

LEARN how to evaluate the performance of your stormwater and wastewater systems and how to identify optimal rehabilitation strategies with the use of latest modelling approaches.

GRASP new model-based concepts that can be applied to your asset management practice, risk management, optimisation of investments, and full lifecycle planning.

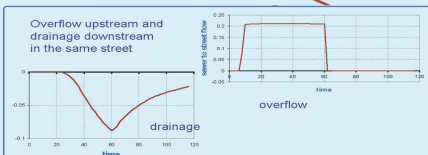
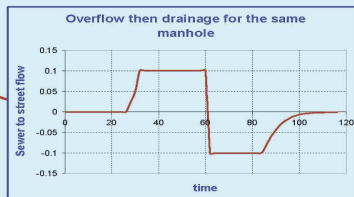
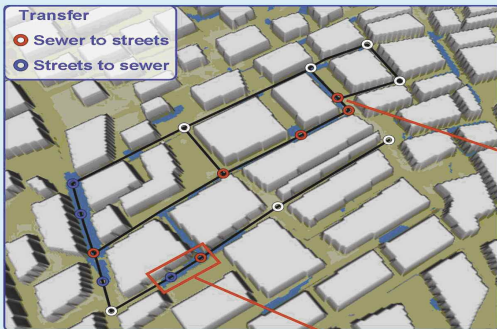
GAIN a thorough understanding of the latest modelling tools and techniques that can help you to better manage your stormwater and wastewater assets.



A SHORT COURSE ON URBAN HYDROINFORMATICS

PUB, SINGAPORE

This short course is structured in a flexible way. Depending on the specific training needs of different interested parties, the scope, date, duration and level of details can be adapted.



UNESCO-IHE
Institute for Water Education



Water for All: Conserve, Value, Enjoy

URBAN HYDROINFORMATICS is concerned with the modelling of urban water systems and the use of communication and information technologies for sustainable urban water management.



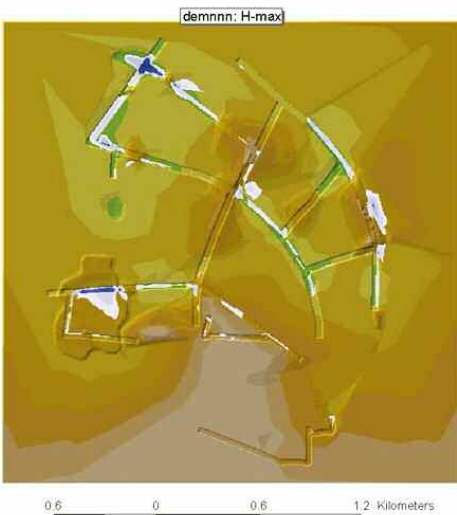
This short course is structured in a flexible way. Depending on the specific training needs of different interested parties, the scope, duration and level of details can be adapted. This brochure describes a general framework which can be easily moulded into a blend of deliverables provided by course facilitators.

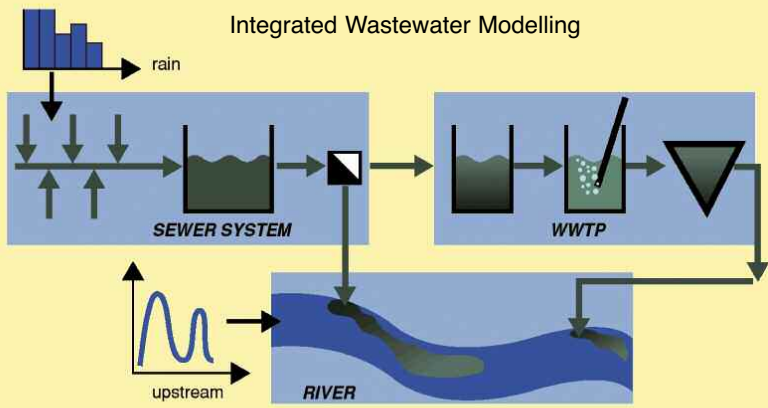
BACKGROUND

Urbanisation in developing countries doubled from less than 25% in 1970 to more than 50% in 2006. It is widely accepted that Urban Hydroinformatics is a necessity for maintaining the environmental integrity and economic functions of the city. However, to do so it requires substantial investments and intensive, long-term cooperation among many stakeholders. Supply of potable water typically enjoys a far higher priority than wastewater management; The UN Millennium Development Goals state that nearly 3 billion people, most in developing countries, still lack access to adequate wastewater facilities. Furthermore, the relentless migration of people from rural areas to cities, uncoordinated developments activities, changing climate and increasing operational and maintenance costs put growing pressure on urban services, and especially on the management of emergencies and disasters.

The situation is even more difficult when taking into account the obvious gap between development levels in stormwater and wastewater services between countries. Undoubtedly, all the countries face challenges in their asset management of different types and levels of complexity. While some countries are still struggling to get basic sanitation facilities, others are implementing state of the art technologies. Very few countries have a respectable proportion of their wastewater collected and treated; some countries have practically no collection and treatment facilities at all. While the sector, financial and project management, and operation and maintenance programmes in some countries are heading towards EU standards, in others it is still very difficult to implement projects and run the facilities in a sustainable way. This reality presents a range of challenges and justifies delivery of a short course on Urban Hydroinformatics.

Flood Modelling and Disaster Management





OBJECTIVES

This short course offers an ideal opportunity for participants to refresh their knowledge with the latest modelling approaches and practices and to build on their experience base. The focus will be given to stormwater and wastewater systems, the assessment of their performance and their impacts on urban environment.

In particular, the participants will:

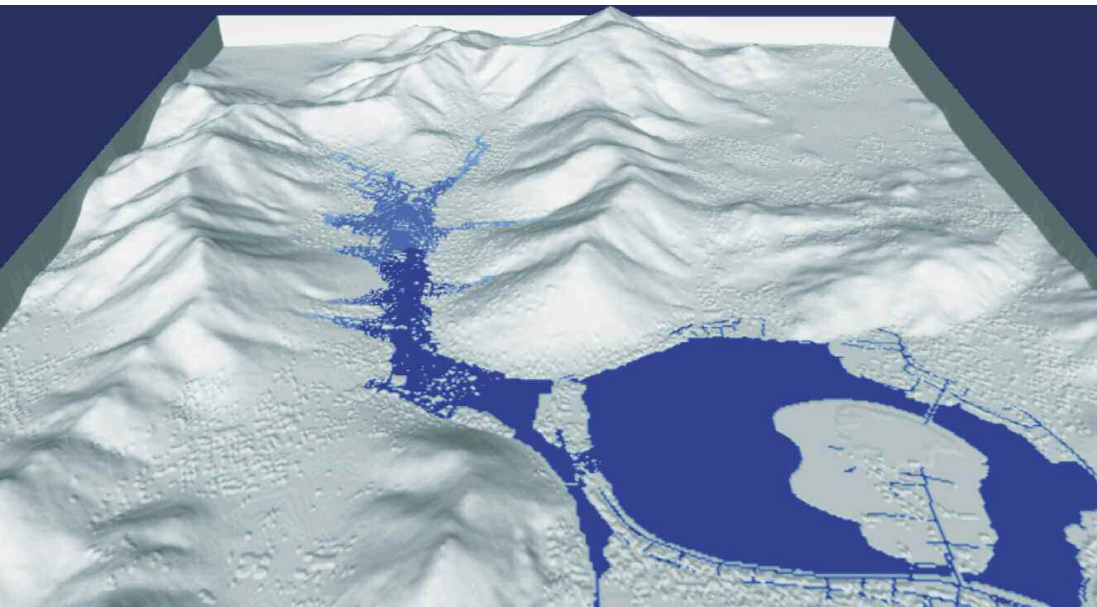
- be exposed to state-of-the-art information on the fast-developing modelling and management techniques and tools;
- have an opportunity to present and share their modelling and management problems with course facilitators and with colleague-participants;
- be exposed to the latest modelling tools used in management of stormwater and wastewater systems and be guided on how to properly address the identified challenges with such tools, not only in situations where sufficient resources are available, but also under the more challenging conditions which can be experienced in real-life;
- have an opportunity to learn about the problems experienced in different cities around the world, and their potential solutions; and
- be given an overview of recent results obtained from the latest industry applications and research projects (for example SWITCH).

OUTLINE

The course consists of a balanced combination of interactive lectures, workshops, real-life studies and computer-based applications. The course should stimulate the exchange of professional experiences among participants and UNESCO-IHE/PUB staff. In addition, an interactive problem-driven session will be organised during which both lecturers and participants will work out conceptual solutions for real-life cases.

The course activities cover the following topics:

- current and future developments in stormwater and wastewater management;
- state-of-the-art tools for modelling, design and operation of stormwater and wastewater infrastructure;
- integrated management of urban water cycle;
- city of the future - SWITCH project;
- practical examples from different cities around the world;
- new concepts: from sewer systems design to integrated planning;
- new approaches for flood damage assessment;
- urban flood modelling with 1D/1D-2D tools;
- use of GIS and Remote Sensing;
- early warning systems;
- overflow modelling/analysis; and
- advanced model-based asset management and whole life cycle assessment.



MODELLING STORMWATER AND WASTEWATER COLLECTION SYSTEMS

- Modelling theory
- Modelling systems (physically-based 1D – 2D, data-driven and computational intelligence)
- Floodplain modelling and analysis
- Separate wastewater and stormwater collection networks
- Combined sewer networks
- Inflow and infiltration
- Predicting the performance of sewer overflows and their impact on receiving waters
- Flood forecasting and management
- Innovative modelling approaches

MODEL-BASED ASSET MANAGEMENT AND OPTIMISATION

- Key principles of advanced asset management
- The role of models in advanced asset management
- Optimisation of rehabilitation of wastewater networks
- Single-criteria and multiple-criteria optimisation principles
- Approaches to solving single-criterion and multiple-criteria optimisation problems
- Global search, evolutionary algorithms and methods of computational intelligence
- Asset condition modelling

INTEGRATED MODELLING AND ASSESSMENT

- Why integrated modelling?
- Understanding the degree of interaction between different processes within the wastewater cycle
- Modelling interaction between subsurface and above surface flows
- Modelling interaction between different components of wastewater cycle
- Issues and challenges in integrated modelling and assessment
- Sequential and parallel simulations
- Real Time Control
- New concepts from stormwater/wastewater design to integrated planning

MODELLING ENVIRONMENTAL IMPACTS

- Sources of pollution in urban areas
- Modelling pollution transport
- Surface runoff quality
- Sediment transport
- Advection-dispersion
- Water quality processes
- How to assess impacts and evaluate different mitigation options
- Dynamic modelling of pollutants from sewer overflows

WATER RECLAMATION AND REUSE

- Introduction
- Water reclamation in Singapore
- Chlorination and chloramination
- Membrane processes
- UV disinfection
- NEWater production process
- Membrane bioreactor (MBR) and MBR-RO
- RO brine treatment and recovery
- Future trends

MODELLING WATER RECLAMATION PLANTS

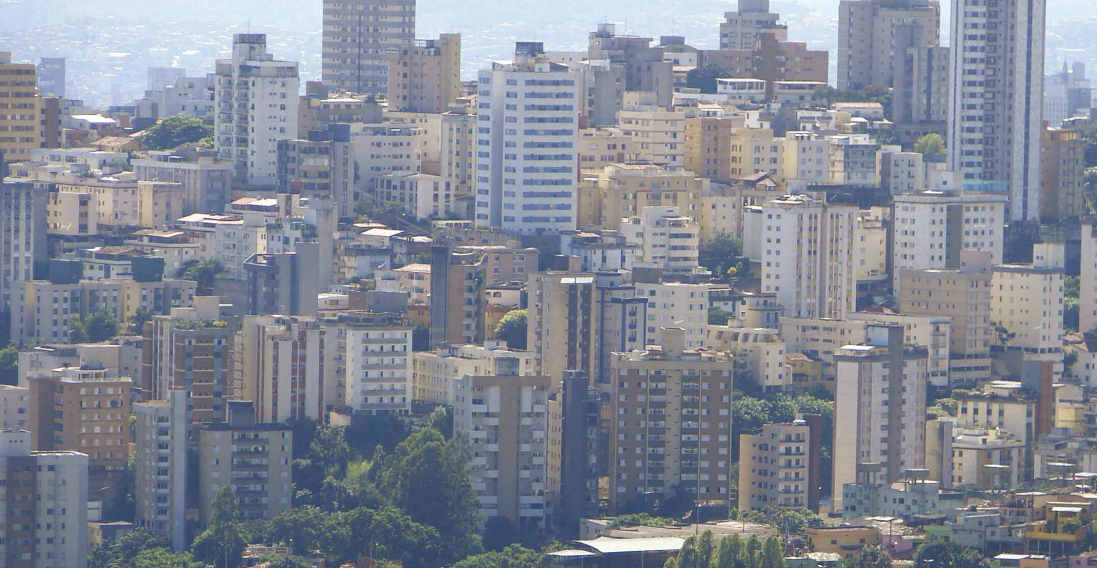
- Benefits of modelling
- Types of modelling
- Steps of modelling
- Parameter identification in modelling
- Activated Sludge Models
- Modelling and simulation softwares
- Case study: Biological Nitrogen Removal Activated Sludge Process in Warm Climates
 - Approaches and procedures
 - Parameter calibration
 - Parameter verification
 - Simulation with verified model

DESIGN OF RAINFALL/FLOW/WATER LEVEL MEASUREMENTS AND WATER QUALITY SAMPLING PROGRAMMES

- Frequency of measurements/samples and selection of appropriate time steps
- Rainfall and flow/water level measurements (principles and technology overview)
- Water quality measurements (principles and technology overview)
- Database development for temporal data collection
- Optimal selection of rainfall and flow/water level gauge locations for model calibration and operational purposes
- Optimal design of water quality sampling locations at treatment plant and receiving waters for model calibration and operational purposes
- Data processing and analysis

GIS AND DSS IN STORMWATER AND WASTEWATER MANAGEMENT

- Theory and application of GIS and remote sensing for urban infrastructure management
- Database development and mapping of spatial features
- Combining different kinds of data within the GIS framework
- GIS as an integral part for effective DSS in wastewater management
- Key aspects in designing effective architectures for DSS and other stormwater/wastewater management information systems



TRAINING METHODOLOGY

This course will apply problem-based learning using real-life examples and case studies.



PARTICIPANTS PROFILE

The target groups are engineers and scientists with background in Civil, Mechanical, Chemical, and Environmental Engineering, or from any other neighbouring discipline who want to gain new knowledge and to build up on their existing knowledge. Participants who can demonstrate a strong professional inclination towards, or need for, urban stormwater and wastewater management in their sphere of work are particularly encouraged to participate.

The course can be tailored for participants coming from different backgrounds (academic, private sector, government) and levels within their organisations. Good English skills are essential. The course can accommodate up to 30 participants.

LANGUAGE

The course's working language is English.

IF YOUR ORGANISATION IS INTERESTED

This course can be tailored to the training needs of individual stormwater/wastewater sector organisations such as professional associations, wastewater authorities and consulting companies. Organisations wishing to offer this course to their employees or members can contact PUB (fong_han_loong@pub.gov.sg).

FACILITATORS

Dr. Zoran Vojinovic, Associate Professor of Hydroinformatics at UNESCO-IHE, has over 13 years of research and industrial experience working in various aspects of water industry in New Zealand, Australia, Europe, Caribbean and South America. While working on different water-related projects, his roles ranged from a specialist advisor for water boards and governments to the multidisciplinary team leader and technical manager for projects which involve modelling and design of various complex water engineering systems, software development, hydrological and hydraulic catchment studies, asset planning, hydrometric data collection, database development and project management.

Dr. Cao is a Senior Research Scientist at the Centre for Advanced Water Technology, a Division of Singapore Utilities International (a wholly owned subsidiary of Public Utilities Board (PUB), Singapore). He is a water pollution control and water quality specialist with over thirty years work experience. He is particularly interested in biological wastewater treatment focusing on process development and optimization. Currently, he is working on nutrient removal, integrated anaerobic and aerobic sewage treatment, water reuse using activated sludge and membrane coupled process. He is also a consultant with the European Commission and The World Bank.

Mr. Ang Chee Meng is an Assistant Scientist at the Centre for Advanced Water Technology (CAWT), a division of PUB Consultants Private Limited, which is a wholly owned subsidiary of Public Utilities Board (PUB), Singapore. He was awarded the Degree of Bachelor of Engineering (Environmental) from the National University of Singapore (NUS). He has been a key member of a series of applied research projects. His project references include the Public Utilities Board (PUB) of Singapore, FujiHunt Photographic Chemicals Pte Ltd and Baxter Singapore Pte Ltd, etc. He is currently involved in several PUB-SUI joint projects on nutrient removal and water reuse by integrated activated sludge and membrane bioreactor system.

Dr. Tao Gui He is a Senior Research Scientist with over 20 years of experience and Section Head at the Centre for Advanced Water Technology, a Division of Singapore Utilities International, which is a wholly owned subsidiary of Public Utilities Board. He is the process consultant for Beijing microfiltration hybrid membrane plant and Singapore Ulu Pandan membrane bioreactor plant as well as design consultant of the water reclamation plant design subject of the National University of Singapore. He is also actively involved in the development of MBR, CDI process and other innovative water and wastewater treatment processes as well as the applications in water reclamation and industrial wastewater treatment.

The UNESCO-IHE Institute for Water Education is established in 2003. It carries out research, education and capacity building activities in the fields of water, environment and infrastructure. UNESCO-IHE continues the work that began in 1957 when IHE first offered a postgraduate diploma course in hydraulic engineering to practising professionals from developing countries.

The Institute is based in Delft, the Netherlands, and is owned by all UNESCO member states. It is established as a UNESCO 'category I' institute jointly by UNESCO and the Government of the Netherlands. The Institute is the largest water education facility in the world, and the only institution in the UN system authorised to confer accredited MSc degrees.

UNESCO-IHE is instrumental in strengthening the efforts of other universities and research centres to increase the knowledge and skills of professionals working in the water sector. The member states of UNESCO have access to the knowledge and services of UNESCO-IHE in human and institutional capacity building, which is vital in their efforts to achieve the Millennium Development Goals, the Johannesburg Plan of Implementation (Agenda 21) and other global water objectives.

WWW.UNESCO-IHE.ORG/EDUCATION



Water for All: Conserve, Value, Enjoy

About PUB

PUB, Singapore's national water agency is in charge of planning, managing and safeguarding Singapore's water resources. PUB manages the complete water cycle along the entire Water loop from sourcing, collection, purification and supply of drinking water, to treatment of used water and turning it into NEWater; with the aim of ensuring an efficient, adequate and sustainable water supply for the country. To accomplish this, PUB has adopted a proactive partnership approach, collaborating with the 3P sectors (public, private and people) on a range of programs, events and activities. Today, PUB has extended its reach to the global community, working with international partners, aid agencies and international organisation to share expertise, create awareness and pursue water sector business opportunities through collaborative R&D and capacity-building programs.



About PUB WaterHub

PUB WaterHub, launched in 2004, is a centre of excellence committed to building a professional and competent workforce for both PUB and the water industry. Bringing technology, learning and networking, all under one roof, WaterHub signifies PUB's continual commitment to Singapore's development as a hub for water-related services and technologies. Through WaterHub, PUB aims to equip water sector personnel with the knowledge, expertise and skills required to take on the new frontiers of a rapidly evolving water industry.

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