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Организация
Объединенных Наций по
вопросам образования,
науки и культуры

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للتربية والعلم والثقافة

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Capacity Building for Water Operators Serving Human Settlements: New Needs and New Challenges

Bruno NGUYEN – International Hydrological Programme
Division of Water Sciences – UNESCO - France

4th UNECWAS Seminar

Tampere, 31 March 2016

United Nations
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UNESCO Chair
in Sustainable Water Services
Tampere University of Technology

INTRODUCTION

United Nations
Educational, Scientific and

PRESENTATION OF UNESCO

- a UN Conference for the establishment of an educational and cultural organization (ECO/CONF) was convened in London from 1 to 16 November 1945, just after the war.
- Representatives of 44 countries decided to create an organization to establish the “intellectual and moral solidarity of mankind”.
- At the end of this conference, 37 countries founded the United Nations Educational, Scientific and Cultural Organization (UNESCO) which was established by the UN General Assembly on November 16, 1945.

INTRODUCTION

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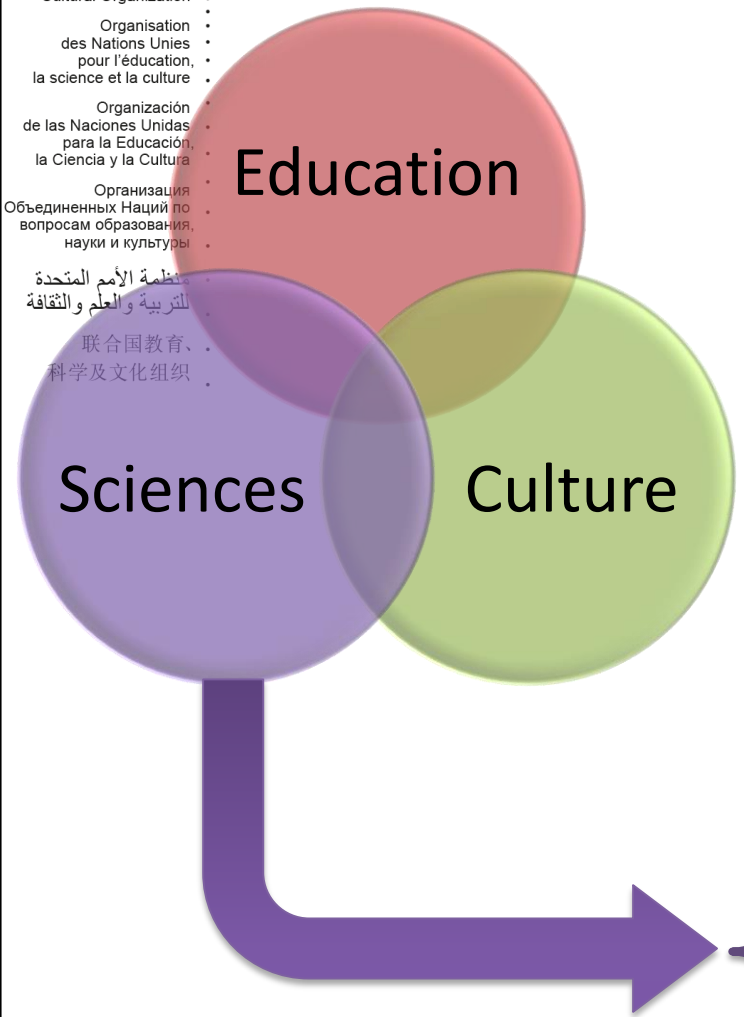

Main priorities : Africa and Gender Equality

Other priorities

- Biodiversity Initiative
- Climate Change
- Education for Sustainable
- Foresight and Anticipation
- Culture of Peace & Non-Violence
- Dialogue among Civilizations
- Crisis and Transition Responses
- Small Island Developing States
- HIV and AIDS
- ICT in Education
- Indigenous Peoples
- Science Education
- Youth
- Development

- Investing in Science Technology and Innovation
- Building Capacity In Science and Engineering
- Water Security
- Geology, Ecosystems and Biodiversity
- Ethics of Science and Technology
- Science for Society

http://en.unesco.org

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THE UNESCO WATER FAMILY

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Strengthening Freshwater Security

UNESCO implements programs to develop the knowledge and capacity to manage freshwater resources

International Hydrological Programme (IHP)

- an intergovernmental programme

UNESCO-IHE Institute for Water Education

- an integral part of UNESCO-category I

World Water Assessment Programme

- Around 30 water research institutes under the auspices of UNESCO (category 2)
- Around 30 UNESCO Chairs in the field of water
- In total more than 1000 water experts

UNESCO HQ is based in Paris

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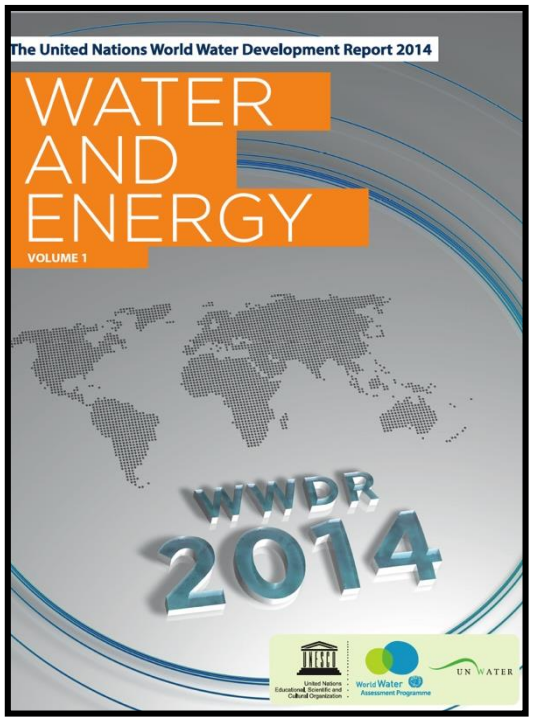
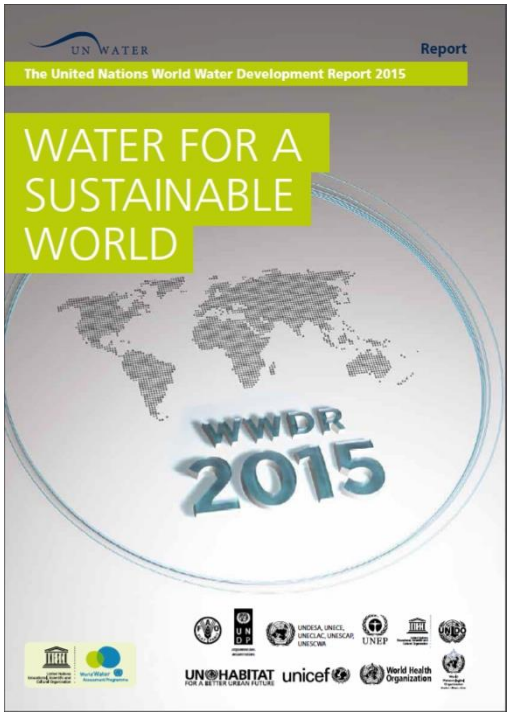
THE UNESCO WATER FAMILY

World Water Assessment Programme (WWAP)

WWAP, founded in 2000, is a UNESCO programme that produces the World Water Development Report (WWDR). WWDR is the United Nations System's flagship publication and UNESCO's most authoritative report on freshwater.



WWAP, through WWDR, targets politicians and decision-makers by providing an accurate analysis of the state, use and management of the world's water resources, defining critical problems, and assessing the ability of countries to cope with water-related stress and conflict. WWDR is published annually since 2014.



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THE INTERNATIONAL HYDROLOGICAL PROGRAMME

The UNESCO IHP is the Scientific Intergovernmental Programme in Hydrology and Water Resources Management of the UN system

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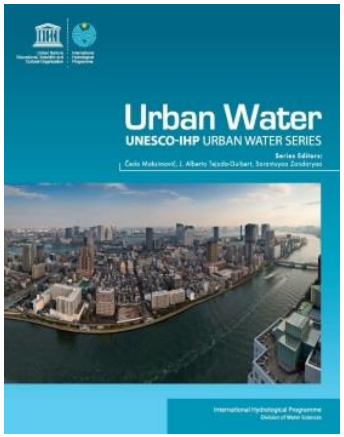
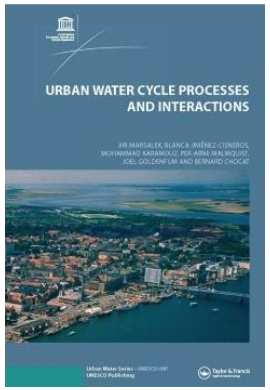
UNESCO is Vice Chair of the UN-Water

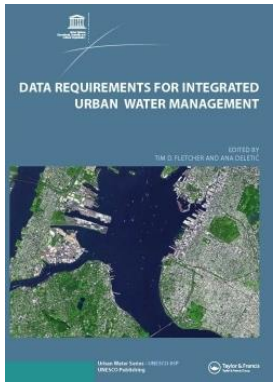
UNESCO's Urban Water Series

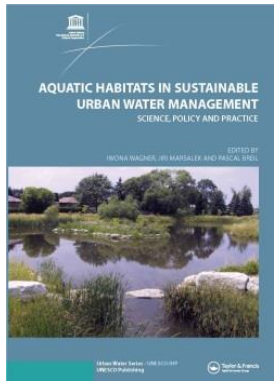
UNESCO-IHP Urban Water Series: the flagship product of IHP activities on "*Achieving Sustainable Urban Water Management*"

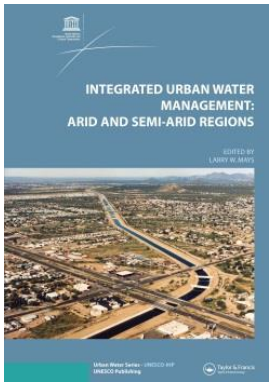
- Other language editions: translation in Chinese and Farsi languages

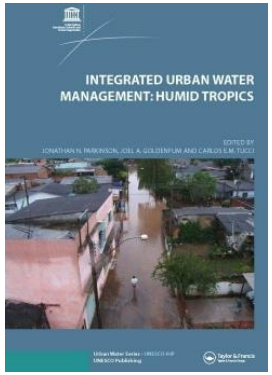


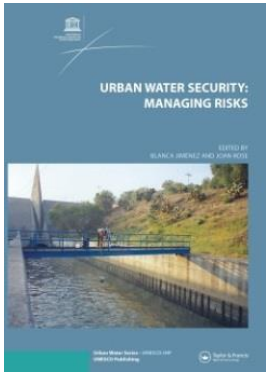


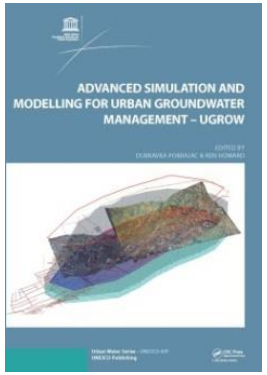


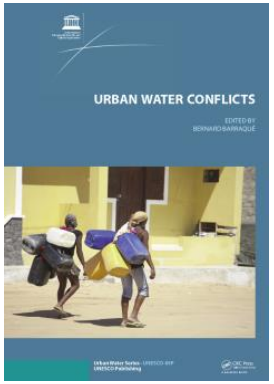












See also http://youtu.be/ImzNmJT3_OA

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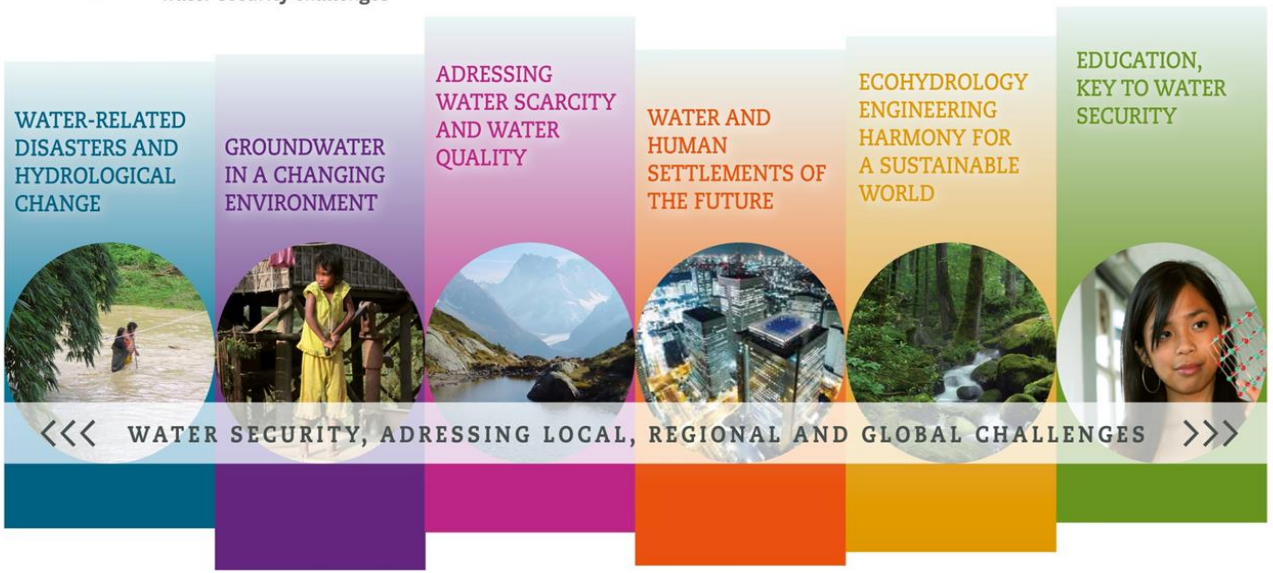
THE INTERNATIONAL HYDROLOGICAL PROGRAMME

UNESCO IHP-VIII Water Security

2014-2021

AXIS 1
Mobilizing International cooperation to Improve knowledge and innovation to adress water security challenges

AXIS 3
Developing institutional and human capacities for water security and sustainability



AXIS 2
Strengthening the Science-Policy interface to reach water security at local, national, regional, and global levels

Global water demand (in terms of water withdrawals) is projected to increase by some 55% by 2050,

UN WWAP 2014

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THE INTERNATIONAL HYDROLOGICAL PROGRAMME

Theme 4: Water and human settlements of the future

Focal Area 4.1- Game changing approaches and technologies

Focal Area 4.2 - System wide changes for integrated management approaches

Focal Area 4.3 - Institution and leadership for beneficiation and integration

Focal Area 4.4 -Opportunities in emerging cities in developing countries

Focal Area 4.5 – Integrated development in rural human settlement

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International Hydrological Programme

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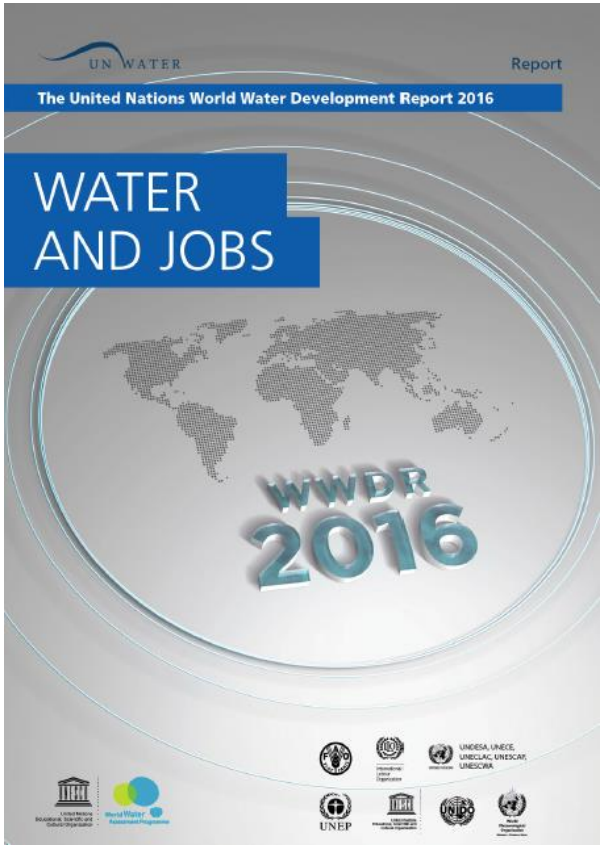
WORLD'S FACTS AND FIGURES

250,000: Number of water and sanitation utilities in the world

240,000: Number of public water and sanitation operators

80%: Part of the workers in the water industry working in water supply and wastewater facilities

623,000: Total estimated professional staff working in water and sanitation utilities



The 2016 World Water Development Report was launched on 3/22

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GAPS IN HUMAN RESOURCES FOR WATER UTILITIES

According to a GLAAS survey on 67 countries:

- **40 %** had sufficient staff to operate and maintain their **urban drinking water** systems.
- **16 %** had the capacity to operate and maintain their **rural drinking water** systems.

Less than **20 %** of countries considered the supply of skilled labor and technicians sufficient to meet the needs in **rural sanitation** (WHO, 2014).

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GAPS IN HUMAN RESOURCES FOR WATER UTILITIES

15 national human resources assessments found an average of **17%** of staff to be **female** (IWA, 2014a).

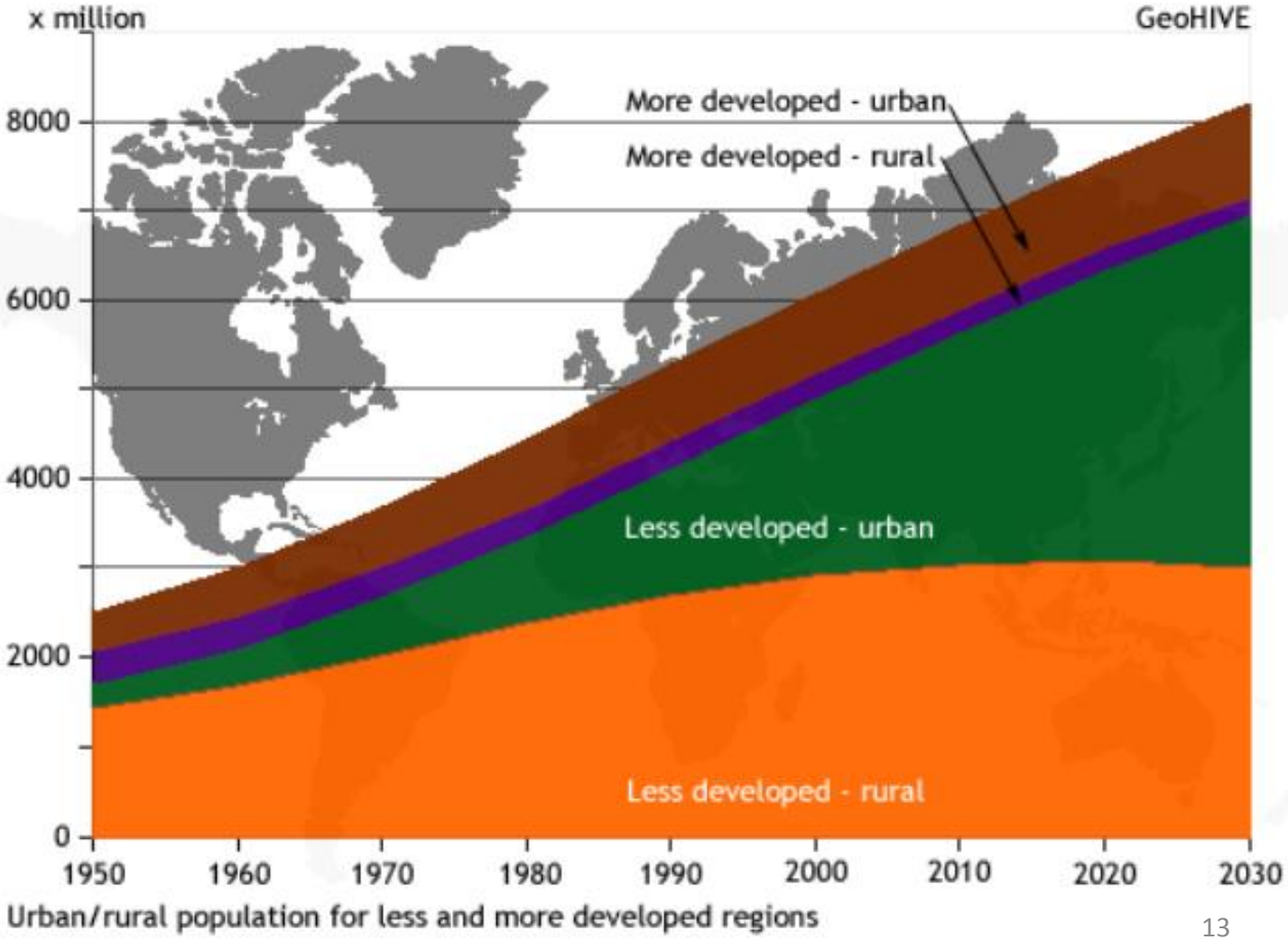
A study conducted in 10 developing countries reveals a cumulative shortfall of **787,200** trained water and sanitation professionals in order to achieve universal coverage in water and sanitation (IWA, 2014a).

CURRENT CHALLENGES FOR WATER UTILITIES

DEMOGRAPHY

Urban Population vs Rural Population

In 2010, earth has become in majority urban for human population.

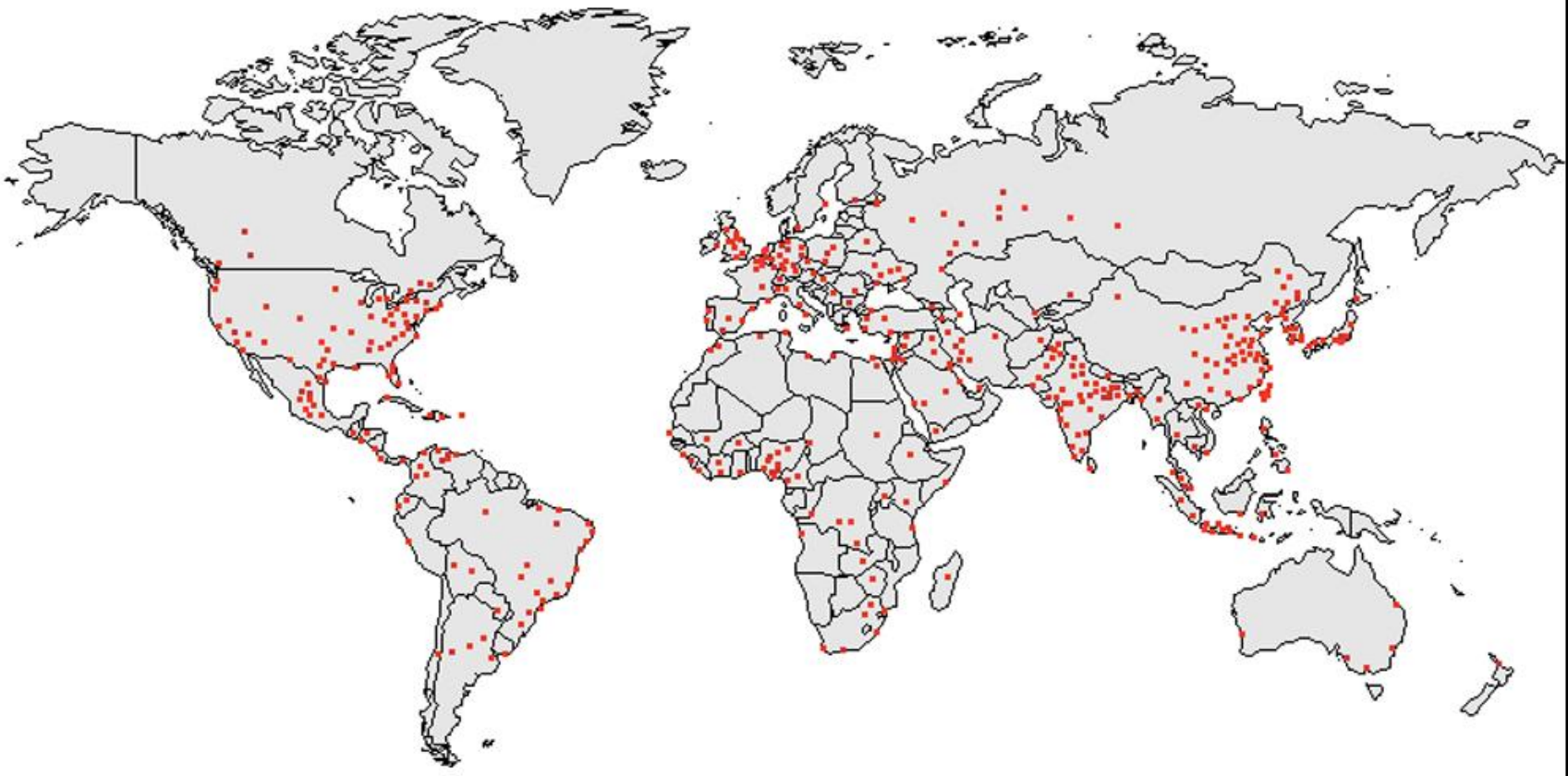


Urban/rural population for less and more developed regions

CURRENT CHALLENGES FOR WATER UTILITIES

DEMOGRAPHY

There were 483 cities with more than one million inhabitants in 2010 (20 in 1950)



Source : PopulationData.net

CURRENT CHALLENGES FOR WATER UTILITIES

➔ The objectives for water suppliers in urban areas are very different from a country to another:

- for the most developed countries, it is to manage at the same time the evolution of the regulation and of the technologies, the protection of the resource and the assets at the lowest cost;
- for less advanced countries with a high demographic growth, the need is to first respond to the huge difficulties for a sustainable, fair and responsible development;
- for all, the local consequences of the Climate Change have to be understood and the necessary adaptation be prepared.

➔ The Training and Capacity Building at utilities should reflect these differences.

CURRENT CHALLENGES FOR WATER UTILITIES

ECONOMIC AND GOVERNANCE ASPECTS

The cost of the infrastructure for water supply is very high and the period of return on those investments is very long. The policy makers have to look specially at:

- Managing the infrastructure in an optimize manner (water losses)
- Correctly sizing the installations (master plan)
- Program the necessary maintenance and renewal of the assets (work plan, financing)
- While keeping a cost of the service acceptable for the consumers.

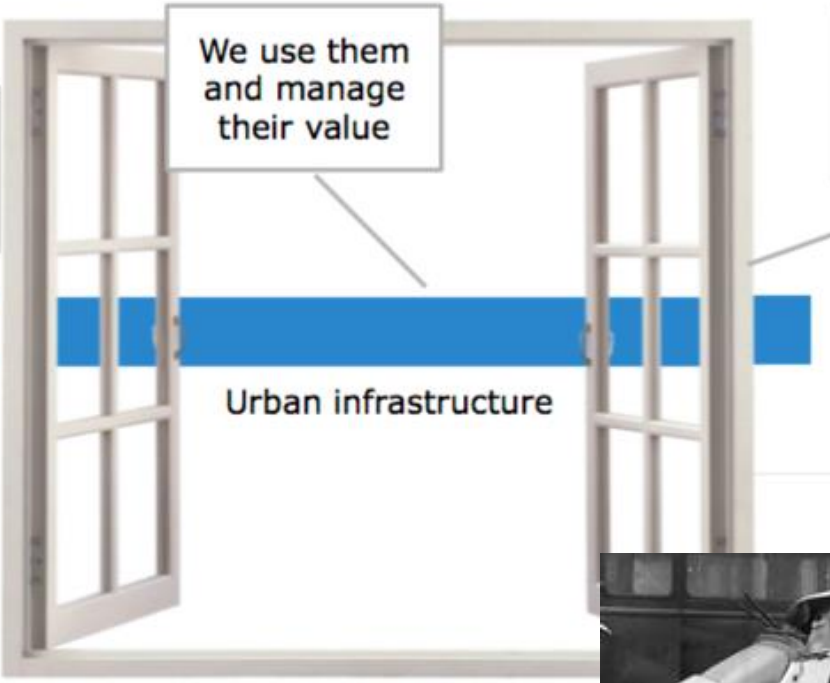
➔ The « water pays for water » is still the main statement.

➔ Even though the economy is today global, the tap water distribution remains local.

➔ **The efficiency of the water services of tomorrow is decided today.**

AGING INFRASTRUCTURE AND ASSET MANAGEMENT

Infrastructures have indefinite lives



Helena Allegre

RISK MANAGEMENT AT WATER UTILITIES

- Water services activities related risks: pollutions, breaks, backflow…. « part of the job »
- Indirect risks as a result of interdependency: interruption of power supply, of communications, delivery failure of reagents, transportation strikes…
- Natural Hazards depending on location and more or less predictable: potentially high level of damages.
- Environmental Hazards: due to the proximity of potentially dangerous activities like chemical factories.
- In a dangerous world, water supply is a potential target.

Water utilities of the 21st century have to be prepared for new levels of risks

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REQUIREMENT FOR THE OPERATION OF WATER SERVICES

To ensure the public water service, one generally needs:

- a resource in sufficient quantity and of minimum quality,
- operational treatment infrastructures,
- consumables (chemicals, vehicles…),
- « fluids » (energy, communication…),
- reservoirs,
- a distribution network (pipes, service pipes, pumping stations, hydraulic apparatus),
- **qualified staff** at the workplace and on call.

Human resources = top layer of efficient water services by utilities.
Water systems are unique: understanding the behaviour of a water system is essential for an efficient operation.

Importance of Knowledge Transfer

TRENDS IN STAFF QUALIFICATIONS REQUIRED

- With the deployment of new technologies

  there is a natural tendency towards both:
  - A diminution of the staff required for a given task.
  - A higher level of qualification of the staff.

- Current trends of installing advanced automation have increased high levels of operation.
- Yet when these systems collapse this can create situations that are difficult to understand and mitigate.

➔ Incidents become more rare and more complex than before.

A TECHNOLOGY LEAPFROG

1980's

An industrial technology revolution occurred in the 1980's with the coupling of RTU (Remote Terminal Unit) and PLC (Programmable Logic Controller).

Water Utilities began using SCADA (Supervisory Control And Data Acquisition) systems and centralizing operation in intelligent control rooms.

Between 1987 and 1997 the staff in the Paris water company was renewed and reduced by 40 %.
The number of shifts (24/7) went down from 17 to 1.

A NEW TECHNOLOGY REVOLUTION

Smart monitor systems

2010's

Integrated Response Management
Decision Support System

Smart Threat Simulator
- Propagation & Impact

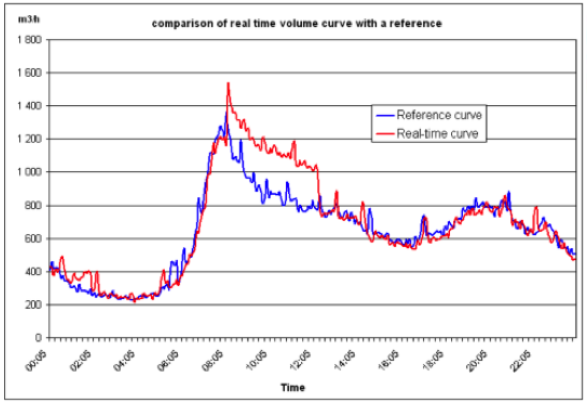
Smart Mitigation Module
- Mitigation options

Smart Event Recognition

Rapid mitigation

Smart deployment strategy
Based on:
- vulnerability
- impact
- mitigation options

Incident on Water Distribution System



Smart Water Systems

OTHER TECHNOLOGY TRENDS AT WATER UTILITIES

- Deployment of AMR systems New services to the customers
- Resource recovery at waste water treatment plants
- Energy recovery from the sewers
- Development of new sensors
- Urine separation
- .....

➔ The development of new technologies will require new competences for the staff.

ENERGY RECOVERY FROM THE SEWERS

The grey water that are sent back to the sewers have an average temperature of 15°C to 21°C. This is because most of the water entering the houses is heated (bathroom, kitchen, laundry..).

The energy cost used for heating drinking water in households generally raises the water bill by 25 % for the user.

Means for recovering energy from the waste water are implemented for test in Paris at a public school and at a swimming pool. The energy recovered is used for heating and cooling the buildings. The City Hall will be the next building in Paris to use this technology.

The experimentation over several years concluded the following:

- Wastewater from 1000 inhabitants could provide heat for 10 inhabitants; but…
- A minimum permanent flow of 300 l/min is required;
- According to this limitation, only 700 buildings over a total of 90 000 would be eligible in Paris (<1%).

Energy production coming from wastewater treatment process is still much more efficient than energy recovery from the sewer system.

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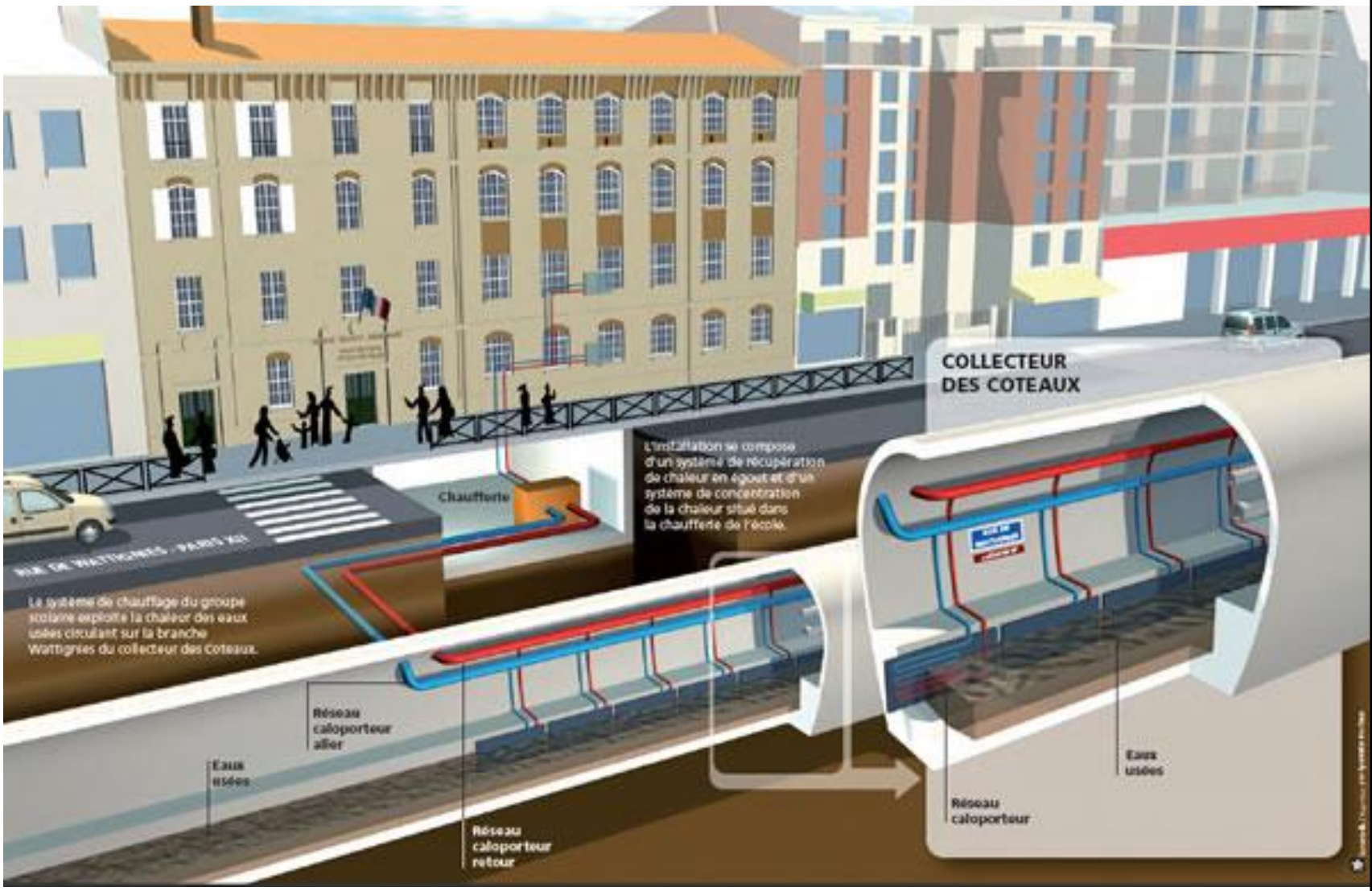
ENERGY RECOVERY FROM THE SEWERS



This system is well adapted to the swimming pool but not efficient with the school.

URINE SEPARATION AND COLLECTION

Urine in wastewater is a main provider of pollution load that has to be treated in sanitation plants.

Urine commonly represents:

- 1% of total wastewater volumes,
- 80 % of total Nitrogenous load,
- 60 % of total Phosphorous load.

Separation of Urine for adequate treatment on low volumes should improve the efficiency of the processes and reduce the costs.

→ Hospitals are now working on the implementation of Urine separation.

URINE SEPARATION AND COLLECTION

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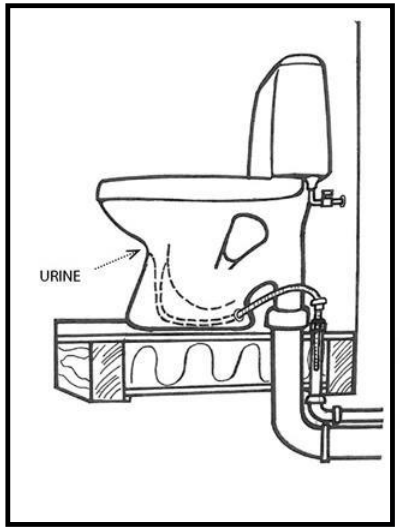
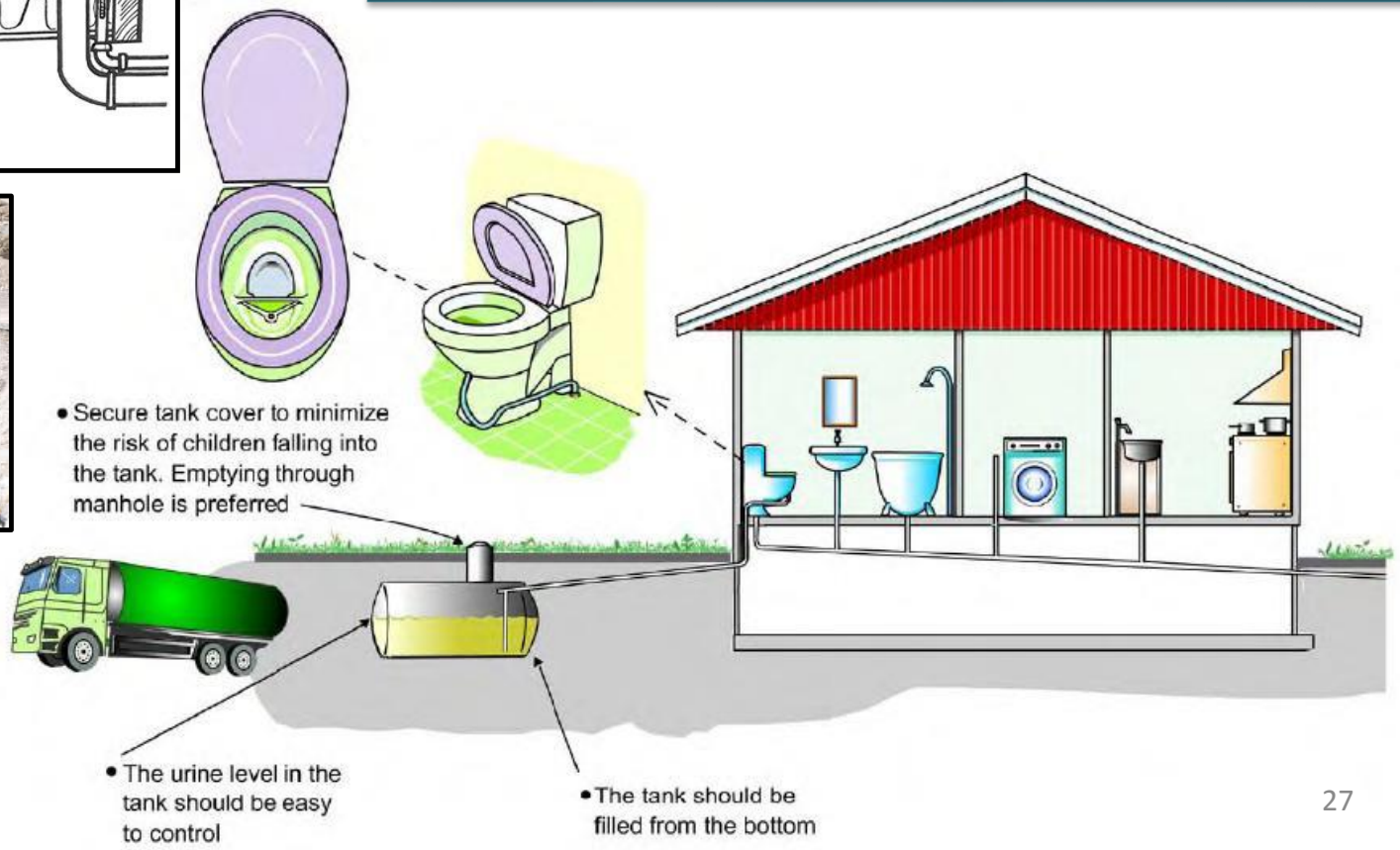
Volume of urine is about 1.5 l/day/inhabitant. These volumes are too small for using regular collection systems.



Urine separation leads to the implementation of special devices for collection and storage.



..and toilets would need to be replaced.

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CONCLUSIONS

Capacity needs at water utilities have evolved and will continue because of the combined influence of:

- New expectations from the customers and from the public in general
- New global context (population growth, aging infrastructure, climate change, evolution of regulations, etc.)
- New technologies and new services

- Water utilities are dealing with infrastructure whose lifetime far exceeds technology development steps.
- Water systems operation and education of future staff generation will definitely change: adaptation is key to sustainability and resiliency.
- Experienced staff now have also to learn from young professionals.

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CONCLUSIONS

- Working in silos is no more an option: multidisciplinary expertise is more and more needed.
- Our water infrastructure is mostly hidden and does not appeal neither to decision makers nor to young students

The Sustainable Development Goals now mention Water in SGD Number 6 for universal access to water and sanitation services: Capacity building will play a major role in the success of the SDGs.

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THANK YOU FOR YOUR ATTENTION

QUESTIONS?