SWITCH

SWITCH Training Kit

INTEGRATED URBAN WATER MANAGEMENT IN THE CITY OF THE FUTURE

SIXTH FRAMEWORK PROGRAMME

'The design and management of the urban water system based on an analysis of the entire system will lead to more sustainable solutions than separate design and management of elements of the system.'

The SWITCH Training Kit

Integrated Urban Water Management in the City of the Future

One system – one approach!

From population growth to rapid urbanisation, changing consumption patterns to deteriorating infrastructure, increasing energy prices to climate change: water systems in cities throughout the world are confronted by an intimidating future. Integrated Urban Water Management (IUWM) can make a difference – and the SWITCH Training Kit has been developed to show how.

Designed for training workshops, but also for individual reading, the SWITCH Training Kit contains six modules covering all of the central features of urban water management (see diagram on the opposite page).

Users will also find insights into:

- the interactions between the different elements of the urban water cycle;
- the wide-reaching benefits of an integrated approach to managing water;
- the recommended phases of a strategic planning process; and
- ways and means to work with local stakeholders effectively.

Target group: Water managers, urban planners and engineers from local governments and water, wastewater and drainage utilities.

Accessibility: Freely available. The SWITCH training modules can be found on the attached CD-ROM. They can also be downloaded from the SWITCH Training Desk (www.switchtraining.eu) along with supporting resources, further training material and a set of practical case studies.

CD-ROM missing?
All SWITCH training materials can also be found at
www.switchtraining.eu

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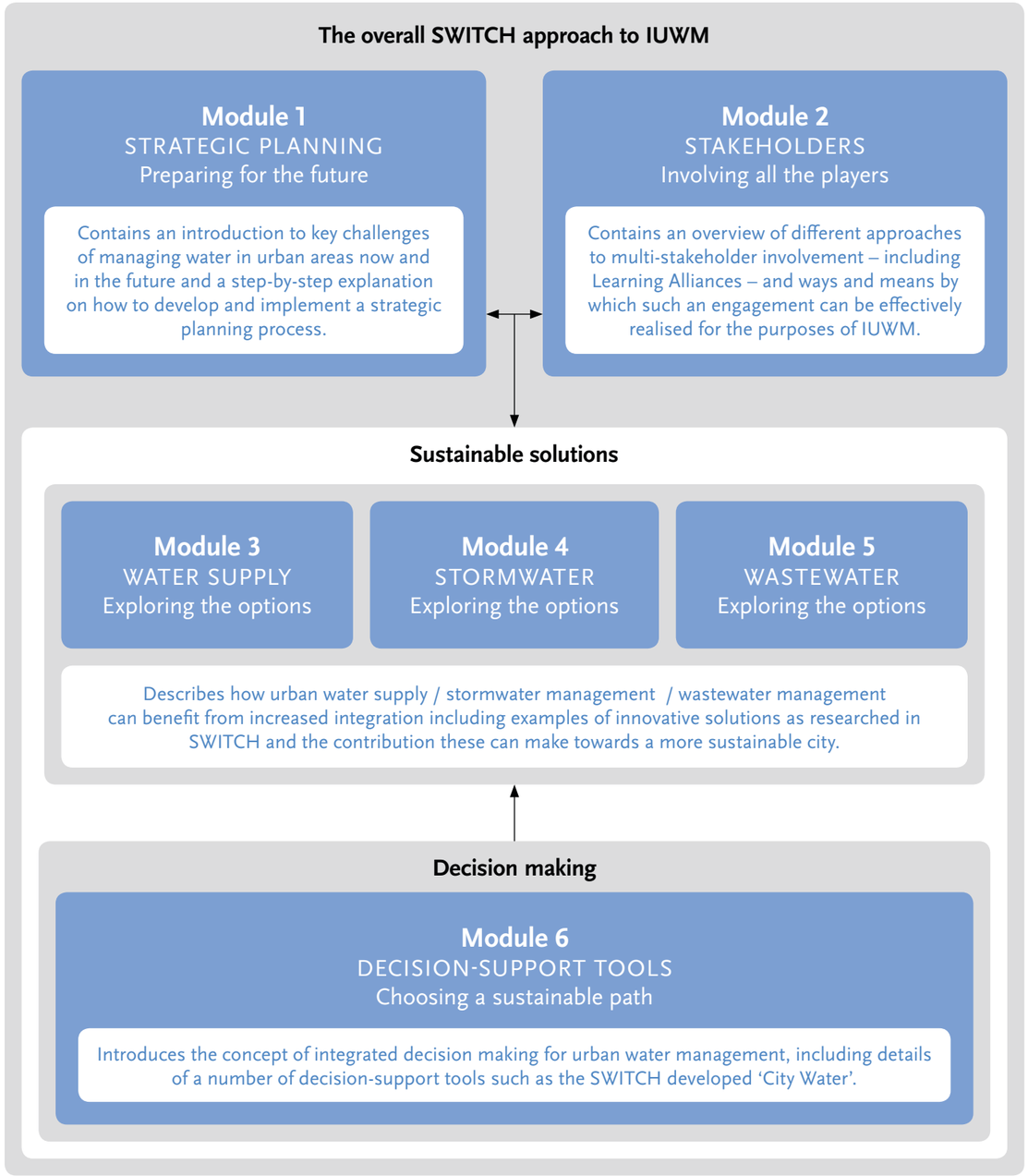
SWITCH Training Kit: All modules



Module 1

STRATEGIC PLANNING
Preparing for the future

In most cities, the different sectors of the urban water cycle – water supply, stormwater, wastewater – are managed by different departments and institutions with minimal coordination in their design and operation. Decisions are taken from a narrow perspective with little consideration for the long-term impacts across the city as a whole.

As pressures such as climate change, population growth and ageing infrastructure increase, this fragmented approach and its dependence on conventional technologies is no longer sufficient to deliver the water services that cities rely on.

Integrated Urban Water Management (IUWM) is an alternative approach. IUWM recognises that problems encountered in one area of the urban water cycle may be the result of (mis)management in another. By looking at water in the city as one system, holistic evaluation becomes possible leading to a more efficient and sustainable use of resources.

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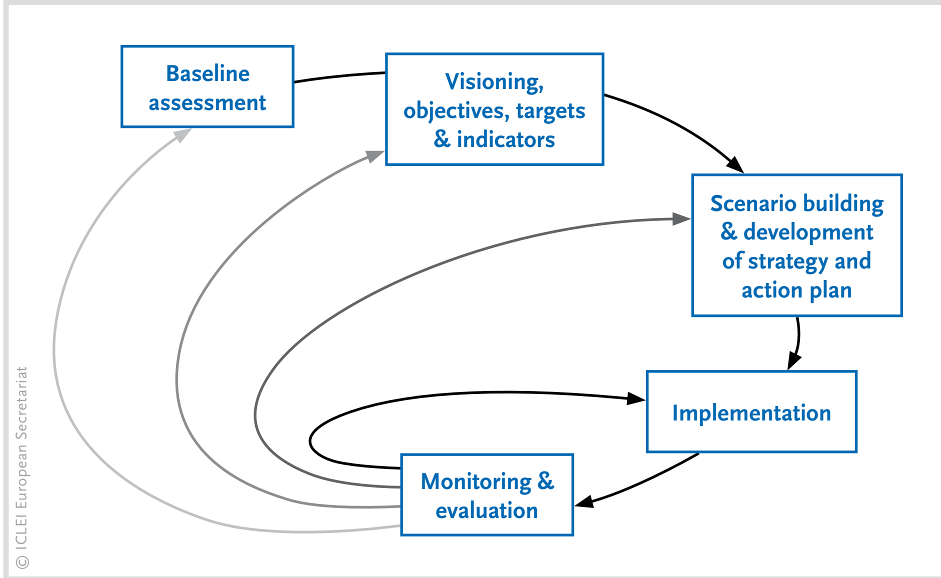
> **The SWITCH hypothesis:**
>
> *'The design and management of the urban water system based on an analysis of the entire system will lead to more sustainable solutions than separate design and management of elements of the system.'*

Module 1 introduces the concept of IUWM and describes how shifting from a conventional approach to urban water management towards an approach based on integration is more suitable to meet current requirements and cope with future uncertainty.

It also demonstrates how greater integration can be realised in practice through the adoption of a strategic planning process. Rather than investing in short-term solutions that focus solely on today's problems, the development and implementation of a strategic plan provides the framework for making sustainable urban water management a reality.



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More specifically, the module will assist users in gaining a solid understanding of:

- what constitutes an integrated approach to managing the urban water cycle and how it differs from a conventional approach;
- how IUWM can help move towards increased sustainability in the urban water cycle and urban development in general; and
- how to adopt IUWM through a long-term strategic planning process.

Module 2
STAKEHOLDERS
Involving all the players

Professionals in water utilities, regulators, environmentalists, government officials, tourists, urban farmers, entrepreneurs, energy providers, lawyers, communities marginalised from mainstream society: all leave their mark on water in the city. Some are users, some are decision makers – all are affected if the urban water cycle is managed poorly.

Many institutions and individuals using or dealing with the urban water system never think about how their actions impact upon water in other locations. Water falls from the sky, comes from the tap, is supplied through pipes - and is carried away in other pipes when it is dirty or flooding the streets. Different bodies are in charge of making sure this happens and communication between them is kept to a minimum.


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Water users and water institutions often only react when problems come to the surface causing tensions and frictions in society. This may be the case, for example, when citizens living in communities with poor water and sanitation services start protesting in front of the city hall about their unhealthy living conditions. Or when the competition for water resources between farmers and industries turns into a major conflict and catches the attention of the media. Or when environmental groups put the spotlight on politicians who have been bribed into ignoring the pollution of rivers and wetlands caused by a company's waste.


© Katarzyna Izydorczyk

Module 2 is based on the conviction that institutions acting in isolation and with little consideration of water users will have no future in urban water management. Big problems require big ideas to solve them and fragmentation doesn't help. Pooling the knowledge, experiences, and resources of stakeholders can significantly improve urban water management. Coordination of needs and interests as well as of strategies and actions is necessary to achieve more efficiency. Encouraging stakeholders to talk to each other is the first step to making Integrated Urban Water Management a reality.


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This module provides an overview of the most relevant stakeholders in urban water management as well as of a range of alternative ways of working with them. Among the different approaches, Learning Alliances stand out in times where water issues become increasingly complex. Learning Alliances are multi-stakeholder platforms that rely to a large degree on the participation of researchers who share their expertise in order to jointly tackle issues of common concern.

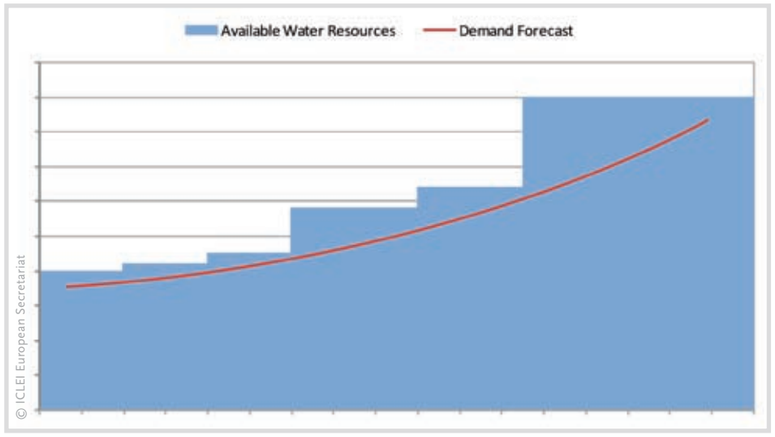
More specifically, the module will assist users in:

- distinguishing between 'good' and 'poor' involvement;
- understanding the rationale and the benefits of working with stakeholders;
- identifying the most important stakeholders in their city and getting them involved;
- planning and coordinating a stakeholder process in the long run;
- becoming aware about the costs and other challenges of stakeholder involvement; and
- assessing the stakeholder process and its outcomes.

Module 3
WATER SUPPLY
Exploring the options

As cities grow and develop, more water is needed to satisfy the increasing demands of domestic, industrial and commercial uses. Traditionally, the solution has been to dam more rivers, drill more boreholes and transfer water from neighbouring regions. But as limited resources become increasingly depleted, cities are running out of options, resulting in water scarcity and the inability to meet demand. Source pollution and the potential impacts of climate change exacerbate the problem further.

The opposite approach is to prioritise investment in reducing demand rather than increasing supply. When combined with source protection, natural water treatment techniques and the use of alternative supplies, such an approach can protect and enhance fragile water environments, reduce service costs and energy consumption, and even contribute to flood control and improved wastewater treatment.



Detachable poster:
The Water-Sensitive City of the Future

The electronic version of this image can be found on the website *www.switchtraining.eu* and on the CD-ROM containing the modules of the SWITCH Training Kit.

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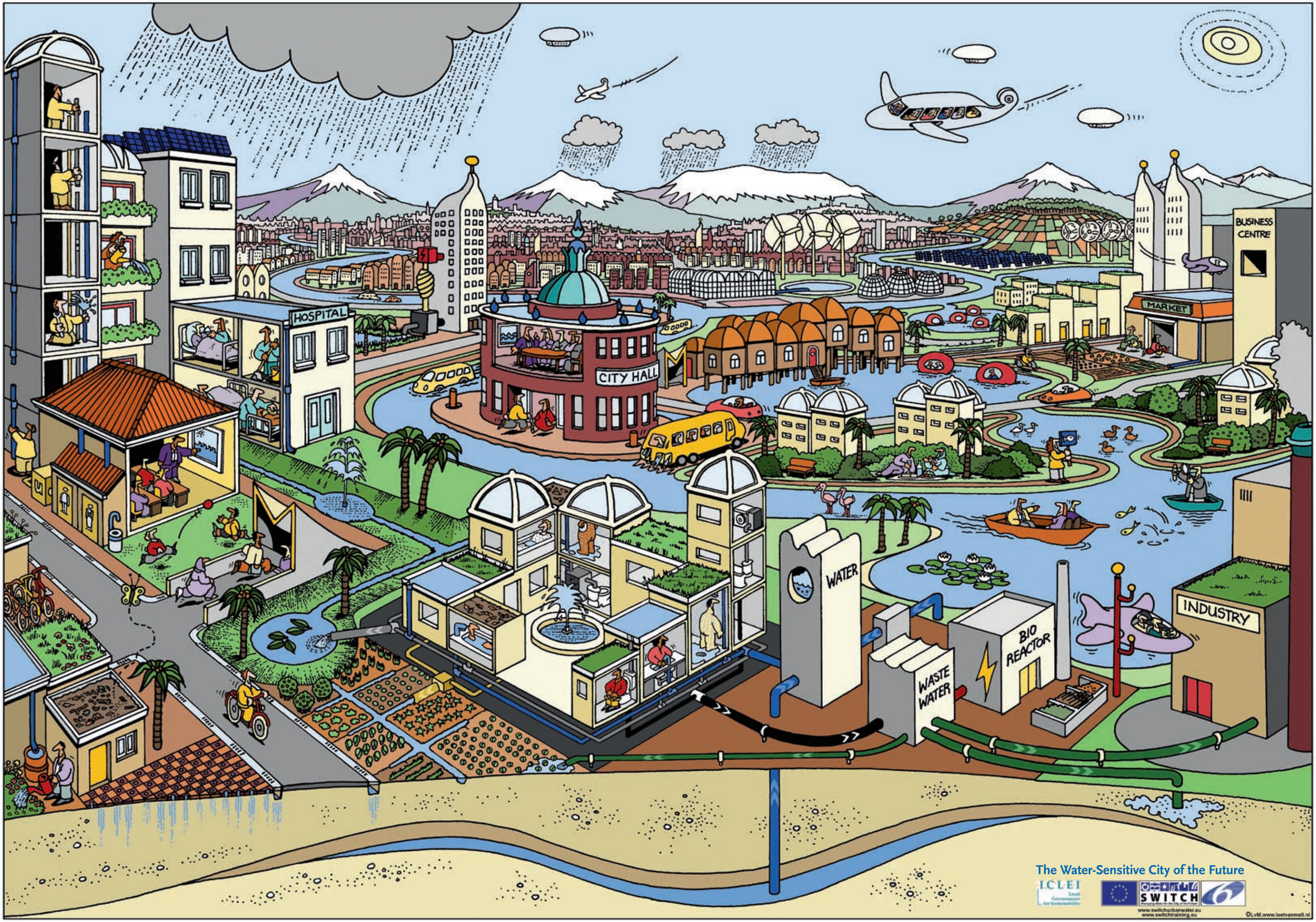
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Module 3 presents an overview of water supply in cities and how this influences, and is influenced by, the urban water cycle and urban development as a whole. The aim of the module is to reassess the conventional approach to urban water supply and to examine an integrated approach that can lead to more sustainable management of resources.

The module also introduces a number of alternative solutions that can replace conventional technologies while yielding additional benefits to urban water management and the quality of life in a city.

More specifically, the module will assist users in gaining a better understanding of:

- what constitutes a more sustainable approach to water supply and how this differs from a conventional approach;
- the direct and indirect benefits that a city can gain by prioritising demand management and alternative sources of supply over increased resource development;
- the opportunities that exist to improve potable water treatment efficiency, particularly through the use of natural systems; and
- the solutions available to put a more sustainable approach to water supply into practice.

Module 4
STORMWATER
Exploring the options

Posing a restriction to development and potential threat to infrastructure, stormwater in the city is typically considered a nuisance. The more a city grows the more problematic stormwater becomes. Urbanisation replaces vegetation with impermeable roofs, roads and paving, restricting the natural attenuation and infiltration of stormwater and creating greater volumes of runoff.

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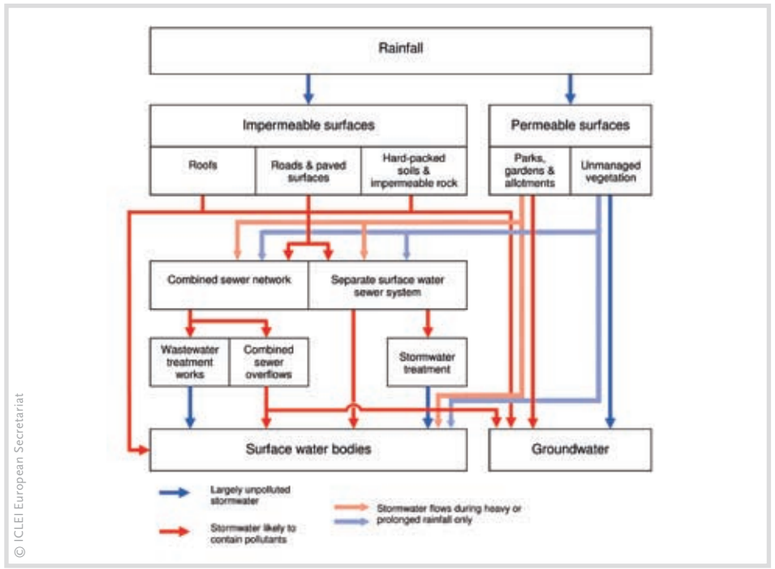
To cope with these increased volumes, urban drainage infrastructure is designed with the aim of conveying rainfall away from the city as rapidly as possible. Taking this approach has, however, negative implications, including localised and downstream flood risk, erosion of streams and riverbanks, groundwater depletion and pollution of receiving water bodies.



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Alternatively, stormwater can be approached and managed not as a nuisance but rather as a resource. By attenuating, infiltrating and reusing rainfall runoff within the city, stormwater management can become an attractive and beneficial feature of the urban landscape.

Module 4 highlights the problems caused by conventional urban drainage methods and explains the benefits of integrating stormwater with other sectors of water management and urban design. These include flood risk management, environmental protection, urban regeneration and the alleviation of water scarcity.

In addition, the module introduces a number of more sustainable urban drainage solutions, such as the use of ponds and wetlands for stormwater retention, vegetation and soils for attenuation, and aquifers for infiltration and reuse. It goes on to demonstrate how these can positively influence urban water management and city development as a whole.


© Johannes Gerstenberg

More specifically, the module will assist users to gain a better understanding of:

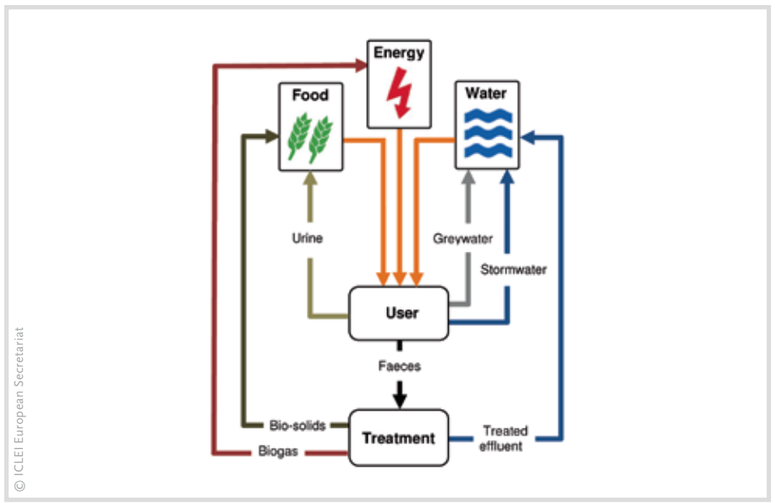
- what constitutes a more sustainable approach to stormwater management and how this differs from a conventional approach;
- the direct and indirect benefits that a city can gain by managing stormwater as a resource rather than as a restriction to urban development; and
- the solutions available to put into practice a more sustainable approach to stormwater management, including the use of natural systems.

Module 5
WASTEWATER
Exploring the options

Urban wastewater is made up of a variety of waste streams, such as faeces, urine, greywater, stormwater and industrial effluent; each differing in volume and composition. Conventional wastewater management is designed to combine these different streams during collection before applying centralised treatment and discharging the effluent to receiving water bodies.

Although capable of protecting human health and the environment, this approach to wastewater management can be inefficient and fails to extract and recycle many of the resources contained within the different streams. The system also lacks flexibility and copes badly with unexpected change such as rapid urbanisation and climatic variation.

As opposed to the combined and disposal-orientated approach of conventional wastewater management, an integrated approach is based on the separate collection and recycling of wastewater streams. This encourages, for example, the use of urine as fertiliser, the generation of biogas from sludge and the reuse of greywater for non-potable water consumption, leading to a range of benefits within and beyond the wastewater management sector.



Module 5 shows how the separate collection, treatment and reuse of different wastewater streams can recycle resources and improve treatment performance. It also demonstrates the positive impacts that this can achieve, particularly for water security, urban agriculture, environmental protection and energy consumption.

A variety of decentralised options that can replace or complement conventional wastewater management infrastructure is introduced. These include technologies that facilitate wastewater separation and reuse as well as flexible treatment solutions that make use of natural systems such as ponds, wetlands and soils.

More specifically, the module will assist users to gain a better understanding of:

- what constitutes a more sustainable approach to wastewater management and how this differs from a conventional approach;
- the direct and indirect benefits that a city can reap by managing wastewater as a resource rather than as a waste product; and
- the solutions that are available to put a more sustainable approach to wastewater management into practice, including the use of natural systems.

Module 6

DECISION-SUPPORT TOOLS
Choosing a sustainable path

Due to the large investment costs and long life span of pipelines, reservoirs and treatment plants, long-term planning is a vital aspect of urban water management. Traditionally, investment and planning decisions are taken independently within different sectors, based on narrowly defined aims and implementation costs. Quantified data and future forecasts are used to identify a solution that addresses a current or anticipated problem under presumed conditions.

This approach leads to the selection of solutions that are optimal for a confined area and specific goal of urban water management. However, it typically lacks the scope to also identify negative knock-on effects – as well as benefits – elsewhere in the system, since it fails to assess the urban water cycle as a whole. In addition, the faith placed in future predictions tends to favour rigid solutions only capable of operating within a rather limited range of variability.

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Integrated modelling and decision-support tools can help assess the urban water cycle from a holistic perspective and facilitate decision making that has a higher chance of leading to sustainable solutions. Rather than focusing only on the economic cost of providing/treating/disposing of a certain quantity of water, an integrated assessment also considers a range of less direct benefits and impacts associated with the natural environment, economy and overall quality of life in the city.

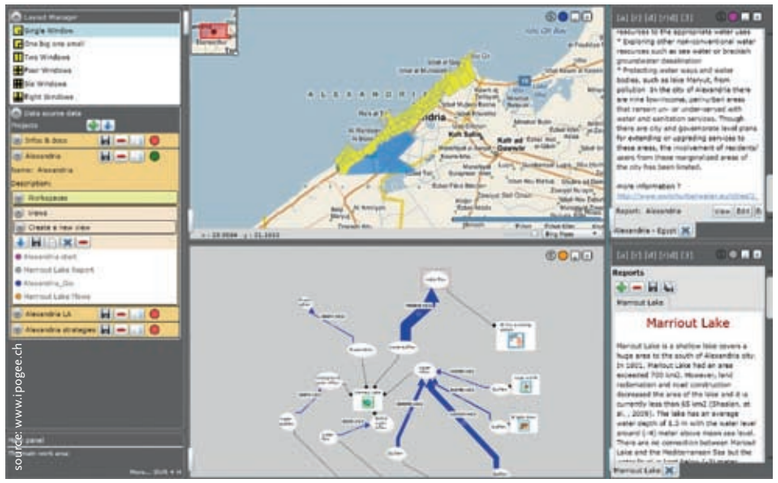
Crucially, integrated decision making acknowledges uncertainty and prioritises interventions that have the flexibility to cope with a range of possible future scenarios, thereby improving the adaptive capacity of the city's water system.

Module 6 introduces a number of decision-support tools that are available to help water managers and urban planners assess the impacts of different actions and policies on urban development more broadly. These tools allow decision makers to explore a range of alternative interventions by providing a system that collects, interprets, revisits and updates the vast amount of information that inevitably needs to be managed.

Adaptable to local circumstances, the tools discussed in this module focus on specific areas of the urban water cycle, such as stormwater management and water supply, whilst ensuring that the input data and interpretation of outputs are placed firmly in the context of IUWM.

More specifically, the module will assist users to gain a better understanding of:

- the way in which integrated decision making utilises information and knowledge to assess the urban water cycle holistically, manage future uncertainty and promote multi-stakeholder engagement;
- how Decision Support Systems can be used to manage large quantities of data and model the impacts of potential strategies and scenarios;
- the use of indicators to evaluate results of data assessment and present complex output to a wider audience; and
- the practical details of selected tools, including the SWITCH developed City Water.



The SWITCH project aimed to achieve more sustainable urban water management in the "City of the Future". A consortium of 33 partner organisations from 15 countries worked on innovative scientific, technological and socio-economic solutions with the aim of encouraging widespread uptake around the world.

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Find out how we can help with your training needs

ICLEI, in cooperation with specialist SWITCH partners, offers tailor-made training workshops on all of the subjects covered by the SWITCH Training Kit. Please contact us if your organisation is interested in building its capacity for Integrated Urban Water Management.

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