

INFLUENCING URBAN WATER MANAGEMENT THROUGH LEARNING ALLIANCES: A MID-TERM REFLECTION ON THE PROCESS IN TEL AVIV, ISRAEL

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INTRODUCTION

City background

Tel-Aviv (area of 500 ha, population of 386,000 increasing up to 1 million because of commuters during the day), is the financial capital city along the Mediterranean coast of Israel. The consolidated urban area surrounding Tel Aviv creates a metropolis of almost 2 million inhabitants. The city provides workplaces for 15% employees of the country (63% of the employees are the commuters), with the annual GDP of 52,000\$ (compared to 17,250\$ in Israel). Dynamic development of the city and increase of population results in increasing water demands and production of sewage (380,000 M³/Day).

The major water issues in the city are related to water scarcity, which is a problem typical for arid countries. Industry is a minor user while the greatest demand results from intensive residential development of the city of Tel Aviv. Water sources include: surface water, ground water and desalinated sea water. The major proportion of drinking water (90%, 45 mln m³ per year) is supplied by Mekorot-National Water Company. The other 10% is supplied by local wells and desalinated sea water (specifically during the short winter season).

Increasing amount of sewage together with the awareness of the water shortage resulted in focusing efforts to develop the best technologies for wastewater reclamation and reuse, where Israel has demonstrated great achievements. In 2005 reclaimed wastewater constituted 15% of the total water sources in the country. Israel reuses 75% of its municipal effluents (350 M m³ / year), which constitutes a result incomparably higher than in other countries (e.g., 12% reuse in Spain, <1% in EU).

The Dan Region Wastewater Treatment Plant (WWTP) treats the sewage biologically and delivers the effluents to Mekorot for further tertiary treatment using the Soil-Aquifer Treatment (SAT) technology. The Dan Region Reclamation Project (Shafdan) is the largest wastewater treatment and reclamation project in Israel. Today it reclaims more than 140 Mm³/yr of wastewater from the Tel-Aviv Metropolitan area and several other neighboring municipalities. The wastewater is treated in an activated sludge plant with single – stage simultaneous nitrification – denitrification. After secondary treatment, the effluent is further treated through recharge to the aquifer and subsequent recovery using the SAT system. High

quality reclaimed water produced by this technology is used for unrestricted irrigation in agriculture in the South of Israel, and enables its economic development. The effluent transport project from the WWTP to the agricultural areas in the south, named the 3rd Line, created a unique, symbiotic dependency between the farmers and the city based on the wastewater treatment: the city provides purified effluents to grow food which, in return, the farmers supply to the citizens.

Today, Dan Region provides from 80 up to 100% of the water for agriculture in the northern part of the Negev Desert, which constitutes 40% of all water supplied to the south of Israel. Wastewater for recovery is also provided by small local communities, where other technologies, such as constructed wetlands, have to be applied. Considering the intensive development of the country, higher demands for agricultural products and water, as well as increasing prices of land, there is a need for improvement of both wastewater treatment and wastewater reuse technologies, in order to increase their efficiency and shortening the time of treatment without jeopardizing the treated and reclaimed water quality.

Organisation of the water sector

Considering the need for efficient solving of water issues in the arid region, the importance of continuous communication among the actors in the water management sector have been fully recognized by the authorities as a part of a water management culture for a long time. Consequently, Tel Aviv has a few existing formal multi-stakeholders platforms related to water problems and dealing with the most important existing and arising water issues, and working together for a long time. The platforms include key organizations involved in water sector in Tel Aviv, managing the issues of drinking water supply and distribution, stormwater, wastewater collection and treatment, effluent supply and water reuse. The meetings take place frequently, from once a month to once a year, depending on the committee, and daily communication involves the key stakeholders in the city. In this situation the process leading to the realization of the goals of the SWITCH project can be directed through the existing and operating structures, which already have well-established contacts.

Box 1. Key actors in the water sector of Tel Aviv

The Ministry of Health (It deals with control of the drinking water quality and the water sources, permits for drilling of wells if used for drinking purposes. Although drilling permits are issued by The Water Authority, they perform environmental studies that show the safety radius areas and the quality of the water to be produced. It performs bacteriological, chemical and hydrological monitoring of the drinking water),

The Ministry of Interior (Central District Regional Committee for Urban Planning, responsible for all the issuing of permits for infrastructure - roads, sewer, natural gas, city-trains, intercity trains, public area building like schools and parks) plans in the T.A. region (and regional urban planning. Their mandate is the responsibility for all planning performed by the Ministry of Interior. It is the professional body of the Regional Committee and it has a strong influence on the decisions of the committee. The director of the Committee is also the chief administrator of the Region for the Ministry of Interior),

The Ministry of Infrastructure - Water Authority (It is the main regulatory body in Israel for the water supply and demand, responsible for all water resources in the country. They issue permits to produce water from different sources including desalination and reclaimed water and also issues quotas for the end-users that restrict the use of a specific type of water to the allocated quota),

Mekorot (Israel's National Water Company engages in a wide range of activities in the management, operation and treatment of all types of water resources: surface water, underground water, brackish

water, seawater and effluents reuse. These include low-cost desalination of seawater and brackish water, water reclamation, advanced water project engineering and development of major infrastructure projects, flow catchment and rain enhancement),

The Tel Aviv Municipality – Water, Wastewater and Drainage Department (It manages the supply of drinking water to the city, disposal of wastewater. It is responsible for the drainage of storm water together with the Yarkon River drainage authority),

The Dan Region Association of Towns (The main services are supervision of the wastewater quality from the industrial plants, the collection and transport of the wastewater to the Dan Region WWTP, treatment of the wastes and handing the effluents to Mekorot for further tertiary treatment and reuse in the south).

The Municipal Water Works Administration (The institution is part of the Ministry of Interior and involved in the decisions of planning and budgeting water supply and distribution systems).

Water issues in Tel Aviv

Water shortage and growing water demand

Water shortage is a typical issue in arid countries. The increase rate of the population, which is 1.5% annually, and urbanization of Tel Aviv and its surroundings expected within the next 20-30 years, may deepen this problem. An increase of demand for housing construction and a shift of agricultural land demand to the South of Israel is expected, while more desertization in the southern parts may likely occur due to climate changes. More water will have to come from local sources (on-site desalination and local wells). The use of effluents for municipal and public purposes (street cleaning, fire fighting, park irrigation, recreational) and also for none-food industries will have to be increased. It is predicted that agricultural water consumption (more than 50% of the total consumption of the country) will go down. However agriculture will still remain the key economic activity in the south of the country and maintaining high quality effluents from the Dan Region (TA area) will be crucial for its development. Wastewater reclamation will become in this situation one of the important strategies for meeting the growing demands. More local effluent reuse for public irrigation and river replenishment can also come from small local treatment plants, which could use diversified treatments based on advanced technologies or natural systems (e.g., constructed wetlands).

The limited infiltration area for the SAT system in Tel Aviv

There are few reasons for exceeded capacity of SAT: 1. Increase of population resulting in higher production of collected sewage available for SAT, 2. Decrease in infiltration capacity due to gradual clogging, 3. Low temperatures causing high viscosity and low evaporation rate 4. Occasional over-flooding of the SAT during winter rain events, due to combined sewerage systems collecting about 10% of storm-water from the city. During such events, part of the treated sewage from the Wastewater Treatment Plant is pumped directly to the sea, wasting the potential SAT-recovered water and impacting the environment. It has been estimated, that about 2-3% of the treated sewage (3M m³/annum) goes to the sea without being reused by the SAT system.

Space availability

Soil Aquifer Treatment (SAT) requires large space, which is needed for gradual infiltration, which on the average takes 6-12 months. The average infiltration velocity of the conventional SAT is 0.5 -2 m/day (Hydraulic loading – 60- 230 m/annum in 1 day flooding and 2 days drying). Today for 400 000 m³/d of the Shafdan effluents, actually 1,100 ha of land for

infiltration is used. In these conditions still there is a lack of land for infiltration mainly on rainy days in the winter. Meeting the requirements for increasing amount of sewage while using traditional technology, requires extension of the land area for recharge to the special aquifer, used for reclaimed water only and isolated from the drinking water aquifer. Dynamic growth of the Tel Aviv metropolis increases, however, land prices and pressure from developers. Lack of space availability limits the possibility of using the traditional systems for SAT.

Limitations of existing SAT technologies and wastewater reclamation options for small communities

Although the SAT technology has been operating for several decades, there is a need for elimination of some technical problems delaying the filtration process (e.g., clogging) and upgrade chemical parameters of the reclaimed water. Other technologies are also needed in alternative wastewater reclamation systems for smaller communities, in areas that lack the access to a qualified aquifer or have too limited space to use the SAT. Such alternative technologies include Constructed Wetlands (CW), Electro Flocculation (EF), CW-EF hybrids and Granular Filtration (GF), which are investigated in SWITCH, by and in collaboration with HUJI team.

Goals of this paper

Learning Alliance is one of the three major pillars in the SWITCH project, which closely associates with the project's activities in the field of research and demonstration. Providing a platform for exchange, mutual learning, communication and networking, Learning Alliance is meant to create a more interdisciplinary perspective and accelerate the process of paradigm shift in urban water management.

This paper aims to look at the characteristics of the process of the Learning Alliance development and operation and draws preliminary lessons from the Tel Aviv experience, mid-way through the project. It is supposed to capture the progress and support further implementation of the project. The paper is based upon the experience of the members of the SWITCH Team in Tel Aviv – the city co-ordinators and the Learning Alliance facilitator, and upon the experience and opinions of members of the Tel Aviv Learning Alliance expressed in interviews conducted in August 2008, and upon the review of the project documents and materials produced within the progress in the application of SWITCH.

The paper outlines key elements of the SWITCH project methodology in Tel Aviv, including the project's theory of change and the approach to develop the Learning Alliance, highlights results achieved to date, and suggest the lessons learnt as well as recommendations intended to help both SWITCH in Tel Aviv and other cities to be an effective project and to maximize its impact and sustainability in other cities.

PROJECT METHODOLOGY

Research and Demonstration: engineering solutions for wastewater reclamation in arid urban areas

The key water issue in Tel Aviv has been recognized and agreed upon by the existing city water stakeholder platforms in advance of the SWITCH project. This is the need to upgrade technology for wastewater reclamation in order to address water shortage problems and assure water for the development of agriculture in the country. In order to increase the process

efficiency, there is a need to elaborate technologies which allow shortening the residence time and area for recharge to aquifer in the SAT system, and upgrade constructed wetland treatment technologies for small communities.

There have been several research projects dealing with different aspects of the above issues in recent years, which have improved the technologies, however did not result in a fully acceptable and economic solution (Box 2). Additionally, in the course of 30 years of the operation of the SAT system, there have been some problems encountered resulting from the technology limitation, especially in the face of increasing demand. These problems include:

- chemical changes in the soil composition of the infiltration fields and also some physical clogging that has slowed down infiltration rates and consequently creating anaerobic conditions unfavorable to the process;
- limitation of the available infiltration area due to high urban development around the infiltration fields;
- Increasing effluent quantities for recharge may lead to more intensive recovery that can result in shorter retention times in the SAT system, which may deteriorate the water quality.

In the case of the Constructed Wetlands, improvement is needed in the efficiency of removing nutrients and other pollutants while shortening the residence time, and assuring stable efficiency of the process throughout the year. There is a need to strengthen the natural processes in CW with other technologies (GF, EF) to mitigate the seasonal fluctuations of the wetland purification efficiency. SWITCH builds upon these experiences and proposed further developments in the area of water reclamation and treatment.

Box 2. Ongoing and completed projects linked to SWITCH

Mekorot is the City coordinator for the LA together with HUJI and one of the major stakeholders in SWITCH Tel Aviv Learning Alliance. It is the National Water Company that supplies 80% of the drinking water in Israel and 70% of water for irrigation.

Mekorot is actively involved in the project with a double function: The company contributes to the research and demonstration part using its vast experience (field implementation and research) in effluent reclamation technologies. It also contributes to the learning alliances by disseminating the long acquired experience in water and wastewater management and training stakeholders involved in water reuse. The company has extensive experience (since 1998) of participation in EU projects, including among others:

4th EU Research Program with a project entitled: **CATCHWATER** “Enhancement of Integrated Water Management Strategies with Water Reuse at Catchment Scale” and in the **5th EU Research Program** with a project entitled: “Integrated Concepts for Reuse of Upgraded Wastewater – **AQUAREC**“. In the **6th EU Research Program**, Mekorot is participating in two research projects (**RECLAIM and SWITCH**) on improvement of Soil Aquifer Treatment (SAT) systems by hybrid SAT and membrane processes (UF- short term SAT, Reclaim and short term SAT- NF, Switch).

EU “Reclaim” project, already completed as if naturally continued by SWITCH Tel Aviv in terms of further research and application of the technology to eliminate micro-pollutants; through the “Reclaim” project has not been part of the Learning Alliance discussions yet, it is to be discussed in the future as comparison to the SWITCH research to show the complementary aspect.

Based upon the stakeholders' (farmers, Water Authority, Mekorot) requests, more research on wastewater reclamation and treatment was needed, and it was proposed within the framework of SWITCH. The project addresses improvements of the following aspects:

1. Improvement of the technology for the Soil Aquifer treatment (SAT), including:
 - development of effective and sustainable treatment and storage technologies into a semi-closed urban water cycle to promote safe wastewater reuse;
 - shortening travel distance/time Soil Aquifer treatment (SAT) by short term SAT and NF polishing will be demonstrated in a field demonstration experiment in the Dan Region Wastewater treatment plant (WWTP);
 - examination of short term SAT as a pre-treatment for membranes with post-treatment by nano-filtration.

2. Coupling electroflocculation (EF) with Granular Filtration (GF) and constructed wetlands (CW) for improved tertiary wastewater treatment, including:
 - Increase in the efficiency of removing nutrients and pollutants by combining CW and other technologies;
 - Development of alternative methodology of water reclamation for small communities;
 - Comparison of the efficiency of the proposed technology in the effluent treatment (based on the experiments using the same effluent is used for CW-EF and SAT);
 - Assessment of the possibility of having the EF as a pre-treatment for SAT; the benefits for such an approach include: minimizing clogging of the infiltration layer; reduction of the area for infiltration and residence time; increasing the capacity of phosphorus removal; replacement of chemicals used on the treatment process (poly-aluminumchloride) with environment-friendly electroflocculator;
 - Assessment of the technology potential for pre-treatment before membrane filtration, before application of the SAT technology;

Box 3. Methods used in water purification and reclamation in the SWITCH project and tested within other ongoing and completed related projects

Polishing - After secondary treatment which is normally a biological treatment of waste water you can further clean the water (polish) by a tertiary treatment (normally sand filtration and disinfection) or it could be microfiltration (0.1 micron filter) or even ultrafiltration. Further polishing or refining or cleaning of the water can be done either by nanofiltration, which mainly removes the micropollutants and some salts or directly by reverse osmosis, which removes all organics and salts.

NF- Nanofiltration - filtration at the level of 0.001 micron;

UF – Ultrafiltration - filtration down to down to 0.01 micron;

EF- Electro -flocculation is a process where flocculation is done not by metallic salts like Aluminum or Ferrum but by slow release from an Aluminum or Ferrum electrode relative to the applied current intensity and voltage. In this case contrary to the metallic salts there are no extra chlorides or sulphates in the water and much less sludge and the efficiency of the flocculation is better.

GF- Granular filtration. For example sand filtration is a GF, but also active carbon filtration or other granular media filtrations are also applied.

Intervention logic

The theory of change of the SWITCH Project in Tel Aviv is based on the intervention logic which aims to make a difference in the future water management and water related aspects and meet the growing demands of the arid areas in the city and beyond. The intervention logic can be described under the following hypotheses:

1. The existing knowledge, monitoring and laboratory experiments, provide a basis for development of solutions to key water-related issues identified by the city stakeholders.

The research institutes involved in SWITCH have long-term expertise in the Soil Aquifer treatment (SAT), electroflocculation (EF) technologies and Constructed Wetlands (CW), which constitute the key issues addressed by SWITCH. The research on these topics has been conducted within several research projects (Box 2).

RECLAIM, which was looking for alternative technologies of water reclamation for unrestricted irrigation. The research was dealing with i) Ultra filtration (UF) of the secondary effluents and dug well injection at short term (up to two months) SAT; and ii) comparison with the actual long - term (up to 12 months SAT) system. SWITCH builds on the experiences gained from the RECLAIM project and uses its results for further upgrading of the technology, towards answering the questions provided in section 2.1. The European Commission expressed interest in continuing the research within SWITCH and comparison of RECLAIM and SWITCH projects (exchange with the EC Reclaim representative, Avelino Gonzales, and the EC SWITCH representative Zissimos Vergos).

The overall goal of the research on the combining Constructed Wetland (CW) and Electroflocculation (EF) technology is upgrading secondary effluent to the level that will permit their use for stream rehabilitation, park irrigation and other municipal uses that require high quality reclaimed wastewater. One of the major issues is investigation of the efficiency of phosphorus removal by conventional (CW) and combined (CW-EF) systems, considering mitigation of the typical effect of the seasonal excess of the phosphorus release over its trapping by a constructed wetland. The research concentrates on evaluation and comparison of the efficiencies of a constructed wetland and the electrochemical technology, in parallel and in series.

The research activities in CW are being conducted in two phases: 1) laboratory experiments, and 2) large scale experiments conducted in the field. Phase 1 is taking part in the Water Treatment Technology Laboratory of the Hebrew University, under the leadership of Prof. Avner Adin. SWITCH in Tel Aviv is putting considerable effort and resources into laboratory and field experiments and monitoring systems in the field (hydrological parameters of the aquifer and wetlands, analysis of chemical and physical parameters of water) in order to quantify fundamental processes related to CW and hybrid methods. Obtained data provides a baseline for the design and monitoring of interventions and testing the technologies in demonstration.

2. Implementing improved SAT and hybrid CW technologies validates the new approach at the WWTP utility and provide basis for scaling-up.

Laboratory experiments and field monitoring within SWITCH provide a basis for validation of the new technologies in the demonstration project at the WWTP utility. Implementing of the technologies on the demonstration site enables optimization of the design and operation of two technologies 1) the improved SAT, tested and demonstrated by Mekorot, and 2) CW hybrid technologies, tested and demonstrated by the Hebrew University. The field experiments, which at the same time constitute these two demonstration projects of SWITCH in Tel Aviv, are conducted at the Waste Water Treatment Plant of the Dan Region. Special systems for testing the new technologies have been constructed and installed in the field and are described in detail in reports provided by the co-ordinator of the project in Tel Aviv. The systems used for research and demonstration will be preserved after the termination of the project as a demonstration system of the developed technologies. At the same time, if the

technologies tested within the project prove to be efficient and economically justified, Mekorot will consider adaptation of the solution and build the full scale systems following the recommendations.

3. The existing city multi-stakeholder platforms strengthened with LA methodologies, provide a stage for networking, mutual learning, demand-led research and lead to upscaling of new technologies and change of perception of water issues in the city.

Tel Aviv has a few existing formal multi-stakeholders platforms dealing with the most important existing and arising water issues. The Learning Alliance methodologies implemented and proposed to the Demonstration Cities within the course of SWITCH (including facilitation methods, visioning, strategy building, communication, monitoring and evaluation) can, however, strengthen the efficiency of the communication, networking, problem solving and paradigm shift within the established multi-stakeholders community and therefore add to the quality of mutual learning and sharing. The visioning and strategizing methodologies which have already been used efficiently in the City can be compared and combined with those proposed by SWITCH, to the benefit of the development and implementation of the water indicators within the City of Tel Aviv Strategic Plan. The efficient methods will also result in an increase of the overall awareness of the water issues in city planning and development.

Tel Aviv Learning Alliance – Water Club

Formation and development

The Learning Alliance was established in the scoping meeting held on 30 July – 3 August 2006. The Learning Alliance in Tel Aviv is locally called the “SWITCH Water Club” as the term Learning Alliance literally translated into Hebrew might be confusing. The member organizations of the Water Club are:

- The Central District Regional Council for Urban Planning of the Ministry of Interior,
- The Water, Wastewater and Drainage Department of the City of Tel Aviv,
- The Dan Region Association of Towns,
- The Water Authority of the Ministry of Infrastructure,
- The Ministry of the Environment,
- The Ministry of Agriculture,
- The Environmental Health Department of the Ministry of Health,
- “Man, Nature, Law” – an NGO,
- The South of Israel Farmers’ Association,
- The Water Workers’ Association,
- MEKOROT – the National Water Company,
- Soil and Water Department at the Hebrew University of Jerusalem,
- The Israel Water Association.

The organizations are represented by individuals who contribute to the decision-making process in the national, regional and municipal water sectors. The members of the Water Club have the ability to develop a vision and also the ability to promote it into the city development program creating sustainable reality. These important characteristics of the members are, in the view of the Tel Aviv Learning Alliance facilitator Avital Dror-Ehre, crucial to establishing and disseminating the idea of Learning Alliance as a key process for sustainable development in Tel-Aviv and other cities in Israel. The members of the Club hold senior positions in essential water institutions in the Tel-Aviv region. Seeding the ideas of the LA

mode of action in such a group and showing them the benefits of the method, are supposed to bear fruit in the long run. Mekorot, the national water company that is involved in many of the water projects, is one of the major actors in the LA. A few members have already absorbed the SWITCH ideas and recognized their benefits. The most active and most enthusiastic of them are Mr David Jackman - head of a water corporation in Tel-Aviv, who, in the LA Facilitator's view, understands that the city can gain benefits from SWITCH. The water chapter in the TA city vision is missing and Mr Jackman believes that with the help of SWITCH and the Water Club it would be formulated and added in an efficient way. Mr Miki Zayde of the National Water Authority, has been involved in the process of the development of water indicators, which, upon consultation with the Learning Alliance, could be incorporated into the City of Tel Aviv Yafo Strategic Development Plan, and who understands the principles and rationale of the SWITCH project and the Learning Alliance concept. Ms Eti Burla and Ms Valerie Pohoryles of the Israeli Ministry of Health, responsible for health-related issues in the Tel Aviv and Central districts respectively, are also among the most enthusiastic members of the SWITCH Water Club and who perceive the Learning Alliance platform as a tool to improve or a forum to discuss important aspects of water management which haven't been focused on in other forums, such as meetings of diverse committees officially and conventionally tackling water-related issues. They believe that a discussion about new technologies and water issues in the Club would lead to more knowledge and understanding, and would help to accept new technologies applied in a safe way with no risk to public health and with benefits to the environment and the city.

SWITCH implements the Learning Alliance concept, viewed by the stakeholders as not entirely new in Israel as a principle, but the unique attribute SWITCH brought about is the idea that research and technology can be treated equally and be more focused on interactions – the researchers will come with the knowledge but what to do with the research will be determined by research users, as the technology is already there – SWITCH is about demand-led research. “The LA will close the gap between the research and the needs agreed by the LA” is the perception by the Tel Aviv facilitator.

LA objectives

The objectives of the Tel Aviv Learning Alliance, both in the long- and short term perspective, were defined by Mekorot, HUJI and UNESCO-IHE during the Scoping Visit, which took place on the 30 July – 3 August 2006.

Long-term objectives described what the Learning Alliance wanted to achieve in terms of policy change and implementation within the perspective of 5 years +. The objectives were considered as preliminary and were supposed to be discussed and adjusted during the first LA meeting:

1. Relevant research results of the entire SWITCH project (i.e. not only those achieved by the research conducted in Tel Aviv) are in the process of being implemented in Tel Aviv. For this to be achieved, in the early stages of the project the TA LA will be exposed to planned research and innovations in the entire project. During the project direct communication links between the TA LA and the researchers in other demo cities and demo sites will be established.
2. The SWITCH approach to urban water management (i.e. holistic management of the urban water system, based on integration of sustainability and risk indicators in decision making and planning, achieved by joint learning and planning by the stakeholders) is adopted by the stakeholders in TA. Ideally, a key institution like the

new Water Authority will adopt the SWITCH approach (may take more than 5 years, possibly 10).

3. The TA LA ('the Water Club') will develop into a council of experts and stakeholders who will be consulted by the water sector institutions. The club will show leadership in urban water management.
4. At the conclusion of the SWITCH project a number of follow-up projects have been identified and funding by water sector institutions in Israel has been assured.

Short term objectives were planned for the period of 1-3, and included:

1. In this meeting the TA LA has been exposed to all planned researches (UF+Short term SAT, Short term SAT + NF, CW AND EF+CW) in the project. These research projects were proposed and approved by the EU before the TA LA was founded. These work-packages were explained to the LA team, discussed in these meetings and approved with no objections by the attending LA members. It was readjusted by the feedback from the LA attendants
2. The discussions in the LA have evolved into a number (3) of possible future scenarios for urban water management in Tel Aviv. These scenarios are subject to analysis by researchers working in Theme 1.
3. A system is in place for exchange of data (research results) between TA LA members, as well as with the wider consortium (data is collected, shared and available)
4. Working relations have been established with the two institutions in Tel Aviv that are working on the development of sustainability indicators (Water Commission and the Strategic and Long-Term Planning unit in the City Engineer's Office). SWITCH is invited to be involved in the inclusion of indicators (sustainability, risk) in decision making.

The objectives have been revised and re-adjusted half way through the project and are presented in the last section of "Results" .

Activities, facilitation, and documentation

The completed SWITCH Learning Alliance meetings include the following:

- Scoping Meeting on 30th July-3rd August 2006;
- "The Sustainability Indicators for Planning and Decision Making for Integrated Urban Water Management" Meeting on 10-11th November 2006, the SWITCH Consortium Scientific Meeting in November 2007;
- In June 2008 SWITCH Tel Aviv co-organized a conference called Water and Irrigation;

The available documentation regarding the development and progress of the Tel Aviv Learning Alliance are: the Scoping Meeting Report and the Learning Alliance Report to May 2007 as well as files of presentations delivered at the November 2006 meeting uploaded on the global SWITCH website.

Assessment/indicators

The evaluation based on the formula worked out and agreed by the SWITCH Learning Alliance Facilitators in the workshop in Ghana in December 2007, hasn't been conducted by the Tel Aviv team. The LA facilitator didn't take part in the Ghana workshop and therefore wasn't familiar with the mechanics of the process.

Using the methodology for the LA evaluation adopted at the above meeting, the reporters of this paper evaluate the process in Tel Aviv as follows:

Box 3. Proposed LA indicators for Tel Aviv LA (the reporters and TA team perspectives)

Objective 1: We know who Learning Alliance members are, and facilitate communication between them effectively

Benchmark [Score 50]: There is an up-to-date record of LA members and their involvement, and some basic communication tools are systematically used (e.g. email, phone) between events.

Score: 50% (both the reporters and TA team)

Objective 2: Regular, effective and innovative events capture and sustain interest of Learning Alliance members

Benchmark [Score 50]: Appropriate events are announced well in advance and use a mix of mainly standard methods to effectively engage interest of city stakeholders at least once every 3 months.)

Score: 35% (reporters): Regular events are held at least every six months, and have impact in capturing the interest of the Learning Alliance members. There is a need for more frequent meetings and more information regarding SWITCH.

Score: 45% (LA team): Events which kept the interest of the LA are held at least twice a year. The events are announced in advance and prepared well to effectively engage interest of city stakeholders. Meetings are well documented (LA team and professional journal). These reports will be available on the internet site. Furthermore, LA members attended SWITCH workshop.

Objective 3: Demonstration activities are undertaken within a framework for scaling-up

Benchmark [Score 50]: Demonstration activity plans are consistent and integrated within LA plans (city storylines) and are supported but without clear commitments to scaling-up.

Score: 50 % (reporters)

Score: 60% (LA team): Demonstration activity plans are consistent and integrated within LA plans and city storylines. SAT and Wetland technologies were established in the SHAFDAN WWTP (pilot scale). Entrepreneurs with potential to scale up demonstration of wetland and green roof were introduced to the LA group.

Objective 4: The SWITCH team and Learning Alliance understand why change is occurring in IUWM, not just what happens

Benchmark [Score 50]: A few process documentation tools are used regularly and results are widely shared within the Learning Alliance.)

Score 35 % (reporters): Occasional ad-hoc process documentation is undertaken using some available tools.

Score 35% (LA team): Minutes of LA meetings are available. A series of articles is used to share information about LA and SWITCH with the water community. A systematic documentation process or tools are not in use (training gap). Note: The LA Facilitator has not participated in most of the LA facilitator workshops, training and meeting such as M&E and documentation.

RESULTS

Meeting water demands in arid regions – advancements of science and demonstrations

Improvement of the technology for the Soil Aquifer treatment (SAT)

The research is conducted in a Dan Region WWTP facility, in a system designed specifically for testing the SAT technologies modifications. The results obtained so far within the framework of other projects show that UF as pretreatment to SAT and the subsequent short term SAT may not remove the micropollutants as effectively as the long term SAT. Longer SAT remove most of the micropollutants today, however it is not efficient in terms of the infiltration area needed for the process and taking into account the lack of land, it is a problem. On the contrary, the techniques based on UF and short term SAT only, whilst infiltrating more effluents in a given area and providing very good chemical and

microbiological quality of water, do not remove all micro-pollutants effectively, due to the short retention time in the aquifer before the water is pumped out. Nevertheless, the water is still suitable for unrestricted irrigation according to all regulations in Israel.

The research is designed towards recognizing whether a system based on natural barrier (short SAT) for clogging material removal (polysaccharides) will enable an NF membrane easy operation and effective removal of the micropollutants. Such a SAT-NF process, which is now being started to be tested by the SWITCH research at the Shafhdan utility, is considered much less energy consuming than the other technologies. The research is being started now, which is possible after termination and analysis of the results provided by RECLAIM (terminated September 2008), which provided data necessary for SWITCH experiment design.

Coupling electroflocculation (EF) with Granular Filtration (GF) and constructed wetlands (CW)

The to-date research focused on laboratory experiments on electroflocculation and field and laboratory experiments evaluating the efficiency of removal of selected nutrients by CW and its combination with other techniques (GF, EF). According to the hypothesis, the electro-physical system will have a major advantage over the CW itself, mainly due to the increased efficiency and seasonal stability of the phosphorus removal process.

This hypothesis has been positively validated by the research conducted in the first part of the project. The general results show that the combination of three methods (CW, GF, EF) has much higher efficiency of removal of selected nutrients than any single method or a combination of two of the methods. The achieved efficiency of the total phosphorus removal by the hybrid method at the level of 97% is an excellent result, comparably higher in relation to other techniques. Good results were achieved for total suspended solids (TSS) removal, which increases from 25% (EF-GF) to 42% (CW) up to 60% (EF-GF-CW). In addition to the phosphorus removal, the system may also have additional abilities of reduction of associated pathogens, heavy metals and, possibly, endocrine disruptors.

The order of the applied technologies had a great importance to the result. In general, the removal was higher if the system started with the CW, and was followed by the other two techniques. Location of the CW at the end of the technological line often resulted in the increase of some parameters. The great advantage of the hybrid method is also the overall costs of operation – reducing electrical energy use and elimination of chemical discharges to freshwater.

Future work will further evaluate the electroflocculation mechanisms, and focus on further evaluation of EF-GF-CW configuration on nutrients removal, and examine EF-GF effect on water quality. It will also concentrate on improving the colloid removal and modeling EF hybrid processes, e.g., EF-UF.

Learning Alliance progress

Strategic Planning

The Visioning workshop for the Tel Aviv Learning Alliance with the application of the methodology used in other SWITCH cities with the support by the relevant professionals from UNESCO-IHE, needs to be scheduled and conducted.

The TA Yaffo Municipality – a member of the TA “Water Club” has a long, practical 10-year experience in the visioning, scenario building, and strategic planning at the City Level. The methodology has been similar to those proposed in SWITCH. This experience may be used not only in the process of the visioning and planning in TA water sector, but also could be considered in the SWITCH project in general (e.g. by inviting the TA municipality with a lecture to a SWITCH meeting; organizing a practical training for the demonstration cities). As far as the Strategic Plan for the TA has been already developed and implemented for almost 10 years, the best possible option for the water sector seems to be to join/complement the existing vision and strategic planning with the water issues. There is a potentially big role for the SWITCH LA here, to raise the awareness and emphasize the need for doing this within the scope of the existing plans. This can be achieved by implementing the “water indicators” (see: 3.3.1. Water Indicators) to the plans by the “Water Club”.

Communication

Interviews conducted with stakeholders in the course of gathering material for this paper – amongst others at the Ministry of Health and the Israeli Municipal Water Works Authority - proved the enthusiasm and belief that SWITCH as a platform has the potential to bridge gaps or complement the existing structure of water management in Tel Aviv and Israel, and make breakthrough change, such as developing the vision for integrated water management in the city, which would complement the existing vision for the city’s development published in 2002 and 2005, which did not involve the water component. This is perceived by the Learning Alliance facilitator as a great natural opportunity for SWITCH to make a huge difference by drawing importance to the water sector as being a crucial stakeholder’s group in the city’s development planning. The LA facilitator says: “The Learning Alliance idea needs time to be explained, understood and internalized”. The Learning Alliance stakeholders were chosen with the expectation that they would internalize and sustain the paradigm - culture, philosophy and tools that SWITCH offers. The LA facilitator says: “In the Water Club meetings we sowed the seeds, and they are supposed to bring fruit in the future, the seeds are here and are very strong - the inspired people in high positions have the influence to change ... see opportunities to contribute to better integration of the water sector, the choice of persons was to ensure efficiency, the top people work understand the process better, they treat the project very seriously. We have seeds deep in the ground! They will grow in the end.”

Box 5. The LA as an extra platform to close the gap between existing structures

The Central District of the Ministry of Health is responsible for all water sources for Tel Aviv and its surroundings, water supply and water treatment systems in the city. The Water resources for the Tel Aviv Region come from the Central District, therefore both units are involved in SWITCH. Among many other activities, it is also responsible for the monitoring of the water related health aspects in the projects directly related to SWITCH - WWTP effluent quality and SAT water quality.

The Ministry officers are aware of the SWITCH project, and see its role as changing the approach to water resources management from traditional to more sustainable. They participated in two LA meetings where the project and its goals were presented, as well as in the Scientific Meeting of SWITCH in Tel Aviv. Mrs Brula says that it was an interesting experience that gave her the opportunity to listen to several lectures giving a broader perspective of the SWITCH project, which she found very interesting. The scientific lectures gave an opportunity to gain important insights into the issues related to drinking water or energy. She feels that some of the problems can be improved through SWITCH communication platforms, which make people talk together and learn about things they didn’t know before. Mrs Brula says that in her opinion, SWITCH provides a good mechanism for communication and problem solving. She feels that in the SWITCH project they are still in the initial stage, and cannot clearly see the end of it now. She would be happy to see more activities happening

within the project. The very good contacts between actors in the city water sector in the TA District and Central Region, as well as among the departments and districts of the Ministry, allow good cooperation and implementation of the SWITCH goals. They are associated with development improvements to the SAT technology, contributing to solving the water shortage issues in Israel.

Mrs Pohoryles is very enthusiastic about the idea of SWITCH. She expressed her readiness for more active work for SWITCH, involvement in more activities and conscious contribution to the project objectives. More continuity in the communication process and full clarity in the ongoing activities would help to develop more of the feeling of the ownership of the project.

Mrs Brula underlined the need to be involved in the project starting from its planning stage. Holding general discussions about the project between its participants, including the Ministry, at the beginning, assures full contribution to the project goals and process, and addressing the needs of the city. There are several questions to be answered in the future. One of them is related to the ongoing construction of a big desalination plant - there is a need to specify detailed criteria for the distribution of desalination, drinking water and sewage facilities. Another issue is related to drinking water reservoirs in the area, where exact regulations and criteria are needed. A sustainable solution for rehabilitation of severely contaminated coastal aquifer is needed - there are two options of dealing with the issue. The first one proposes setting up a treatment facility at each well while the other one proposes construction of a central plant. The discussion about it is needed for decisions, and the SWITCH platform provides this opportunity.

The role of LA is seen in the ability to consider important decisions from different points of view and chose the best solutions to the existing problems. It also gives equal opportunity to all the actors, also to those whose voice would not have the same strength in other situations. We know who the right person is to ask the question and we always get the answers we need. It seems that LA is a good platform for asking these questions, Mrs Burla and Mrs Pohoryles said. They also mentioned that there are many other platforms around the water sector that are operating in the city. There is still a need to build a better identity among the LA group.

The Ministry is looking forward to the results of the research. They have not yet been able to apply the results of it, as the research and demonstration process are still in progress. The ministry is well aware of the research and demonstration scope, as they learned about the particulars of it from the lectures and discussion about the demonstration projects during the LA meetings and the SAT workshop in November 2007. Additionally, Mrs Burla is one of the members of the Recharge Follow-up Committee, which gives her additional opportunities to influence the research and decision process and specify the key issues.

The Ministry contributes to the dissemination of the SWITCH project. It was presented in the forum of engineers in a Central District. The forum meets every month and its major mandate is to discuss the emerging issues in the district. SWITCH was presented there by Mrs Burla and Mrs Pohoryles. The feedback from the engineers was positive, and they would be willing to receive more information about the progress of the project. On the other hand, considering the high number of existing committees in the region, she would see the role of the LA as an informal committee. One of the important activities for the LA could be the Visioning for water resources management. It has been a very difficult process so far, as the existing committees continue the known path, unwilling to change the paradigm and the way of doing things in the management.

Sources: Eti Brula, Central District , Valerie Pohoryles, Tel Aviv Region, Ministry of Health, Environmental Health Department

Box 6. “SWITCH deals with sustainable management of water resources” – perceptions by a Learning Alliance Stakeholder

The Chief Engineer of the Municipal Water Works Administration based in Tel Aviv – Mr Hezi Bilik – refers to SWITCH as a project aiming at sustainable management of water resources.

The institution he works for, part of the Ministry of Interior of the State of Israel, is in charge of the water supply in all the municipalities of a population of 3,000 or more, apart from the three big cities (Jerusalem, TEL AVIV and Haifa). For each such municipality, and there are about 200 of them, the Municipal Water Works Administration prepares the water master plan and implementation programs for the renewal and development of the systems as well as the funding. For the last 7 years a serious process of building water and sewage corporations to take the service from municipalities to municipal independent corporations owned by municipalities, has been in progress. The corporations are meant to be independent of the government funding, sufficiently supported by the money coming from the tariffs. Currently there are already 14 corporations established since 2004.

“We are the regulator for the corporations in charge of water management in all aspects – economic, engineering, also implementation of what is new” says Mr Bilik, a member of several committees, among them the Committee for the Approval of the Master Plans of Municipalities, where he is the Head, the Water Quality Standards Committee, the Regional Water Plants Committee in the Israeli Water Authority, and the Committee of the Water Authority for Water Policy, which deals with the protection of the surface and underground water and water supply systems, the Water Security Committee, the Fire Protection Agencies Committee which sets standards. He frequently meets people from the water sector and has a good overview of what is happening in it.

Mr Bilik participated in the Tel Aviv Learning Alliance’s first meeting with enthusiasm and curiosity about what the platform could offer and where it could contribute. For the first time there he heard about various kinds of indicators in the context of the planned development of ones for water, was very inspired by the idea and decided to develop and implement indicators for his organization in order to compare the corporations. He shared his impressions with a colleague from the Water Authority (Miki Zayde) and he prepared the initial indicators for the Head of the Water Supply Department of the State, and asked for the budget for their further development.

He was not present at the second meeting and, most importantly, in the SAT workshop where the different projects on SAT (the conventional, Reclaim, SWITCH RTD.) were explained and the sites visited in a 2 day workshop. So he has less idea than others who have attended on what is going on with the SWITCH research and how he can use it to his advantage. He is not very involved with water reuse, but rather drinking water supply.

He is interested in getting to know about what the SWITCH researchers do and the possibilities of working with them concerning his field of work, e.g. as far as the prevention of the contamination of groundwater in Tel Aviv, Holon, Batyam is concerned. The SWITCH meeting Mr Bilik participated in provided good access to new information, he thinks the Water Club is a very useful network.

Based on an interview with Mr Hezi Bilik, Chief Engineer, Municipal Water Works Administration, Member of the SWITCH Water Club (Tel Aviv Learning Alliance)

Prospects for up-scaling of the SWITCH-related solutions in Tel Aviv

Water Indicators

The greatest potential for having a visible and sustainable impact on water issues in Tel Aviv relates to the idea of the “Water Indicators”. It has the potential to link the water issues to the existing Strategic Plan of the TA city, provides a great opportunity to upscale the LA activities and gives the promise of a great impact going beyond the water sector (e.g., spatial

development, strategic plans, city vision). The idea appeared when the Water Club started and the TA City Planners gave a presentation on several indicators that they have already implemented in the city Strategic Plan. At the same time the Water Authority, another LA member, presented the idea of Water Indicators, aimed at monitoring the water issues in the city. While the main indicators for the Water authority were water indicators, the City Planners did not envisage any water indicator in their analysis. By bringing them together the SWITCH TA LA organizers (MEKOROT, HUJI) have coupled them through the LA platform at the first LA meeting and consider the inclusion of water indicators in the TA Strategic Plan.

The Municipality of Tel-Aviv Yafo has resolved to prepare a strategic Plan for the city, and become a flagship example of the planning in the country. The Plan is based on basic principles, assuring multi-disciplinarity (it is concerned with the following city aspects: social fabric, economy, culture, leisure, land use, urban fabric, transport and environment); wide public participation; consensus building; early completion and formulation of action plans; transparent planning process and empowerment of the municipality. The Plan consists of 4 strategic lines, including 'future pictures', policy, delivery means and indicators for monitoring how the vision is being reached in the city. Strategic plan has no legal basis, but is an agreement of society of where we want to go. The vision and targets are, however, present in each office in the form of a poster on a wall. Working plans for the city are elaborated every year according to the vision. There is also dedicated software developed for the implementation of the vision, which includes targets, and which help the strategic planning. The planning process included 3 phases:

1. creating the city profile: the process involved 15 discussion groups, dealing with general subjects and areas of the city, and involving 550 participants, including inhabitants, stakeholders, and assuring participation of different organizations and social groups, e.g., youth, foreign workers, handicapped people.
2. creating the vision for the city. The vision was created at the 29 workshops attended by 200 participants, and using different facilitation methodologies. The following vision for the city has been formulated: "Tel Aviv Yafo will continue to function as the economic and cultural capital of Israel and, in parallel, become an exemplary city for the quality of life provided to its residents."
3. monitoring and control of the implementation process: The plan includes a series of over 50 indicators, which show the trends of changes of particular parameters essential for achieving the vision. The indicators are carefully selected according to methodological criteria, are evaluated against them and have a well specified structure. They are the major monitoring tool for the vision implementation, and show the progress by indicating the changes in Tel Aviv, as well as comparing the results with other cities in the county and abroad.

Box 7: Tel Aviv Strategic Plan

The Strategic Planning Unit has been responsible for developing plans for the city of Tel Aviv, connecting them with the national and regional planning, as well as the monitoring of their implementation. The Unit is directly responsible to the City Council and Mayor, although following the central management model, the city plans are approved at the national level by the respective ministries. With the experience the unit has gained in the visioning and planning process, it is the most sophisticated and professional planning unit in the country, Mr Segal says. Tel Aviv is the only municipality developing a Strategic Plan.

Mr Segal says that the Strategic Planning Unit has played a minor role in SWITCH so far. However they can see several benefits in the co-operation so far, as well as possible advantages in the future:

The unit has actively participated in 2 meetings of the Learning Alliance (Water Club), which provided a good platform to learn about what the other people are doing in the city in the water sector, as well as about SWITCH in general, which was possible thanks to the participation of the visitors from IHE, while the related lectures on the local SAT were given by Mekorot. Although most of the lectures were focused on water in SWITCH, which is not the direct field of interests for the Unit, they showed the need for building a common language between the water professionals and urban planners, and developing ways of working together. As far as the particulars of the research can not always be useful for the planners, it is important to understand the goals of the research, its possible applications, significance for the city, as well as potential benefits and/or dangers related to water issues. There is a need to fit this information into the city planning to complete the picture. Connection of researchers, practitioners and decision makers is crucial for this process, and the Water Club can provide a platform for doing this.

Another vital advantage of participating in the meetings was the opportunity to present to the Water Club the methodology for strategic planning and system of indicators, which the Unit has developed for the city of Tel Aviv. The methodology is similar to that proposed by SWITCH and has been already applied to the City of Tel Aviv since 2000. Mr Segal thinks that it can also be successfully used for water the visioning and strategic planning for water issues, and the Unit would be willing to share the methodology and contribute with its experience to this process in Tel Aviv as well as in other cities.

Source: Guido Segal, Strategic Plan Manager, Strategic Planning Unit, Engineering Department of the Tel Aviv Yafo Municipality

Green building

One of the examples that SWITCH has contributed to linking the people and initiatives is the idea of the development of a design of a “Green Building” to be constructed in the vicinity of the University of Tel Aviv, in collaboration with Elram Consultants. The project is meant to implement sustainable solutions developed and tested by SWITCH in Tel Aviv and SWITCH consortium partners around the world and could be implemented together with the Learning Alliance multi-stakeholder engagement methodology.

Box 8. Linking SWITCH Tel Aviv Learning Alliance to the Elram Consultants’ Ecological Building project

Tel Aviv is a SWITCH city where these opportunities are perceived with great enthusiasm by stakeholders applying energy renewal and water recycling means as a contribution to creating a more sustainable environment as well as attractive new architectural spaces using traditional methods and natural characteristics of a site as engineering and research inspiration. On the other hand, there are perceived to be potential restrictions resulting from expected difficulties in application such as those of institutions setting and executing standards for environmental security – the Ministry of Health being among them.

Maximum water reuse by recycling grey water, rain-harvesting, air-conditioning water reuse, and solar energy used together with the use of natural capacities of the site for ventilation, are ideas incorporated to be tested in a project of an “Ecological Building” which is supposed to be constructed on a slope in the Tel Aviv city centre in the vicinity of the University of Tel Aviv,

the Yarqon River, the central station and the major road tract, meant as a statement by a group consisting of construction and electrical engineers, architects, urban planning consultants, a PV systems consultant, Avi Aharoni and Dr. Haim Cikurel – members of the SWITCH Tel Aviv Management Team. Both the building design team and the SWITCH team expressed enthusiasm regarding possible future collaboration in promoting sustainable water management and sustainable architectural design.

Inspiration for the design coming from history and tradition, draws from the “Four Room” House at Tel Qasile, characteristic of Iron Age architecture and water- harvesting - collection and infiltration of rain water, reuse of “grey water”, collection of the air-conditioning condensed water, roof gardening, low evaporation characteristics, effective utilization of water resources, and improvement of insulation in the building. It offers integration within the existing landscape and the creation of a new green area for residents and commuters.

Engineer Rami Benzvi, whilst looking for the expertise in water reuse, approached Haim and Mekorot. Both Haim and Avi thought that it would be a good idea to link such a novel project with the SWITCH Demo program and to explain to the LA the advantages of doing so. As a gray water alternative two opposite solutions were proposed:

1. Membrane bioreactor – expensive and energy consuming but provides safe water for reuse.
2. Wetlands- cheap, low energy consuming and also relatively safe if a proper disinfection is performed (UV) before reuse.

The idea of using Wetlands for this process came from newspaper reading where it was mentioned that an Israeli company is selling the know how in US about wetlands for graywater in housing areas (Ayala Company – partners of the wetland project with Adin). They approached developers near TA, and agreed to do a project, but the Health Ministry was against it mainly due to the lack of trust in management/daily maintenance of the system, and the possible health hazard. In the case of the Green Project, the location (inside the TA University) and the professional staff make it easy for the Health Ministry to agree to such a project. This will be presented in the upcoming LA meeting and discussed with all LA members including the Health Ministry.

Elram Cosultants have found the SWITCH Tel Aviv Learning Alliance a platform well capable of facilitating stakeholder dialogue and SWITCH research is going to have a chance to be applied in the project very much “on the ground”. There is enthusiasm and belief that SWITCH can make a difference in cutting through usually lengthy pre-application procedures through its Learning Alliance.

Source: Based on a meeting presenting a design for a “Green Building” by Elram Consultants, an emerging member of the SWITCH Water Club

FURTHER PLANS

The long-term goals of the Tel Aviv Learning Alliance have been revised half-way through the realization of the project and readjusted following the developments during the project implementation to follow the needs of the water-related issues in the city and growing awareness. These at the end of August 2008 include:

- Continuing the process leading to agreement by the member organizations on the most efficient and beneficial water indicators for Tel Aviv, which are meant to serve as a tool to monitor water-related processes, already started by Mrs. Tami Gabrielly working in the

Tel Aviv Municipality - which with the participation of 1,000 representatives of diverse stakeholder groups developed since 2004 has been implementing the Strategic Development Plan for Yafo Tel Aviv, one of its components being 40 indicators related to four strategic lines, one involving the environment, which is supposed to include water indicators as part of the SWITCH goals in the city; the process will involve collecting data from the Learning Alliance, and upon the agreement implementation of the indicators;

- Addressing storm-water issues (although 90% of the storm water is already disconnected from the sewer to disconnect the remaining 10%) to solve part of the problems in the SAT system (hydraulic loading on rainy days).
- The green project: the idea here is to save water and energy by using state-of-the-art technology. The recently emerging 'Green Building' project in the vicinity of the Tel Aviv University campus will use the expertise of SWITCH partners around the world (although green roofs in other countries are not used to using water from gray water reclamation) to recycle gray water. Applying the learning alliance methodology to facilitate the process to connect the researchers, engineers and architects to the authorities to inspire their willingness to take a look at innovative recommendations and review existing environmental security requirements against new technologies.
- Developing the master-plan for the water sector in Tel Aviv.

The short term objectives planned for the period of 1-3 years, specified by the Tel Aviv Team during the scoping meeting and included in the scoping report, were addressed as follows:

- In 3 meetings, the TA LA has been exposed to all planned research (UF+Short term SAT, Short term SAT + NF, CW AND EF+CW and innovations (Green house) in the project. The SAT research was proposed and approved by the EU before the TA LA was founded. These workpackages were explained to the LA team, discussed in these meetings and approved with no objections by the attending LA members. They were readjusted by the feedback from the LA attendants.
- The discussions in the LA have evolved into a number (3) of possible future scenarios for urban water management in Tel Aviv. These scenarios are subject to analysis by researchers working in Theme 1.
 - *Progress: As far as the writers of the paper are concerned, the 3 scenarios haven't been formulated.*
- A system is in place for exchange of data (research results) between TA LA members, as well as with the wider consortium (data is collected, shared and made available)
 - *Progress: As far as the writers of this paper are concerned the system hasn't been established yet.*
- Working relations have been established with the two institutions in Tel Aviv that are working on the development of sustainability indicators (Water Commission and the Strategic and Long-Term Planning unit in the City Engineer's Office). SWITCH is invited to be involved in the inclusion of indicators (sustainability, risk) in decision making.
 - *Progress: This objective has been achieved in that the working relationship background seems to be in place.*

Additionally, the short-term goals of the Tel Aviv Learning Alliance as stated at the end of August 2008 are:

- To have the third LA meeting on 18th September 2008, whose aim is to discuss the water indicators, to present the green house project, and to address any questions or issues identified by the Learning Alliance members in the meeting preparation process. There is going to be an article (already the third) reporting on the meeting in a professional journal called "Water and Irrigation", written by its editor, who finds SWITCH very interesting

and has already published an article written by her personally, and one by the LA Facilitator.

- To have the visioning workshop for Tel Aviv with the support of the IRC - in order to do that the communication between the SWITCH Management Team in the Netherlands and the facilitator needs to be resumed to set the date and provide an IRC facilitator experienced with the visioning methodology to support the Tel Aviv team with tools and expertise; the facilitator considers the visioning workshop as very important and a great opportunity to complement the established city vision with a vision regarding water management in the city; it is a serious task in a city with a long-term culture of participatory problem-solving processes, and the expectations regarding the visioning methodology and its application by the high-level positioned stakeholder representatives need to be met;
- To build the city website. So far the LA Facilitator said she hadn't had sufficient staff, time, financial or educational resources or enough external consortium support to do that. In order to meet this goal she needs support.

CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNED

- The SWITCH Management Team in Tel Aviv are very keen on the project and care about bringing about the change towards integration in the water management in their city and country;
- Professor Avner Adin – the city coordinator – is not only a researcher, but also a practitioner, e.g., working closely with and for the agricultural sector in Israel, involved in some decision-making bodies (committees), therefore knowing and understanding their perspectives;
- Meetings in the water sector have a great tradition and culture of communication, following the cultural setting of the city, the meetings of the Tel Aviv Learning Alliance were planned in the scoping meeting in 2006 to take place every 6 months; The SWITCH Learning Alliance process does not seem to be intense enough, there have been 3 meetings held so far, the available documentation apart from the scoping meeting report are presentations prepared for it. The last Learning Alliance report is dated May 2007. The LA report 2008 hasn't been written, the stakeholder/institutional analysis hasn't been completed;
- Regarding the reporting – there have been many requests from the Management Team to provide the information (e.g. tables), with similar if not identical information only under various captions or in various configurations. The reporting load is therefore very high, more focus needs to be attached to the process and work on the ground instead. The result of asking for a lot of reporting with limited or no feedback and limited or no support may in the end result in no reporting;
- The need for feedback from the Management Team and constant effective communication has been emphasized;
- The evaluation of the progress on the Learning Alliance development conducted by the reporters was made through making the agreed four objectives common for all the SWITCH cities showed that in all the four aspects there is an urgent need to pace up with the process in terms of:
 - applying advanced communication tools such as the website, and Google groups, where information clearly related to the activities of the TA learning alliance would be disseminated,
 - SWITCH events, which need to be held every 3 months to meet the initially set goal,

- Process documentation – needs to be conducted regularly to clearly capture the LA process.
- Including water indicators into the existing Tel Aviv Yafo strategic plan has the potential of achieving significant impact in the city and in the SWITCH project – the methodology and the training resources may be shared by Tel Aviv Learning Alliance members – the Strategic Planning Unit of the Municipality of Tel Aviv Yafo. Perhaps incorporating the Strategic Planning Unit Coordinator/Facilitator to the SWITCH Tel Aviv Facilitation team could enhance the facilitation in the Tel Aviv Learning Alliance;
- It was mentioned by the TA Team that water platforms already exist in Tel Aviv. Creating another one (SWITCH LA) similar to the existing ones may be viewed as a multiplication of the existing bodies. Therefore it is crucial to prove that the SWITCH Learning Alliance offers something unique and innovative, and is able to inspire, lead and enrich the process towards integrated management of the water sector and sustainable development. It appears to have to be made sure that the uniqueness of SWITCH is well disseminated in the city, and that it makes a difference – the uniqueness has to be pinpointed and well-defined for the SWITCH Tel Aviv to trust and internalize.
The trust and internalization for the uniqueness of the project goes hand in hand with the clarity for the role of the Learning Alliance platform, the substance and reliability of its methodology that would be clear in the SWITCH project as a whole, as well as with the feeling of support that the SWITCH Tel Aviv receives and may expect to receive from the SWITCH Management Team. Some of the questions to be asked, to validate the uniqueness of SWITCH and the innovative approach it offers, may be: “What would be different in the communication if SWITCH were not there?”, –“Is it helping to make things different?”;
- The interviews show that the water sector stakeholders in Tel Aviv (most also operating on the national level) know some general objectives of SWITCH and lack clarity on others, so more communication about SWITCH is recommended with a clear statement of the project’s goals in general and in the city of Tel Aviv/Israel in particular. There is an information gap. Bridging the gap will ideally lead to more involvement by stakeholders, their appreciation of the process and the methods developed by the Tel Aviv team and by the SWITCH training providers. The process needs continual monitoring and evaluation, and to be consistently planned/adjusted to the requirements on the ground, and therefore bringing about more impact in the water sector;
- The LA facilitator is perceived by her team colleagues and the authors of this paper as a person with qualities of a respected and dedicated facilitator, comfortable with the concept of a multi-stakeholder platform such as the Learning Alliance, and confident with the difference it has the potential to offer. She possesses extensive knowledge of the Tel Aviv/Israeli water sector, water issues and problems, she knows the stakeholders, their perceptions and expectations, but is, however, committed to jobs outside SWITCH that are her full-time employment. In the scoping meeting report it was said that the Tel Aviv LA facilitator would dedicate 0,5 day per week to the SWITCH Learning Alliance tasks, which in time has proved insufficient regarding time as funding allocated for the remuneration, as it turned out in the process of implementation of the SWITCH project that the facilitation of the Learning Alliance platform would require full-time work commitment to complete all the activities such as organizing and facilitating the LA meetings, reporting, communication with the Learning Alliance and the Management Team, participation in trainings and implementing the tasks required after the trainings. The facilitator needs to commit on a full-time basis or have a support person/team to work with her that would cover the full-time needs;

- Cities are suggested to be represented in the Management Team to form the Global SWITCH Learning Alliance and to be involved into the project/process management;
- Creating a kind of “SWITCH Research Portal” with all the research to be shared placed in one easily accessible and comprehensive site, would be a great opportunity to share the expertise of the teams and researchers involved in SWITCH, as well as to have a fuller picture of the progress in science which is there to support the real, demand-led change towards integrated water management in the cities;
- Support for the identification of opportunities for raising extra funds for the Learning Alliance by the Management Team, to support the process in those cities, is needed; Cities are suggested to be represented in the Management Team to form the Global SWITCH Learning Alliance and to be involved into the project/process management;

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- Prof. Avner Adin, the SWITCH City Coordinator, Water Treatment Technology Laboratory, Hebrew University, researcher
- Dr Avi Aharoni, the SWITCH City Coordinator, MEKOROT Company, researcher
- Avital Dror-Ehre
- Dr. Haim Cikurel, researcher, MEKOROT Company consultant
- Mr Hezi Bilik, the Chief Engineer of the Municipal Water Works Administration based in Tel Aviv
- Mr Guido Segal, Strategic Plan Manager, Strategic Planning Unit, Engineering Department of the Tel Aviv Yafo Municipality
- Mrs Eti Brula, Central District, Ministry of Health, Environmental Health Department:
- Mrs Valerie Pohoryles, Tel Aviv Region, Ministry of Health, Environmental Health Department
- Mr Tomer Kraitzer, MEKOROT, Operational and Process Eng., Wastewater Treatment and Reclamation Plant
- Elram Consultants’ Ecological Building project

Unfortunately, because of timing problems, the farmers' representative could not be interviewed in this visit. However, information about their role was provided by Prof. Adin.