



## Sustainable Water management Improves Tomorrow's Cities Health **SWITCH**

### **Context**

Conventional urban water management (UWM) offers inherent risks and limited sustainability in the face of global environmental change. As global change pressures increase, most cities will experience difficulties in efficiently managing scarcer and less reliable water resources while attempting to satisfy water uses/services and waste water disposal. Environmental, social and/or economic damage are likely consequences without adaptation. In order to meet these challenges, SWITCH calls for a paradigm shift in UWM. There is a need to convert ad-hoc actions (problem/incident driven) into a coherent and consolidated approach (sustainability driven). This need drives the approach planned within the SWITCH integrated project.

### **Research concept**

SWITCH is an action research project. Its main objectives are the development, application and demonstration of a range of tested scientific, technological and socio-economic approaches and solutions that contribute to sustainable and effective UWM.

The project is being implemented by a consortium of partners from around the world through seven complementary and interactive themes. Innovation is being achieved through a combination of:

- *action research*: addressing problems through innovation based upon the involvement of users.
- *learning alliance driven*: linking stakeholders to create win-win solutions along the water chain;
- *cross-cultural*: European cities learn from each other and from developing countries, and vice versa.
- *strategic and holistic*:: to consider the urban water system, and its components, (at the city level) in relation to its impact and dependency on the natural environment in the river basin (river basin level) and in relation to Global Change pressures (global level).
- *sustainable and risk based*: to address opportunities within a framework that explicitly focuses on sustainable options and addresses explicitly the risks inherent in take-up.

The success of the project will not be measured by the extent of outputs in learned journals but in the take-up by the communities that benefit directly from the research.

### **Instruments and scope**

SWITCH is an integrated project with 32 partners, their resources, and a total budget of over 25 million Euros, including budget for demonstration activities in 9 cities in Europe and developing countries. It is hoped that SWITCH will rapidly grow to embrace the



membership of the Learning Alliances in each of the demonstration cities and will engage all stakeholders at local, national and international levels to ensure rapid uptake of the approach and the results.

Figure 1 schematically illustrates the building blocks of the project that will underpin the development of new integrated urban water management approaches.

At the heart of SWITCH are the Learning Alliances. Learning Alliances are described in the next section. Nine cities will be developing Learning Alliances in the first instance including Birmingham. An international Learning Alliance is also being put in place to provide the integration between the city-based learning alliances.

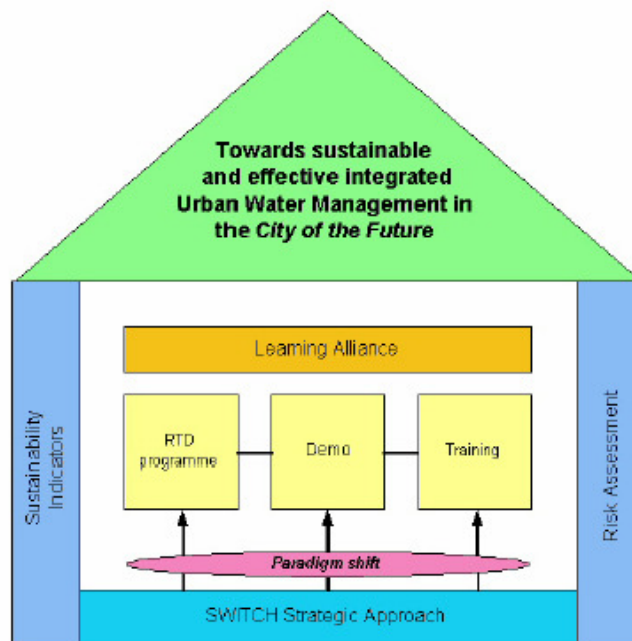


Figure 1: Schematic presentation of SWITCH

### Learning Alliances

A Learning Alliance (LA) is a group of individuals or organisations with a shared interest in innovation and the scaling-up of innovation, in a topic of mutual interest (e.g. integrated urban water management). LAs typically consist of a series of structured platforms, at different institutional levels (neighbourhood, city, river basin, national, international), designed to break down barriers to both horizontal and vertical information sharing, and thus to speed up the process of identification, adaptation, and uptake of new innovation. These platforms bring together a wide range of partners with capabilities in: planning; implementation; regulation; policy and legislation; research and learning; and, documentation and dissemination. In the SWITCH project the city level will be especially important as a platform to work towards integrated urban water management and institutional change to implement this new paradigm, LAs will need to span a wide



range of issues and sub-sectors within cities including urban water supply, drainage and flood management, wastewater treatment, environmental management etc.

LAs will undertake action research and implementation of demonstration activities within the nine SWITCH demonstration cities and are intended as a platform for the coordinated mobilization of the knowledge, resources and decision-making of different stakeholders. These stakeholders will be involved in identifying, developing and implementing innovations within their area of common interest, and by so doing ensuring that these suit both the needs and capacities of end-users and city level organisations. Conducting research within an alliance of practitioners, researchers, policy makers and activists is intended to lead to greater impact and more potential for taking innovations to scale through the development of more locally appropriate innovations, high ownership of the concepts and process; and enhanced capacity of LA members. Nesting learning alliances at different levels will both shorten the time between developing new knowledge and scaling it up within cities and countries; and, will ensure that city level solutions are nationally and internationally relevant and applicable.

LAs will be established in each of the nine demonstration cities coordinated by a city level coordinator. Alliances will also be developed at global, national (where appropriate) and neighbourhood levels (where appropriate). LAs provide the mechanism to work towards integrated urban water management at the city level in the nine demonstration cities. They provide a mechanism to ensure that:

- a wide range of city organizations develop ownership of the SWITCH project
- all research activities are problem focused and based upon stakeholder and problem analysis conducted within cities during the inception phase
- all research activities consider the needs of city organisations who are the ultimate targets for uptake of research findings from the outset
- city organizations are involved as much as possible in the actual research activities and promote learning related to SWITCH research
- research is linked as far as possible to ongoing activities with the demonstration cities
- research activities on various sub-themes are linked to the demonstration projects
- all research themes and sub-themes consider the linkages, opportunities and tradeoffs with other sub-theme activities

The principles presented in the Fano Guidelines (Building Capacity for Local Sustainability) developed by the DISCUS project (Developing Institutional and Social Capacities for Urban Sustainability; [www.governingsustainablecities.org](http://www.governingsustainablecities.org)) will form an initial basis for developing learning alliances within the demonstration cities.

### **Research Themes**

The seven themes being developed through SWITCH cover all the main areas of research and development that are needed immediately to develop a new paradigm for urban water management. The seven themes (one management and training theme and six R&D



# SWITCH

themes) are presented in Table 1 and the relationships between the six major R&D themes and the perceived needs for research are identified in Table 2. Each research theme is divided into work packages. The main elements for each work package are summarised here but these may change in response to the needs of the members of the Learning Alliances in the demonstration cities.

The associations and links between the six R&D themes are presented pictorially in Figure 2 below.

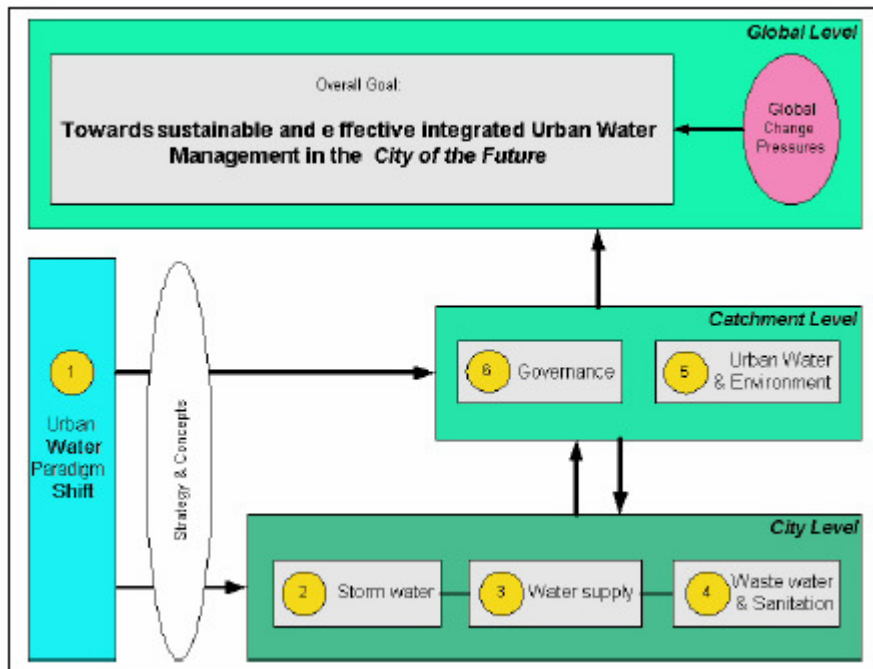


Figure 2: Associations and links between the R&D themes to meet the project goal

The main objectives for each theme are:

### *Theme 1: Urban Water Paradigm Shift*

- To develop a coherent strategic approach for integrated UWM based on sustainability and risk assessment indicators, which will guide actions under the Paradigm Shift and responds effectively to important global change pressures.
- To develop effective and interactive computer models for the analysis, integration, and validation of technological options and scenarios, and to develop a decision support system.
- To provide a framework by which the science and technology developments and innovative concepts generated under SWITCH can be optimally integrated into existing urban water infrastructure and management systems.
- To improve the integration of the UWM dimension in the overall urban planning process and to evaluate the conditions to be fulfilled and the overall approach for proper implementation of these instruments.



*Theme 2: Storm water management*

- To investigate, and assess the risks of storm water technologies and approaches for storm water control, which are appropriate for coping with the effects of different global change drivers whilst maintaining efficient levels of prevention/protection against flooding, water pollution and water shortage.
- To develop concepts of sustainable storm water resource use which cities can utilise for their own storm water management strategies, and identify catchment-scale storm water management strategies for integration into urban land management planning, thus contributing to the delivery of the requirements of the EU Water Framework Directive (WFD).
- To resolve technical and environmental issues that have a potentially significant impact on the application and uptake of specific urban storm water control options under consideration

*Theme 3: Efficient water supply and water use for all*

- To develop and test holistic demand management tools, encompassing commercial and physical aspects, with the aim of reducing water wastage and providing educational material on the two main components of losses (commercial and physical) to enable local operators (public or private) to effectively manage demand in their water supply systems.
- To develop and demonstrate sustainable treatment (and storage) technologies for the promotion of safe waste water reuse
- To determine the technical, ecological, economic and social feasibility of a novel upgrading method of secondary effluent from waste water treatment plants, to be utilized for city greening and stream rehabilitation.

*Theme 4: Water use in sanitation and waste management*

- To develop, demonstrate and disseminate pollution-prevention based approaches to wastewater handling in urban areas based on Ecological Sanitation (ecosan).
- To develop sustainable industrial emission standards and demonstrate their use and applicability in the tannery industry in Bogota, Colombia.

*Theme 5: Urban water environments and planning*

- To develop instruments and methods for the improved integration of UWM into the sustainable management of rivers, lakes, and other (urban) water bodies and their landscape systems in UWM, under increasing pressures from urban sprawl, density, pollution, and climate variability.
- To develop instruments and methods for the integration of existing urban water infrastructure, such as channels, ports, and other engineered waterscapes in the urban water cycle and river basin ecosystem.
- To improve urban and peri-urban livelihoods and urban food security in selected Demo-cities, through sustainable and integrated multi-functional land use,



including efficient use of freshwater, storm- and waste water in urban agriculture and forestry.

- To assess and maximize the use of natural systems and processes for the effective management of water supply, sanitation and urban drainage services, and of the urban water cycle as a whole.

*Theme 6: Governance and institutional change*

- The leading governance work package (**governance for integrated urban water management**) focuses on analysis and development of guidelines. These aim to: 1) critically examine existing institutional arrangements, and governance constraints and opportunities towards implementing IUWM; 2) to identify and test effective means of facilitating institutional co-operation and co-ordination, especially lessons from Learning Alliances as mechanisms for institutional change for IUWM; and 3) to develop and validate replicable guidelines to support procedural equity in stakeholder engagement in IUWM including appraisal and communication tools
- The **learning alliance** work package focuses on bringing about institutional change and aims to: 1) optimize the integration of research and demonstration activities at the city level; 2) effect - establish procedures and facilitate the institutional changes necessary for scaling-up the strategic findings of participating organisations and networks within these cities (e.g. lessons for policy and practice at neighbourhood, city, catchment, and national levels); and 3) identify and document the mechanisms and processes associated with institutional learning and change across cities through the 'learning alliance approach', and consolidate and share the lessons learnt for global impact.
- The **optimising social inclusion** work package focuses on improving knowledge and skills at all levels, and where necessary change attitudes, for conducting pro-poor, socially inclusive, participatory planning and management processes at city level
- The **Financing, cost recovery and institutional models** work package aims to: 1) determine which sources of finance have been used for the demo projects in different cities and some other relevant examples; 2) identify partnerships developed to finance the innovative water and sanitation projects; 3) find out whether innovative financial instruments and appropriate legal forms been used, involving the private sector; and 4) check which cost recovery systems have been introduced and whether they have been effective.



# SWITCH

Table 1: SWITCH Themes and Work-packages.

Theme	Sub-Theme	Title	Coordinator
0 - Overarching activities <b>UNESCO-IHE</b>	0.1 0.2 0.3	-Project management -Dissemination and training -Switch demonstration cities	UNESCO-IHE ICLEI UNESCO-IHE
1 – Urban water paradigm shift <b>UNESCO-IHE</b>	1.1 1.2 1.3 1.4	-Development of a strategic approach and of indicators for sustainability and risk assessment -Modelling of urban water systems and the development of a decision support system - Integration of existing infrastructure - Strategic planning, implementation and performance assessment	UNESCO-IHE UNESCO-IHE UA EPFL
2 – Storm water management <b>MU</b>	2.1 2.2 2.3	- Technological options for storm water control under conditions of uncertainty - Decision-making processes for effective urban storm water management - Environmental change studies for storm water control and reuse options	MU MU UNI-BHAM
3 – Efficient water supply and water use for all <b>HUJI</b>	3.1 3.2 3.3	- Demand management for optimization of urban water services - Safe water reuse - Urban water supply and use – other productive reuses	WEDC UNESCO-IHE HUJI
4 – Water use in sanitation and waste management <b>WU</b>	4.1 4.2	- Eco-sanitation and decentralised waste water management in an urban context - Management of industrial emissions	WU UNESCO-IHE
5 – Urban water environments and planning <b>UNI-BHAM</b>	5.1 5.2 5.3	- Urban Waterscapes _ Planning and Development in Urban Transformation Processes - Use of urban water (fresh and wastewater) for urban agriculture and other livelihood opportunities. - Maximising the use of natural systems in all aspects of the municipal water cycle	TUHH ETC UNESCO-IHE
6 – Governance and institutional change <b>IRC</b>	6.1 6.2 6.3 6.4	- Governance for integrated urban water management - Learning alliances - Optimising social inclusion - Financing, cost recovery and institutional models	MU IRC IRC UNESCO-IHE

Table 2: Relationship between perceived research needs and research themes.

State of the art/Problem	SWITCH Themes
Inappropriate 19th Century framework (the conventional urban water cycle)	1. Urban Water Paradigm Shift
Urban Water Quantity problems (flooding and droughts)	2. Storm water management
Urbanisation and inequality/disparity	3. Efficient water supply and water use for all
Low wastewater and sanitation coverage with corresponding ecological and public health damage	4. Water use in sanitation and waste management
Limited development of the role and potential use of natural systems and processes for effective Urban Water Management	5. Urban water environments and planning
Out of date governance structures and fragmented institutions	6. Governance and institutional change



## Research Partners

The current research partners are listed below. The list is likely to expand as new members are invited to join through additional funding calls of the European Union under Framework VI. Associated partners are also likely and a proposal is currently being prepared to suggest the best way to bring in other research networks and organisations that can contribute effectively to the work of the project. The coordinating partner is UNESCO-IHE.

1. UNESCO-IHE Institute for Water Education (UNESCO IHE), the Netherlands
2. Stichting International Water and Sanitation Centre (IRC), the Netherlands
3. ETC Foundation (ETC), the Netherlands
4. Wageningen University (WU), the Netherlands
5. Middlesex University Higher Education Corporation (MU), the United Kingdom
6. The University of Birmingham (UNI BHAM), the United Kingdom
7. Ove Arup and partners Limited (ARUP), the United Kingdom
8. UGMT Limited (UGMT-NRI), the United Kingdom
9. Technische Universität Hamburg – Harburg (TUHH), Germany
10. Mekorot Israel National Water Co (MEKOROT), Israel
11. The Hebrew University of Jerusalem (HUJI), Israel
12. Chongqing University (CHONU), China
13. Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences (IGSNRR CAS), China
14. Ayuntamiento de Zaragoza (AYTO), Spain
15. University of Lodz (UL), Poland
16. International Water Management Institute (IWMI), Ghana
17. Department of Civil Engineering, Kwame Nkrumah University of Science and Technology (DCE-KNUST), Ghana
18. Prefeitura Municipal de Belo Horizonte (SUDECAP), Brasil
19. Univesidade Federal de Minas Gerais (EFMG), Brasil
20. ICLEI – European Secretariat, GmbH (ICLEI), Germany
21. Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland
22. National Technical University of Athens (NTUA), Greece
23. Centro Inter-Regional de Abastecimiento y Remocion de Agua2 (CINARA), Colombia
24. IPES - Promocion del Desarrollo Sostenible (IPES), Peru
25. Ingenieurgesellschaft Prof. Dr. Sieker mbH (IPS), Germany
26. Technische Universität Berlin (TU BERLIN), Germany
27. Loughborough University (WEDC), United Kingdom
28. House of Water and Environment (HWE), Palestine
29. Center for Environment and Development for the Arab Region and Europe (CEDARE), Egypt
30. Universidad Nacional (UNAL), Colombia
31. University of Abertay (UA), United Kingdom
32. Hamburg Municipality (FHH/BSU/LP), Germany

Each partner is working on several work packages and the links between the work packages and the partner activity is shown in Table 3.



# SWITCH

Table 3: Partner Activity by Theme

Partners		Theme 0			Theme 1				Theme 2			Theme 3			Theme 4		Theme 5			Theme 6			
Nr.	Name	0.1	0.2	0.3	1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	5.1	5.2	5.3	6.1	6.2	6.3	6.4
1	UNESCO-IHE	*	*	*	*	*					*		*		*	*		*	*	*	*	*	*
2	IRC	*	*	*								*			*	*		*	*	*	*	*	*
3	ETC	*	*	*											*	*		*	*	*	*	*	*
4	WU	*	*	*											*	*		*	*	*	*	*	*
5	MU	*	*	*					*	*	*							*	*	*	*	*	*
6	UNI BHAM	*	*	*	*	*					*		*					*	*	*	*	*	*
7	ARUP	*	*	*					*	*	*							*	*	*	*	*	*
8	UGMT-NRI	*	*	*					*	*	*							*	*	*	*	*	*
9	TUHH	*	*	*											*	*		*	*	*	*	*	*
10	MEKOROT	*	*	*											*	*		*	*	*	*	*	*
11	HUJI	*	*	*	*	*								*	*	*		*	*	*	*	*	*
12	CHONU	*	*	*										*	*	*		*	*	*	*	*	*
13	IGSNRR CAS	*	*	*										*	*	*		*	*	*	*	*	*
14	AYTO	*	*	*								*	*	*				*	*	*	*	*	*
15	UL	*	*	*								*	*	*				*	*	*	*	*	*
16	IWMI	*	*	*										*	*	*		*	*	*	*	*	*
17	DCE-KNUST	*	*	*										*	*	*		*	*	*	*	*	*
18	SUDECAP	*	*	*	*	*			*	*	*						*	*	*	*	*	*	*
19	UFMG	*	*	*	*	*			*	*	*						*	*	*	*	*	*	*
20	ICLEI	*	*	*														*	*	*	*	*	*
21	EPFL	*	*	*				*	*	*								*	*	*	*	*	*
22	NTUA*	*	*	*														*	*	*	*	*	*
23	CINARA	*	*	*	*	*												*	*	*	*	*	*
24	IPES	*	*	*					*	*	*				*	*		*	*	*	*	*	*
25	IPS	*	*	*					*	*	*							*	*	*	*	*	*
26	TU BERLIN	*	*	*									*	*	*			*	*	*	*	*	*
27	WEDC	*	*	*									*	*	*			*	*	*	*	*	*
28	HWE	*	*	*	*	*								*	*	*		*	*	*	*	*	*
29	CEDARE	*	*	*														*	*	*	*	*	*
30	UNAL	*	*	*											*	*		*	*	*	*	*	*
31	Abertay	*	*	*			*	*	*	*	*					*	*		*	*	*	*	*
32	FHH/BSULP	*	*	*			*	*	*	*	*					*	*		*	*	*	*	*

## Demonstration Cities

In addition to Birmingham there are 8 other demonstration cities. There are also several further locations (study sites) where specific research is being undertaken that are outside of the demonstration cities but are regarded as useful to the programme of work. Table 4 summarises the spread of activity within the cities. It is anticipated that changes will take place in this Table as the project evolves.

Table 4: Links between themes and demonstration cities and study sites.

			Theme 1				Theme 2			Theme 3			Theme 4		Theme 5			Theme 6			
			1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	5.1	5.2	5.3	6.1	6.2	6.3	6.4
<b>Demonstration Cities and local partners</b>																					
Hamburg	TUHH, FHH/BSULP	Germany										*	*	*	*	*	*				
Birmingham	UNI BHAM, ARUP	UK	*	**				*		*						*					
Lodz	UL	Poland														*					
Zaragossa	AYTO	Spain							*	*	*										
Tel Aviv	HUJI, MEKOROT	Israel	*	*						*	*	*									
Beijing	CHONU, IGSNRR CAS	China P.R.										*	*	*	*	*					
Alexandria	CEDARE	Egypt															*	*	*	*	*
Accra	IWMI, DCE-KNUST	Ghana								*	*	*	*	*	*	*	*	*	*	*	*
Belo Horizonte	SUDECAP, UFMG	Brasil	*	*			*	*	*	*	*										
<b>Study sites</b>																					
'Ruhrgebiet'	IPS	Germany					*	*	*	*	*										
Bogota	UNAL	Colombia										*	*	*	*	*	*	*	*	*	*
Cali	CINARA	Colombia	*	*												*	*	*	*	*	*
Lima	IPES	Peru										*	*	*	*	*	*	*	*	*	*



## **Training**

The overall aim is to disseminate the new knowledge, innovations and shared learning produced under the six main themes of the research on integrated urban water management among a wider audience including policy makers, the scientific community, sector implementers and the general public for the aim of supporting uptake and exploitation of the innovative urban water management strategies and approaches developed in the SWITCH project. Specific objectives are:

1. to produce a comprehensive and consistent SWITCH Training Package in English and an European focus for water professionals working with local governments covering the six main themes of the research project;
2. to adapt the training material (as above) to the institutional, administrative and knowledge framework conditions of four regions, i.e. for China, Latin America, South East Asia and Africa. In the case of China and Latin America translate the material into Mandarin and Spanish respectively;
3. to make the SWITCH training package part of the standing offer of five major training institutions in regions across the world (see above), including provision of capacity building of trainers to deliver;
4. to build the capacity of one major training provider each in China, Latin America, South-East Asia, Africa and Europe for delivering the SWITCH training based on a national or regional adaptation (as above);
5. to make the experiences and learning generated through the SWITCH project and its demonstration activities available to specific audiences as well as the general public;
6. to employ various channels and different types of media in order to reach a wider audience external to the SWITCH consortium, e.g. other cities, interested sector practitioners, policy makers and other stakeholders in the general public, including end-users.

## **Summary**

SWITCH is a large project which has the opportunity through its strategic approach and through its R&D contributions to have a significant impact on Integrated Urban Water Management. It is hoped that by integrating the research activity of the project with the aspirations of the memberships of the Learning Alliances that rapid uptake and scaling up of the research outputs from the project will be achieved during the 5 years of the project and thereafter.

RM/PS  
13<sup>th</sup> June 2006.