



## **018530 - SWITCH**

### **Sustainable Water Management in the City of the Future**

Integrated Project  
Global Change and Ecosystems

#### **D6.2.3 Action plans for implementation (city storylines 2007)**

Period covered: from M1 to M12

Date of preparation: M12

Start date of project: 1 February 2006

Duration: 60 months

Project coordinator name: Carol Howe

Project coordinator organisation name: UNESCO-IHE

Revision [final]

## SWITCH Accra City Story

### Description of the city and its water resources

Accra, is the administrative, political and commercial capital of Ghana gets its water supply from various sources, including the municipal water system (Weija dam and Kpong dam of GWCL), private trucks and commercial outfits. Accra has a current population of about 2 million. It is the most populated and the fast growing metropolis in Ghana with an annual growth rate of 4.3 % (National Population Census, 2000). In addition, Accra has a functional population of 2.5 to 3 million people in terms of socio-economic activities aside the residential dimensions. The production levels of GWCL do not meet the demands of city and therefore most suburbs of Accra such as Adenta and newly developed areas are not connected to the distribution networks. Those connected to distribution networks are not supplied daily. According to Agodzo et al. (2003), the total amount of grey and black wastewater currently produced annually in Ghana has been estimated as 280 million m<sup>3</sup>. This untreated water is derived mainly from domestic sources, as Ghana's industrial development is concentrated along the coastline where urban water treated or untreated is disposed off into the ocean. It is established as well that less than 5% of the households in Accra are connected to pipe sewerage systems, while 21 % use flood drains (gutters) as open sewerage that ends up in nearby urban water bodies. Kitchen and bathroom drains are usually directed into open drains. Most of urban drains are not covered and investigation shows that some households without adequate sanitation facilities engage in directly defecation into these drains. The 2000 population Census shows that one third of all households in Ghana use public toilet due to absence of toilet facilities in many dwellings. Presently, a large modern biological treatment plant is in operation after it started in some few years ago. However this plant handles about 8% of Accra's inner city wastewater from domestic and industrial sources. Currently, this plant operates about three times below capacity due to constraints of small urban sewerage network. Additionally only about 10% of Accra's waste water is collected for some form of treatment. There are about three other smaller treatment plants scattered in the city. Wastewater management is the sole responsibility of the Accra Metropolitan Assembly. The other percentage of wastewater is discharged untreated to open drains, wetlands and natural channels that finally discharge into the Odaw river, Korle lagoon or the sea.

### Main water pressures and issues

Accra, like many parts of the world, faces challenges in accessing clean and safe water. Water distribution network is limited but existent. More than 50% of the population do not have house or yard connections. They get their water supply from secondary sources such as water tank operators at exorbitant prices. This means the urban poor who are not connected to the GWCL network pay more for the same quantity of water supplied. GWCL is losing a lot of water and consequently money due to poor condition of the pipes and illegal connections. It is not uncommon to see busted pipe because these pipes are laid haphazardly and all these water are wasted. It has become a norm to see people carrying their buckets, pans jerry cans, etc looking for water every morning. This water issue do affect productivity as people spend time to get a bucket of water.

**City Coordinator: Esi Awuah**

**City facilitator: Bertha Darteh**

**Learning Alliance members goals and aspirations**

<b>LA member</b>	<b>Issues, goals and aspirations</b>
City Coordinator	Form a Switch core team, provide outcomes of the scoping visit to SWICTCH researchers, interact with switch management and researchers, support the design of LA workshop, it's methodology, programme and implementation, coordinate the development of action plans for follow – up on LA workshop
LA facilitator	Interact with city coordinator and LA support team, operationalize scoping feedback activities, develop a SWITCH Accra fact sheet, coordinate with Accra stakeholders, organise and arrange all logistics for workshop, document and disseminate LA process including concise workshop report, identify and discuss opportunities for linking up with other initiatives.
IWMI represented by Dr. Liqa Raschid	Strong research in water management for agriculture, regional resource centre for urban and peri-urban agriculture
KNUST represented by Prof. Esi Awuah	Good capacity in research and training, strong research potentials and provision of skilled personnel for the sector, availability of students to participate in
A civil society representative, e.g. TREND represented by Eugene Larbi	Training, research and networking for the development of delivery and sustained management of water and environmental sanitation facilities, knowledge management initiatives in the Ghanaian water and sanitation sector, the knowledge management initiatives is currently being spearheaded by the KM task force. The KM taskforce intends to stimulate knowledge and information development, sharing and management in the WASH (water, sanitation and Hygiene) and IWRM sector.

**SWITCH in the City**

The SWITCH projects aims to achieve a paradigm shift in urban water management to get sustainable, effective and safe urban water systems.  
SWITCH employs Learning Alliances (multi-stakeholder platforms) which help the

exchange of knowledge and experiences between government, private sector and civil society stakeholders and the various activities.

Major problems SWITCH will be tackling are:

1. Lack of access to safe water and sanitation especially in poor areas
2. Pollution of water bodies due to inadequate treatment and poor sanitation
3. Polluted wastewater use in agriculture
4. Flooding due to poor drainage, silted channels and blockage because of solid waste
5. Improper land use planning and control in urban water management

#### Major activities and impact of SWITCH in first 12 months

Month	Activity	Person Responsible	Contribute to X Deliverables/Impact
Feb '06			
March			
April	City Scoping		
May			
June	Stakeholder consultations /scoping visit		
July	Preparation of SWITCH Info sheet		
August	5.2 Exploratory study		D5.2.1
September	5.3 Review of natural systems - ongoing		
October	<ol style="list-style-type: none"> <li>1. Field Research on health indicators(1)</li> <li>2. Recruitment of LA facilitator</li> <li>3. Upgrading of city Action plan</li> <li>4. Seminar on Water in Accra</li> <li>5. Inventory on agric demand for ecosan nutrients</li> </ol>	<ol style="list-style-type: none"> <li>1. Peter vd S. (Isabella &amp; Ibrahim)</li> <li>2. Olufunke Cofie</li> <li>3. LA facilitator</li> <li>4. Olufunke Cofie</li> <li>5. Alicia Roman/Felix (TUHH)</li> </ol>	<ol style="list-style-type: none"> <li>1. D12 (1.1)</li> <li>2. D4 (6.2)</li> <li>3. D3 (6.2)</li> <li>4. D</li> </ol> D4.1-5R
	5.2 Meeting on water use in UA	Olufunke Cofie	D5.2.6; D5.2.2
December			

#### Linkages of SWITCH with other regional/city water initiatives

1. RUAF
2. TECHNEAU
3. NUFFIC - KNUST
4. RESPTA – Re-use of ecological sanitation products for tropical Agric.

#### The NEXT 18 Months

#### Summary of the main points/focus of SWITCH activities in the next 18 months

Month	Activities
Jan'07	Training for LA facilitator in Alexandria and First LA workshop
February	Workshop on Theme 1, workshop and training on UA

March - April	Exploratory survey			
May/ June	Second LA workshop and workshop on natural systems			
<b>Issues to be addressed</b>				
<b>Month</b>	<b>Issues to be addressed</b>			
Jan' 07	<ol style="list-style-type: none"> <li>1. Training on facilitation, documentation and monitoring for LA facilitator in Alexandra – 1wk</li> <li>2. Overview of all themes – 5.2, 5.3, 3.1, 6.2, 6.3, 6.4, 1.1 etc</li> <li>3. Research and demonstration needs assessment</li> <li>4. 6.4 Kick-off of the financing study</li> </ol>			
February	<ol style="list-style-type: none"> <li>1. Theme1 Workshop on Paradigm shift: sustainability indicators for decision making/planning</li> <li>2. 6.2 Stakeholder mapping/analysis –</li> <li>3. 6.3 Action planning for optimizing social inclusion activities</li> <li>4. 5.2 Workshop and training on UA</li> </ol>			
March – April	<ol style="list-style-type: none"> <li>1. 6.3- survey of best practices and methodologies for social inclusion – 2 months</li> <li>2. Demand Management case study investigation</li> </ol>			
May/ June	<ol style="list-style-type: none"> <li>1. 2nd LA meeting – progress review and operational planning for next months</li> <li>2. 6.3 identification and prioritization of needs of vulnerable groups</li> <li>3. 5.3 Workshop on natural systems to discuss opportunities</li> <li>4. Results of financing presented to kick start the CBA (depending on response from LA)</li> </ol>			
<b>SWITCH goals and objectives – Impact to be realised</b>				
<b>Learning Alliance Activities</b>				
<b>Activity</b>	<b>Specific objective</b>	<b>Task</b>	<b>Deliverables</b>	<b>Milestones</b>
<b>Planning</b>		1. Stakeholder consultations and constituting the coordination team and the LA		
<b>Exploratory study on urban water resources</b>	To identify how urban water resources are managed, institutions responsible and the effect of urban water on hydrology	<ol style="list-style-type: none"> <li>1. Stakeholder analysis beyond the scoping exercise</li> <li>2. Review of urban H<sub>2</sub>O resources mgt and institutions</li> <li>3. Est. of urban H<sub>2</sub>O use, its effects on hydrology</li> </ol>		
<b>Training (capacity building) in LA</b>		Development of appropriate training modules		

<b>processes</b>				
<b>LA Forum meetings/ workshops</b>	Get stakeholders together to define the required paradigm shift in and appropriate framework for IUWM	1.Elaboration and prioritization of issues on IUWM 2. Launch the LA	1. An established LA platform for IUWM 2. Workshop reports	
<b>Research and demo activities</b>				
<b>Information exchange</b>		City website maintenance, email list serve/ discussion forum, prepare city profile or fact sheet on IUWM		

**Research activities**

*Table on specifics of work activities (workpackages to contribute)*

Work package	Specific objective	Task	Deliverables	Milestones	Lead Partner

**Demonstrations**

**Training plans**

Training activity	Purpose	Target audience	Type of materials/delivery	Deliverable

**Dissemination activities**

Dissemination activity	Purpose	Target audience	Deliverable



**Links to other areas of the SWITCH DOW**



## City Story Belo Horizonte

### Description of the city and its water resources

Belo Horizonte (BH) is the capital of the State of Minas Gerais, which in economic terms (gross product) is the third among the 26 Brazilian states. The city lies at 20° South latitude and 44° West longitude (Figure 1) and has an altitude of 750 to 1,300 metres. It is located in a mountainous region of tropical soils that originated from the decomposition of metamorphic rock. Tropical highland weather predominates in this area, with an average yearly rainfall of 1,500 mm and an average yearly temperature of 21°C. The rainy season lasts from October to March, when 90% of the total yearly rainfall occurs. BH has 2,227,400 inhabitants with a population density of 6,900 inhabitants/km<sup>2</sup>. It is a planned city, built in 1898 to become the capital of the state. The total area of the municipality is 330 km<sup>2</sup>. The overall metropolitan area (RMBH; Belo Horizonte Metropolitan Area) consists of 33 distinct municipalities with an area of 9,179 km<sup>2</sup> and 3,900,000 inhabitants. Population growth in Belo Horizonte is virtually reaching a saturation level. Present average population growth rate is at 1.1 % per year (from 1990 to 2000) and a population of 3,000,000 inhabitants is expected for 2030. However, pressures on water resources due to population growth as well as a variety of environmental impacts due to rapid urban expansion may be consistently expected in the metropolitan region of Belo Horizonte (RMBH), where population growth rates higher than 5% per year are still observed in certain townships. Population projection for the RMBH is at about 8,000,000 of inhabitants in 20030.

The water supply system (drinking water) connects to 99.7% of Belo Horizonte residents with an average supply rate of 286 litres per inhabitant/day. The water supply system presents high standards in terms of operation as well as water quality. Surface sources predominate in the BH water supply system. There are four main sources, namely:

- Velhas (Velhas River Basin) with a capacity of 6.75 m<sup>3</sup>/s;
- Manso (reservoir, maximum storage: 121,000,000 m<sup>3</sup>) with a capacity of 4.2 m<sup>3</sup>/s;
- Serra Azul (reservoir, maximum storage: 93,000,000 m<sup>3</sup>) with a capacity of 2.6 m<sup>3</sup>/s;
- Vargem das Flores (reservoir, maximum storage: 44,000,000 m<sup>3</sup>) with a capacity of 1.2 m<sup>3</sup>/s.

The total water supply production capacity is 16.3 m<sup>3</sup>/s, however, present demand in the Metropolitan Region of Belo Horizonte is for 11,9 m<sup>3</sup>/s. COPASA, the state company which has the concession for water supply and sanitation in Belo Horizonte, is currently increasing the capacity of Velhas system and duplicating the capacity of the Manso system.

In BH, about 92% of the population is connected to the wastewater sewerage system but there is a lack of wastewater treatment facilities and of interceptor pipelines, at the level of 50% of the required pipeline's length. There are two relatively recent wastewater treatment plants in operation, the Arrudas WWTP and the Onça WWTP, with a total capacity to treat 4.0 m<sup>3</sup>/s. In the future, those WWTP will have their total treatment capacity increased to 8.1 m<sup>3</sup>/s and will then be able to treat almost 100% of the total wastewater flow generated within the Arrudas and Onça catchments, including wastewater drained from the Contagem municipal area located upstream of both catchments.

### Main water pressures and issues

The following are some of the identified risks and pressures for the water domain in BH:

- Water supply:
  - Water quality degradation due to catchment environmental degradation, emergence of pathogen occurrences, accidental contamination or operational failures;
  - Flow reduction during dry seasons due to global change and local anthropogenic impacts on the hydrological regime;
  - Disruption of water supply systems due to natural hazards such as flooding, fires

or landslides.

- Wastewater:
  - Persistent and chronic pollution of receiving water due to lack of investments to increase (wastewater treatment plants) WWTP treatment capacity and to implant interceptor pipelines;
  - WWTP not equipped to remove nutrients and emerging pollutants such as endocrine-disrupting chemicals;
  - Disruption of wastewater systems due to natural hazards like flooding or landslides.
- Stormwater:
  - Significant increases in the occurrence of floods due to different factors: increases in imperviousness, new developments in flood prone areas, climate change
  - Pollution of receiving waters by wet weather diffuse pollution;
  - Persistent and chronic pollution of receiving water due to different factors: no implementation of planned interceptors; persistence of illicit connections between stormwater and wastewater sewerage systems, lack of investments on wastewater treatment ...
  - Risks associated to the use of best management practices (BMPs), e.g.: failures on flooding control and wet weather pollution abatement, lack of maintenance, insufficient technology update ...

**City Coordinator:**  
**Nilo de Oliveira Nascimento**

**Learning Alliance members goals and aspirations**

<b>LA member</b>	<b>Issues, goals and aspirations</b>

**SWITCH in the City**

First activities of Learning Alliance in Belo Horizonte allowed to the identification of the following major problems on IUWM:

- Frequent flooding at different neighbourhoods with characteristics of flash floods.
- High pollution of receiving waters at the urban area and downstream (creeks, detention ponds, rivers) mainly due to:
  - Diffuse sources: typical urban diffuse pollution + solid waste and intensive erosion processes;
  - Interconnection among sewerage and storm water systems and lack of interceptor pipelines.
- Pollution problems of drinking water sources due to the upstream urbanisation, mining and agricultural activities at the Metropolitan scale (RMBH).
- Illegal occupation of risky areas mainly by low-income people – risk of flooding, landslide and health risk due to poor sanitation conditions.
- High costs of structural measures in storm water management.
- Lack of integrated planning: urban development associated to sanitation and storm water management planning.
- Need of institutional development for enhancing decision making, budget planning and technology update (e.g.: knowledge on the system functioning, data collection and treatment, use of non-structural measures in storm water management).

- Need to develop inter-municipal cooperation.
- Need to increase public participation in decision making concerning UWM, including flood and diffuse pollution control, stream restoration in urban areas, scenic enhancement of landscape including water bodies ...

Research and demonstration activities have been conceived in order to deal with the identified problems at technical, institutional, social, economic and legal domains. Main topics presently pointed out are:

- Identification, adaptation and uptake of new technology and alternative innovative approaches to IUWM with focus on the use of BMPs in the storm water and wastewater domains.
- Identification and development of flood control alternatives in urban areas with focus on non-structural measures adapted to flash flood occurrences.
- Identification, use and evaluation of alternatives on modelling storm water systems.
- Development of indicators of sustainability on IUWM.
- Identification of ideal and achievable institutional frameworks, legal bases and financing models to deal with new approaches as viewed in terms of the current organizations, institutional actors and their mandates.
- Setting up links of SWITCH research, demonstration and training activities with other on-going programmes in Belo Horizonte and in Brazil, namely:
  - The Brazilian Continuous Education Programme in Water Supply and Sanitation, funded by the federal Ministries of Cities and of Research and Technology.
  - PBH on-going programs: DRENURBS, Storm Water Master Plan, Sanitation Master Plan, Urban Water Committee

### **Major activities and impact of SWITCH in first 12 months**

The main activities developed during the first 12 months were centred on the definition of main objectives of the SWITCH project in BH, the constitution of terms per work packages, the search for complementary funds, mainly for research and training activities, the design of the first experiments to be implemented from the beginning of 2007.

The main activities and issues in 2006 are the following:

- The first LA general meeting, with the purpose of presenting SWITCH, describing LA principles and methods and addressing the goals and aspirations of participants;
- Three meetings with the participation of UFMG and PBH/SUDECAP teams led to the detailed formulation of objectives and basic methodologies for SWITCH in BH city.
- The application by UFMG to a research-funding program of the Brazilian Ministry of Science and Technology of a research project on stormwater management and water governance. The UFMG has been accepted and at about 80,000 euros were ascribed for investments on equipments (rain gages, flow meters, computers ...) and scholarships for 3 students during 2 years. This project started in October 2006.
- The application by UFMG to scholarships from the Brazilian Ministry of Science and Technology for funding two pos-doc researchers, one to develop researches on stormwater management (WP 2.1 e 2.2) and the other on governance (WP 6.1 and 6.2). This proposal was accepted and both researchers are starting their activities in February 2007.
- The design of the first experiments on stormwater source control devices and on wetlands, which will be used for research and demonstration. Two areas for wetland experiments were identified and these experiments will be designed in January 2007. First experiments on source control devices include a detention and two infiltration trenches. Areas for installing these source control experiments were chosen and the design of the devices is concluded.
- PBH/SUDECAP launched its modelling project, involving stormwater modelling of all the BH territory. This programme will contribute to SWITCH by issuing information and data on the stormwater system functioning, the identification of major operational problems

and a complete assessment of flood risk at BH.

- The Brazilian Continuous Education Programme in Water Supply and Sanitation, a training programme funded by the federal Ministries of Cities and of Science and Technology, offered its first 4 training courses in December 2006. An association of this programme with the SWITCH training activities in BH is to be completely established by January 2007.
- BH SWITCH team subjected 4 papers to the First SWITCH Scientific Meeting. Five members of this team participate to the meeting; three of them with travel costs covered by UFMG SWITCH funds.

### **Linkages of SWITCH with other regional/city water initiatives**

- The Brazilian Continuous Education Programme on Water Supply and Sanitation, a training programme funded by the federal Ministries of Cities and of Science and Technology. This programme is focused in offering training courses on water supply and sanitation addressed to professionals acting in the urban waters area. In the state of Minas Gerais, at about 24 courses will be organised in 2007, in Belo Horizonte and other municipalities. UFMG is the leading university of this programme in the Brazilian southeast region, comprising the states of Minas Gerais, São Paulo, Rio de Janeiro e Espírito Santo. As previously mentioned, UFMG teams involved in this programme and in SWITCH are working on the association of both projects.
- The Brazilian Ministry of Science and Technology launched in 2006 a 2-year research programme on integrated urban water management. A research network of 6 universities has been stated to develop research activities in this domain in the cities of Belo Horizonte, Brasília, Porto Alegre, Santo André, Recife, and Natal. UFMG, which is one of the universities participating to this network, has associated research activities to be carried out in this programme with those of SWITCH in BH.
- The municipalities of Betim, Contagem, Sabará and Santa Luzia, which have been contacted to participate to the BH Learning Alliance are invited to develop in their territory demo activities similar to those in BH. SWITCH teams in BH can offer expertise for the conception and implementation for that.

### **The NEXT 18 Months**

#### **Summary of the main points/focus of SWITCH activities in the next 18 months**

- Evaluation of indicators currently employed by PBH/SUDECAP for water supply and sanitation planning and management. First developments of a wider base of indicators, including sustainability indicators (WP 1.1).
- Evaluation of the issues of the programme on stormwater modelling developed by PBH/SUDECAP. Start the SWITCH modelling approach for a selected catchment in the BH municipality (WP 1.2).
- Start the planned experiments on stormwater management, involving experiments on wetlands, detention basins and source control devices (WP 2.1 and 2.2).
- Review of the theory and practice of good governance and the development of institutional, governmental and social organisation maps (WP 6.1).
- Consolidate the BH Learning Alliance (WP 6.2).
- Offer two training workshops on integrated urban water management in cooperation with the Brazilian Continuous Education Programme in Water Supply and Sanitation (WP 0.2).
- Create the BH SWITCH website for dissemination of SWITCH issues (WP 0.2).
- Participation to three international events: NOVATECH conference, in Lyon (France), in June 2007, 11<sup>th</sup> Diffuse Pollution meeting at Belo Horizonte, in August 2007; Franco-Brazilian meeting on urban hydrology, in Belo Horizonte, in December, 2007 (WP 0.2).
- Participation to two national meetings (Brazil): National meeting on urban waters, in São Carlos, in May 2007, and the National Symposium on Water Resources Engineering, in

São Paulo, in November 2007 (WP 0.2).

**Issues to be addressed**

**SWITCH goals and objectives – Impact to be realised**

### Learning Alliance Activities

Activity	Specific objective	Task	Deliverables	Milestones
Training of the LA facilitator (January 2007)	Develop skills in project management, action research processes, facilitation, team work, monitoring and evaluation	Participation to the facilitator training workshop	LA facilitator trained	Report on training the LA facilitator
Formal invitation to new members (January to March 2007)	Complete the stakeholder representation in LA	Contact stakeholders	Final composition of the LA	Report on the final composition of LA, description of institutions participating to the LA
Second LA meeting: workshop on WPs' plans (March 2007)	Discussion, update and validation of the LA action plan and constitution of thematic work groups, with special focus on 2007 activities. Discussion, update and validation of WP 1.1, 1.2, 2.1, 2.2 and 6.1 plans.	Preparation of the meeting. Meeting realisation. Report of the meeting.	Meeting realisation.	Report on the second LA meeting.
Third LA meeting: workshop on stormwater experiments (August 2007)	Evaluation of preliminary results of first experiments on stormwater source control. Visit to the sites of experiments	Preparation of the meeting. Meeting realisation. Report of the meeting.	Meeting realisation plus visit to the sites.	Report on the third LA meeting
Fourth LA meeting: workshop about WPs 1.1, 2.2 and 6.1 (December 2007)	Evaluation of progress done on WP 1.1, 2.2 and 6.1	Preparation of the meeting. Meeting realisation. Report of the meeting.	Meeting realisation.	Report on the fourth LA meeting

## Research activities

WP	Specific objective	Task	Deliverables	Milestones	Lead Partner
1.1	To develop sustainability indicators addressed to urban water management and apply them to current and innovative schemes in Belo Horizonte	To make an inventory and evaluation of indicators currently used by PBH for urban water planning and management. To proposal of a set of indicators of sustainability adequate for application at the BH context	Inventory and evaluation of indicators currently used by PBH for urban water planning and management. Set of indicators of sustainability adequate for application at the BH context. Selection of case studies within the BH municipality.	Report on indicators currently used by PBH for urban water planning and management. Report on indicators of sustainability and a priori evaluation of their applicability in BH. Report on the use of sustainability indicator in BH case studies	WP 1.1 team is coordinated by Márcio Baptista at UFMG and Ricardo Aroeira at PBH.
1.2	To evaluate the issues of the programme on stormwater modelling developed by PBH/SUDECAP. To start the SWITCH modelling approach for a selected catchment in the BH municipality.	To evaluate the modelling strategies and modelling results of the on-going programme on stormwater modelling. To completely formulate the objectives of WP 1.1 application in BH. To review the available data and information.	Report about the PBH stormwater modelling. Workshop on WP 1.1 objectives and methodologies in BH.	Report about the PBH stormwater modelling. Report on WP 1.1 objectives and methodology. Report on availability of data and information for modelling urban water systems.	WP 1.2 team is coordinated by Nilo Nascimento at UFMG and José R. Champs at PBH.
2.1	To assess the functioning and efficiency on runoff control and	To design, implement and	Project of experiments on	Report describing the project of	WP 2.1 team is coordinated by Nilo

	<p>pollution abatement of source control devices. To assess potential risk on employing source control devices (soil and groundwater contamination, health risk).</p>	<p>operate experiments on source control devices</p>	<p>source control devices Implementation and operation of source control experiments</p>	<p>experiments on source control devices Report on the mplementation and operation of source control experiments</p>	<p>Nascimento at UFMG and José R. Champs at PBH.</p>
2.2	<p>To develop and adapt to the BH context the technology of tested source control devices. To evaluate the decision making processes in urban stormwater management in BH.</p>	<p>To evaluate issues of source control experiments (WP 2.1) in terms of design criteria, maintenance requirements, building and maintenance costs.</p>	<p>Review of stormwater strategies and decision-making processes in urban stormwater management in BH Application of life-cycle cost calculation developed by MU</p>	<p>Report on current stormwater management strategies in BH Report on the decision making-process in urban stormwater management in BH</p>	<p>WP 2.1 team is coordinated by Márcio Baptista at UFMG and José R. Champs at PBH.</p>
6.1	<p>To review of the theory and practice of good governance. To develop institutional, governmental and social organisation maps</p>	<p>Literature review of the theory of good governance; evaluation of its implications for IUWM in BH and its metropolitan region. Constitution of maps of institutional, governmental and social organisations related to UWM in BH and it metropolitan region</p>	<p>To review the theory and practice of good governance and evaluate its implications for IUWM. To prepare institutional, governmental and social organisation maps for BH and its metropolitan region..</p>	<p>Report on literature review of good governance. Maps of institutional, governmental and social organisations related to UWM in BH and it metropolitan region.</p>	<p>At UFMG, the coordination of WP6.1 is shared by Heloisa Costa, Geraldo Costa and Léo Heller. At PBH, the coordination of WP6.1 is shared by Sônia Knauer, Ricardo Aroeira and J.R. Champs.</p>



## Demonstrations

Description of demonstration activities that will take place in the City including:  
what research theme the demos are associated with :

- *purpose of demo*
- *applicability across SWITCH*
- *timeline*
- *deliverables*

## Training plans

Training activity	Purpose	Target audience	Type of materials/delivery	Deliverable
Workshop on integrated urban water planning	Assessing the experience of the audience on planning activities. Developing the concept of IUWM Training of tools for IUW planning.	Technical staff of municipalities. Urban planners and architects. Stakeholders and decision-makers acting in the urban context	A brochure on IUWM and IUW planning. Materials for group activities: maps, pictures, data and information	Training of at about 20 participants in a 32-hour workshop.
Workshop on stormwater BMP	Assessing the experience of the audience on decision-making for urban stormwater management. Disseminate	Technical staff of municipalities. Urban planners and architects.	A brochure on stormwater BMPs. Materials for group activities: maps, pictures, data and information. Simplified models specially developed for	Training of at about 30 participants in a 32-hour workshop.

	<p>technological alternatives in the stormwater domain.</p> <p>Training on decision-making for effective urban stormwater management.</p> <p>Training on the design of BMPs.</p>		<p>training on BMP's desing.</p>	

**Dissemination activities**

Dissemination activity	Purpose	Target audience	Deliverable
Participation to scientific meetings (3 international and 2 national meetings in 2007)	Dissemination of SWITCH issues by scientific papers	Scientific community and students working on IUWM	Publication of at least 5 papers about SWITCH issues in BH.
BH city website	Dissemination of SWITCH activities in BH	Stakeholders Decision-makers Technical staff of municipalities Scholars and students Public in general	The city website.
Brochure about SWITCH activities in BH	Dissemination of SWITCH activities in BH	Stakeholders Decision-makers Technical staff of municipalities Scholars and students Public in general	The brochure about SWITCH activities in BH.

### Budget requests for LA activities

The requested budget regards funds for covering consumable costs for organising two conferences and editing 4 brochures about de SWITCH project in Belo Horizonte. The conference central themes are:

- Conference on governance for integrated urban water management; tentative date: May or June 2008;
- Workshop on best management practices in urban water management; tentative date: May or June 2009.

#### Unitary costs: Consumables

Average costs for	Cost (Euro)
Ordinary LA meetings	200 per meeting
Conferences	12250 per conference
Brochure publication	2000 per edition

#### Discriminated costs

Consumables - material de consumo		
Type	Quantity	Cost (Euro)
Conferences	2	24500
Brochures	4	8000
<b>TOTAL REQUESTED</b>		<b>32500</b>



**Table 2 – Source control pilot experiments at DRENURBS catchments**

Activities	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Team gathering				■																
Literature review				■	■	■														
Definition of experimental sites and choice of BMPs						■	■													
Design of source control devices						■	■													
Experimental project and protocol strategy						■	■													
Implementation of experiments								■	■											
Monitoring phase									■	■	■	■	■	■	■	■	■			
Data treatment and analysis, modelling									■	■	■	■	■	■	■	■	■	■		
Edition of reports, guidelines and scientific papers										■				■				■	■	■
Interaction with LA activities						■		■		■		■		■		■		■		■
Workshop on BMPs in Belo Horizonte																			■	

**Table 3 – Catchment scale experiments: Santa Lúcia detention basin, wetlands and DRENURBS catchments**

Activities	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Team gathering	■	■	■																	
Literature review		■	■	■	■															
Definition of experimental sites			■	■																
Design of the artificial wetland					■	■														
Experimental project and protocol strategy					■	■														
Implementation of experiments						■	■													
Monitoring phase									■	■	■	■	■	■	■	■	■			
Data treatment and analysis, modelling									■	■	■	■	■	■	■	■	■	■		
Edition of reports, guidelines and scientific papers						■				■				■				■	■	■

Interaction with LA activities																			
Workshop on BMPs in Belo Horizonte																			

**Links to other areas of the SWITCH DOW** *for other costs such as training, research, etc.*

## SWITCH City Story Template – BIRMINGHAM

### **Description of the city and its water resources**

*Description of city including water sources, growth projections to 2030, water demands and constraints, status of wastewater management*

Birmingham's past undoubtedly goes back as far as the Bronze Age and beyond. Early Roman roads passed through the region and following on from that Anglo-Saxon tribes started to settle in the area around 700 A.D. The town of Birmingham was a hamlet of the followers of theingas of Birm or Beorma thus giving the name to the settlement that was to become Birmingham.

Following the Norman Conquest (1066) The Domesday book (inventory of the holdings of the inhabitants of the country) of 1086 noted that Peter de Birmingham was holder of a manor and was the first record of Birmingham. At the time there were five villagers and four smallholders with two ploughs. The most populous area at Aston records 43 adults.

The next recorded entry of significance comes in 1166 when another Peter de Birmingham bought the right to hold a weekly market in his castle and this was related to the developing cloth making industry.

In the early 1500's the population of the town of Birmingham reached 1000 inhabitants. The civil war came and went. Birmingham surpassed Coventry in size and status making it the largest town in Warwickshire. In the mid 1600's, the population rose to some 7000 inhabitants. However by 1700 William Westley drew up a town plan and calculated the population of Birmingham as 15,000. In fifty years between the two records the doubling of the town's population was caused by immigration from the surrounding towns and villages. Birmingham was gaining a reputation as a trading and manufacturing town of status. Nails, metalwork, and anything in iron was being exported to London and Europe. Birmingham had a monopoly. The change to industrialisation had taken hold. Mills sprang up all around the town. Corn mills were being converted to the production of metal rolling and ironwork. Birmingham continued to grow over the 18<sup>th</sup>-19<sup>th</sup> centuries and by the early 1900's it was a world renowned industrial city. Earlier, driven by rapid industrialisation canals were constructed which connected Birmingham to the sea and enabled the city to export manufactured goods throughout the world. Birmingham has today more kilometres of canal than Venice and these, having fallen into decay by the mid 1900's are now forming the nucleus of some major regeneration projects that we are seeing today.

During the 19th century, at the time of the Industrial Revolution, Birmingham's population grew rapidly. Clean water was in short supply and there were major epidemics of water-borne diseases including typhoid, cholera and diarrhoea.

Birmingham City Council set about finding a clean water supply for the City. James Mansergh had previously identified the Elan and Claerwen Valleys' in Wales as potential water gathering and storage areas. Birmingham Corporation agreed and an Act of Parliament was passed for the compulsory purchase of the total water catchment area of the Elan and Claerwen Valleys (some 180 square kilometres).

In 1893 the building work began and by July 1904 King Edward VII and Queen Alexandra opened the Elan dams and water started flowing along 118 km of pipeline to Birmingham. The whole of the Elan scheme had cost £6 million and employed 50,000 men in total.

This very much catered for the provision of water to the city for the next 100 years. However through various Acts and Directive coming from London and Europe saw the water and sewerage provision of the Municipal Authorities passing into Regional Water Authorities based upon river catchment areas. By the Water Act of 1991 these Water Authorities were turned into Privatised, Regulated Companies along with the complete transfer of all assets. In the Birmingham area this was to the Severn Trent Water Company and this led on to an integration of water supply systems across the rivers Severn and Trent catchment region currently having some 9 million inhabitants.

The population of Birmingham is c 1 million but it sits in the administrative region of the West Midlands and with the other adjoining municipal areas of Sandwell & Dudley, Wolverhampton, Walsall and Solihull accounts for almost 5 million inhabitants all told.

Birmingham is a modern, diverse and multicultural society and sees itself as being the “second city” in the United Kingdom. It connects to its surrounding neighbouring Municipalities through various government organisations but principally the West Midlands Regional Assembly who is responsible for the Spatial Strategy for the region.

Currently the Regional Spatial Strategy is looking at development options to meet the governments housing targets and in Birmingham there are some 400,000 dwellings (2001 Census). The three options for Birmingham (and the West Midlands Metropolitan Region) for the 2026 horizon are:

	<b>Number of Households 2001 <sup>1</sup></b>	<b>Option One Dwellings 2001-2026</b>	<b>Option Two Dwellings 2001-2026</b>	<b>Option Three Dwellings 2001-2026</b>
<b>Birmingham</b>	<b>390,792</b>	<b>70,800</b>	<b>88,500</b>	<b>104,900</b>
Coventry	122,353	19,000	44,000	44,000
Dudley	124,988	21,000	21,500	24,000
Sandwell	115,426	23,600	24,000	26,100
Solihull	80,930	11,000	13,800	18,800
Walsall	101,333	17,400	22,000	22,500
Wolverhampton	97,122	17,400	17,900	20,400
<b>Metropolitan Region Total</b>	<b>1,032,944</b>	<b>180,200</b>	<b>231,700</b>	<b>260,700</b>

This could correspond to an rise in population within the city of Birmingham and the West Midlands Metropolitan Area of:

	<b>Population 2001</b>	<b>Option One Population Increase 2001-2026</b>	<b>Option Two Population Increase 2001-2026</b>	<b>Option Three Population Increase 2001-2026</b>
<b>Birmingham</b>	<b>c1,180,000</b>	<b>177,000</b>	<b>221,250</b>	<b>262,250</b>
<b>Birmingham Total Projected Population (approx)</b>		1,295,000	1,339,250	1,380,250
<b>Percentage Increase (approx)</b>		17.70%	22.10%	26.25%
<b>Metropolitan Region Total (approx)</b>	<b>6,455,900</b>	<b>6,906,400</b>	<b>7,035,150</b>	<b>7,107,650</b>

However the Sustainability Appraisal (SA) to date has indicated that Severn Trent has water resource limits within the region the SA also shows the Environment Agency data demonstrates that much of the Region has no additional surface water available and in some areas groundwater abstraction is unsustainable.

In the future, most new developments will be built at densities higher than have occurred in the past. Draft Government guidance indicates that there should be a presumption that no new development should be built at a net density of less than 30 dwellings per hectare and recommends a range of densities, depending on the nature of the area, from 30 – 40 dwellings per hectare in rural areas to over 70 dwellings per hectare in City Centres.



This will imply a greater concentration on terraced properties and flats. This could help to ease affordability problems but could limit the extent to which new housing development could meet the full range of identified needs. There will inevitably be a “hardening” of the urban landscape, potentially 70 dwellings per hectare, and hence a greater need to control run-off from rainfall events and the attendant increasing localised risk of flooding. Particularly as there is a requirement under the Planning Policy Statement 25 (PPS25) which dictates that a climate change factor of 20% be added to all Flood Risk Assessments and new development designed to accommodate this.

New housing will have Sustainability Targets of water supply demand reduction/efficiency of 20% savings on current a demand which in effect means a reduction of 25 l/h/day/household (Severn Trent estimated average household consumption 2004-05 was given as 132 l/h/d).

Currently less than 26% of households in the UK have metered supplies and Birmingham follows a very similar pattern.

### *Main water pressures and issues affecting Birmingham*

The major pressures on water in Birmingham for the future (and the West Midlands Metropolitan Region as a whole) are generally in line with all similar Western European cities with a similar evolution. These can be divided in to the following components:

1. Surface water management and quality
2. Ground water protection and management
3. Flood risk

Birmingham because of the changes from industrial to service sector industries over the post war period has an increasing ground water level which is now starting to affect sub-surface infrastructure and mobilise pollutants from contaminated land (brown field areas of former industrial use). This in turn leads to pollution of the fluvial systems and contamination of raw water supplies.

Increasing populations lead to rising demand for potable water and increasing flows and loads in the sewerage and sewage treatment infrastructure. This is a particular problem as Birmingham, just as in other historic cities, has much of its area drained by combined (foul and surface water) collector systems.

As a consequence of ever increasing development and the general “hardening” of the urban landscape Birmingham is exposed to ever increasing localised flooding events and this is being exacerbated by climate changes. This is exacerbated by an increasing population and pressures from the need to develop new industries and employment opportunities to replace the former manufacturing based activities. This leads to regeneration of large areas of the conurbation and the need for a better environment in which the new skills can be developed that are attractive to inward investment in these new industries.

### **City Coordinator:**

Philip Sharp – Over Arup & Partners Limited

### **Learning Alliance members goals and aspirations**

*Combined description of goals and aspiration here – specific key stakeholder goals and aspiration in table*

<b>LA member</b>	<b>Issues, goals and aspirations</b>
Birmingham City Council	Management and Control of the Municipal Functions and Governance for the City of Birmingham including Health, Education,

	Housing, Employment Creation and Environment (transport, planning, They are also leading in the planning and implementation of Urban Regeneration one of which is Eastside.
Severn Trent Water Limited	STWL are the Regulated Water Company responsible under the water Industries Act for the provision of water and drainage services for the Severn and Trent catchments (approximately) and in the current context for the City of Birmingham. They are a former public utility and are now a stock market listed plc and subject to regulation by OFWAT, the Environment Agency and Drinking Water Inspectorate. Their Head Quarters are in the city.
Environment Agency	The Environment Agency was formed from the previous National Rivers Authorities who were responsible for the control of water resources and water quality. The EA now has the full remit to control air, land and water pollution. They issue and control IPPC licences and are responsible for flood management and coastal protection/management. They have recently become statutory consultees to the Planning Process.
British Waterways	British Water are a government statutory body responsible for the management of inland navigations. These are a collection of former private waterways and canals and they now form part of a national network. They are also holders of abstraction and discharge licences and answerable to the EA for water quality. They are funded through licences and predominantly government grants.
Solihull Metropolitan Borough Council	SMBC are the Municipal Authority for the Solihull area of the West Midlands conurbation. They have the same areas of responsibility as Birmingham City Corporation for their area.
West Midlands Regional Observatory	The government body responsible for reviewing the state of the West Midlands, and providing access to information and intelligence. This community of data and intelligence users represent both the key suppliers of data and the key users of information services. They work with partners to identify and map key information resources, and signpost these resources using an online catalogue.
Consumer Council for Water – West Midlands	Consumer Council for Water is the industry watchdog, set up to represent customers of water and sewerage companies in England and Wales and provide a strong national voice for customers.
West Midlands Regional Assembly	Currently the West Midlands Regional Assembly is responsible for developing and co-ordinating a strategic vision for improving the quality of life in the region. The Assembly is responsible for setting priorities and delivering regional strategies, including the West Midlands Spatial Strategy. The areas where the Assembly has specific

	responsibilities range from business and economic development through to social inclusion, and regional planning through to the environment. These responsibilities are outlined through their regional priorities, and it is the Assembly's job to communicate and deliver regional strategies for each of these areas, and to ensure they are tailored to meet the needs of the West Midlands.
Groundworks – West Midlands	<p>Groundwork's is of a partnership that's vision is a society made up of sustainable communities which are vibrant, healthy and safe, which value the local and global environment and where individuals and enterprise prosper.</p> <p>Groundwork's purpose is to build sustainable communities through joint environmental action.</p> <p>They do this by developing and delivering partnership projects that enable an integrated and community-led approach to local regeneration. Use environmental improvements as a means of achieving social and economic change and help individuals and organisations contribute to sustainable development They are heavily involved in the eastside Regeneration project in Birmingham.</p>
Advantage West Midlands – Regional Development Agency	<p>Advantage West Midlands is the Regional Development Agency (RDA) for the West Midlands, the region at the heart of the UK which includes the seven metropolitan districts of Birmingham, Coventry, Dudley, Sandwell, Solihull, Walsall and Wolverhampton.</p> <p>Advantage West Midlands was established by the Government in 1999 along with seven other RDAs, to transform England's regions through sustainable economic development. All RDAs are non-departmental public bodies that are accountable to the Department of Trade and Industry.</p>
UKWIR – UK Water Industries Research	<p>UKWIR was set up by the UK water industry in 1993 to provide a framework for the procurement of a common research programme for UK water operators on 'one voice' issues. UKWIR's members comprise 24 water and sewerage undertakers in England and Wales, Scotland and Northern Ireland.</p>
British Water	<p>An organisation dedicated to the promotion of the interests of British Water Industries including water companies, manufacturing operations, etc. They organise international trade missions and provide a platform for contacts through the various British Embassies Commercial Attaché's.</p>
CIWEM – Chartered Institution of Water	<p>CIWEM is a professional body governed under Charter looking after the interests of Water</p>

and Environmental Managers.	Engineers and Environmental Managers in the UK (and increasingly internationally)
OFWAT – The Office of the Water Regulator – England & Wales	OFWAT is the Water Industries Regulator for England and Wales established by government to set and regulate the pricing levels of the Water Companies (in England & Wales). OFWAT reports annually to Government on the performance of each water company and advise government on the need for further legislation of the operator licences.

### **SWITCH in the City**

#### *Role of SWITCH in the City (What integrated urban water management might look like for city X, SWITCH approach and problems SWITCH will be trying to tackle (during life of SWITCH project)*

Five aspects of Birmingham's water environments will be tackled in the next 5 years. Three are concerned with resolving groundwater issues and safe groundwater/aquifer reuse (WP2.3,WP3.2,WP5.3), one is concerned with stormwater management and the additional resource and ecological benefits of extensive green roofs (WP2.3) and one is concerned with quantifying the potential impacts (on energy, waste, water, organisation and cost) of alternative options for IUWM (WP1.1, WP1.2). The SWITCH approach underpins the delivery of these specific tasks, which are all stakeholder driven. Policy issues are also high on the Learning Alliance agenda and will also be addressed under WP6.1. SWITCH training and SWITCH knowledge transfer from other demonstration cities will be critically developed to assist the evolution of IUWM practice in Birmingham. By concentrating on a limited range of objectives in this 5 years, SWITCH has an opportunity to strongly develop an LA culture that can be developed and enhanced within the existing organisational framework. The primary aim is to expose to the widest audience in Birmingham the breadth of actions in IUWM required for a sustainable future and the strength of a community based approach to delivery of agenda's for knowledge acquisition through research and training and knowledge application for scaling up innovations in the region.

#### **Major activities and impact of SWITCH in first 12 months** *(scoping studies/workshops, demos, research, interactions with stakeholders, etc.*

A scoping questionnaire was issued after the first LA meeting in June 2006 and scoping meetings were held with the majority of the stakeholders. The results from this exercise are providing the inputs to the development of the demonstration work in years 3 to 5 as well as to reviews of training requirements from the SWITCH partnership, assessment of requirements from the SWITCH global work under Themes 1 and 6.

All SWITCH research in Birmingham is long term requiring at least 2 years to mature. The SWITCH research sites have been established at the University of Birmingham campus and on the Tame river for the groundwater investigations. Baseline investigations have been completed and experimental work has commenced and data collection is underway. Co-funding for the research from LA members is now fully committed.

Workshops on stormwater management have been held and introductions to the Birmingham based research and its expected outcomes have been presented. A more detailed briefing on the extensive Green roofs project and its benefits to the LA took place in December 2006.

The SWITCH concept has been effectively introduced to the core Birmingham stakeholders. SWITCH as a concept and as an integrated EU project is recognised within the UK water sector.

#### *Linkages of SWITCH with other regional/city water initiatives*

Regional Climate Change Task Group – newly formed [Phil... I assume we could get a reciprocal arrangement for connecting ideas with this group]

UKWIR research programme: Inclusion of UKWIR provides national association [Phil, Need to confirm UKWIR attendance through names suggested by Mike F. to drive links at national level.

Eastside Demonstrator: [Hopefully we can formalize the link with this group next week.]

Birmingham Green Roofs project: [Will need to complete the link here through Rosemary Coyne]

## The NEXT 18 Months

### Summary of the main points/focus of SWITCH activities in the next 18 months

Field research initiated in the current 12 months will be continued through the next 18 months (WP2.3 (Extensive green roofs), 3.2 (Viral migration in aquifers), 5.3 (NA at the stream-aquifer interface). Development of the Learning Alliance Activities will be furthered through: consolidation of the LA meeting programme; expansion of the stakeholders through links with other actions taking place within Birmingham related to water; expansion of training opportunities for LA partners; collation of the spatial data sets required for the systems modelling under WP1.1 and WP1.2; gaining a deeper exploration of action research needs within the LA membership; reviewing the status of the Birmingham LA and evaluation of the approach taken to its implementation in the first 18 months.

### Issues to be addressed (be as specific as possible – eg not Stormwater)

**Sustainable IUWM** WP1.1 & 1.2: Gathering and collating all applicable spatial data for the development and testing of the IUWM and sustainability assessment models. Initial production of a prototype systems analysis model using part of Birmingham for the initial trial. Integration of concepts derived from the evaluation of Birmingham with the overarching programme of modelling under 1.1 and 1.2

**Stormwater Management** WP2.3 Collection and analysis of ecological and hydrological experimental data from the extensive green roofs; evaluation of options for storm water storage and use below ground (ASR), updating of the Birmingham Groundwater Model to permit testing of the impacts of modified recharge patterns on groundwater levels, construction of the initial stormwater GIS mapping and analysis application for assessing alternative stormwater management strategies. Develop a training package to be adopted for Extensive Green Roof implementation.

**Safe Water Reuse** WP3.2 Collection of viral data from Birmingham boreholes to examine the occurrence of human viral populations in groundwater and their relationship to sewer leakage. Implementation of viral migration experiments for the purpose of quantifying viral hazards for aquifer storage recovery from injection of viral populations with treated effluent.

**Use of Natural Systems** WP5.3 Undertake a suite of field experiments to determine the extent to which natural attenuation (NA) of contaminants at the interface between groundwater and surface water is dependent on the hydraulic regime with the express aim of developing guidance on the use of this NA contribution in pollutant risk assessments. Development of a training package for the assessment and quantification of NA processes in urban rivers for risk assessment calculations.

**Governance and Regulation** WP6.1 & 6.2 Undertake development of a report on the organisation of the Birmingham institutional and governance arrangements to underpin the assessment of options for change

**Training** WP0.3 Complete a training needs analysis for Birmingham stakeholder to inform training activities within SWITCH that may be applied in Birmingham in Years 3 and 4 of the programme. Review pathways for training uptake and participation based on the SWITCH training package.

### SWITCH goals and objectives – Impact to be realised

Goal: New knowledge to support future decisions on aspects of urban groundwater management

Objectives:

- Implementation of experimental investigations to achieve the goal in the following areas:
  - Systems based sustainability modelling
  - Extensive green roof ecological and hydrological data collection
  - Viral migration and fate studies
  - Hyporheic zone investigations.
- Training material development
  - Extensive green roofs: Development and Benefits
  - Hyporheic Zone in Probabilistic Risk Assessment

Impacts:

- Improved understanding of groundwater opportunities and threats for IUWM in Birmingham
- Indication of groundwater based innovations for reducing city water demand, lowering

flooding hazard and improving urban surface water habitat and health.

**Learning Alliance Activities** (Could be table include workshops of LA with researchers or only LA, development of a MOU or other charter type, terms of reference instrument, training activities, conferences, etc.)

Activity	Specific objective	Task	Deliverables	Milestones
LA Meeting December 2006	Discuss Scoping Survey results	Presentation of Green & Brown Roof Research	Scoping Study Report	December 2006
Expand LA to include Developers, Federation of House Builders, etc.	Further widen the view on Urban Water Management issues from a developer's perspective.	Encourage active learning on new technologies, gain feedback on existing SUD's techniques.	Supplement to Scoping Report	Feb 2007  Supplement Report March 2007.
LA Meeting	Presentation on Scientific meeting plus other SWITCH updates. Presentation on Demonstration for Birmingham	To gain buy- in/commitment to demonstration project.	Demonstration Project.	June 2007
LA Meeting	SWITCH update and feedback on Demonstration project	Presentation on demonstration.		November 2007.

### Research activities

*Overall description of research activities that will occur in the City of Birmingham and how these activities will be integrated to produce the impact and SWITCH city-wide outcomes (city coordinator to write)*

*Table on specifics of work activities (workpackages to contribute)*

Work package	Specific objective	Task	Deliverables	Milestones	Lead Partner
WP0.3	Report on the start-up of the Learning Alliance in Birmingham	Task 1 – To train Learning Alliance members	D0.3.2 – Report on the start-up of the Learning Alliances	M0.3.2 – Decisions on the objectives, planning and implementation method for the demo projects Based on output from LA meeting – June 2007	ARUP
WP1.1	To develop innovative modelling approached for assessing sustainability	Task 1b. Field research. To identify the leading principles, concepts and approaches Task 2b. To integrate identified/developed	D8.UB Report on a risk assessment /management tool for urban water.	Completion of the primary design for a new method of sustainability assessment (PhD project – Part 1) at	UNI-BHAM

		indicators in activities of WP1.2, Task 3a. To identify and/or (further) develop risk assessment methodologies in urban water.		Month 30	
WP1.2	To develop a systems based analysis tool for assessing sustainability impacts of alternative IUWM strategies	Task 1: Review of all available related data and information Task 5: The development of an integrated management model	D1.2-UB Trial demonstration of systems modelling framework and data use.	Completion and testing of the new sustainability assessment, systems based model using data from Birmingham (Month 45)	UNI-BHAM
WP2.3	Develop the green and brown roofs studies to provide the data for decision making  Evaluate Groundwater Use	T1.2 Ecological and hydrological monitoring T1.3 Statistical analysis T1.4 Statistical and physical modeling T2.1 Creation of a GIS model T2.2 Combined surface and ground water modelling studies	D1.2 Extended data sets D1.3 Report on the Ecological benefits D1.4 Report on the hydrology and effluent quality D2.1 A GIS based data integration tool D2.2 Development rules for assessment of groundwater related impacts		UNI-BHAM
WP3.2	Understanding migration and fate of viruses in groundwaters and their impact on ASR	T3.2.3 Aquifer Storage Recovery (ASR)	D3.2.3.1.a.i At least 1 publication (submitted) D3.2.3.1.c.i Field scale process descriptions of viral fate and transport	M30: Complete experimental programme and report raw results	UNI-BHAM
WP5.3	Quantifying the natural purification capacity of the hyporheic zone beneath rivers and streams	Task 4b a) Hyporheic zone assessment.	D9. Results of pilot and field studies D10 Design criteria and computer models	M36. Design criteria and computer models for stimulation of self-purification capacity of water bodies	UNI-BHAM
WP6.1	Identification	Task 6.1.6	D6.1.2 An	R2:	ARUP

	of barriers, opportunities and organisational arrangements for integrated urban water management	To identify, with Learning Alliances, barriers against, and opportunities	institutional map for Birmingham	Development of institutional, governmental and social organisation maps. Completion date: Month 24	with UNI-BHAM
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### Demonstrations

*Description of demonstration activities that will take place in the City including: what research theme the demos are associated with :*

- *purpose of demo*
- *applicability across SWITCH*
- *timeline*
- *deliverables*

Not applicable... All anticipated Birmingham demonstrations to begin at the end of year 3, based on the results of the RTD programme.

### Training plans *(Complete in consultation with ICLEI).*

Training activity	Purpose	Target audience	Type of materials/delivery	Deliverable
Green and Brown Roof Developments	To introduce the potential benefits and functioning of extensive green roofs	City Planners and Interested Professionals	1 Day overview course	Course notes and presentation materials
Natural attenuation in the hyporheic zone	To explore methods for the exploration and assessment of NA capacities for Urban Rivers	River engineers, environmental scientists	1 day introductory course (to be developed to a full design course as the RTD work is completed)	Course notes and presentation materials

### Dissemination activities *(can include plans for conferences, newsletters, scientific publications, press releases, media campaigns, website, policy briefs, etc.)*

Dissemination activity	Purpose	Target audience	Deliverable
Electronic news letter	Communications within the Birmingham LA	Birmingham LA	Twice yearly news letter.
Conference presentations	Disseminate research developments based on Birmingham initiated studies	National and international research and user communities	



Press release on SWITCH and the Birmingham LA	Introduction to the national water community of the LA approach and SWITCH research	UK city councils and water companies	
Birmingham Web Site	To maintain contact with LA members and allow for dissemination of knowledge/information, etc.	Birmingham Learning Alliance, plus others.	Permanent for the life of the project.
<b>Potential DA</b>	<b>Purpose</b>	<b>Target audience</b>	<b>Deliverable</b>
Birmingham Learning Alliance key member visit to Hamburg and Lodz	Cross LA information and exchange of ideas/approaches	Hamburg/Lodz and Birmingham LA's	Comparisons Report

**Budget requests for LA activities** *including city coordinator, facilitation, city specific support activities. (Table)*

<b>Activity</b>	<b>Period</b>	<b>Full Cost Budget €</b>
Facilitation of LA	Next 18 months	80,000.00
City Coordination	Next 18 months	5,000.00
News Letter	Next 18 months	2,000.00
Web site	Nest 18 months	5,000.00

**SWITCH City X timeline of activities** (all activities including research, demos, training, and LAs.)

TBA.

**Links to other areas of the SWITCH DOW** *for other costs such as training, research, etc.*

TBA.



## SWITCH City Story Hamburg 01 Feb 2007

### Description of the city and its water resources

The city Hamburg has an increasing population and is one of the fastest growing cities in Germany. The expected population growths (60.000 people until 2020) and the expanding harbour evoke a predictable need for urban development. Related to this background the municipality Hamburg developed a model of qualitative and sustainable urban growth. The objectives were defined in the key concept 'Metropolis Hamburg – expanding city'. The urban development mainly takes place in the south of the city, in particular on the river island of Wilhelmsburg. The island will be scene of the International Building Exhibition (IBA) 2013 and the International Horticultural Exhibition 2013.

Hamburg has a central water supply system with several wells which tap voluminous aquifers. Since the mid 1980<sup>th</sup> the average water consumption per capita was reduced. Despite of the increasing population, there is no shortage of drinking water expected in future. Hamburg has a sewerage system which contains over 99% of all inhabitants. The sewerage system is connected with a central sewage treatment plant which ensures a progressive multi stage treatment of waste water.

### Main water pressures and issues

Hamburg has following main water pressures and issues:

- Flood risks, caused by the river Elbe and the North Sea (possibly increasing by the global climate change)
- Fluvial flooding in the inland, caused by storm water
- Pollution of the surface waters caused by industries, agriculture and storm water (to ensure the quality of surface waters a storm water treatment is necessary)
- High/ rising ground water tables (caused by the reduction of ground water extraction)
- Limited capacity of the existing sewerage system so that the present sewers cannot guarantee additional effluent (possible solution: decentralized storm water management)
- Water as an element to develop attractive locations (facilitate a high quality of housing, increase the quality of life and attract new groups of inhabitants)
- Water management in districts in conversion (the urban development should be based upon the existing technical infrastructure)

The island of Wilhelmsburg, as the main area of the future urban development, is characterized by the combination of 'technical' water management problems (flood risks, decentralized storm water management etc.) and 'urban planning' demands (water as an element to develop attractive locations etc.). Regarding these problems the learning alliance Hamburg decided, to prepare an 'overall management for the water system of the river island of Wilhelmsburg' as demonstration project.

### City Coordinator:

The demonstration city Hamburg has two city coordinators, a representative for the municipality and a representative for workpackage 5.1:

- Heike Langenbach, HafenCity University Hamburg - Landscape Architecture and Planning (also facilitator learning alliance)
- Andreas Kellner, State Ministry of Urban Development and Environment Hamburg

### **Learning Alliance members goals and aspirations**

The issues, goals and aspirations of the key stakeholders of the learning alliance Hamburg (Hamburg Water Expert Council) are:

<b>LA member</b>	<b>Issues, goals and aspirations</b>
HafenCity University Hamburg – Landscape Architecture and Planning	Analysis of state of the art and best practice of Water Sensitive Urban Design (WSUD) solutions. Implementation of the principles of WSUD (demonstration project)
State Ministry of Urban Development and Environment Hamburg (several departments)	The municipality is interested in further research activities and demonstration projects in the themes WSUD, storm water management and sustainable water management to improve the every day work.
International Building Exhibition Inc.	The IBA will demonstrate innovative projects in relation to the future of urban design. Different aspects concerning a sustainable urban water system play a central role.
Hamburg Water Inc.	Interest in further research and demonstration activities to facilitate a sustainable storm water management.

### **SWITCH in the City**

Hamburg wants to support sustainable and innovative solutions of water management in districts in urban transformation processes. There are a number of critical issues, that urgently need solutions, facing the environmental quality of the water system as well as progressive risks and water problems under global environmental change. This requires innovative water management solutions which are able to combine innovative water techniques and modern urban planning and improve cross linkages.

The demonstration city Hamburg wants to prepare an 'Overall management for the water system of the river island of Wilhelmsburg'. Further a small-scale demonstration project (built environment) is in progress of preparation. The objective is to manage the various interests in terms of water and to gain a balanced and self-sufficient water system. The water management system should be based on indicators of sustainability (ecological, social and cultural benefits). The sustainable water management closely has to take into account the future urban development and should be related to the interests of the International Building Exhibition 2013. The application for the island of Wilhelmsburg should support the lasting establishment of a water management in Hamburg, which takes the demands of sustainability and WSUD into account.

### **Major activities and impact of SWITCH in first 12 months**

In the following the major activities of SWITCH in Hamburg in the first 12 months were listed (Details: storyline WP5.1, Hamburg LA action plan month 7 to 64):

- Scoping visit (including excursion, workshop with the members of the learning alliance and a scoping report)
- Establishment and working process of the Hamburg learning alliance (core members, project management LA, several meetings LA, support of research activities WP 5.1, interviews about water management, preparation of the demonstration project)

- Hamburg etc.)
- Review of planning strategies of WSUD in Hamburg (deliverable 5.1.1; 5 small scale case studies current solutions and best practices WSUD; expert interviews, document analyses, site inspection)
  - Analysis responsibilities and decision making mechanisms in Hamburg
  - Start of the demonstration project Hamburg (decision about project, refine objectives etc.)
  - Prepare 'Analysis of the Urban Water System Hamburg' (in cooperation with theme 1)
  - Start analysis concerning indicators of sustainability (support WP 1.1)
  - Prepare analysis 'Storm water reuse in Hamburg' (support theme 2)
  - Dissemination activities (press release, content homepage, etc.)
  - Linkages with other demonstration cities (excursion Zaragoza)
  - Support the organization of the SWITCH Coordination Workshop in Hamburg

### **Linkages of SWITCH with other regional/city water initiatives**

There are no linkages of the local SWITCH activities Hamburg with other regional water initiatives. But there is an interchange with the person dealing with the research activities FLOWS (Flood Plain Land Use Optimising Workable Sustainability) and UWC (Urban Water Cycle) which take place in Hamburg.

### **The NEXT 18 Months**

#### **Summary of the main points/focus of SWITCH activities in the next 18 months**

In the next 18<sup>th</sup> months the SWITCH project Hamburg focuses on following activities:

- An emphasis of SWITCH Hamburg is the demonstration project 'Overall management for the water system of the river island of Wilhelmsburg'. The overall management should be prepared by the WP 5.1, the municipality Hamburg and the local LA.
- An important activity is the planned international conference dealing with the topic 'Water Sensitive Urban Design'. International speakers should present the experiences with sustainable water management and the cooperation with urban planning. The conference takes place within the context of the International Building Exhibition interim presentation 2007 in Hamburg.
- WP 5.1 continues the work in Hamburg with the evaluation of sustainable components of WSUD. The research results should be included in a WSUD design manual (1<sup>st</sup> rough draft).

Additional activities in the next 18 months in Hamburg are:

- Workshops theme 1 with the LA Hamburg (2 workshops)
- Dissemination activities (press releases, extension homepage SWITCH Hamburg etc.)
- Deepening the cooperation with the international members of the SWITCH consortium
- Learning alliance (enlargement of the LA, continue the working process of the LA etc.)

### **Issues to be addressed**

The demands and issues of SWITCH were listed above.

### **SWITCH goals and objectives – Impact to be realised**

See deliverables learning alliance, research activities, demonstration activities and dissemination activities.

### Learning Alliance Activities

The activities based on the 'Hamburg learning alliance action plan – month 7 to 64'. The emphasis of the next 18<sup>th</sup> month are the demonstration project on Wilhelmsburg and the international conference WSUD.

Activity	Specific objective	Task	Deliverables	Milestones
Demonstration activities		Preparation demonstration project Wilhelmsburg		Months 13-18
Demonstration activities		Process demonstration project Wilhelmsburg		
Enlargement LA		Concept to involve a decision level in the LA		Months 13-18
Enlargement LA		Concept for stakeholder engagement		Months 13-18
Enlargement LA		List further participants population level		Months 13-18
Dissemination/ interchange research		International conference WSUD	Conference/ report	Months 13-24
Dissemination/ interchange research		WSUD design manual (1 <sup>st</sup> rough draft WP 5.1) discussion and feedback from LA		Months 13-24
Dissemination/ interchange research		Sustainable indicators for decision making and decision support (theme 1)		Months 13-24

### Research activities

Hamburg is connected with several research activities. In the centre of attention is WP 5.1 'Water Sensitive Urban Design' (WSUD). The content of WSUD corresponds with the requirement of the every day work in Hamburg, a combination of 'technical' water management problems (flood risks, storm water management etc.) and 'urban planning' demands (water as an element to develop attractive locations, planning in urban transformation processes etc.). Apart from WP 5.1 the demonstration city Hamburg will be cooperating with other research activities. In the next 18 months following activities are planned:

Work package	Specific objective	Task	Deliverables	Milestones	Lead Partner
1.1	Sustainability indicators for planning and decision making	Workshops 'General introduction IUWM/ sustainability' and 'Scenario planning'		2 Workshops	WP 1.1 FHH/ BSU

		with members LA			
		Check possibilities of implementation in demonstration project / IBA (small feasibility study)			WP 1.1 FHH/ BSU
1.4	Decision support tools	Check possibilities of presentation for LA			WP 1.4 FHH/ BSU
2.1 / 2.2	Urban stormwater management	Check possibilities of implementation in demonstration project / IBA (small feasibility study)	D 2.1.1 a D 2.1.1 b D 2.1.1 c D 2.2.2 a D 2.2.2 b		WP 2.1 WP 2.2 FHH/ BSU
3.2	Water reuse	Check possibilities of presentation for LA			WP 3.2 FHH/ BSU
4.1	Eco sanitation	Check possibilities of implementation in demonstration project/ IBA (small feasibility study)			WP 4.1 FHH/ BSU
5.1	Water sensitive urban design	Presentation and discussion results small scale analyses WSUD with LA	D 5.1.1	Workshop	WP 5.1 FHH/ BSU
		Check possibilities of implementation in demonstration project / IBA (small feasibility study)	D 5.1.1		WP 5.1 FHH/ BSU
		Discussion of WSUD design manual (1 <sup>st</sup> rough draft) with LA	D 5.1.2	Workshop	WP 5.1 FHH/ BSU
5.3	Urban agriculture	Check possibilities of presentation for LA			WP 5.3 FHH/ BSU
6.	Policies	Interchange institutional mapping			WP 5.1

### Demonstrations

The learning alliance Hamburg decided that as part of the demonstration project an 'Overall management for the water system of the river island of Wilhelmsburg' should be prepared. The objectives of the overall management are:

- Develop a concept for the island Wilhelmsburg which includes all relevant themes of water management and facilitates a sustainable water management.
- Combine the requirements of future urban development (in particular IBA 2013) with the demands of a sustainable water management.

The overall management is an innovation of the present planning process and should improve the implementation of the water management measures as well as the achievement

of synergies:

- Synergies between the several demands of water management
- Synergies between water management and urban and landscape planning
- Synergies reached by a faire planning process, stakeholder engagement etc.
- Synergies of cross-border planning compared with isolated applications
- Use the development process of urban planning to implement objectives of water management

The overall management should also advance the implementation of small innovative water management solutions. The detailed content will be discussed with the members of the learning alliance. Possible themes are:

- Storm water management (quality and quantity of storm water in future and in existing development sites)
- The urban and landscape design of the waterfront or fluvial parks
- The management of the historical ditch network
- Management of rising ground water tables
- Flood protection (e.g. development of additional retention volume)
- Eco-sanitation

The 'Overall management for the water system of the river island of Wilhelmsburg' will be completed in the next 18 months (months 13-30). Following activities will be realised:

- Continuation project management and refine the scope and objectives of the overall water management.
- Enlargement of the learning alliance Hamburg with local stakeholders which are interested in the water management on Wilhelmsburg. A communication process with the several local members of the learning alliance is planned.
- Inquiry of basic data concerning water management and of existing concepts in relation to water management and urban planning. The evaluation of basic conditions of water management in Wilhelmsburg based on existing surveys e.g. 'Analysis of the Urban Water System Hamburg'.
- The development of indicators of sustainable water management for Wilhelmsburg (in cooperation with theme 1).
- Develop concepts for the water management on Wilhelmsburg. As listed above the results from the WP should be used and modified for the overall water management. Other results of the overall water management will be developed in a communication process with the several local members of the learning alliance.

Based on the overall management of the water system a small-scale demonstration project (built environment) of WSUD on Wilhelmsburg is planned. The small-scale project can serve to introduce the ideas of the water management on local level. The small-scale demonstration project will be refined in the months 28-30 based on the results of the overall management. The detailed project design and the realisation of the demonstration project will follow.

### Training plans

There are following offers of training activities in Hamburg:

Training activity	Purpose	Target audience	Type of materials/delivery	Deliverable
Training college 'Fluvial Park EXPO Zaragoza'	Combination of sustainable water management and landscape design	Open (students)	Landscape design concept / Documentation of the results	



Training college 'Fluvial Park IBA 2013'	Combination of sustainable water management and landscape design	Open (students)	Landscape design concept / Documentation of the results	
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### Dissemination activities

Dissemination activity	Purpose	Target audience	Deliverable
Conference WSUD	Organization of an international conference about WSUD with additional dissemination (website presentation, press release etc.)	Members LA, Professionals of urban and landscape design and water management	Conference and documentation
Website	SWITCH Hamburg website	General public, persons interested	

### Budget requests for LA activities

In the next 18 months the demonstration city Hamburg, the LA Hamburg and the WP have a budgets request (overview budget request see Hamburg LA action plan month 7 to 64). To guarantee the co-financing of the planned international conference 'WSUD' funds (cost estimation 5.000 €) are needed:

- Travel and subsistence for national and international speakers
- Dissemination costs (invitation, publication etc.)

### SWITCH Hamburg timeline of activities

- Month 13-18: training college 'Fluvial Park'
- Month 13-24, Evaluation of sustainable components of WSUD (deliverable 5.1.2)
- Month 13-24, WSUD design manual (1<sup>st</sup> rough draft), discussion with LA, dissemination of WSUD design manual (deliverable 5.1.2)
- Month 13-24: International conference 'Water Sensitive Urban Design'
- Month 13-30: Theme 1 workshops (2 workshops)
- Month 13-30: Demonstration project 'Overall water management on the river island of Wilhelmsburg'
- Month 28-30: Refine and select small-scale demonstration project
- Month 13-30: Dissemination activities (press releases, extension homepage SWITCH Hamburg etc.)
- Month 13-30: Co-operation with the international members of the SWITCH consortium
- Month 13-30: Learning Alliance (enlargement of the LA, establish different levels of the LA, continue the working process of the LA)
- Month 25-36: Evaluation of urban planning strategies, which are appropriate to integrate sustainable water system in town districts (deliverable 5.1.3)
- Month 25-36: WSUD design manual (2<sup>nd</sup> revised rough draft) discussion with LA

### Links to other areas of the SWITCH DOW

None

## LODZ - SWITCH City Story

### Description of the city and its water resources

The City of Lodz is a city of 800 thousands inhabitants (agglomeration of 1 million inhabitants), located in central Poland. The city is located on a steep between uplands and lowlands and the area raises from 180 m above sea level in its western part to 235 m in the East, on the first order watershed between the Vistula and Oder Rivers System (the two major basins in Poland). The city area is divided into 18 catchments drained by small urban streams (average flow  $< 1 \text{ m}^3 \text{ s}^{-1}$ ). During the industrial revolution in the early 30's of the XIX century, the streams were channelized and turned underground, becoming a part of storm water system of the city. Lodz is equipped with a mix drainage system – combined in the centre, old part of the city and separated in the new, outskirt sections – in general, about 80% of the population has access to the sewer system.

Some rivers sections (basically those located at the outskirts of the city) have been relatively less degraded, and flow through with the semi-natural open river corridors. Strengthening of channels, highly impermeable surfaces in the city and relatively high slope of stream channels (5-7 ‰) result with high surficial runoff and discharge in the streams. Degradation of freshwater habitats reduces their capacity for water retention and self-purification resulting with low water and ecological quality.

Growth projections for the city of Lodz predict possible decrease from 768,9 thousands in the year 2005 down to 605,1 thousands in 2030, which may have further effect on water resources management. Recent activities undertaken by the city authorities (restructuring of motorways, airport, encouragement of new investors) may reverse this trend;

### Main water pressures and issues

Urban water management in the city of Lodz is challenged by it's specific hydrological situation determined by its location, dynamic industrial development in XIX century and recent decrease in the population number:

- location of the City on the first order watershed between the Vistula and Oder Rivers System requires **inter-basin transfer of water** from the water intakes at the Vistula catchment (Pilica River) to the disposal at the Oder catchment (Ner River);
- the city location and streams chanalization together with compacted and highly impermeable historical development of the city **reduced water retentiveness** in the landscape and capacity of streams. This particularly evidences during storm events, through increased the flow peaks in the streams and sewage treatment systems;
- **rivers degradation** reduced also their capacity for selfpurification, deteriorating the quality of water, ecological stability of the ecosystems and thus the quality of life in the city;
- treated sewage from the City are disposed into a small river (the Ner River) of natural flow about 0,3 m<sup>3</sup>/s, with the sewage outflow of 2,5 m<sup>3</sup>/s and **exceeds the capacity of the sewage treatment system for stormwater purification**;
- The Ner river floodplain have been severely **contaminated with heavy metals and organic compounds**. During last years, due to decrease of water consumption in the city, the average river flow and ground water level at

floodplain decreased, resulting with mineralisation of cumulated organic matter in aerobic condition and in leaching heavy metals from the soil.

- **Sewage sludge utilization:** the Group Waste Water Treatment Plant (GWWTP) produces 70 000 ton of sewage sludge, which causes additional economic and ecological issue;

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### Learning Alliance members goals and aspirations

LA member	Issues, goals and aspirations
<b>Department of Infrastructure</b> The Office of the City Lodz	co-ordination of the program of small retention, operation and management of the sewage treatment plant in Lodz, sewerage system developments, managing municipal investments.
<b>Department of Environmental Protection and Agriculture</b> The Office of the City Lodz	integrated water resources management, management of infrastructure, rational usage of natural resources and shaping natural environment for sustainable development, management, control and planning the city's green areas, registration of nature monuments, punishments execution.
<b>Department of Strategy and Analysis</b> The Office of the City Łódź	providing of the coherence between the investments projects with the development strategy of the City of Lodz, analyses of socio-economic problems, predictions of development trends, coordination of works on statistical data and databasis providing of strategic goals and directions of development in terms of infrastructure investments
<b>The Office of Town Planning and Architecture</b> for the Lodz Region	elaborating development plans, approving investments location, giving the opinion on solutions to the architecture-related issues.
Department of Sewage Systems <b>Waterworks and Sewage Systems Company</b>	production and provision of drinking water for entire Lodz agglomeration and Tomaszów Mazowiecki (60 mln m <sup>3</sup> per year). It exploits 1933 km of water supply system and about 1600 km of sewerage system.
<b>Waste Water Treatment Plant in Lodz</b> Process and Environment Protection Unit Technologist in Process and Environment Protection Unit	purification of sewage from the City of Lodz and some surrounding towns, sewage sludge utilization, management of the protective zone around the city.

<b>Technical University of Lodz</b> , Department of Environmental Engineering Subdepartment of Water and Sewage Technology	quantification of hydrological cycle in the catchments and water supply/demand balance  development stormwater management plans
<b>Voivod Inspectorate of Environmental Protection in Lodz</b> Department of Monitoring	Monitoring of the rivers, reservoirs and groudwater in Lodz Region
<b>NGO "Lodz na Fali"</b>	-Development of education, promotion and PR activities in cooperation with authorities, public and private enterprises and community for the integrated development of the City of Lodz, its society and improvement of environment in Lodz
<b>Elementary School No 172 /</b> Head of the School	Primary education
<b>Secondary School No 15 /</b> Biology Teacher	Secondary education
<b>Interantional Center for Ecology Polish Academy of Sciences /</b> Director of ICE PAS	- basic monitoring and ecohydrological research in the 2 demonstration areas - major issues addressed: water retention in the landscape, water quality, ecological stability, application of ecohydrology system approach for environment improvement, stability and socio-economic feedbacks - adaptations of management and existing/planned infrastructure according to the EH principles
<b>Department of Applied Ecology University of Lodz</b> Interantional Center for Ecology Polish Academy of Sciences / Director for International Cooperation	- basic monitoring and ecohydrological research in the 2 demonstration areas - major issues addressed: water retention in the landscape, water quality, ecological stability, application of ecohydrology system approach for environment improvement, stability and socio-economic feedbacks - adaptations of management and existing/planned infrastructure according to the EH principles - overall project co-ordination

### **SWITCH in the City**

Collapse of textile industry and change of the City image from industrial city to the centre for education, science and development of new technologies, changes the expectations of society, also regarding the city landscape and the quality of life. Additionally, decreased water use in the last 20 years, forcing the necessity of changing the approach to water management in the city. There is an increasing need to change the perception of the role of the water in the city. Extending the technical systems for urban water management with ecological solutions may not only improve the quality of environment but also lower costs of management and rise economic income for society. There is a need of elaborating a comprehensive scientific background and implementation plan to address this issue, which will require co-operation of scientists, officials, local NGOs, and society. The major activities will

address:

1. Elaboration and demonstration of strategy for restoration of municipal rivers, stormwater management, increasing water retentiveness and improvement of quality of life (Sokolowka River):

The project validates implementation of ecohydrology approach as one of the essential components of urban water management, based on three fundamental canons. It i) uses synergies between catchment water cycle and dynamic of its biotic component, ii) harmonizes existing and planned hydrotechnical solutions with ecological biotechnologies, and iii) integrates complementary synergistic measures at all scales.

The concept of the restoration project will address the following issues:

- reduction of the stormwater sewage flow peaks by series of ponds and reservoirs, creation and restoration of river floodplain and wetlands;
- increase of water retentiveness in the city landscape (mitigation of extreme flows, increase of groundwater level, support of city vegetation) by application of phytotechnology;
- increase of the quality of water, ecological stability of freshwater resources and increasing their carrying capacity by instream ecohydrological regulation;
- Increase of quality of life and aesthetic values in the catchment by restoration of the river corridor, ecotone zones and landscape;
- increase of human health by incorporating the measures into development plan of the city, based on relationships between the effect of green-lands and water on frequency of allergies and asthma cases;

2. Elaboration and demonstration of strategy for sewage water management, environment quality and positive socio-economic feedbacks (Ner River): Traditional sewage treatment plants often do not possess sufficient efficiency and face high costs of construction and exploitation which has to be carried by local communities. Extending the sewage treatment by constructing willow plantations and wetlands results in more efficient reduction of pollutant loads and sludge utilization problems and generate additional benefits. Implementing willow plantations reduces problem of sewage sludge utilization and may contribute to water quality improvement (constructed wetlands). Additionally, it provides alternative sources of energy (bioenergy) and thus revenue for local economy while reducing outflows of capital for fossil fuel use. The production of bioenergy can result with quicker return of the invested capital through a short rotation time of the plantation and high planting density. The preliminary calculations shows, that wood chips from short rotation forestry (SRF) of the area to be established in the project, can cover the energy needs for municipal buildings in the City of Lodz and eliminate problem of sewage sludge utilizing. Reduction of heavy metals in the sludge is necessary to increase efficiency.

Based on ecohydrological approach, the restoration strategy will integrate measures at all scales and contribute to generating positive economic feedback:

- catchment scale – increase of stormwater retention at the city by increase of water infiltration, constructed wetland and restoration of rivers (related to the activity 1).
- floodplain scale – fitoextraction of heavy metals using willows for both water and floodplain quality improvement and production of biomass (bioenergy), including restoration of floodplain with native plant communities;

- local scale – application of sewage sludge for fertilization remote bioenergetic plantations (enhancement of production of biomass and bioenergy and economical utilization of sewage sludge);

**Major activities and impact of SWITCH in first 12 months** (*scoping studies/workshops, demos, research, interactions with stakeholders, etc.*)

Selection of two catchments in the pilot project allowed tackling a comprehensive scope of water related issues in the city and translation laboratory and micro-scale experiments into meso- scale, for testing ecohydrological solutions in practice. The following issues are addressed:

1. SOKOLOWKA RIVER: Restoration of the municipal river for stormwater management, increase of water retentiveness and improvement of quality of life;
2. NER RIVER: Sewage water management for environment quality and positive socio-econoimc feedbacks;

Research activities

Research activities related to Topic 5, WP 5.3. The following topics were covered at various scales:

1. CITY OF LODZ:
  - i) preliminary analysis of the hydrological cycle in the city, with special emphasis on the demonstration catchments;
  - ii) collection of available historical data; iii) collection of maps, aerial photographs and satellite images of the city;
2. SOKOLOWKA RIVER:
  - i) For pilot monitoring purpose, samples for physical analysis (temperature, oxygen, concentration, pH, conductivity, mineral and organic suspended mater content), chemical analysis (TP, TN, P-PO4, N-NH4, N-NO3), biological analysis (zooplankton, phytoplankton, chlorophyll-a) were collected from 10 sampling stations along the river and 5 stations on its reservoirs from Jan 2006 till now, weekly. Additionally, monitoring included collection of water, sediments and biological samples for heavy metals, micropollutants as well as hydrological measurements.
  - ii) The automatic online hydrological and climate monitoring stations are being now installed.
  - iii) A PhD programme was launched in September 2006, in the scope of the research: “Application of ecohydrology for urban river restoration with special consideration of harmonization of hydro-technical infrastructure with ecosystems”.
3. NER RIVER – Group Waste Water Treatment Plant: Efficiency of closing nutrient and anthropogenic cycles by application of the phytotechnology:
  - i) Experimental plantation at the protective zone of the WWTP was established in the Protective Zone of the WWTP in 2004. The first phase of the SWITCH project was concerned with continuation of the permanent monitoring of the plantation, in order to estimate efficiency of various willow species in heavy metals accumulation, sewage sludge utilization, biomass/bioenergy production and its possible contribution to energetic needs of the City;
  - ii) Restoration of the Ner River valley – experiments on inactivation of nutrients and toxic substances/heavy metals by native willow species, depending on hydrological characteristics of the valley;

Scientific papers published in the first 12 months:

- Zalewski M & Wagner I. 2006 "Ecohydrology in Urban Water Habitat restoration" in EH & HB Journal.

#### Demonstration activities

1. SOKOLOWKA RIVER:
  - Construction and opening of the first reservoir (Teresa Reservoir) in the demonstration section of the Sokolowka River;
  - Participation of a secondary school in the "World Cleaning" Action – Sokolowka River (the urban water stream to be resorted in the SWITCH demo);
  - Installation of the automatic online hydrological and climate monitoring stations at the river catchment.
2. NER RIVER:
  - Monitoring of experimental plantation at the protective zone of the Group Waste Water Treatment Plant at the Ner River;

#### LA Activities

- Mapping of potential institutions/stakeholders to participate in LA
- Scoping meeting for the LA members, May 2006;
- Consulting of the Action Plan with the potential LA members;
- Identification of the LA leader;

#### Dissemination

- Presentation of the SWITCH Project/Lodz in the World Water Forum, March 2006, Mexico-City, Mexico, UNEP/UNESCO session;
- Presentation of the SWITCH Project/Lodz in the international integrated revitalization conference "Vision Ksiezy Mlyn 2007-2013", Lodz, Poland, September 2006;
- Presentation of the SWITCH Project/Lodz in the Inter Academy Panel Conference, Lodz, Poland, 28-29 September 2006;
- Production of the informative brochure on the SWITCH activities in Lodz (in english);

#### **Linkages of SWITCH with other regional/city water initiatives**

The activities developed in the SWITCH project are concordant with the regional programmes for urban water management, implemented by the City of Lodz Office. The long term co-operation between the University of Lodz and the Municipal Office of Lodz has resulted in joint activities within the City "Small retention" initiative, which has been enriched by the SWITCH programme.

#### **The NEXT 18 Months**

##### **Summary of the main points/focus of SWITCH activities in the next 18 months**

The research topics, related to demonstration activities and mostly related to the WP 5.3, and, together with demonstration activities will continue in the two demonstration areas: Sokolowka River and the Ner River/GWWTP.

After the first year of research, both stations have been well monitored, providing profound background for further research and demonstration activities. Therefore the next 18<sup>th</sup> months will be devoted to deepening

#### LA Activities

- Networking and advocating for extending the LA influence and identification the new partners;
- Co-operation with schools in the area, demonstration activities and awareness rising

using the automatic online hydrological and climatic monitoring system installed in the first 12 months in the Sokolowka River catchment;

- Development of the City of Lodz LA SWITCH Project webpage with electronic discussion forum;
- Production of newsletters and dissemination of the information for stakeholders;
- Organising trainings and meetings for the LA group and contribution to the UMW plans and policy in the city;
- Organising an open exhibition “Ecohydrology meets Economy. Integrated Revitalization Exhibition” in the city; The exhibition will be connected with an open art competition for schools and adults on the water issues in the Lodz City;
- Identification of indicators, monitoring and evaluation the LA impact;

#### Dissemination

- Publication of the chapter describing the activities undertaken in the City of Lodz in UNESCO IHP/MAB handbook:  
Pascal B., Wagner I., & Marsalkr J. 2007. “Integrating Aquatic Habitats into Sustainable Urban Water Management”.  
The chapter: Wagner I., Bocian J. & Zalewski M. “Inclusion Of Ecohydrology Concept As Integral Component Of Systemic Urban Water Resources Management. The City Of Lodz Case Study, Poland”
- Development of the City of Lodz SWITCH Project webpage.
- Preparation of leaflets and information materials about the SWITCH Project and Lodz LA in polish;
- Presentation of the results of the research, LA and demonstration activities in the International Symposium: “New directions in Urban Water Management”, 12-14 September 2007, UNESCO Headquarters, Paris (France); - 2 presentations and 2 posters;

#### RTD

- The planned activities are listed in the section: Research activities

#### **Issues to be addressed (be as specific as possible – eg not Stormwater)**

The issues are listed above.

#### **SWITCH goals and objectives – Impact to be realised**

The goals and objectives are listed above.

#### **Learning Alliance Activities**

<b>Activity</b>	<b>Specific objective</b>	<b>Task</b>	<b>Deliverables</b>	<b>Milestones</b>
Participation in the Training on the LA methodology Cairo	Advancement and consolidation of the city LA in the demonstration cities through training of the appointed facilitators	Creation and enlargement of the Lodz LA	<b>D6.2-8R</b> <b>D6.2-9R</b> <b>D6.2-10R</b> <b>D6.2-11R</b>	



Meeting In the primary school on the cooperation related to the Sokolowka River project	Involvement young people in the activities of LA, dissemination of information on LA	Dissemination Sokolowka River project	<b>D.1.2. 1a, 1b, D1.2.2, D1.2.3 D1.2.4, D1.2.5, d1.2.6</b>	
Workshop on Storm Water and Decision Support System	Improvement of the Storm water management decision support system	Organization of Workshop for 20 LA participants	<b>D2.2.1, D2.2.2, D 2.2.3</b>	
Preparation of Leaflet on SWITCH Project in Polish version	Dissemination of information on SWITCH	Preparation and translation promoting materials on SWITCH Project	<b>D.1.2. 1a, 1b, D1.2.2, D1.2.3 D1.2.4, D1.2.5, d1.2.6</b>	
Preparation of leaflet on LA activities	Dissemination of information on LA SWITCH	Preparation and translation promoting materials on LA activities	<b>D.1.2. 1a, 1b, D1.2.2, D1.2.3 D1.2.4, D1.2.5, d1.2.6</b>	
Training on the stakeholders involvement	Advancement of stakeholders involvement in the process of implementation solutions related to the urban water management through training of the appointed facilitators of LA	Elaboration of Concept to involve a decision level in the LA	<b>0.2.2.</b>	
Establishment of the web site of SWITCH LA in English and polish version	Dissemination of information on LA SWITCH	Design and launching of Lodz LA web site	<b>D.1.2. 1a, 1b, D1.2.2, D1.2.3 D1.2.4, D1.2.5, d1.2.6</b>	
Creation of "educational path" on the Sokolowka River	Dissemination of information on Sokolowka Project	Design and launching of educational project	<b>D.1.2. 1a, 1b, D1.2.2, D1.2.3 D1.2.4, D1.2.5, d1.2.6</b>	
Training on Optimizing social inclusion - stakeholders mapping and action planning	Elaboration of System and methods to involve society in the Project activities	Participation in the training, NGOs involvement	<b>6.3 D1 6.3 D3</b>	
Training in financial analysis & fund-raising	Project development facility, raising implementation funds;	Establishment of the system including financial institutions and private and public sectors	<b>D6.4-1 R D6.4-2 R</b>	
Exhibition "Ecohydrology meets Economy. Integrated Revitalization	Project dissemination, young people involvement	Organizing the exhibition jointly with the artistic competition "Water in e city of	<b>D.1.2. 1a, 1b, D1.2.2, D1.2.3 D1.2.4, D1.2.5, d1.2.6</b>	

Exhibition”		the Future”		
Institutional Mapping Workshop	Project development facility, mapping	Co-Organizing Workshop for LA participants		

### Research activities

Following the consultation with the LA members, the scope of the research has been formulated, and the research activities have been allocated among the following 9 working groups:

- WG 1. Analysis of the hydrological cycle;
- WG 2. GIS and topographic documentation and analysis;
- WG 3. Development of scenarios of Global Climate Change;
- WG 4. Inactivation of pollutants in the river valley by vegetation (Ner River);
- WG 5. Phytoremediation, sewage sludge utilization and biomass/bioenergy for energetic needs of the City (Ner River);
- WG 6. Phytosociological maps of the river valley for estimation of biodiversity and optimization of water/nutrient retentiveness (Sokolowka River);
- WG 7. Use of ecohydrology concept and phytotechnology for elimination of cyanobacterial blooms appearance in municipal river and lake systems (Sokolowka River);
- WG 8. Quantification of the effect of green areas of the City of Lodz on epidemiology and frequency of incidences of allergy and asthma.
- WG 9. Restoration management project and development of flexible adaptation strategies for the management of urban catchments in the City of Lodz;

The groups will provide the following deliverables within the next 18 months, contributing to the WP 5.3:

month	Tasks	WG
M13 luty 07	Literature review	ALL
M14 marzec 07	Monitoring of physical and chemical parameters of the Sokolowka River - summary of the first year results	WG1
M15 kwiecień 07	Collection of digital and traditional maps for the project.	WG2
M16 maj 07	The evaluation of the activity of the soil microorganisms (soil metabolisms) and estimation of the toxicity of soil after use of the different doses sewage sludge in the environmental and experimental conditions (Phytotoxkit Test, Microtox).	WG5
M16	Review paper on factors driving landscape changes in suburban and urban areas and influence of those changes on quality of life	WG6
M17 czerwiec 07	Paper/report on micropollutants in the Ner River	WG4
M17 czerwiec 07	Paper: Literature review on harmonisation of engineering and ecological solutions in IUWM	WG1
M24 styczeń 08	Preparation of the satellite images and GIS analysis results.	WG2
M25 luty 06	Report on GCC scenarios for the Lodz City	WG3

M26 marzec 08	Estimation of the efficiency of absorbing the elements in the rhizospheres (rhizobox)	WG5
M26 marzec 08	Biological characteristic of river and reservoir system -preliminary results	WG7
M26 marzec 08	Report: Hydrologiczal characteristics of the Sokolowka catchment	WG1
M30 lipiec 08	Paper/report on optimization of urban landscape toward human -well being	WG6
M30 lipiec 08	Paper on GCC Scenarios in the City of Lodz and impact on IUWM	WG3

*Table on specifics of work activities (workpackages to contribute)*

Work package	Specific objective	Task	Deliverables	Milestones	Lead Partner
<b>WP 5.3.</b>	Literature review	Literature review			
<b>WP 5.3.</b>	Workshop on natural systems use June 2007	Organizing the workshop			
<b>WP 5.3.</b>	Report on RTD activities/ Dec. 2007			Report	

**WP 0.2** Cross-cutting training activities

**WP 2.2.** Determining Technological Options for stormwater control

**WP 2.2.** Decision making processes for effective urban stormwater management

**WP 2.3** Environmental Change Studies for stormwater control and reuse options (to be considered to lower the stormwater runoff and peaks to treatment plant)

**WP 5.1** Planning of the city landscape, including EH measures for water retentiveness increase and human health

**WP 6.1** Governance for Integrated Urban Water Management (to help with the LA establishment and training)

## **Demonstrations**

The demonstration activities will continue on the two demonstration areas, and will include the following tasks and deliverables:

### 3. SOKOLOWKA RIVER:

#### Purpose:

Elaboration and demonstration of strategy for restoration of municipal rivers, stormwater management, increasing water retentiveness and improvement of quality of life (Sokolowka River).

#### Tasks/timeline/deliverables:

- Continuation of works at the Teresa Reservoir (constructed in 2006): Development of the protective vegetation belt (including ecotone zones) around the reservoir and island (02.2006-06.2007/report and documentation);
- First stage of the construction of the Zabieniec reservoir –project documentary (02.2006-06.2007/project documentation);
- Hydrological monitoring of the Sokolowka River: Final installation of the online monitoring system for research, education and demonstration (02.2006-06.2007/report documentation);

- Development of the mathematical model of stormwater runoff in the Sokolowka River catchment (02.2006-06.2007/model documentation);
- Restoration of the natural river bed between reservoirs (600 m section, meander M8) – project documentary (02.2006-06.2007/project documentation).

#### 4. NER RIVER/GWWTP:

##### Purpose:

Sewage water management for environment quality and positive socio-economic feedbacks.

##### Tasks/timeline/deliverables:

- Exploitation of the existing willow plantation, 70 ha (02.2006 – 06.2007/report data on the willow exploitation) ;
- Establishment of new areas of willow plantation in the protective zone of the GWWTP (12.2006 / documentation);
- Elaboration of the strategy for the sewage sludge management and biomass production in the GWWTP (12.2006/strategy report);
- Elaboration of the conceptual mathematical model for the sewage sludge management and biomass production in the GWWTP (06.2006/model documentation);

### Training plans

Training activity	Purpose	Target audience	Type of materials/delivery	Deliverable
Determining Technological Options for stormwater control	Improvement of stormwater control and reuse options (to be considered to lower the stormwater runoff and peaks to treatment plant)	Technical University of Lodz, Department of Environmental Engineering Subdepartment of Water and Sewage Technology Department of Infrastructure The Office of the City Lodz, Department of Environment and Agriculture The Office of the City Łódź, Sewage Treatment Plant in Łódź - The Process and Environment Protection Unit		<b>D 2.2.1a</b> <b>D 2.2.1b</b> <b>D4.1</b>
Decision making processes for effective urban stormwater management	Improvement of the decision making processes related to the stormwater management	Department of Infrastructure The Office of the City Lodz, Department of Environment and Agriculture The Office of the City Lodz, Sewage Treatment Plant in Lodz - The Process and Environment		

		Protection Unit The Office of Town Planning and Architecture for the Lodz Region		
training on LA Methodology - Alexandria	Advancement and consolidation of the establishment of city learning alliances in the demonstration cities through training of the appointed facilitators	LA of the City of Lodz Facilitator and students studying learning alliance processes, who will be working part- or full-time to establish the learning alliance processes in their cities.		<b>D6.2-8R</b> <b>D6.2-9R</b> <b>D6.2-10R</b> <b>D6.2-11R</b>
training on stakeholders involvement	Advancement of stakeholders involvement in the process of implementation solutions related to the urban water management through training of the appointed facilitators of LA	LA of the City of Lodz Facilitator		
Optimizing social inclusion - stakeholders mapping and action planning	Elaboration of System and methods to involve society in the Project activities	LA of the City of Lodz Facilitator NGOs		<b>6.3 D1</b> <b>6.3 D3</b>
Training on Financial Analyses and Fund Raising	Establishment of the system of financial institutions, including private and public sectors, supporting implementation of proposed solutions elaborated by research institutions; project development facility, raising implementation funds	Facilitators of the LA of the City of Lodz, Department of Promotion The Office of the City Lodz,		<b>D6.4-1 R</b> <b>D6.4-2 R</b>
Institutional Mapping	Improvement of the mapping	Facilitators of the LA of the City of Lodz,		<b>D6.4.1</b> <b>D7.3.1</b>

Workshop	potential institution for supporting activities development in the framework of SWITCH project	Department of Promotion The Office of the City Lodz		
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### Dissemination activities

Dissemination activity	Purpose	Target audience	Deliverable
Handbook: UNESCO MAB – Urban Water Habitat Programme	Dissemination of scientific results and information about the Lodz project	Scientists, general audience	
symposium			
Preparation of Leaflet on SWITCH Project in Polish version	Dissemination of information on SWITCH	Stakeholders, scientists, local authorities, society	D.1.2. 1a, 1b, D1.2.2, D1.2.3 D1.2.4, D1.2.5, d1.2.6
Preparation of leaflet on LA activities	Dissemination of information on LA and LA in Lodz	Stakeholders, LA	D.1.2. 1a, 1b, D1.2.2, D1.2.3 D1.2.4, D1.2.5, d1.2.6
Establishment of the web site of SWITCH LA in English and polish version	Dissemination of information on LA SWITCH	society	D.1.2. 1a, 1b, D1.2.2, D1.2.3 D1.2.4, D1.2.5, d1.2.6
Creation of “educational path” on the Sokolowka River	Dissemination of information on Sokolowka Project	society	D.1.2. 1a, 1b, D1.2.2, D1.2.3 D1.2.4, D1.2.5, d1.2.6
Exhibition “Ecohydrology meets Economy. Integrated Revitalization Exhibition”	Project dissemination, young people involvement	Organizing the exhibition jointly with the artistic competition “Water in the city of the Future”	D.1.2. 1a, 1b, D1.2.2, D1.2.3 D1.2.4, D1.2.5, d1.2.6

### Budget requests for LA activities

	Total cost			Summary
	Man days	Staff costs	Other costs	
LODZ				
1. SWITCH LA meetings in Lodz			2400	2400
2. LA Secretariat establishment and support		6000		6000
3. Establishment of the LA structure and official launching			1000	1000
4. Creation of Lodz website			600	600
5. Production of local information materials			2000	2000
7. Own costs to participate in Alexandria workshop on LA methodology training			3000	3000
Total		6000	9000	15000

Detailed budget has been provided in the LA Action Plan.

### SWITCH City Lodz timeline of activities

Month		LA	Demo	RTD	Dissemin.	Training	Tasks
<b>M12</b>	<b>I 07</b>	X		X			Workshop Łódź WP 2.2 i 2.1 Storm Water and Decision Support System +LA 20 participants
		X				X	Training on stakeholders involvement
		X				X	Training on LA Methodology - Alexandria
		X			X		Preparation of leaflets and information materials about the SWITCH Project and Lodz LA in polish;
<b>M13</b>	<b>II 07</b>			X			Literature Review Inventory of natural systems and processes for Urban Water Management (UWM). <b>report EU</b>
		X				X	Optimizing social inclusion - stakeholders mapping and action planning
<b>M14</b>	<b>III 07</b>	X			X		Establishment of the web site of SWITCH LA in English and polish version
				X			Monitoring of physical and chemical parameters of the Sokolowka River - summary of the first year results
<b>M15</b>	<b>IV 07</b>	X					Opening of the artistic competition "Water in the city of the Future"
				X			Collection of digital and traditional maps for the project.
		X				X	Financial analysis & fund-raising
		X					Training on Financial Analyses and Fund Raising
							Meeting In the primary school on the cooperation related to the Sokolowka River project
<b>M16</b>	<b>V 07</b>	X			X		Creation of "educational path" on the Sokolowka River
				X			The evaluation of the activity of the soil microorganisms (soil metabolisms) and estimation of the toxicity of soil after use of the different doses sewage sludge in the environmental and experimental conditions (Phytotoxkit Test, Microtox).
				X			Review paper on factors driving landscape changes in suburban and urban areas and influence of those changes on quality of life
<b>M17</b>	<b>VI 07</b>		X	X			Development of the protective vegetation belt (including ecotone zones) around the reservoir and island and elaboration of operational procedures
							Paper/report on micropollutants in the Ner River
				X			Paper: Literature review on harmonisation of engineering and ecological solutions in IUWM
<b>M18</b>	<b>VII 07</b>	X					Closing date of the artistic competition "Water in the city of the Future"
				X		X	Plan to use natural systems in Demo-cities
		X					Progress report Demo site Łódź. <b>report EU</b>

				X		Organise a workshop in Łódź on use of natural systems and produce a plan to maximise their use in Demo-cities WP 5.3 Łódź, 20 participants
					X	Publication of a chapter (Lodz Demosite) in UNESCO IHP/MAB handbook on IUWM
<b>M19</b>	<b>VIII 07</b>		X	X		Hydrological monitoring of the Sokolowka River: Final installation of the online monitoring system for research, education and demonstration
<b>M20</b>	<b>IX 07</b>	X				Exhibition Ecology meets Economy. Integrated Revitalization Exhibition. Official closing of the arctic competition.
				X	X	Presentation of the results on the International Symposium: "New directions in Urban Water Management", Paris (France);
<b>M21</b>	<b>X 07</b>	X				Institutionl Mapping Workshop
	<b>XII 07</b>			X		Report on RTD activities. <b>report EU</b>
		X				Report on LA activities. <b>report EU</b>
			X			Report on Demonstration activities. <b>report EU</b>
<b>M24</b>	<b>I 08</b>			X		Preparation of the satellite images and GIS analysis results.
<b>M25</b>	<b>II 08</b>			X		Report on GCC scenarios for the Lodz City
<b>M26</b>	<b>III 08</b>			X		Estimation of the efficiency of absorbing the elements in the rhizospheres (rhizobox)
				X		Biological characteristic of river and reservoir system -preliminary results
				X		Report: Hydrological characteristics of the Sokolowka catchment
			X			Establishment of new areas of willow plantation in the protective zone of the GWWTP
<b>M29</b>	<b>VI 08</b>	X				First stage of the construction of the Zabieniec reservoir –project documentary
<b>M30</b>	<b>VII 08</b>			X		Paper/report on optimization of urban landscape toward human - well being
				X		Paper on GCC Scenarios in the City of Lodz and impact on IUWM
			X			Restoration of the natural river bed between reservoirs (600 m section, meander M8) – project documentary
			X	X		Elaboration of the conceptual mathematical model for the sewage sludge management and biomass production in the GWWTP
			X	X		Development of the mathematical model of stormwater runoff in the Sokolowka River catchment

**Links to other areas of the SWITCH DOW** *for other costs such as training, research, etc.*



None

## SWITCH City Story Template – TEL AVIV

### Description of the city and its water resources

The city of Tel Aviv was founded on 1909 as an outside neighbourhood of the city of Jaffa where the living and sanitation conditions were not very good. The vision of the city founders was a city designed along the lines of the Garden City Movement, headed by the British city planner Sir Ebenezer Howard. They had in mind a green and spacious city, the very opposite of the urban squalor of Yafo.

A house Builders Association was formed, and once enough people had registered for the new neighbourhood land was purchased east of Neve Tzedek, not far from the beach (hear the Dan Panorama Hotel today). The land was divided into 60 plots for the first 60 families who had joined the Association. The land was allocated by a lottery at the end.

During almost a decade Tel Aviv has developed to modern city of: (July 2006)

371,400 inhabitants for an area of municipal jurisdiction of 51.76 km<sup>2</sup> (area of dwelling 77.3 km<sup>2</sup>) with a high population density (7200 persons/ km<sup>2</sup>). The annual growth rate of the population is lately 2.2% with 150100 households (with a high percentage of non married young people or single elderly people so that the average persons/household is 2.2).

There are more women than males in the city (52%/48%) and the median age is 33.9 (compared to 28.3 as median age in Israel).

There are 225,919 housing units (residential and non-residential) for a total surface area of 24,252,000 m<sup>2</sup>.

Tel Aviv is a wealthy city compared to the national average (comparative income of 119.4%) there are 199,300 employed residents and the unemployment rate (6.9%) is lower than the national average. Also the poverty level (portion of population living below poverty level) is 11.9% as compared to the whole countries' average of 22.4%.

Tel Aviv is the commercial centre of Israel with a population of over one million arriving to the city during the day.

As a Mediterranean seashore town the climate in Tel-Aviv is mild (lowest daily average temperature (in January) is 9.6 °C and the highest average daily temperature (in August) is 30.2 °C while the average rainfall is 530 mm./yr.

The drinking water to the city is mainly supplied by Mekorot (41 MCMY or 90% of all the supply) and another 10% (around 5 MCMY) is supplied by local wells and disinfection of the water by the city. The water is supplied to the customers by the municipality who also maintains the pipe-lines and the water reservoirs in the city and cares for the proper water pressures and disinfection. On the total around 46 MCMY is supplied by the municipality to customers by around 1000 kms of pipe-lines.

In the 1950's most of the city's supply was from local wells only but due to excessive salinity and industrial pollution only 9 wells out of 80 are active. Besides the Ministry of Health the water quality is also monitored by the municipality

The municipality also collects the wastewater by a pipe-line system (around 501 kms.) and pumps it to the WWTP through the central pipe-line (Reading-Rishon), both owned by owned by the Dan Region Association of Towns.

Drainage of rain – water, monitoring of the consumption of the water and production of wastewater by citizens and the collection of taxes for drinking water consumption and wastewater collection taxes are also performed by the municipality.

- Sometime in the future; Tel Aviv would like to be independent from the national water system (run by Mekorot) by own desalination systems

- A list of 60 indicators is used in the implementation phase of the strategic plan.
- There is a pipe rehabilitation program in Tel Aviv. Old pipes: 50-60 years are being replaced..
- A calibrated EPA net model for the distribution network is under development
- 97% of the customers in Tel Aviv are metered.
- Pressure management is applied to reduce losses.
- The system is not yet optimized for saving energy in pumping stations.

The Dan region Association that collects and treats the wastewater from Tel – Aviv and surrounding towns was originally formed by 7 municipalities (while Tel Aviv was the central one) in the 1950's. Today there are 24 municipalities that are connected to the central WWTP and around 2 million p.e. of wastes are treated. Still the central municipality is Tel-Aviv since during the day more than one million citizens come to the city and also Tel-Aviv is the commercial and cultural centre of this region. The other duties of the Association is also to supervise the sources of wastewater that are conveyed to the WWTP by a special department who visits industrial plants in Tel Aviv and its surroundings or other sources of wastewater besides the households and prevents pollution at the source. The Association has also established an oil and grease collection and treatment system and a salt separation and sea disposal system. Both help improve the quality of the wastewater that is conveyed to the WWTP. They also are planning to treat the sludge from the WWTP.

#### **Main water pressures and issues**

1. Regular water supply to the city during dry seasons in semi-arid conditions.
2. Growing population and depleted water sources including industrial pollution and crawling salinization affecting the local wells and aquifers.
3. Change in wastewater and effluent treatment trends due to rapid urbanisation that requires decentralized and compact systems.
4. Effective storm water management.
5. Water reuse including gray water and resulting dual systems operations.
6. Expanding water and future effluent desalination projects.
7. Effective pipe leakage control methods.
8. Managing the water sources by the help of sustainability indicators.

**City Coordinator:** Jointly, Prof. Avner Adin (HUJI), Avi Aharoni (Mekorot)

#### **Learning Alliance members goals and aspirations**

<b>LA member</b>	<b>Issues, goals and aspirations</b>
Ministry of Interior, Central District Regional Council 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 (1.7 million population) and regional urban planning. One of main achievements of the government is the collection of all regional governmental offices under one building in each regional capital (Kiriath Yamina)

	<p>this eases the communication between different governmental offices and decisions are more quickly taken and permits issued.</p> <p>The government created a national committee who deals with objections raised by public organisations or other governmental bodies to regional projects. Each project is publicly discussed and objections can be raised within 60 days of the publication. If a project is delayed due to the objections for a long time, this committee tries to mediate and relieve the impasse.</p>
<p>The city of Tel-Aviv (T.A.) Water, wastewater and drainage department</p>	<p>Supply of drinking water to the city. Disposal of wastewater. Responsible for the drainage of storm water together with the Yarkon River drainage authority. The sewer system in the city is connected to the regional sewage collection system of the Dan Region Association of towns. Drinking water: 90% or 45 MCMY is supplied by Mekorot to the city which cares for the quality and the right supply pressure of the water. The other 10% of the supply is by local wells operated by the municipality who also disinfects the water before supply.</p> <p>Besides that the city takes care of the water reservoirs and also monitors the consumption of the water and production of wastewater by citizens. The city is in charge at this stage for the collection of taxes for drinking water consumption and wastewater collection although the trend is to separate this from the municipality and leave it under municipal private companies who will better care to repair the old pipelines and better maintain the whole system since the money collected will go for water and wastewater systems operation only</p>
<p>Dan Region Association of Towns</p>	<p>The Dan region Association of Towns is a Non-Profit Organization that actually includes the 7 original municipalities and other municipalities that receive the services making on the total 24 municipalities for 2 million p.e.</p> <p>The main service is the collection and transport of wastewater to the Dan Region</p>

	<p>WWTP, treatment of the wastes and handing the effluents to Mekorot for further tertiary treatment and reuse in the south. The other duties of the Association is also to supervise the sources of wastewater that are conveyed to the WWTP. All the big projects are planned and performed by outside sourcing. The routine maintenance is in-house. In the future The Association is planning to introduce a primary treatment step to the WWTP and also to treat the sludge by partly composting and partly incinerating it.</p>
<p>Ministry of National Infra-structures, Water Commission</p>	<p>The main regulatory body in Israel for the water supply and demand. Responsible for all water resources in the country. Each year 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.</p> <p>The Commission is the major governmental body that pushed the decision to unit all concerned water related government offices under the State Water Authority (beginning 2007). The idea is to have a central body that will decide on all water and wastewater matters and this will prevent the non-efficiency of having a lot of offices having jurisdiction on the same water source. This body will include all concerned governmental offices and regional bodies and will be leaded by the actual Water Commissioner.</p> <p>Main future plans: The "2002-2010 plan" that has the purpose to ease the situation created in early 2000 by adding 315 MCMY of desalinated water to the water balance and also add more reused effluents (up to 500 MCMY in 2010). Long range strategic planning to 2040 will deal with 10 different water related subjects. The Master Plans are prepared by the Commission in-house. Besides that the Water Commissioner has formed recently a committee (that includes Prof. Avner Adin, our HUJI partner) who will choose the proper sustainability indicators for effective integrated water management.</p>

Ministry of the Environment	Responsible for the pollution of air, water and land. The Ministry is a partner in regional (Mediterranean) sustainability parameters development project.
NGO – “Man, Nature and Law”	An NGO that has as a main concern the improvement of the environmental conditions of the Israeli population. They are like a watch dog of the public health. Their involvement includes industrial pollution, air pollution, drinking water pollution, soil pollution..
Ministry of Health, environmental Health Dept., Central District and Tel-Aviv Region	<p>The Ministry of Health is divided in to 7 districts throughout Israel. Each district has a district office under the management of the District Physician (doctor)..</p> <p>Their mandate is covered by a series of laws and regulations. Their activities include:</p> <p>Control of the drinking water quality and the water sources. Permits for drilling of wells (if they will be used for drinking purposes) through them. They have to ensure that contaminated wells are not used for drinking water. Although drilling permits are issued by The Water Commission. They perform environmental studies that show the Safety Radius areas and the quality of the water to be reclaimed. They perform bacteriological, chemical and hydrological monitoring of the drinking water. Other activities include:</p> <p>Issue of permits for water and wastewater systems in new building projects. Prevention of flow of pesticides tank wash water and fertilizer tanks washing to the water systems. Monitoring of effluent reuse regulations in the city for public gardening (1992) is their responsibility too.</p> <p>Other projects that they monitor are: Desalination system of the TA municipality, the quality in the flood water collection system of the municipality, monitoring of the WWTP effluent quality, SAT water quality, sludge incineration study.</p>

<p>Farmers association in the South of Israel</p>	<p>The biggest agricultural company in Israel. They culture 15000 hectares of land and use 24 MCMY of water of different qualities (effluents, drinking water, salty water, desalinated water..). The main crop is wheat (7000 hectare crop, 600 hectare for seeds), also pees, 1000 hectare, 1000 hectare water-melon, 1000 hectare potatoes (they grow three times more since they have reclaimed water) and different other crops. They receive through Mekorot (SAT treated water) around 13 MCMY. They are satisfied with the Shafdan water quality but need more effluents for irrigation to replace the drinking water. Some encountered problems in supply are due to the clogging of their pre-filters before irrigation by sand, algae (from the open reclaimed water reservoirs) and also the manganese that comes in the pipe –line. One of other objection is the high price of reclaimed</p>
<p>Water Workers Association</p>	<p>Established in 1954, mainly to improve expertise in irrigation, IWWA is a cooperation, its members mostly 'small' water supply companies, mostly for agricultural water supply. Today, IWWA is also involved in reducing water losses in urban areas and also in optimization of operational reservoirs in urban water distribution networks.</p>
<p>Mekorot, National water company</p>	<p>The National Water Company that supplies 90% of the drinking water in Israel and reclaims 75% of all wastewater that are distributed for irrigation. One of the two SWITCH partners .</p>
<p>Soil and water department the Hebrew University</p>	<p>The Soil and water department conducts research on quality improvement and new technologies on drinking water, reclaim water, desalinated water and industrial waste treatment.</p>
<p>Israel Water Association</p>	<p>The Israeli Water Association is an NGO with members from all sectors of water and wastewater. The association has members from different affiliations such as design, management, operation, industries, economy, law, education and</p>

	<p>government authorities. IWA's unique position as Israel's leader in providing conferences, courses and seminars on water and wastewater issues for the professional water sector grants a golden opportunity and platform for disseminating the outcome of the various work packages.</p>	
<p><b>Switch in the City</b></p> <p>The integrated water management in future Tel-Aviv will ensure safe drinking water and safe water for other applications in the city. The Learning Alliance methodology will be applied as a managerial tool. The problems and issues to be tackled has been identified as follows:</p> <ol style="list-style-type: none"> <li>1. Safe and regular water supply to the city during dry seasons in semi-arid conditions.</li> <li>2. Industrial pollution control and salinization reduction to protect local wells and aquifers.</li> <li>3. Adaptation of novel methodologies and equipment in wastewater and effluent treatment to fit climate and demographic changes.</li> <li>4. Effective storm water management, emphasizing flood control in downtown Tel-Aviv.</li> <li>5. Municipal water reuse including gray water and resulting dual systems operations, in addition to agricultural irrigation in the periphery.</li> <li>9. Planning sea water, brackish water and effluent desalination projects.</li> <li>10. Effective pipe leakage control.</li> <li>11. Managing the water sources applying urban-specific sustainability indicators.</li> </ol>		
<p><b>Major activities and impact of SWITCH in first 12 months</b></p> <ol style="list-style-type: none"> <li>1. Major activities: <ul style="list-style-type: none"> <li>• Scoping studies</li> <li>• Workshop on Indicators in Tel-Aviv (TLV).</li> <li>• Establishment of LA group</li> <li>• Establishment of a Water Club with the stakeholders membership for discussions of relevant SWITCH issues</li> <li>• Entertaining visits to the main demonstration site of TLV Wastewater Reclamation Project (Shafdan)</li> <li>• Performing research according to WP3.2 and WP3.3</li> </ul> </li> <li>2. Impact of SWITCH in first 12 months: <ul style="list-style-type: none"> <li>• Connecting TLV City, Ministry of Environment and Water Commission experts working on sustainability indicators. Those people never knew of each other's work before.</li> <li>• Prof. Adin has been invited to participate in a new Steering Committee of the Water Commission on Sustainability Development Indicators.</li> <li>• The Israeli Foreign Ministry has asked to participate in future events of the LA</li> </ul> </li> </ol>		



## Linkages of SWITCH with other regional/city water initiatives

The Israeli Ministry of Environmental Protection which is a partner of the TA Learning Alliance (the Water Club) is also a partner in another EU program (Short and Medium Term Environmental Action Program for the Mediterranean (SMAP). Website: <http://www.smaprms.net>)

## The NEXT 18 Months

### Summary of the main points/focus of SWITCH activities in the next 18 months

Main SWITCH activities in Tel-Aviv:

1. Two meetings of the Water Club – April 2007, November 2007
2. Sustainable Development Indicators Steering Committee kick-off meeting organized by the new Israel National Water Authority - April 2007
3. Soil-Aquifer Treatment (SAT)-Nanofiltration (NF) demonstration project operation
4. Electroflocculation (EF)-Constructed Wetland (CW) demonstration project operation
5. Training Workshop on SAT
6. Training Workshop on EF-CW

## Issues to be addressed

1. Regular water supply to the city during dry seasons in semi-arid conditions.
2. Growing population and depleted water sources including industrial pollution and crawling salinization affecting the local wells and aquifers.
3. Change in wastewater and effluent treatment trends due to rapid urbanisation that requires decentralized and compact systems.
4. Effective storm water management.
5. Water reuse including gray water and resulting dual systems operations.
6. Expanding water and future effluent desalination projects.
7. Effective pipe leakage control methods.
8. Managing the water sources by the help of sustainability indicators.

## SWITCH goals and objectives – Impact to be realised

- Safe and uninterrupted water supply to the city
- Better flood control
- Safe and improved reuse of reclaimed effluents

## Learning Alliance Activities

Activity	Specific objective	Task	Deliverables	Milestones
Water Club				
Sustainable Development Indicators				

Steering Committee kick-off meeting				

### Research activities

Work package	Specific objective	Task	Deliverables	Milestones	Lead Partner
WP 3.2					
WP 3.3					
WP 6					
WP 1.1					
WP 2					
WP 3.1					

### Demonstrations

- Soil-Aquifer Treatment (SAT)-Nanofiltration (NF) demonstration project operation
- Electroflocculation (EF)-Constructed Wetland (CW) demonstration project operation

Research Themes involved: Mekorot, HUJI, TUB, IHE

Will take place within the next 18 month timeline.

### Training plans

Training activity	Purpose	Target audience	Type of materials/delivery	Deliverable
SAT workshop	Info and techno transfer	Stakeholders and SWITCH researchers		
EF-CW workshop	Info and techno transfer	Stakeholders and SWITCH researchers		

### Dissemination activities

Dissemination activity	Purpose	Target audience	Deliverable

Engineering Water Magazine (local)	Info and techno transfer	Water professionals	Articles
Scientific journals			
Websites: IWA, Environmental Protection Ministry, more	Info and techno transfer	Stakeholders and professionals	

### Budget requests for LA activities

TEL - AVIV	Total cost			Summary	Summary	EC contribution
	Man days	Staff costs	Other costs	research	training	total
1. Facilitation of club	26	6000			6000	
2. Workshop costs					2500	
3. Participates in two training courses					6000	
4. "Water Club" activities					1000	
Total		6000			15500	155 00

### SWITCH City Tel-Aviv timeline of activities

### Links to other areas of the SWITCH DOW