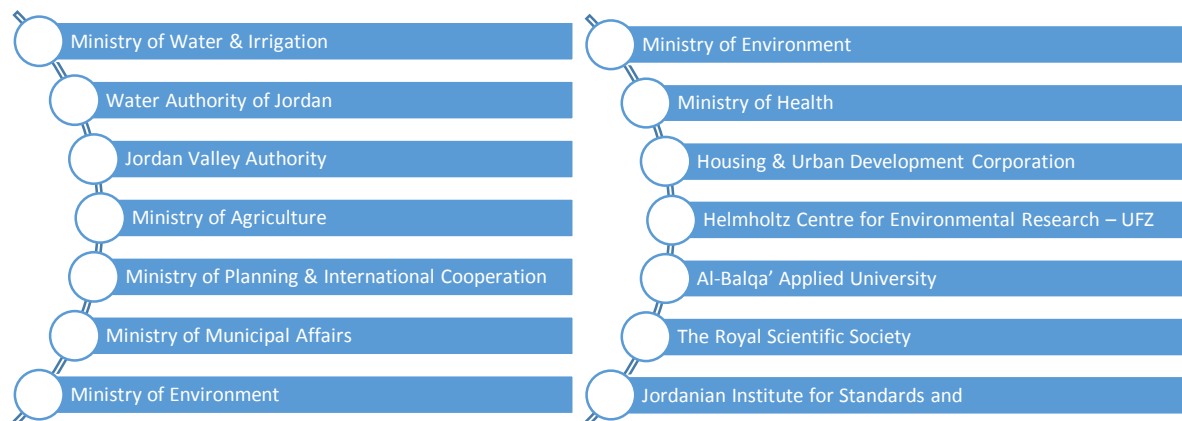


Fig 11 National Implementation Committee members

5.3 Topics and Programme

The overall objective of the workshop was to develop the capacity of water sector professionals and academics in Jordan with regard to practical applications of decentralized wastewater treatment solutions for improved decision-making and better management of water services.

This objective was achieved through lectures, technical visits to demonstration facilities, plenary discussions and field excursions. In addition, the World Meteorological Organization (WMO) provided the participants with material in the form of brochures, compact discs (CDs) and other publications containing detailed information on the links between weather, climate and health.

The workshop provided information on the following elements of decentralized wastewater management (see Annex I Workshop Programme)

- Introduction to decentralized wastewater treatment and its implications for sustainable development and water resources management in Jordan
- Treatment and reuse technologies for decentralized wastewater management
- Requirements for operation and maintenance schemes for decentralized wastewater management
- Planning and management of decentralized wastewater facilities including stakeholder participation, user education, financing and compliance
- Strategies for applying the knowledge acquired during the programme

- Developing networks and information-sharing opportunities.

The minutes of the workshops provide a more detailed view into the topics and their corresponding discussion (see Annex III Workshop Minutes).



Fig 12 Members of the NICE committee attending the introductory lecture on Decentralized Wastewater Management given by Dr. Manfred van Afferden



Fig 13 Eng. Ali Subah from the Ministry of Water and Irrigation presenting the Jordanian Water Strategy.

5.3.1 Panellists

The workshop attracted the participation of the following experts:

Table 7 Workshop panellist for the event

Name	Institution	Topic
H.E. Eng. Basem Telfah	MWI	Jordanian Water Strategy & Decentralized Wastewater Management
Eng. Ali Subah	MWI	Jordanian Water Strategy & Decentralized Wastewater Management
Eng. Malek Rawashdeh	WAJ	Actual & Planned Development Projects in the Jordanian Wastewater Sector
Dr. Muna Hindiye	WAJ	Jordanian Wastewater Standards & Challenges of DWWM Solutions
Dr. Manfred van Afferden	UFZ	General Principles of Decentralized Wastewater Management
Dr. Mi-Yong Lee	UFZ	Bottlenecks for Implementation of DWWM

Beate Richter	KfW	Financial Concepts for the Wastewater Sector
Dr. Bassim Abbassi	Al-Balqa Applied University	Guided Tour at the Fuheis Site & Technical Aspects of DWWT Solutions (CW, SBR, MST, MBR, Reuse, Sludge Treatment)
Eng. Nabil Wakileh, NAWCO	Nabil Ayoub Wakileh & Co.	Guided Tour at the Fuheis Site & Technical Aspects of DWWT Solutions (CW, SBR, MST, MBR, Reuse, Sludge Treatment)
Eng. Mohammad Al-Asali	ENGICON	Costs Recovery and Wastewater Tariffs in Jordan
Eng. Thomas Aubron	UFZ	Site Selection for Decentralized Solutions
Jaime A. Cardona	BDZ e.V	GIS-Based Decision Support for DWWM Solutions

5.3.2 Component I: Introduction to Decentralized Wastewater Systems

The topics covered the main central definition regarding decentralized wastewater treatment solutions within the SMART project, as well as the main international agreement about this issue. This component introduced the participants to general aspects of wastewater systems, the importance of the treatment of wastewater and the various types of systems (central and decentralized options). In addition, this component provided participants with a general overview of the current wastewater treatment situation in Jordan. Information was also presented on central wastewater systems and the problems associated with wastewater in rural and peri-urban areas.

5.3.3 Module II: Technical Aspects of Decentralized Wastewater Management in Jordan and Field Trip to the Fuheis Demonstration Site

This component provided participants with information on fundamental aspects of wastewater treatment systems. The first module was focused on the characterization of wastewater, the components of municipal wastewater treatment, and the components of biological wastewater treatment in small plants. This set of modules was complemented by a field trip to the SMART Research, Training and Demonstration Site in Fuheis (Al-Salt). This component included the

presentation of specific wastewater treatment technologies that have been constructed within the framework of the SMART project.



Fig 14 Members of the NICE committee attending the introductory lecture on Decentralized Wastewater Management. Eng. Nabil Wakileh explaining the wastewater quality achieved by treatment technologies at the Fuheis Research and Demonstration Centre



Fig 15 Members of the NICE committee attending the introductory lecture on Decentralized Wastewater Management. Dr. Bassim Abassi speaking about wastewater treatment technologies.

5.3.4 Module III: Planning, Development and Financing of Decentralized Wastewater Management Solutions

The aim of this component was to provide participants with an understanding of what is required in terms of planning and regulatory frameworks for the sustainable operation of decentralized wastewater systems in Jordan. Decision-making tools for decentralized wastewater management were introduced here. This component also included some aspects regarding the development of sustainable sanitation systems as part of urban planning and the role of the participation of different stakeholders in the planning process. In addition, the module included information on the requirements for wastewater to be discharged into the sewage system and also pointed out the need for decentralized or small-scaled wastewater treatment systems in Jordan. This information provided an important input for the discussion session that was held at the end of the component.

The module also presented information and outlined the problems and challenges of wastewater treatment in urban and rural areas of Jordan, including potential financial scenarios. In this context, the module included a lecture from the (KfW) development bank on

a natural channel for the spreading of new and successful decentralized wastewater treatment approaches. Secondly, the ministries have trained staff and a permanent presence in all parts of the country. In this way, the innovative concepts for decentralization of wastewater treatment promoted by the capacity development programme can be better understood and applied by local final users.

In terms of future funds for implementing DWM approaches, the participation of development banks such as the KfW within the CD activities, improved awareness of decentralized wastewater treatment and reuse systems as a suitable financial target for infrastructure projects in the country. The participation of the KfW represented a significant positive result of the CD activities that will play a significant role in the future implementation of the decentralized approach in the water sector in Jordan.

References

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2. Pinkham, R.D., et al., *Valuing decentralized wastewater technologies: A catalog of benefits, costs, and economic analysis techniques*. Snowmass, Colorado: Rocky Mountain Institute, 2004.
3. Tropp, H., *Water governance: trends and needs for new capacity development*. Water Policy, 2007. **9**.
4. MWI. *Water for Life, Jordan's Water Strategy 2008-2022* Jordan Ministry of Water and Irrigation (MWI) 2009 [cited 2013 07.07.213]; Available from: <http://www.mwi.gov.jo/mwi/Water%20Strategy%2009.pdf>.

ANNEX I: Workshop Programme and Concept

TECHNICAL WORKSHOP

“DECENTRALIZED WASTEWATER MANAGEMENT IN JORDAN”

29th to 30th of April 2013

Hotel ‘Le Méridien’, Shmeisani, Amman

Introduction

Currently, the water supply in Jordan is over allocated, which is resulting in negative environmental and economic impacts. The project “Sustainable Management of Available Water Resources with Innovative Technologies” (SMART) has set out to assist in addressing these issues. One key aspect of this approach is the effective management of wastewater.

Decentralized Wastewater Management can play a significant role in the alleviation of water scarcity and pollution. This SMART-concept is also reflected in Jordan’s Water Strategy 2008-2022. In addition to setting the aim of adequate wastewater collection and treatment for major cities, the strategy specifies that decentralized wastewater management systems shall be built to serve semi-urban and rural communities and that decentralized wastewater management approaches shall also be explored for new urban settlements.

Objective

In order to contribute to the development of decentralized wastewater management solutions for Jordan, the Helmholtz Centre for Environmental Research – UFZ in association with the Training and Demonstration Centre for Decentralized Sewage Treatment – BDZ e.V. has proposed the Workshop “DECENTRALIZED WASTEWATER MANAGEMENT IN JORDAN”. This forum will provide an up to date perspective on the challenges associated with the effective implementation of decentralized wastewater management solutions in Jordan.

The aim of the technical workshop on decentralized wastewater management is to assist the “National Implementation Committee for Effective Decentralized Wastewater Management in Jordan” (NICE) with the development of managerial and technical issues associated with the implementation of decentralized wastewater solutions.

The workshop will provide information on the following elements of decentralized wastewater management:

- Introduction to decentralized wastewater treatment and its implications for sustainable development and water resources management in Jordan;
- Treatment and reuse technologies for decentralized wastewater management;
- Requirements for operation and maintenance schemes of decentralized wastewater management;
- Planning and management of decentralized wastewater facilities including stakeholder participation, user education, financing and compliance;
- Strategies for applying the knowledge acquired during the program; and
- Developing networks and information sharing opportunities.

Additionally, the course also offers the opportunity for participants to learn, discuss and exchange ideas with experts and professionals involved in decentralized wastewater management programs from Germany and across the globe.

Participants

The workshop is offered to the following members of NICE:

- | | |
|---|---|
| 1. Ministry of Water & Irrigation | 9. Housing & Urban Development Corporation |
| 2. Water Authority of Jordan | 10. Helmholtz Centre for Environmental Research – UFZ |
| 3. Jordan Valley Authority | 11. Al-Balqa' Applied University |
| 4. Ministry of Agriculture | 12. The Royal Scientific Society |
| 5. Ministry of Planning & International Cooperation | 13. Jordanian Institute for Standards and Metrology |
| 6. Ministry of Municipal Affairs | |
| 7. Ministry of Environment | |
| 8. Ministry of Health | |

and the Observers of NICE.

Topics and Program

Module I: Introduction to Decentralized Wastewater Management

This component will introduce the participants to the general aspects of wastewater systems, the importance behind the treatment of wastewater and the different types of systems (centralized and decentralized options). This component also offers participants a general overview to the current wastewater management in Jordan and includes some aspects of the development of sustainable sanitation systems as part of urban planning as well as the role of the different stakeholders in the planning process.

Module II: Technical Aspects of Decentralized Wastewater Management in Jordan

This component provides participants with information on the fundamental aspects of wastewater treatment systems. The first module is focused on the characterization of wastewater, the components of municipal wastewater treatment, and components of biological wastewater treatment of small plants. This set of modules will be complemented by a field trip to the SMART Research, Training and Demonstration Site in Fuheis (Al-Salt). This component includes the presentation of specific wastewater treatment technologies that have been constructed in the frame of the project SMART.

Module III: Planning, Development and Financing of Decentralized Wastewater Management Solutions

The aim of this component is to provide participants with an understanding of what is required in terms of planning and regulatory frameworks for the sustainable operation of decentralized wastewater systems in Jordan. Decision-making tools for decentralized wastewater management will be introduced. This component also includes some aspects regarding the development of sustainable sanitation systems as part of urban planning and the role of the participation of different stakeholders in the planning process.

Panellists

- | | |
|---------------------------------|-----------------------------------|
| • H.E. Eng. Basem Telfah, MWI | • Beate Richter, KfW |
| • Eng. Ali Subah, MWI | • Dr. Bassim Abbassi, BAU |
| • Eng. Malek Rawashdeh, WAJ | • Eng. Nabil Wakileh, NAWCO |
| • Dr. Muna Hindiye, WAJ | • Eng. Mohammad Al-Asali, Engicon |
| • Dr. Manfred van Afferden, UFZ | • Eng. Thomas Aubron, UFZ |
| • Dr. Mi-Yong Lee, UFZ | • Eng. Jaime Cardona, UFZ |

Schedule

Day 1: Monday, 29th of April 2013

MODULE I: Introduction to Decentralized Wastewater Management Approaches		
08:00 – 08.30	<i>Registration & Coffee Break</i>	ECO-Consult
08.30 – 08.45	Welcome by Chair of NICE Technical Committee	Eng. Ali Subah
08.45 – 09.30	General Principles of Decentralized Wastewater Management	Dr. Manfred van Afferden
09.30 – 10:15	Jordanian Water Strategy & Decentralized Wastewater Management	Eng. Ali Subah
10.15 – 10.45	<i>Coffee Break</i>	
10.45 – 11.30	Actual & Planned Development Projects in the Jordanian Wastewater Sector	Eng. Malek Rawashdeh
11.30 – 12.15	Costs Recovery and Wastewater Tariffs in Jordan	Eng. Mohammad Al-Asali
12.15 – 13.00	Jordanian Wastewater Standards & Challenges of DWWM solutions	Dr. Muna Hindiye
13.00 – 14.00	<i>Lunch</i>	
MODULE II: Technical Aspects of Decentralized Wastewater Management Solutions		
14.00 – 14.30	<i>Shuttle to Fuheis from Hotel 'Le Méridien'</i>	
14.30 – 16.00	Guided Tour at Fuheis Site & Technical Aspects of DWWT Solutions (CW, SBR, MST, MBR, Reuse, Sludge Treatment)	Dr. Bassim Abbassi / Eng. Nabil Wakileh
16.00 – 16.15	<i>Coffee Break</i>	
16.15 – 17.00	Guided Tour at Fuheis Site & Technical Aspects of DWWT Solutions (CW, SBR, MST, MBR, Reuse, Sludge Treatment)	Dr. Bassim Abbassi / Eng. Nabil Wakileh
17.00 – 17.15	<i>Shuttle to Restaurant Zuwwadeh (Fuheis)</i>	Eco-Consult
17.15 – 18.30	<i>Dinner at Restaurant Zuwwadeh (Fuheis)</i>	
18.30	<i>Shuttle to Hotel 'Le Méridien' from Restaurant Zuwwadeh</i>	Eco-Consult

Day 2: Tuesday, 30th of April 2013

MODULE III: Planning, Development and Financing of DWWT&R		
08.00 – 08.30	<i>Arrival and Coffee Break</i>	
08.30 – 08.45	<i>Photo Shooting</i>	
08.45 – 09.30	GIS-Based Decision Support for DWWM Solutions	Eng. Jaime Cardona
09.30 – 10.15	Site Selection for Decentralized Solutions	Eng. Thomas Aubron
10.15 – 10.45	<i>Coffee Break</i>	
10.45 – 11.30	Financial Concepts for the Wastewater Sector	Beate Richter
11.30 – 12.00	Introduction to Roundtable: Bottlenecks for Implementation of DWWM	Dr. Manfred van Afferden
12.00 – 13.00	<i>Lunch</i>	
13.00 – 15.00	Roundtable: Bottlenecks for Implementation of DWWM	Dr. Mi-Yong Lee / Dr. Manfred van Afferden
15.00 – 15.45	Implications for the National Implementation Committee	Dr. Mi-Yong Lee
15.45 – 16.00	Feedback and Farewell	All

ANNEX II: Workshop Attendance List

Technical Workshop SMART and NICE
"Challenges of Decentralized Wastewater Management in Jordan"
29th to 30th of April 2013

NICE Steering Committee							
No.	Organization	Name	Position	Email	Mobile	Confirmation / Attendance* April 29 th	Confirmation / Attendance* April 30 th
1.	Ministry of Water & Irrigation	H.E. Eng. Basem Telfah Chair	Secretary General	Basem_Telfah@mwi.gov.jo	5652260-1124		
2.	Ministry of Water & Irrigation	Eng. Ali Subah	Secretary General Assistant Technical Affairs	Ali_Subah@mwi.gov.jo	5652260-1123 0777295902	*	*
3.	Water Authority of Jordan	Eng. Malek Al- Rawashdeh Vice Chair	Secretary General Assistant Technical Affairs	Malek_rawashdeh@pmu.gov.jo Malek_Alrawashdeh@mwi.gov.jo	5652262-1454	*	
4.	Jordan Valley Authority	Eng. Qais Owais	Secretary General Assistant North & Middle Jordan Valley	Qais_owais@mwi.gov.jo Qais_owais@yahoo.com	5697908- 0795649822		*
5.	Ministry of Environment	Eng. Adnan Al- Zawahrah	Director of Inspection and Control	zawahreh2001@yahoo.com	5560113 0790190091	*	*
6.	Jordanian Institute of Standards and Metrology	Eng. Mohammad Said Al- Askar	Director of Inspection and Control	Mohammad.Alaskar@jsmo.gov.jo	5301225-2002 0798201980	*	*
7.	Housing and Urban Development Corporation	Dr. Eng. Mohammad Kreishan	Manager of Studies, Design and Tenders	mkreishan@yahoo.com	0797313234 0777387575	*	*
8.	Ministry of Health	Eng. Salah Al-Hayari	Director of Environmental Health	cic@moh.gov.jo	5650626 0799050206	*	*
9.	Ministry of Municipal Affairs	Eng. Akram Al-Sunaa	Director of Projects	sunnaakram@yahoo.com	0795059014		
10.	Ministry of Agriculture	Eng. Suliman Sawalha	Director of Irrigation and Land Use	sulymansawalha@yahoo.com	0777771435	*	
11.	Ministry of Planning & International Cooperation	Eng. Ahmad Al-Jazzar	Head of Water and Agriculture Division	Ahmad.j@mop.gov.jo	0795295404	*	*

12.	Al-Balqa University	Dr. Bassim Abbassi	Dean of Scientific Research	babbassi@bau.edu.jo	0795602866	*	*
13.	Helmholtz Center for Environmental Research – UFZ	Dr. Roland Arno Müller	Head of Department Environmental Biotechnology Center	Roland.mueller@ufz.de	+49-341-235 1275		
14.	Royal Scientific Society	Eng. Wael Taher Suleiman	Head of Water Studies Division	Wael.suleiman@rss.jo	0795151593	*	*

Observers Steering Committee

No.	Organization	Name	Position	Email	Mobile	Confirmation / Attendance* April 29 th	Confirmation / Attendance* April 30 th
15.	Gesellschaft für Intl. Zusammenarbeit (GIZ)	Eng. Guy Honoré	Coordinator German-Jordanian Cooperation	Guy.Honore@giz.de	079507657 06 5690051	*	
16.	Kreditanstalt für Wiederaufbau (KfW)	Beate Richter	Country Director Jordan	Beate.Richter@kfw.de	65 85 43 96		*
17.	ACWUA	Dr. Jarrah Al Zubi	Project Manager	substitute H.E. Eng. Khaldoun Khashman	06 5161900	*	
18.	IUCN	Eng. Fida Haddad		substitute Eng. Sameeh Nuimat	0777888162		

NICE Technical Committee

No.	Organization	Name	Position	Email	Mobile	Confirmation / Attendance* April 29 th	Confirmation / Attendance* April 30 th
19.	Ministry of Water & Irrigation	Eng. Hadeel Al-Smadi	National Water Master Plan	Hadeel_Smadi@mwi.gov.jo	0775644055	*	*
20.	Ministry of Health	Eng. Mohammad Al-Abbadi	Head of Water & Waste Water Resource Monitoring	Mohd_abadi@yahoo.com	0772246783	*	*
21.	Water Authority of Jordan	Eng. Majed Joudeh	Head of Wastewater Projects	Majed_Joodeh@mwi.gov.jo	798503361	*	*

22.	Jordan Valley Authority	Eng. Raji Al-Hurani	Head of Water Quality Monitoring		065697908	*	*
23.	Ministry of Environment	Eng. Ahlam Badar	Head of the Environmental Audit and Inspection	Ahlmroben@yahoo.com	0788599679	*	*
24.	Jordanian Institute of Standards and Metrology	Eng. Salah Obiedat	Head of Import Control		0799031479		
25.	Housing and Urban Development Corporation	Eng. Khawla Albaw	Management of Studies, Design & Tenders Dep.	khawla_albaw@yahoo.com khawla.yousef@hudc.gov.jo	0795370864	*	*
26.	Ministry of Municipal Affairs	Eng. Arin Najjem	Head of Monitoring and Control	Areennajim@yahoo.com		*	*
27.	Ministry of Planning & International Cooperation	Eng. Ebaa Al-Eassa	Project engineer	Ebaa.eassa@mop.gov	0799973316	*	*
28.	Helmholtz Center for Environmental Research	Dr. Manfred van Afferden	Leader Working Group: Decentralized Wastewater Management	manfred.afferden@ufz.de	+49 341 235-1848	*	*
29.	Al-Balqa' University	Ala'a Al Din Tahboub	Professor for Agriculture				
30.	Royal Scientific Society	Eng. Tharwh Qutaish	Senior Water Specialist	tharwh.qutaish@rss.jo	701 Ext. 2428	*	*

Observers Technical Committee							
No.	Organization	Name	Position	Email	Mobile	Confirmation / Attendance* April 29 th	Confirmation / Attendance* April 30 th
31.	Gesellschaft für Intl. Zusammenarbeit (GIZ)	Irene Sander	Technical Advisor	irene.sander@giz.de	079-7569413		*
32.	ACWUA	Eng. Mustafa Nasereddin	Director of Programs and Technical Services	Mustafa_Nasereddin@acwua.org			

Others							
No.	Organization	Name	Position	Email	Mobile	Confirmation / Attendance* April 29 th	Confirmation / Attendance* April 30 th
33.	Engicon	Eng .Firas Matar	CEO O&M	fmatar@engicon.com	0797031673	*	
34.	NAW	Eng. Nabil Wakileh	General Manager	nabil@naw-co.com	0795582428	*	*
35.	WAJ	Eng. Ameerah Nuwara	Section Head	Ameerah42@yahoo.com	0798503386	*	
36.	Engicon	Eng. Mohammad Al Esaili	Wastewater expert	m_al_esaili@hotmail.com	0786106169	*	
37.	WAJ	Eng. Iyad Hamdi Mahnoud	Engineer			*	
38.	WAJ	Eng. Muna Al-Hindiyeh	SGA Monitoring and Laboratories		0777488880	*	*
39.	Engicon	Anas Farraj	Training coordinator	Afarraraj@engicon-om.com		*	*
40.	ECO-Consult	Lana Zubi	Consult	lane.zubi@ecoconsult.jo		*	*
41.	ECO-Consult	Saja Khaldoun Al-Khashman				*	*
42.	MWI	Eng. Ali Breazat	National Master Plan Department	ali_breazat@mwj.gov.jo		*	

NICE Office							
No.	Organization	Name	Position	Email	Mobile	Confirmation / Attendance* April 29 th	Confirmation / Attendance* April 30 th
43.	UFZ	Dr. Mi-Yong Lee	Project Manager	mi-yong.lee@ufz.de	077-653-7779	*	*
44.	UFZ	Geol. Essra'a Al-Hadhab	Research Fellow	essra.al-hadhab@ufz.de	077-653-7776	*	*

ANNEX III: Workshop Minutes



Minutes of Meeting
Technical Workshop SMART and NICE
"Challenges of Decentralized Wastewater Management in Jordan"
29th & 30th April 2013
Hotel 'Le Méridien', Shmeisani, Amman

Time		Speaker	Points
From	To		
29 th of April 2013			
Module I: Introduction to Decentralized Wastewater Management Approaches			
08.50	08.55	Dr. Mi-Yong Lee (NICE-O)	Welcome
08.55	09.00	Eng. Ali Subah (MWI)	Welcome address on behalf of H.E. SG Eng. Basem Telfah. Eng. Ali Subah stresses the importance of the NICE committee for improving the water sector and the significance of each member (Steering, Technical and Observers). He also highlights the fact that UFZ adapted the idea of the committee in cooperation with MWI.
09.00	09.35	Dr. Manfred van Afferden (UFZ)	“Introduction to Decentralized Wastewater Management Approaches” Presentation
09.35	09.50	Discussion	Dr. Mi-Yong Lee (NICE-O): There are three types of decentralized wastewater treatment systems in your presentation, which type would be most suitable under the circumstances of Jordan? Dr. Manfred van Afferden (UFZ): Although on-site treatment plants can achieve satisfying results, they may be not suitable to be applied in Jordan in terms of the socio-economic aspects. The on-site treatment type is costly, and may not be feasible but for middle & upper classes. The treated water can be used for irrigating gardens or be applied to other water reuse activities. However, on-site treatment is only suitable if there is financial capacity to afford it on the part of the customer. Therefore, for most of the population in Jordan, those who are not connected to wastewater collection networks should be served through cluster treatment systems and other feasible types. Eng. Ali Subah (MWI): Awareness campaigns are very important and should be taken into

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			consideration and implemented due to the previous negative experiences of our people with wastewater treatment, so that they accept decentralized wastewater treatment in the future. We need good examples and good awareness building for acceptance of such systems. Dr. Manfred van Afferden: Strategies and plans are in place to increase the awareness for the locals. For that, we constructed our demonstration site in Fuheis as well as our pilots in order to show how the systems might look and how they work and how people should deal with it. At a very early stage, and I agree completely with you, we should include the population in the discussion when going to an area or region to implement decentralized systems. That is a very important point. Eng. Wael Suleiman (RSS): You mentioned something that is related to legislation and I wonder if legislation should be adapted to these systems? So, is there a need to adapt legislation to these technologies? And another issue is the involvement of the local communities. Is there any specific role of NGOs or CSOs in the targeted areas? Dr. Manfred van Afferden (UFZ): Concerning technology or let us say “technology selection” or “technology recommendations”. Of course we have some results from our SMART activities during the past years based on which we can recommend some technology groups that are suitable in different areas in Jordan. We have not addressed so far putting technologies into legislation or into standards. This is always a long process but I can give you an example of how it might function. That does not mean to copy such an approach, but in Europe, for example, we have the approach, in order to avoid for all smaller treatment systems individual permitting procedures and an individual technology assessment, a European regulation exists for producer companies supplying treatment systems. These companies can bring their technology to a certifying place in order to certify their system for the European mean effluent quality. However, I am not sure whether we should apply such a pre-certifying procedure in Jordan, because here we are dealing with different frame conditions. The European certification refers to a BOD concentration that under Jordanian conditions would mean diluted wastewater. Normally the wastewater in Jordan has higher BOD concentration and a completely different composition. We cannot simply apply the European regulation to Jordan. Eng. Nabil Wakileh (NAWCO): Just a comment to Eng. Ali’s comment. In terms of public awareness, there is a video uploaded to our website, which explains the functionality of our
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			systems. We can pass the link and may be the participants here can help us distribute the link to other people: http://www.iwrm-smart2.org/index.php/publications
09.50	10.15	Eng. Ali Subah	<i>“Decentralized Wastewater Management & Jordan’s Water Strategy” Presentation</i>
10.15	10.35	Discussion	Eng. Ali Subah appraised that the Disi project will operate by July 2013. Eng. Nabil Wakileh: In this context, it is noteworthy to mention that, there is a difference between cesspit and septic tanks. However, cesspits are more dangerous. Until now, there is no obligatory legislation that controls their construction. Eng. Ali Subah: I have never seen one septic tank or cesspit built that is closed. These septic tanks and cesspits, no matter how much control there is, have a lot of problems and all our springs are suffering from those pits, unprofessional pits that leak a lot or infiltrate. Eng. Mohammad Al-Esali (Engicon): Yes, in Jordan there should be specific rules or a specific legislation for constructing septic tanks in order to control the outlet and the pollution. Eng. Ali Subah: In terms of legislation and regulation, we are forerunners in the world. But unfortunately the problem is the implementation. If we as Jordanians talk about implementation we wonder, why things are not implemented. And unfortunately we do not implement and we need others to implement. If you speak to people in the street you will learn that every one is talking about implementation. And I do not know who is wrong? Me? You? I do not know. Dr. Manfred van Afferden: Yes, a question concerning the overall water budget. Do you consider artificial recharge as a reuse that enters, let us say, in the overall water budget for 2025 or do you mean reuse only for production. Eng. Ali Subah: No, when we talk about reuse, we talk about reuse in the field or for industry. In terms of water balance, artificial recharge was around 83 in 1994 and is now around 63 MCM. Eng. Firas Matar (Engicon): To which extent would the implementation of decentralized wastewater treatment systems affect the water budget? Because as far as we know, all reuse takes place in the agricultural sector in Jordan. So, if you implement decentralized systems, I think this will affect the water budget of Jordan. Eng. Ali Subah: We talk about areas that are currently not served by centralized treatment. We talk about rural areas mainly where groundwater or surface water is affected and where locally treated wastewater can be reused and can substitute fresh water that nowadays people are using





			for their fields. So, this will protect our environment, will protect our groundwater or surface water from pollution and we will have additional resources for poor people in the rural areas for their use for agricultural activities and to their benefit, plus illegal use of fresh water will be reduced. Eng. Saleh Al Hayari (MoH): Will you be taking health dimensions into consideration when you will be using reclaimed water? Eng. Ali Subah: Thanks to God, the MoH is monitoring everything. We cannot offer water without MoH approval. We are unable to use anything without the permission of the MoH. I expect that this applies to both, centralized and decentralized systems. You are the main player for us. You are the ones that are presented in the Steering and Technical Committee so that you will make us aware before we fall into traps and before transmitting water to those areas.
10.35	10.55	-	Break
11.00	11.15	Eng. Malek Al-Rawashdeh / Eng. Majed Joodeh	<i>“Actual & Planned Development Projects in the Jordanian Wastewater Sector” Presentation</i>
11.15	11.40	Discussion	Eng. Majed Joodeh presented the material on behalf of Eng. Malek Al-Rawashdeh Eng. Saleh Al-Hayari (MoH): When will the South Amman wastewater treatment plant be in operation? What is the construction status of the network that serves the area there? Eng. Majed Joudeh (WAJ): For the South Amman networks we have tenders and some networks have been implemented. Three of them have been tendered and are now starting implementation. When the plant will be operating we will declare the connection time. Possibly at the end of 2014 we will finalize this treatment plant. Eng. Iyad Hamdi (WAJ): The areas Shouneh north and Al-Dayat are served by tankers. The population in the Jordan Valley is increasing and I would like to know whether there are any plans to connect these areas, because there are too many septic tanks and cesspools. Are there any plans for extension of Kufranjah WWTP? I heard that the plant is currently overloaded? Eng. Majed Joudeh (WAJ): In Kufranja we will make an extension of 9,000 m³/day. The plant is currently receiving 2,800 m³/day and it treats 2,035 m³/day. And the treated wastewater is provided for irrigation of forest for land of the Ministry of Agriculture. The septic tanks in Shouneh have a capacity of 1,200m³/day. There are plans at WAJ to locally treat and reuse this wastewater.





		Eng. Malek Al-Rawashdeh (WAJ): The study consists of 5 or 6 packages, and the tender has been issued. Dr. Manfred van Afferden: The reclaimed wastewater in the Jordan Valley is reused under the supervision of JVA. How do you manage the local reuse for areas such as Irbid or the South of Jordan? How do you manage the reuse in these areas for these new treatment plants? Is the WAJ responsible for what and for what purpose? How do you control it? How do you distribute it? Who will get how much water? Eng. Majed Joudeh (WAJ): We have a contract with the farmers. They pay 10 piasters for each cubic meter they use. Eng. Malek Al-Rawashdeh: It is WAJ who is responsible for allocating the reclaimed water among the farmers. It is a direct approach. They approach us and there is a contract we sign with them. The contract is a simple contract and not big. And not everybody is interested in reusing treated wastewater. But we usually coordinate among the stakeholders. So, it is a normal process we do not face any problems here. We arrange our plans and programs on an annual basis. We check each year, whether there are any newcomers to this system. I think what we are doing now is quite good, because we do not have any problems and already 92% of the reclaimed wastewater is utilized. But may be later we will think about a different vehicle. Should there be more pressure from the user side. If the users increase, then we will establish a scheme to arrange utilization. Eng. Saleh Al-Hayari: The wastewater of four districts is collected in the Shouneh septic tank. There is overflow and the tankers come very often and this is very expensive. A new treatment plant should be built there because this is causing significant environmental and health problems. Eng. Malek Al-Rawashdeh: Yes, I agree with you. We are facing this problem everywhere. We have not yet solved all issues of sewerage that is conveyed by tankers, especially in the northern regions. The nearest location where they could transfer water to is Al-Akadar (near Ramtha, south of Irbid), which is too far away. The treatment plant that has been constructed in Foa'ra (in the Irbid Governorate) cannot receive every tanker and they are facing a lot of problems and water is scattered in the wadis and also down to Al-Shouneh. We are working on it. It is not yet finalized. I hope that Al-Shouneh will be solved. All these projects are in a huge need for investment and we are donor-driven regarding the investment. Wherever we can secure an investment, we go there. Eng. Wael Suleiman: All the examples that were mentioned in the presentation are considered as
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		centralized WWTP models. Are you considering decentralized systems in the future strategic planning? And if you have so many problems with the current wastewater treatment plants, who is going to take care of the future wastewater treatment plants? Eng. Malek Al-Rawashdeh: All mentioned models (in the presentation) are centralized systems. Decentralized systems are another alternative, a secondary option that we consider. And as soon as we see that decentralized systems can deal with big localities, we are going to go for this alternative. But until now we are still piloting and we are still developing the concept for macro-decentralized systems that serve bigger localities. Centralized is not covering the whole Kingdom, but there are plans and we are trying to cover the whole of Jordan geographically. The demand is huge and there are a lot of projects to be conducted, a lot of rehabilitation, a lot of expansion, a lot of projects. This is for the time being. For the future, I think, we are in need to develop our master plan on the whole wastewater system. We claim that we have a master plan but it seems that we either have to update, revise or to develop a new mater plan based on which we can act in the medium or long-term Dr. Bassim Abbassi: What is the percentage of the people connected to the WW collection network? What is the expected percentage to be reached by the projects that you have been describing? Eng. Malek Al-Rawashdeh: We have now 67% of the population connected. Our plan is to reach 75% by 2016. These projects are linked to heavy investments. However, the problems that we are facing are not just related to the investment and the construction of the systems, it is also the maintenance and operation. We are trying now to find a way to operate these systems through PPPs or private sector participation in order to minimize the burden on the public sector, on the WAJ. These models should be developed also and we are also working on this. We are not rushing to expand the percentages. We are not looking to the percentages alone. We are also trying to secure the quality of the provided services, because we are facing a lot of problems, and we are now more environmentally sensitive. I have a plan to follow the National Agenda, and the National Strategy and WAJ objectives, but in a secure manner. Dr. Bassim Abbassi: The population growth should be taken into consideration while planning this. Let us say in 2016 we will have 8 or 9 million people. So at 75% we are talking about 2 million people that are not connected.
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			Eng. Malek Al-Rawashdeh: We will actually reconsider our figures. The new situation will be considered. It is not fully obvious yet, but it is one of our priorities these days to integrate this in the plans. That is for sure. Eng. Thomas Aubron (UFZ): How are you prioritizing your wastewater projects? And secondly, how do you identify your problems? What is the path from the information to the problem solution? Eng. Malek Al-Rawashdeh: Actually, we do have criteria for this. The priority list is prepared based on the size of the community, and the number of people to be served and the geography, the size of demand and will from the public, form the media and the government. And we are balancing all these needs and we make our plans accordingly. And then we are also coordinating with the donors. There are donors who are interested in specific areas. For example: The MCA or the MCC are working in the Zarqa Governorate. Whenever a donor is interested in a specific area, we coordinate with them in order to serve this area. Eng. Mohammad Al-Abadi (MoH): Is there any awareness campaign work included in the technical affairs work at the water authorities? Eng. Malek Al-Rawashdeh: The core business is to secure the finance and provide all procedures of tendering, planning and supervising and certainly to provide water services. When you think about centralized systems, whenever you start a project, the study, design, tendering and all these procedures take about 3-4 years before starting construction and it takes may be another 1 or 2 years to build the system, to put it in operation and to commission it. Awareness is not a duty of the technical affairs, but it is may be partly a task of the other partners, such as the companies Yarmouk, Miyahuna and Aqaba. They integrate in their programs such awareness programs. I know it is very important. For me it is a secondary priority and for those who are working in awareness programs and with administrative issues it is a core business. We appreciate any interested stakeholders or partners or companies or our donors, we appreciate awareness programs and we will provide a platform for these programs. However, we are not professional in this business, but we participate in all these programs.
11.40	12.05	Eng. Mohamed Al-Esali	<i>“Cost Recovery and Wastewater Tariffs in Jordan” Presentation</i>
12.05	12.15	Discussion	Eng. Ali Subah: In your presentation it should be differentiated between MWI, WAJ and JVA. MWI





			is responsible for establishing plans and strategies, but not for managing wastewater. It should be clear which authority is responsible for what as regards to wastewater. Also, your recommendations are interesting, but please let's talk about implementation and the acceptability of the tariffs. Please let us remind ourselves, that we are Jordanians. You also mentioned that there are overloaded wastewater treatment plants. Please also mention in your presentation all the efforts that are undertaken by WAJ in order to expand capacities and provide services to all. Dr. Bassim Abbassi: I would appreciate if you could provide us with calculation based on Kilowatt per cubic meter, for example, in order to use a common language. Eng. Wael Suleiman: You compared Fuheis and Baqa'a regarding the cost per cubic meter. For Baqa'a the cost are about 0.99 Fils and for Fuheis they are 0.227 Fils per cubic meter. Have you measured the cost of environmental impacts between them? And what is the difference in terms of output quality / discharge between Fuheis and Baqa'a? And for Fuheis, I think the capacity is now about 2,700 m³, but what happens if we have about 10,000 m³? Will the quality be the same? Eng. Mohammad Al-Esali: Of course, if you use the same technology and you increase the capacity, the tariff will in general be the same when you use the same technology. For this reason, you see for Fuheis 0.23 Fils and for Abu Nseir 0.23 Fils and that is because they are using the same technology, which is activated sludge. In terms of quality, I also expect it will be good quality because it is operating below capacity. Eng. Jaime Cardona (UFZ): What is included in the treatment cost? Are you considering items such as investment cost, re-investment cost and the life span of the project? Is this included and if not, why so? Eng. Mohammad Al-Esali: It is not included. Only the operation and maintenance cost are considered and the objective is to recover parts or all of the operation and maintenance cost. But if you want to cover the other cost too, you would have to choose another method and include depreciation, inflation, re-investments, etc. Whether this is covered or not, is a matter of policy and this should of course be reflected in the tariff structure. Eng. Malek Al-Rawashdeh: Our policy as MWI and WAJ is not to reach that level of cost recovery. The tariff structure is a sensitive issue here and it is not decided on the ministry level, but on the cabinet level. And we cannot enforce the structure that we like or that is recovering the
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			investment cost and the operation and maintenance cost. So, we are trying to improve our efficiency in the systems and the wastewater treatment plants. But we could yet not reach that level. It is a mutual discussion and debate among MWI, WAJ, and the cabinet and every one concerned with that. We are emphasizing on where we can have an input, which is efficiency improvement, whereas the policy decision-making is beyond our capabilities. Eng. Mohammad Al-Esali: Yes, I agree with you and I think it would be better to increase the tariff little but very often.
12.15	12.40	Dr. Muna Hindiye	<i>“Jordanian Wastewater Standards and Challenges for Decentralized Wastewater Management Solutions” Presentation</i>
12.40	13.00	Discussion	Eng. Ali Subah: Please explain to me the risk from eggs of Syrian origin for Jordanian citizens. And as regards to the contraction between discharged treated water in the wadi and drinking water. Dr. Muna Al-Hindiye (WAJ): For the intestinal nematodes a great job was done by WAJ since the 1980ies. More than 24 wastewater treatment plants have been established. This is a huge number of treatment plants and that has helped people to improve their health. Before the 80ies there were many worms in people's stomachs, but since the 90ies I have not found one patient with worms. Now, Syrian people have these worms, because they do not have wastewater treatment plants and 60% of Syrians have these worms in their stomachs, especially in Aleppo and in Halab. Now that they come to Jordan, of course, we now find these eggs in our wastewater treatment plants and I am sure if we did not take our precautions and put our barriers in place, I am afraid we would have these deceases again in our community. Eng. Mohammad Al-Esali: You suggest blending wastewater with fresh water to reduce the level contamination, is that right? Dr. Muna Al-Hindiye: Yes, with dams, for example, like Khirbet Al-Samra treatment plant or Jerash treatment plant and Ermamin treatment plant (Salt) - a small one for the peasants - they all discharge to the King Talal Dam. This is one of the barriers reducing the numbers of pathogens by mixing the water with fresh water and also the process of mixing and of enhancing the oxygen, you know, as well as the impact of sunlight. So, these are good barriers for reducing these pathogens. Eng. Mohammad Al-Esali: But dilution is not the solution for pollution. Dr. Muna Al-Hindiye: No, dilution is the solution for pollution. This is the first class in water and wastewater engineering.





		Dr. Manfred van Afferden: Thank you very much for this very nice presentation. You gave the concept of barriers from the new WHO guideline. I don't know if all of us here are familiar with the barrier concept, so perhaps two or three words only, to explain it a bit more in detail. I want to add only, that not only some heavy metals are not consistent with the norms also the concentration of NO₃ as it is stated in the norm is below the WHO regulation for drinking water. So, that means we are putting no fertilizers on the field. We are even extracting fertilizer because we have to give water to the fields where the concentration of fertilizers is less than for drinking water. Perhaps we will find time in the future to discuss which barriers will be helpful for the decentralized sector. Dr. Muna Al-Hindiye: Actually for the reduction of pathogens that has been published in 2006 there is a report on this, which has been done by Prof. Duncan Mada through GIZ in Jordan and actually we do have excellent results. We do not have any problems of irrigation with treated wastewater. We could even irrigation uncooked vegetables, you know? We are so strict. To be too strict may also be dangerous for our health. Now, each barrier reduces pathogens and I can give you detailed information on the performance of each barrier. For example, wastewater treatment plants reduce pathogens by 4 to 5 logs. If e.coli concentration is 10⁷ before the treatment it will be 10⁴ in the effluent. For the performances of rivers and dams in terms of reduction of contamination it is important to know that the life cycle of the pollutants is the determining factor. All pollutants have a life cycle. Using sunlight, dilution and aeration helps reducing the pathogens. The heavy metal concentration in our wastewater treatment plants is low because we are not an industrial country. However, in some sludge studies zinc turned out to be a little bit higher, i.e. to the higher edge of the permissible limits. So, for heavy metals we are not worried at all, but for pathogens we need to be very careful. Nitrate is good as a fertilizer. For COD and BOD, I do not care, because it is good for agriculture. But we are worried about the nematodes and the pathogens. These are the most important barriers that we have to tackle. Irrigation ponds used by farmers also reduce 2 to 3 for pathogens. Sand filters reduce 1 to 2 logs and drip irrigation systems are important because the water is directed away from the fruits. So, this helps reducing the pathogen risk as well. Sunshine reduces pathogens by 2 to 3 logs. On household level practices such as washing, peeling and cooking also help at protecting us from the risk of using treated wastewater in agriculture. Eng. Nabil Wakileh: I remember some 10 years ago we were contacted for monitoring violation
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			especially with regards to industrial connections to the sewer systems. At that time my proposal was to establish online systems in the sewer lines. That way, one does not need many people. As mentioned earlier, the Ministry of Environment does not have enough staff to monitor all the sites. So, I remember at that time it was a difficult solution since it was an expensive instrument. But now I think they have become popular and are handier. That is only a suggestion that somebody might start thinking about this. And there is a similar context: Leak detection in our water systems. Dr. Muna Hindiye: Excellent. Yes, I think this is a very important suggestion. When we try to collect samples from industrial entities, they would ask us to stay outside and may be half an hour later they bring fresh water flush it and then ask us to collect our samples. So, I think online monitoring is a very important measure and would also solve this problem for us. Dr. Bassim Abbassi: I know that you are planning to modify and review the guidelines and since we are talking about decentralization here - what do you think are the chances of introducing new guidelines for decentralized wastewater treatment? Because until now we are using the standards that are being used for all treatment plants in Jordan, regardless of the size of the plants. Dr. Muna Al-Hindiye: Why do you want to have two standards? What is the difference? Dr. Bassim Abbassi: In Western countries, such as Germany, the United States and Canada there exist different guidelines for different sizes of treatment plants. So, how would you think that this could also be the case in Jordan? Dr. Muna Al-Hindiye: I do not know. I am interested in the effluent. Whatever technology you have, centralized, decentralized, I am interested in whether the effluent is good for reuse. Full stop. Dr. Bassim Abbassi: You are one of the decision-makers in Jordan and your feedback will be taken into consideration for the revision of the standard. And I have been told that JISM is revising some of the standards including 893-2006. I believe it is time now, since we have included decentralization in the Jordanian Water Strategy. So, it is time also to include the topic. Dr. Muna Al-Hindiye: Yes, I think this is important. When we update the standards we have to include and highlight the decentralization concept in our standards. Dr. Manfred van Afferden: I agree, you are interested in effluent qualities and I really appreciate your barrier concept. Even this barrier concept that is quite new and hopefully might be applicable
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			here, would solve some of these questions of different standards for different technologies. But you can see standards as well from another point of view, i.e. implementing standards. Implementing a standard that has defined, let's say 100 parameters for a small treatment plant and you have hundreds of these treatment plants - how would you monitor them? This aspect is very important for the implementation of such systems. So, it has to be defined what treatment effluent these systems have to have. We need some certification of such systems but later there is no possibility neither in Europe, the United States or other countries to control all the parameters on a very frequent level for all these smaller treatment systems. Dr. Muna Al-Hindiye: I agree with you. Eng. Nabil Wakileh: The difference between centralized and decentralized in terms of effluent quality is this: In a centralized system you are dealing with a huge amount of water and spillage is very possible while spillage from decentralized treatment is almost impossible. We have done some testing at locations where treated wastewater could infiltrate much easier and spillage into wadis does not occur there. Also, some parameters are important for centralized treatment, which are not important for decentralized treatment systems, like e.g. nitrogen. As long as there is no spillage, nitrogen is not really a big deal for decentralized systems. So there are a few parameters, which are different between centralized and decentralized treatment. And also even for centralized. All our centralized treatment plants have laboratories, so the quality is monitored almost on a daily basis while decentralized treatment plants - sometimes you may have a laboratory but it is not really monitored on a daily basis. So, some parameters have to be strict for decentralized systems, while some parameters do not have to be as strict. Dr. Muna Al-Hindiye: Yes, I agree. Eng. Mohammad Al-Abadi: The standard 893 includes two requirements, measured and general. We need WAI to monitor these requirements and to conduct studies on the causes of exceeding standard parameters. Your presentation focuses on the measure requirements. However, MWI or WAI can enforce any entity to remain below these parameters. This standard focuses on the water quality in order to fit with the purpose of reuse and this is based on the reuse activities, such as for example irrigation of fruit trees. Also, our standard should be in compliance with the WHO standards. Eng. Mohammad Al-Esali: I agree with the difference between centralized and decentralized
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			treatment. Mainly because nematodes and other diseases are more likely to come from centralized treatment plants and to be spread in large scale. But in small communities systems the risk is confined to the community itself.
13.05	14.00		Lunch
Module II: Technical Aspects of Decentralized Wastewater Management Solutions			
14.00	14.40	-	Transfer to Al-Fuhais WWTP
14.45	15.00	Dr. Bassim Abbassi	Introduction to SMART II project
15.00	15.30	Dr. Bassim Abbassi Eng. Nabil Wakileh Eng. Iyad Zreiqat Eng. Ghaida Abdallat	Guided Tour
15.30	15.50	-	Break
15.50	17.00	Dr. Bassim Abbassi Eng. Nabil Wakileh	Guided Tour
17:00	18:15	-	Dinner at Al-Zuwwadeh
18:15	18:20	-	Farewell and return to Amman
08:55	09:00		SMART video form Nabil Wakileh Company
April 30, 2013			
Module III: Planning Development and Financing of DWWM			
09:00	09:05	Dr. Mi-Yong Lee	Welcome
09:05	09:25	Eng. Jaime Cardona	"GIS- Based Decision Support for DWWTP Solutions" Presentation
09:25	09:40	Discussion	Eng. Mohammad Al-Esali: Were the cost of land included in the calculation? What were the effluent quality assumptions in your presentation? Eng. Jaime Cardona: The scenarios we used are all based on category A of the standard JS 893-2006. And yes, we assumed 20,000 JOD per square meter for land acquisition. However, that can vary. It could be very interesting in the future to perform sensitivity analyses of different land acquisition prices. Eng. Wael Suleiman: So, your preference is scenario 5, i.e. cluster, decentralized, with reuse





			benefits? Eng. Jaime Cardona: This scenario generates the least cost, since it is operated by the public sector, technically maintained by the private sector, based on energy prices for the public sector, and reuse benefits are included in the calculation. This is a theoretical case study. We wanted to see the behavior of decentralization in Jordan with data and market prices in order to get more accurate information. Beate Richter: There are already two existing wastewater treatment plants in your study area. Did you compare the cost of connection to these centralized treatment plants? Eng. Jaime Cardona: For one, we compared the connection to Al-Salt treatment plant. The topography is so strong, that this solution is not cost effective because too much pumping is required. Then we compared the cost of decentralized wastewater treatment with a new centralized treatment plant nearer to the settlements based on the historical cost of activated sludge treatment in Jordan. Beate Richter: But would the population growth area next to Al-Salt be more adequate? I mean from an urban planning point of view? Dr. Mi-Yong Lee: We also looked at the suburban area of Al-Salt. Jaime developed the scenarios for Maghareeb and we calculated the connection to the nearest centralized treatment plant which is Al-Salt. It has almost the same distance of about 6 km. But the distance is huge because you need lifting stations and the cost is really high. Beate Richter: Yes, okay. Then you would have just another treatment plant in this area. But what does decentralized in this context actually mean? Eng. Jaime Cardona: Decentralized means among others things, to define catchment areas in order to avoid pumping stations and to reduce the distance for conveyance lines to centralized treatment plants. That is, we split the catchment areas to avoid the need for pumping station. We save cost for construction and O+M of conveyance at a level, which has a significant effect on the final JD/m³ treated. That is what we want to demonstrate. Decentralization, however, does not apply to every single case. It is strongly related to management of conveyance to the treatment plant. Beate Richter: So, "decentralized" means "without pumping"? Eng. Jaime Cardona: Yes, this is one of the main criteria, but not only without pumping. It means
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			avoiding pumping but it also means to have the treated wastewater near the generation point for reuse. The water is there and it is being reused there directly, the sludge is treated there and is reused there too, as fertilizer. This is beyond the scope of avoiding pumping. Dr. Manfred van Afferden: Yesterday, we tried to define decentralized. Decentralized is more or less a question of sizing, i.e. smaller than 5,000 PE. That is the easiest definition. And all the other aspects, such as forming operation and maintenance clusters of different smaller treatment plants, which is the concept here, is developed in order to save cost. And therefore, always the comparison to central treatment, i.e. bigger than 5,000 is what we have in our scenarios. Dr. Jarrah Al-Zoubi (ACWUA): You depended on a theoretical study to decide which scenario is most suitable. Now, how close are your figures to reality? And are your results based on hypothetical figures or on real life experience? Dr. Mi-Yong Lee: A survey has been conducted to investigate on the public acceptability and the results were positive. Dr. Bassim Abbassi: I know that your case study results are based on two years work. My comment on this is, that this study was conducted for the areas of Ira and Yarqa. These villages are densely populated when considering the principle of decentralization. But when you consider other areas in Jordan where we have a few hundreds of people living in remote areas, I believe decentralization is the only option. So, here we have many alternatives and Jaime just showed us that decentralization might be an option. However, sensitivity analysis is important and should be further enhanced in order to make sure that we have realistic numbers and that we can produce definite decisions. Eng. Mohammad Al-Esali: From where does the difference in O+M cost between the private sector and the public sector stem? Eng. Jaime Cardona: The difference stems from differences in salaries and also from differences of energy prices between the private and public sector.
09:40	10:00	Eng. Thomas Aubron	<i>“Site Selection for Decentralized Solutions”</i> <i>Presentation</i>
10:00	10:15	Discussion	Dr. Manfred van Afferden: With this presentation we tried to sensitize people. We only ask questions and describe problems. This was done with purpose in order to set the stage for the manifold questions to which we can already provide answers. So, please go ahead in asking.





		Eng. Thomas Aubron: Before starting with the discussion, I would like to thank Dr. Bassim Abbassi and Eng. Nabil Wakileh for their support in the site selection. They helped a lot and knocked on many doors to identify people who were interested and in need of these treatment systems. I know they spent a lot of time and without them we could not have installed anything and would not have been able to identify these sites while facing all these difficulties. So, thank you very much! Eng. Mohammad Al-Askar: Those questions are directed to the Steering Committee. Because you need answers and the answers are not there yet. Eng. Thomas Aubron: We have some ideas but that does not mean that it is going to be the committee's ideas and the committee's point of view. And what we want with explaining what the difficulties were is that we want you the committee and the people that are going to be invested in the decentralized wastewater treatment and reuse approach, to ask your own questions and to find your own answers. We cannot come with a universal possibility. So, there are specific problems in Jordan, which are related to the topography, related to the standards, to administration and to the allocation of responsibilities among the ministries. And that is specific to Jordan. So, that means that you in Jordan will have to coordinate. Beate Richter: Why to complicate things by installing onsite WWTPs, while treatment in clusters maybe more feasible? Dr. Manfred van Afferden: We understand decentralized systems in Jordan as cluster systems with an investment of more than 20 million on a regional scale. These clusters may include on-site, village clusters and semi-centralized systems. It depends on how we structure these systems in a specific area, according to the requirements of this area. Decentralized systems like these are interesting for development banks, for governments as well as for operation and maintenance companies to deal with, if several systems can be implemented within one investment project. One simple individual household system will not be interesting neither for any government nor any development bank. On-site systems can be interesting where a large number of such systems where they are more economical than connecting these households to central sewer. It is the decision of the committee whether to leave this to the responsibility of the house owners. We started like this in Europe several years ago and faced big problems of failure in operation and maintenance, because the individual household owner was not able to maintain and operate such
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			a small treatment plant over a longer time. Now, there is this change where larger private companies realize these cluster solutions that include as well on-site systems. Eng. Thomas Aubron: And to answer the questions why we include the reuse in our concept: We want to make sure what is going to happen with the treated wastewater and which quality we will need to provide based on the standards. Eng. Mohammad Al-Esali: If power is the major issue in your site selection may be solar or wind power generation can be a solution for this problem? Eng. Thomas Aubron: Solar systems in rural areas will be a good solution, but this is highly dependent on the budget allocated. Potentially in remote areas solar energy will be a key.
10:15	10:50	-	Break
10:50	11:20	Beate Richter	<i>“KfW Development Bank – How we finance” presentation</i>
11:30	11:40	Discussion	Dr. Manfred van Afferden: I would like to pose a question concerning the critical issue of tariffication. Would you accept, let us say, subsidies on tariff of wastewater treatment cost, as an argument for long-term feasibility of such a treatment system, meaning that the Jordanian government would decide that it cannot charge more but internally we will subsidize these system by other taxes or charges; or would you prefer to stick to the concept of recovery cost for operation and maintenance? Beate Richter: In principle the cost should be recovered fully or should at least cover the operational and maintenance costs. Actually we are accepting already subsidizing tariffs. We also think that instead of raising tariffs, one should always think firstly about how to reduce losses. This is also an issue. We are not the bank saying you have to increase because the tariffs are too low, we also think you can structure tariffs according to different consumer types. But the problem here is that we are not sure that the subsidies will be paid. In other countries we would accept this, because we know that the subsidies are there. We would may be put pressure on that the subsidies are decreased over a life span, so that after ten years we can be sure that we have a full coverage of operational cost. But here we accept subsidies and we already know that we are not sure that they are going to paid and that is why we have water companies, especially in the North, that have big losses, and WAJ has big losses as well, really huge losses. Dr. Bassim Abbassi: For any project you have certain steps of preparation and you also





			differentiate between loans and grants. In one project preparation where is the loan part and where the grant part? Beate Richter: This is not visible. First of all, the project appraisal is always done according to the same steps for both grants and loans. And then we use the grant to leverage the amount of money, because if it would be the money that we get from the Ministry of Planning and International Cooperation we could not finance a single town. We take our own funds to leverage the amount of money and by this we can provide a concessional loan. It is a blending of instruments. Otherwise we could not extend a concessional loan, which means we have a grant element in the loan. So the grant element comes from the BMZ (Federal German Ministry of International Cooperation) and then we mix it with our 'commercial market' funds and make a package. And apart from this we have grant financing for accompanying measures. And this is for free; it comes from a separate fund, from the Ministry (BMZ). Eng. Thomas Aubron: Can KfW also fund operation and maintenance cost or will that be on charge of the country? Beate Richter: We finance investments and training to enable the partners to operate the investments independently but then we are out. We are not financing operating cost. When the project is finished, the investment has been done and post-installment training has been done, we have implemented the project. Then we monitor the operation for one or two years and assess the experiences. Eng. Thomas Aubron: What if WAJ or MWI is not able to provide the staff for all the new systems to operate and maintain? Because that can be a serious issue in terms of sustainable operation of the systems. Beate Richter: Than you cannot have a project. All our projects require country contribution, which means that the Jordanian government shows commitment, first of all money wise - so we have financial commitment of the Jordanian government. And that is why we are making appraisals. Because, if you do not have the staff there, at least until the first disbursement appropriate staff should be in place, or otherwise there is not project, no. Eng. Nabil Wakileh: In Jordan we have very good experience with investment in electrical supply for villages. The government finance 1 fils per Kilowatt on each bill and then they collected this money and spent it on expanding the infrastructure for electrical supply to villages. I mean, this
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			can be one source of finance. For example, people could be charged with 1 fils per cubic meter for water services. The money could be directed directly to an account, which would be dedicated to invest into decentralized wastewater treatment plants. Beate Richter: Yes, this is completely fine. We do that in other cases. In the water sector in Jordan it was not applied for several reasons. It is very good. We also do this in other countries and it also increases the ownership for infrastructure itself, so that it is not destroyed etc. This would actually be a good idea here, but then you have the problem in Jordan, that the water bill is not enough to cover the cost. In Africa, where the state is strong, you can go from household to household to collect money for infrastructure. In general this is a nice idea, but here in Jordan, the tariffs are too low. Eng. Nabil Wakileh: Yes, I agree, but even with the tariffs being to low, people will understand that they are paying a certain amount to support their village. So, it is a different approach on how to increase the tariff. You are not increasing the actual tariff but you are taking a small extra portion to support the villages. In terms of the mentality of the people, this can be acceptable. Dr. Manfred van Afferden: In terms of finding new ways of financing: Installing wastewater treatment systems that protect drinking water resources - of which in Jordan there are a number already at risk or polluted - would lower the cost of spring water in terms of chlorination etc. This type of secondary cost savings and benefits, would you accept this as well? Beate Richter: Yes, if we frame it with the context of climate change adaptation or environmental protection - we call it climate change adaptation but we mean measures that will help prevent Jordan to have even less groundwater resources available in the future. Yes, and it would not be a pure residential wastewater treatment project, but an environmental project and that is no problem because water and environment are the main focus areas of KfW Development Bank here in Jordan.
11:40	11:45	Dr. Manfred van Afferden	Role play of implementing DWWM
11:45	13:15	-	Lunch
13:15	15:10	Workshop	Defining the Bottlenecks for DWWM in Jordan







Possible bottlenecks for DWWM:

- EIA of DWWT plants
 - ownerships
 - coordination among stakeholders
 -
- head of EIA
head of license
Committee
resp. person for tendering
in Waf

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