HIGHLIGHTS

UNESCO IHE DELFT

Message from the Rectorate

Dear readers,

We hope you enjoy this edition of Highlights, covering some of the Institute's activities during 2016. It was an eventful and productive year, during which the Institute welcomed students, staff and visitors from all over the world. You only have to walk through our doors to realise what a vibrant, international, multidisciplinary Institute we are.

2016 was significant for UNESCO-IHE, due to the adoption of the UN Sustainable Development Goals a few months earlier, which includes Goal 6: Ensure access to water and sanitation for all. The Institute supported and hosted a workshop about the SDG 6 Monitoring Activity (GEMI) organized by the Dutch Ministry of Infrastructure.

Staff members participated in an advisory capacity to the ' Special Envoy for International Water Affairs' of the Netherlands, Henk Ovink, under the framework of the High Level Panel on Water.

As part of our commitment to lifelong learning, the Institute launched its first alumni online seminars in autumn. The lectures are given by specialists from all over the world. Due to their success, with a large number of alumni and other interested people following them, they will continue throughout 2017.

A total of 25 MSc students, as well as nearly 50 short course water professionals from SIDS countries pursued courses at the Institute in the framework of the project "Strengthening Small Island Developing States' capacity in the water sector to cope with the effects of climate change".

The Graduate School for Water and Development provides a stimulating research environment, especially for the almost 140 PhD fellows active at the Institute in 2016, of which 15 successfully defended their thesis.

In 2016, approximately 50 research and capacity development projects were initiated within the second phase of the DUPC programme, a four-year cooperation between the Dutch Ministry of Foreign Affairs and the Institute.

December 31st 2016 was a significant date for the Institute, as it marked the end of the existing agreement with UNESCO, as a Category 1 institute. The process of transition towards becoming a Category 2 Institute started on 1 January 2017. As stated in a Joint Communiqué by UNESCO Director-General, Irina Bokova, and the Minister of Education, Culture and Science of the Kingdom of the Netherlands, Jet Bussemaker, "a new cooperative framework would provide the necessary flexibility to allow the Institute to grow and develop for the benefit of UNESCO Member States".

The transition will have little impact on the normal workings of the Institute and our educational courses, research programmes and capacity development projects go from strength to strength. We see the future development as an opportunity to reaffirm the Institute's important position as an effective actor in the international water community. We will continue our work under the name 'IHE Delft Institute for Water Education', but in this booklet we have referred to projects and events of 2016 using our former name.

With best regards,

Dr. Fritz Holzwarth, Rector a.i.
Dr. Johan Aad van Dijk, Business Director a.i.

Equipping people and organizations to solve water and development challenges worldwide, contributing to the UN Sustainable Development Goals

IHE Delft Institute for Water Education (formerly UNESCO-IHE) is based in Delft, the Netherlands and carries out educational, research and capacity development activities in the broad fields of water engineering, water management, environment, sanitation and governance.

IHE Delft is the largest international graduate education institute in the field of water. The Institute offers 4 MSc programmes, numerous short and online courses and a PhD programme, in collaboration with partner universities. Since 1957, the Institute has provided graduate education to more than 15,000 practising water professionals, as well as thousands of short course participants from 162 countries.

The Institute is an essential part of the UNESCO Water Family, providing education, research and capacity development. The United Nations has given the Institute the mandate to play a global role in educating and training a new generation of water professionals. In addition, the Institute facilitates capacity development in organizations, providing an enabling environment for well-informed decision-making and improving integrated water management practices.

The Institute's ties to the Dutch water sector are equally important, as they provide access to specific knowledge and add to the Institute's relevance in the Dutch socio-economic context.

Vision

IHE Delft envisions a world in which people manage their water and environmental resources in a sustainable manner, and in which all sectors of society, particularly the poor, can enjoy the benefits of basic services.

Mission

We contribute to the education and training of professionals, expand the knowledge base through research and build the capacity of sector organizations, knowledge centres and other institutions active in the fields of water, the environment and infrastructure in developing countries and countries in transition.

IHE Delft in a nutshell

Core activities

Education & Training

IHE Delft offers both degree programmes (MSc and PhD levels) and non-degree programmes (short courses, online courses and tailor-made training) for engineers, scientists and professionals from various disciplines, working in the water, environment and infrastructure sectors. IHE Delft is implementing its educational activities increasingly with partner institutes worldwide, making water education more accessible and affordable for a growing number of students.

Research & Innovation

The Institute's research activities concentrate on six main research themes and contribute to the knowledge base concerning the water environment, at the same time complementing its education and capacity development activities. Significant parts of the research programme are done via PhD research (the programme is implemented in cooperation with partner universities in the Netherlands such as TU Delft and Wageningen University), MSc thesis research and post-doctoral research programmes.

Capacity Development

IHE Delft engages in institutional strengthening projects and provides advisory and consultancy services to knowledge institutes, water sector organizations, knowledge networks and UNESCO member states. Through these operations, the Institute increases its global impact and helps to build sustainable organizations that are equipped to manage water resources effectively and deliver water services sustainably. The Institute also has a policy forum function and acts as an intermediary between science and policy making.

UNESCO-IHE Highlights 2016

The overview below presents highlights, events and activities in which the Institute was engaged.

20 January
Minister of Mauritius signed MoU on the development of an early warning system for storm surge with Stichting Deltares and UNESCO-IHE.

9 February
The Dutch Ministry of Foreign Affairs and UNESCO-IHE jointly launched the project 'Strengthening Small Island Developing States' capacity in the water sector to cope with the effects of climate change'.

15 February
The National Research and Innovation Agency (ANII) and UNESCO-IHE signed an agreement of partnership in a new water research centre in Uruguay.

17 February
UNESCO-IHE, UNESCO Tehran Cluster Office, the University of Tehran and the Ministry of Energy of Iran signed a MoU to support the setup and operation of a Regional Institute of Water Education.

19 February
Director General of Rijkswaterstaat signed the financial agreement that relates to the MoU between UNESCO-IHE and the Dutch Ministry of Infrastructure and Environment.

10 March
The Roth Foundation granted three fellowships for UNESCO-IHE Short Courses on safe drinking water and sanitation to female water professionals from Sub Saharan Africa.

21 March
On the occasion of Women's day UNESCO-IHE organized a conference, 'Wanted: Women in Water', on progression for women in the water sector.

12 April
The EU awarded a Horizon 2020 project on microbial desalination (MIDES) demonstrating new affordable technologies for desalination to cope with shortage of fresh water.

21 April
4th annual Water Sector Market of UNESCO-IHE where students met with Dutch water sector companies.

22 April
Launch of the special publication on climate change to mark the signing of the UN climate agreement.

25 April
Closing Ceremony 25 April: UNESCO-IHE organized the Regional launch of the UN World Water Development Report 2016 (WWDR) in the Netherlands.

25 April
Book launch 'Experimental Methods in Wastewater Treatment' which assembles and integrates innovative experimental methods from research groups and practitioners around the world.

26 April
Closing ceremony where 123 UNESCO-IHE water professionals received their MSc diploma.

9 May
UNESCO-IHE convened a special workshop on building city resilience and staff contributed to Resilient Cities Leadership event.

24 May
UNESCO-IHE participated in a high level panel on water and the Sustainable Development Goals.

26 May
UNESCO-IHE and Central Java Province signed a MoU to enhance cooperation in promoting and organizing capacity development for staff of CJP.

14 June

A roundtable discussion on placing sustainability at the heart of agricultural development was held at UNESCO-IHE, co-hosted by the CGIAR programme on Water, Land and Ecosystems.

16 June

20 representatives from Latin American embassies visited the Institute to discuss potential ways in which UNESCO-IHE can assist Latin American countries with their water related needs.

7 July

The WATERSPOUTT consortium was awarded €3.6 million by the European Commission under the Horizon2020 programme, to develop water disinfection methods using sunlight.

7 July

András Szöllösi-Nagy, former Rector of UNESCO-IHE, was elected Chairperson of the Intergovernmental Council of IHP.

8 July

Announcement by UNESCO Director-General Irina Bokova, and Jet Bussemaker, the Minister of Education, Culture and Science of the Netherlands of the start of the process for UNESCO-IHE to become a UNESCO Category 2 Institute.

12 July

UNESCO-IHE launched a research paper on how we understand capacity development, what we do in practice and where we are heading with capacity development in the face of complex challenges and demands.

21 July

UNESCO-IHE and Maputo Water Company in Mozambique (AdeM) organized the inception workshop of the AltWater project.

11 July

The Horizon2020 funded project 'SIM4NEXUS' held its kick-off meeting. The project focuses on integrated management of the land, water, food and energy nexus.

1 September

The new H2020 project 'Ground Truth 2.0: Environmental knowledge discovery of human sensed data', was launched and aims to demonstrate and validate six scaled up citizen observatories in real operational conditions, in EU and Africa.

6 September

UNESCO-IHE attended World Water Week in Stockholm as part of the UNESCO Water Family.

7-9 September

UNESCO-IHE hosted the Work in Progress Workshop for the monitoring of the Water SDGs, within the framework of GEMI.

15 September

Professor Seifeldin Hamad Abdalla from Sudan won the UNESCO-IHE Alumni Award 2016.

19-24 September

UNESCO-IHE's Aquatic Ecosystems group was present at the 10th INTECOL International Wetlands Conference which was held in Changshu, China.

4 October

UNESCO-IHE launched the first series of Alumni Online Seminars.

12 October

UNESCO-IHE Emeritus Prof. Bart Schultz won World Irrigation Prize and Drainage Prize

25 October

Joyeeta Gupta was announced Co-chair of GEO-6 to lead the production of the sixth edition of the 'Global Environment Outlook' (GEO-6), the most comprehensive assess-ment of the state of the world's environment.

3 November

UNESCO-IHE announced as winner of the ISNDT Water 2016 Sanitation Innovation Award.

8 November

UNESCO-IHE received a grant from The Bill & Melinda Gates Foundation to strengthen human resources in sanitation via postgraduate education and professional training.

24 November

Launch of the Nile Water Lab which explores three modern irrigation projects along the Nile, discussing Nile controversies and how policy makers, journalists and civil society engage in the issues.

21 December

UNESCO-IHE celebrated its 50th Anniversary of Hydrology Education.

How to solve water issues in my home country?

Ramkrishna Paul
India

"In India, almost 60 percent of the population does not have access to safe sanitation. My main focus is to improve the lives of people by improving the sanitation facilities for their daily, basic needs. When I finish my study, I will return to India and implement my work on the ground, so that I can see the impact and the benefits it brings to the environment and people."

MSc programme in Water Management | Water Quality Management

Angela Maria Paula Bayona Valderrama
Colombia

"In Colombia it rains a lot, so water resources are not the problem, but our sanitary systems are. People are drinking contaminated water. With my studies I would like to contribute to solving this problem by addressing how people are dealing with resources, and how these are being treated and consumed. There are many rural areas in Colombia that have low water quality, there should be a plan to solve this problem. I would like to work for the government in Colombia."

MSc programme in Water Management | Water Quality Management

Tanyaradzwa Mawoyo
Zimbabwe

"I believe that I will be able to assist my country in managing water resources. Given that agriculture is using over 70% of the fresh water that is available globally, if we can use water efficiently in agriculture, the water can be allocated to other users and sectors. I would like to apply my knowledge in my home country first and in southern Africa."

MSc programme in Water Management | Water Resources Management

Armando Alfredo Chitika Holguín
Mexico

"My country is very large - the northern region has a huge desert. There is a lack of water, but we have huge production in agronomy. The aquifers are overexploited as people continue to harvest crops to survive. They seek help from the National Water Commission. I would like to advise the authority on creating a culture that sustains water as the main source of life in Mexico and gives it the importance it deserves. My main goal is to help Mexico right now."

MSc programme in Water Management | Water Conflict Management

Richard Mutua
Kenya

"In Kenya we experience various problems in the field of water resources. There is a huge population that has no access to water services; most Kenyans (85%) live in rural areas. It is difficult to provide water services to those people. It costs a lot and it needs leadership, planning and proper management. I would like to go back to my country and face the water challenges."

MSc programme in Water Management | Water Conflict Management

Anparasi Amuthalingam Sivabalan
Sri Lanka

"The main issue in Sri Lanka is water pollution. People are drinking water that is contaminated. The water treatment plants are not advanced. If we want to have an advanced treatment of water, we have to increase the tariffs. My aim is to control water pollution caused by wastewater discharge in Sri Lanka."

MSc programme in Sanitary Engineering | Urban Water and Sanitation

Angel González Carballo
Spain

"In my previous job in the oil and gas industry, I was confronted by the critical impact water management has on food security, public health, human development, population migration, environmental sustainability and conflicts. Consequently, I have decided to adapt my knowledge and skills and devote my energy to water, the fundamental of life on our planet. I believe the world today needs the humble contribution of each one of us to reach the goals set in the Sustainable Development Goals agenda."

MSc programme in Water Science and Engineering | Hydrology and Water Resources

Oclaya Sophia Verwey
Surinam

"One of the main problems in Surinam is that the groundwater is being salinated, due to overpumping. Another problem is a lack of water supply to rural areas. When I finish my study I would like to contribute to solving challenges in my country and be able to understand these better to find the most appropriate solution. I am keen to transfer my skills and knowledge to others."

MSc programme in Water Science and Engineering | Hydrology and Water Resources

Laddaporn Ruangpan
Thailand

"Thailand is facing many problems related to water management: floods during the monsoon, water scarcity in the dry periods. This causes many problems for agriculture, infrastructure and food supply. Water is the most important asset in life and you need to use it every day. In Thailand we have a lot of water resources, but we cannot manage them. I want to be a professional in this field and advise my country on how we can solve water problems within the Sustainable Development Goals. This is why I decided to study in the field of water."

MSc programme in Water Science and Engineering | Hydroinformatics - Modelling and Information Systems for Water Management

Fatima Azhar
Pakistan

"Pakistan has the world's largest canal based irrigation system, but at the same time, it is one of the most water stressed countries. The way out of the energy crisis for Pakistan is the single renewable energy resource that Pakistan possesses in abundance: hydropower. Apart from the energy crisis, Pakistan also experiences floods due to its climatic and ecological conditions, which cause the Indus river system to overflow. The future of Pakistan depends on how it develops and manages its water resources."

MSc programme in Water Science and Engineering | Hydraulic Engineering and River Basin Development

News & Events

193 MSc students from 50 nationalities graduated and were welcomed into the UNESCO-IHE alumni community in 2016.

Alumni Award 2016

The UNESCO-IHE Alumni Award is given each year to an alumna/us who is at the height of her or his career. This person is a proven role model for other water professionals, and has demonstrated the impact of her/his work in a water related field, to improve people's quality of life.The UNESCO-IHE Alumni Award 2016 was won by Prof. Seifeldin Hamad Abdalla, a former Minister of Water Resources in Sudan, who is still working for the Ministry. He received the award for his outstanding contribution to water-related issues sustaining the livelihoods and well-being of communities in Sudan, especially through Nile Basin transboundary work.

Alumni Award winner Prof. Seifeldin Hamad Abdalla from Sudan (middle) with the Rectorate

Online Seminars

UNESCO-IHE launched a series of Online Seminars especially designed for alumni. These seminars are lectures transmitted over the web that address different topics to continue providing lifelong learning to the Institute's alumni community, as well as other audiences interested in the subjects. The lectures are given by specialists from all over the world. The first two seminars were given by Prof. H. Gijzen on 'Transforming Our World: the 2030 Agenda for Sustainable Development' and Prof. J. Gupta on 'Sharing our Water: Water justice issues in the Anthropocene'. A large number of people followed the seminars online. The seminars will continue in 2017, starting again in March.

Prizes & elections

Prof. PhD Esi Awuah, UNESCO-IHE alumna from Ghana, was honoured with the award of 'Officer of the Order of Volta' by the President of Ghana, John Maham on 29 October 2016. She received the award for her role in Engineering, Water and Sanitation Education in Ghana. She holds the position of Vice Chancellor at University of Energy and Natural Resources, Sunyani, Ghana
Dr. Rose Kaggwa, UNESCO-IHE alumna from Uganda was awarded the 2016 IWA Women in Water Award. She obtained her Master's of Engineering and her MSc and then, in 2005 completed her PhD at the Institute. She works as Director Business and Scientific Services at National Water & Sewerage Corporation in Uganda.

Another alumnus, Dr Silver Mugisha, also from Uganda, was elected the Vice president of the IWA. He holds the position of Managing Director National Water and Sewerage Corporation in Kampala Uganda. He obtained his MSc in Sanitary Engineering in 2000.

Alumni gatherings

Six alumni gatherings took place on different continents as part of the Institute's continued engagement with alumni. Among them was the World Water Week in Stockholm, attended by more than 15 alumni. Others took place during staff missions, as for example in Ecuador and Peru, which celebrated its first alumni gathering, with an attendance of 10 alumni at each event.

Alumni support at Educational Fairs

The Institute was successfully represented by alumni at Educational

Alumni gathering at Stockholm Water Week. Alumnus Jonathan Norman Grant from USA with UNESCO-IHE alumni officer Maria Laura Sorrentino.

Fairs in Ecuador, Indonesia, Peru & the Philippines. They actively promoted UNESCO-IHE and answered questions from many potential students. We would like to thank Marco Albarracín, Marielena Lucen, Grace Palomino, Iván Rodriguez, Gita Ramadanthi, Heru Ramanda, Fajar Wicaksono, Fauzy Nasruddin, Rosita Djuwita, Russelle Pandaraoan and Diane Llanto for the great job done.

Alumni working on DUPC2 projects

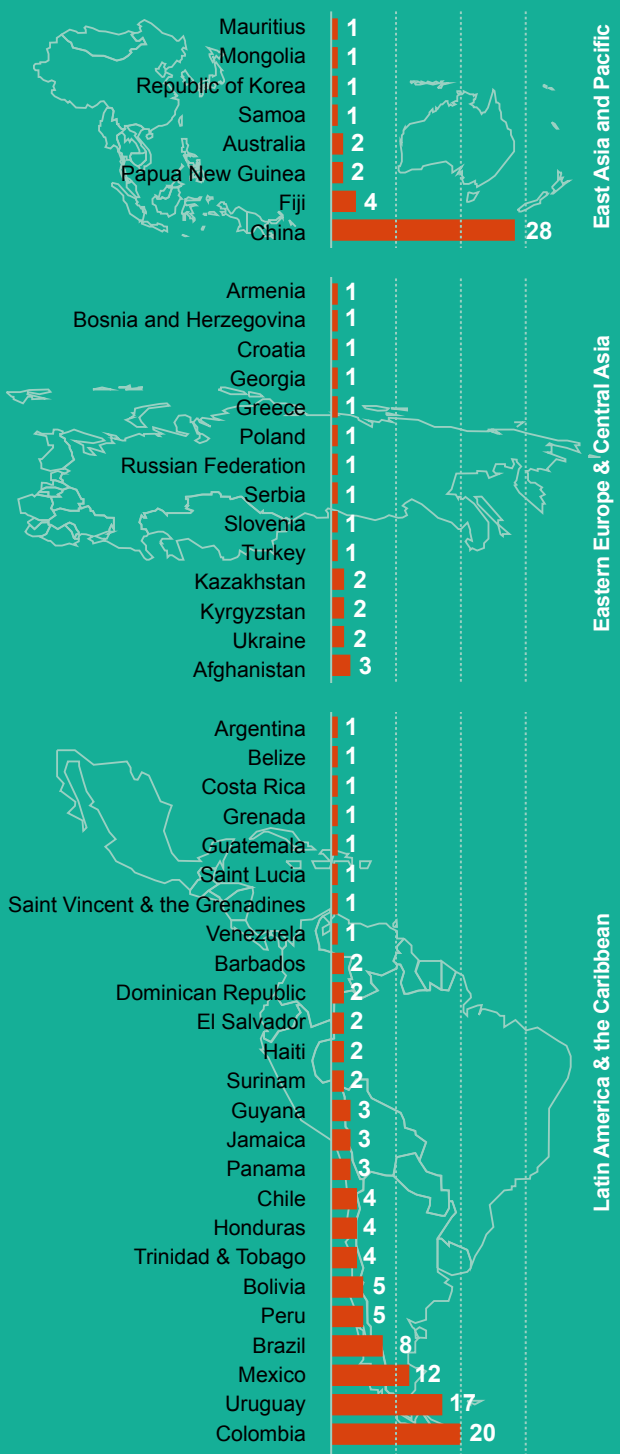
Alumni are regularly involved in projects that UNESCO-IHE either coordinates or in which the Institute participates, in various countries. That is the case with the proposals submitted for the DUPC2 projects, in which alumni from Asia, Africa and Latin America are engaging.

GEMI alumni participation

In September, UNESCO-IHE hosted the Work in Progress Workshop for the monitoring of the Water SDGs, within the framework of GEMI. The workshop was organised by the Netherlands Ministry of Infrastructure and Environment, supported by UNESCO-IHP, UNESCO-IHE, and the Netherlands and German IHP-HWRP Committees. Alumni Mr Ali Subah, Ministry of Water Irrigation of Jordan and Mr Callist Tindimugaya, Ministry of water and Environment of Uganda were actively involved.

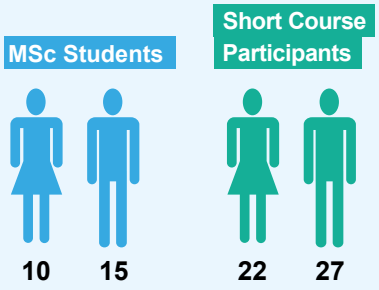
649 students

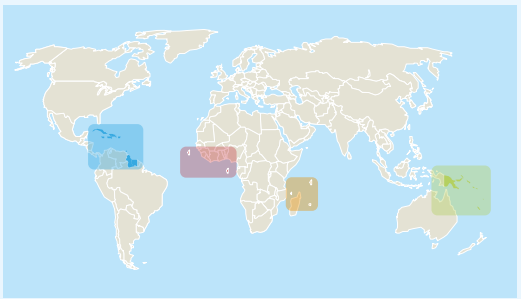
In 2016, a total of 649 MSc students were studying at the Institute. Some of them started their studies, others worked on their thesis, or have graduated and now form part of the lively UNESCO-IHE alumni community. The graphic below shows the variety of our students' home countries. 102 different nationalities were studying at the Institute in 2016.

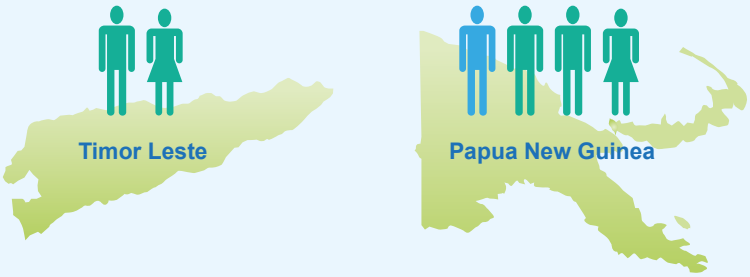


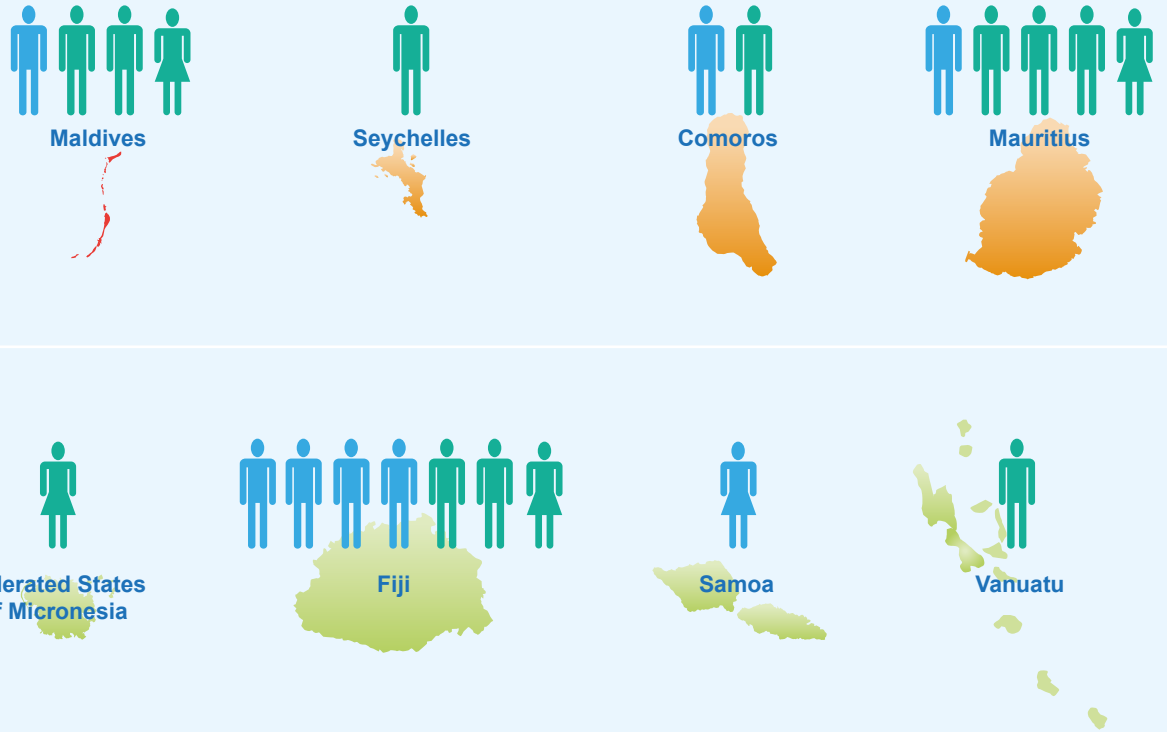
Strengthening Small Island Developing States' capacity in the water sector

In 2015, the Ministry of Foreign Affairs of the Kingdom of the Netherlands and UNESCO-IHE Institute for Water Education jointly launched the project "Strengthening Small Island Developing States' capacity in the water sector to cope with the effects of climate change". The project aims to strengthen the capacity of professionals and decision makers to improve water management in SIDS, to better address future challenges such as coping with the effects of climate change. In October 2016, 20 students from SIDS countries joined five students who had started their studies in 2015. Furthermore, UNESCO-IHE provided 49 water professionals and decision makers with specific expertise on relevant topics, by enabling them to enrol in UNESCO-IHE short courses.



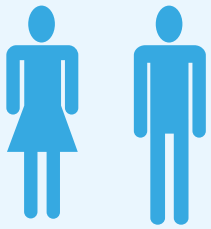





Maldives
Seychelles
Comoros
Mauritius
Federated States of Micronesia
Fiji
Samoa
Vanuatu
Jamaica
Dominican Republic
Barbuda
Antigua
Saint Vincent & Grenadines
Grenada
Guyana
Surinam

Facts & Figures 2016

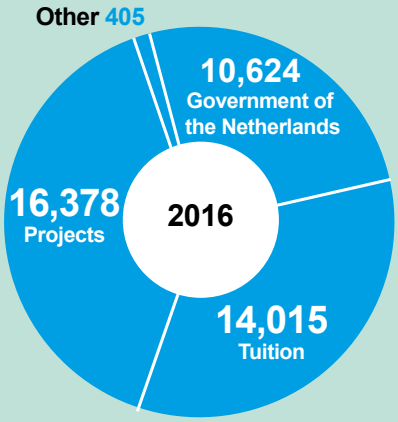
218
UNESCO-IHE staff



103 115

33 nationalities

Income in Euros

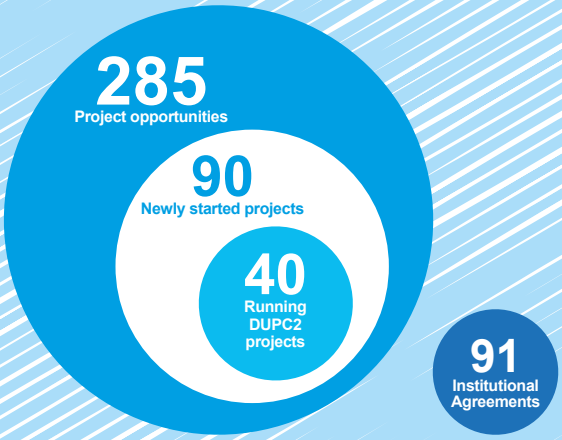


41,422
Total turnover

735
Overall result

x 1,000

Projects



Students enrolled per MSc programme

36
Environmental Science

24
Urban Water and Sanitation

33
Water Management

112
Water Science and Engineering

Facebook likes

1-1-2016	31-12-2016
12,940	17,217

Twitter followers

1-1-2016	31-12-2016
6,200	9,227

MSc Students

1,908 MSc applications

193 MSc graduates

10.7 percent enrolled (205)

66 139

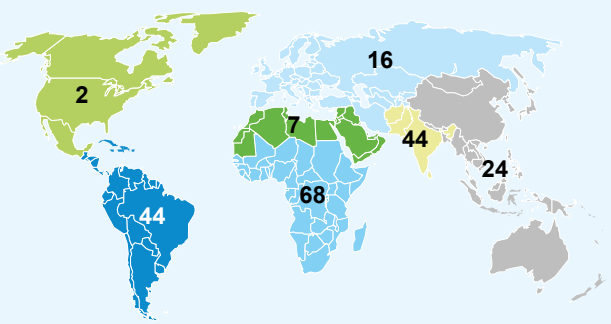
PhD Fellows

136 PhD fellows

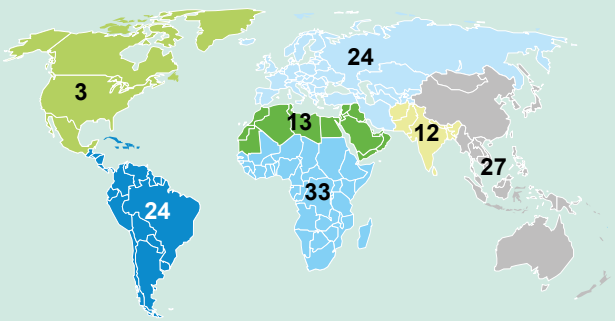
15 PhD theses produced

52 84

Number of MSc students per region of origin



Number of PhD fellows per region of origin



E-newsletter subscribers

1-1-2016 **4,411**

31-12-2016 **6,691**

Website

Unique visitors 443,750

Pageviews 2,263,186

RESEARCH | PHD

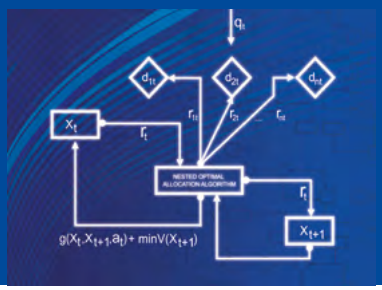
UNESCO-IHE PhD Research 2016

A large part of the research agenda at UNESCO-IHE is implemented through our PhD fellows from all over the world. Fifteen PhD fellows defended their thesis last year. Their research topics are very varied, ranging from the more technical/natural sciences to the social sciences. Below you can see a presentation of all the thesis topics.

8 April

Nested Algorithms for Optimal Reservoir Operation and Their Embedding in a Decision Support Platform

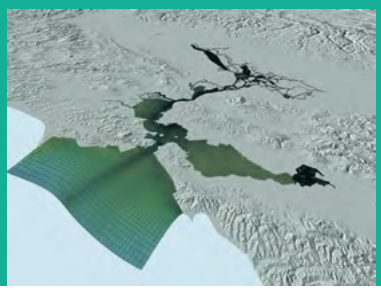
Mr. Blagoj Delipetrev
The former Yugoslav Republic of Macedonia



12 April

Multiple Scales of Suspended Sediment Dynamics in a Complex Geometry Estuary

Ms. Fernanda Minikowski Achete
Brazil



13 June

Establising the Environmental Flw Regime for the Middle Zambezi River

Ms. Elenestina Mwelwa-Mutekenya
Zambia

13 June

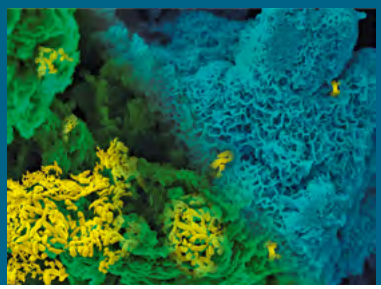
Operational Flood Forecasting, Warning and Response for Multi-Scale Flood Risks in Developing Cities

Ms. María Carolina Rogelis
Colombia

28 June

Manganese Removal from Groundwater. Role of Biological and Physico-Chemical Autocatalytic Processes

Mr. Jantinus Bruins
The Netherlands



4 October

Flood Hazard Mapping. Uncertainty and its Value in the Decision-making Process

Mr. Micah Mukungu Mukolwe
Kenya

13 October

Managing Basin Interdependencies in a Heterogeneous, Highly Utilized and Data Scarce River Basin in Semi-Arid Africa

Mr. Jeremiah Kipkulei Kiptala
Kenya

18 November

Microbial Synthesis of Chalcogenide Nanoparticles

Mr. Mal
India

18 November

Two-step Biological and Chemical Leaching for the Recovery of Copper and Gold from Electronic Waste

Mr. Isildar
Turkey

21 November

Autotrophic Nitrogen Removal from Low Concentrated Effluents. Study of system configurations and operational features for post-treatment of anaerobic effluents

Mr. Sanchéz Guillén | Panama

21 November

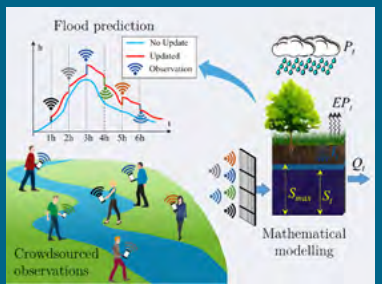
Modelling Approaches to Understand Salinity Variations in a Highly Dynamic Tidal River. The case of the Shatt-al-Arab River

Mr. Ali Dinar Abdullah
Iraq

28 November

Improving Flood Prediction Assimilating Uncertain Crowdsourced Data into Hydrologic and Hydraulic Models

Mr. Maurizio Mazzoleni
Italy



16 December

Optimization of electron donor supply to sulphate reducing bioreactors treating inorganic wastewater

Mr. Reyes Alvarado
Mexico

16 December

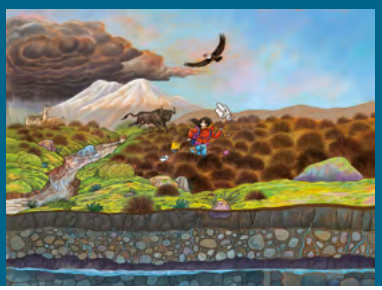
Performance Assessment and Enrichment of Anaerobic Methane Oxidizing Microbial Communities from Marine Sediment in Bioreactors

Ms. Bhattarai Gautam
Nepal

20 December

Ecohydrology of the Andes Páramo Region

Ms. Veronica Graciela Minaya Maldonado
Ecuador



Highlights of the Graduate School

The Graduate School for Water and Development provides a stimulating research environment for PhD fellows and staff of the Institute. Our 136 PhD Fellows produce the majority of the Institute's research output.

In 2016, a PhD committee was put in place, strengthening the operational side of the programme. Our goal is to support academic quality and relevance in meeting the serious challenges of sustainable water use in increasingly difficult situations. The new set-up has enabled a professional structure for registrations and the varied formalities required by our Dutch partner universities, to which all promotors of PhDs are formally associated and which they must meet. Some conundrums presented themselves in aligning the different approaches to graduate education, but these were resolved through great collaborative efforts. Square pegs were indeed slotted into round holes!

At the same time throughout 2016, a range of improved structures, from admission to graduation, were developed. This is the important "backroom" work of the Graduate School and its dedicated support staff that includes the Fellowship Officer and the Beadle.

We are now able to build on the new structures and to explore both academic and business opportunities for PhD research at the Institute. Courses specially designed for meeting some of the many challenges of Water and Development are being constructed and, through the support of a traineeship for a year, we will be better able to do some homework in identifying where we sit in an increasingly competitive field.

Upcoming actions include facilitating a "wicked problems" seminar series, instigating development of two courses open for external fellows, internal support sessions in writing, data analysis and communication, and responding to a changing financial and business landscape that the PhD programme needs to be aware of and responsive to. We will keep working with the PhD community and will continue to do our best to support its members. This will continue the success of our multidisciplinary and varied research that in the year 2016 produced 15 PhDs. We are proud of each one of them.

Ken Irvine
Director of the Graduate School and Professor of Aquatic Ecosystems

On 20 December 2016, Ms. Veronica Graciela Minaya Maldonado successfully presented and defended her PhD thesis and was awarded with a Doctoral degree. Professor Arthur Mynett was her promotor.

New tools for monitoring the operation of reverse osmosis desalination plants

The increase in the world population, in municipal and industrial water demand, and drought are driving forces for finding alternative water sources. Desalination with reverse osmosis (RO) has significantly reduced production costs to less than 1 $/m3 of drinking water from seawater.

In the last few years, UNESCO-IHE's Water Supply Engineering chair group has focused on developing new methods that create added value for improving the operation of full scale desalination plants. Seawater has very different properties than freshwater, which greatly influences the applicability of normal standard laboratory and field methods. The new methods created at UNESCO-IHE deal with linking water characteristics to the treatment operation of RO membranes (e.g. fouling rate).

The new methods are the following:

• The modified fouling index ultrafiltration (MFI-UF) which measures more accurately the particulate fouling potential of water, due to the ability to perform the test in closer conditions to those of the real RO operation
• The transparent exopolymer particles (TEP) which has been demonstrated to play a role in the development of biological fouling of RO membranes
• Adenosine triphosphate (ATP) in seawater samples, which also allows measurement of the biological growth and correlates these measurements with biological fouling of RO membranes.

The new set of tools are currently applied in full scale desalination plants in the Middle East, Australia, Spain, and in the Netherlands.

Waves and Coasts in the Pacific

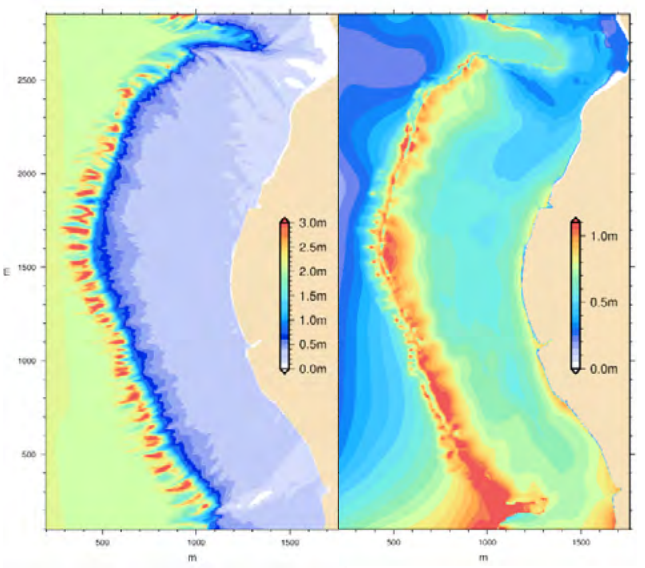
Over the past 5 years, UNESCO-IHE has supported the Secretariat of the Pacific Community (SPC) in developing predictive models of swell wave propagation and long ("infragravity") waves generated by wave groups breaking on coral reefs. These long waves and the wave setup can cause large runup on coasts protected by coral reefs and can cause extensive inundation and damage.

Existing model trains for storm surge and wave prediction routinely ignore such waves, and therefore often completely fail to predict any such damage due to cyclones and large swell events.

The SPC team has collected field data from a range of locations and, in collaboration with the UNESCO-IHE Coastal Systems & Engineering and Port Development chair group, has developed good forecasting skills using the new XBeach model developed at the Institute.

XBeach is a two-dimensional model for wave propagation, long waves and mean flow, sediment transport and morphological changes of the nearshore area, beaches, dunes and back barrier during storms. It is a public-domain model that has been developed with major funding from the US Army Corps of Engineers, Rijkswaterstaat and the EU, supported by a consortium of UNESCO-IHE, Deltares, Delft University of Technology and the University of Miami.

The Secretariat of the Pacific Community is now increasingly running operational models, for instance at the site of Maui Bay, Fiji.



Swell wave height (left panel) and long wave height (right panel) at Maui Bay, Fiji. The simulation is made by using XBeach. Source: SPC

Investing in Land and Water: turning climate finance mechanisms into tools for cooperation

This project, under the CoCoon research programme, investigates the implications of different approaches for benefit sharing mechanisms within climate financing projects for various groups of stakeholders at national, regional and local level, including the access to natural resources (e.g. land, water, forest).

The project partners believe that investments made under climate finance mechanisms can potentially contribute to local development and poverty reduction when they support cooperative and inclusive approaches for sharing financial and other project related benefits among stakeholders as well as proportionally sharing of costs, risks, rights and responsibilities associated with managing the impacts of climate change. In this way, CoCoon aims to contribute to climate financing projects that are set up in such a way as to avoid any potential conflicts over natural resources arising from the investments.

By analyzing existing experiences at local, national and international level, general lessons can be learned and applied to new mechanisms. These lessons also help improve the track record of the implementation of existing mechanisms. Scaling between case studies and national and global policy will be a key challenge. This will be achieved using a mix of bottom-up and top-down approaches to understanding policy impacts. The concept of joint learning is central to the project's impact strategy, and refers to its collaborative research approach.

Increasing African preparedness for future climate change challenges

Africa is one of the regions most in need of innovative solutions for tackling water and climate change challenges. Yet many parts of Africa are also suffering from a lack of water-related skills and capacity, as well as widespread institutional fragmentation.

AfriAlliance - *the Africa-EU Innovation Alliance for Water and Climate* - aims to prepare Africa better for future climate change challenges, by having African and European stakeholders work together in the areas of water innovation, research, policy, and capacity development. Rather than creating new networks, AfriAlliance is consolidating existing ones into an effective, problem-focused, knowledge sharing mechanism.

In 2016, AfriAlliance successfully launched its first set of five Action Groups. The AfriAlliance Action Groups bring together African and European peers, with relevant knowledge, expertise and solutions, to tackle water and climate change challenges. One of the five Action Groups will highlight its progress at the upcoming AfriAlliance Conference in South Africa in March 2017: Integrated Water Resource Management and Ethics led by Rhodes University.

2016 also marked the beginning of the AfriAlliance annual Innovation Bridge Events (IBEs). These events aim to match universities, research organisations, science councils and industrial companies, showcasing innovations in water & climate change with potential collaborators, funders and investors to facilitate the commercialisation of these innovations. The first event was held in October 2016 in Botswana, in conjunction with the 17th WaterNet Symposium. Four more events will be held, each in different regions of the African continent.

The AfriAlliance consortium consists of 16 African and European partners, is led by UNESCO-IHE (Project Director: Dr. Uta Wehn) and runs from 2016 to 2021. The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 689162.

www.afrialliance.org

afrialliance

Africa-EU Innovation Alliance for Water and Climate

Fostering demand-driven Action Groups

Triple sensor monitoring & forecasting

Online platform for knowledge sharing

Matching short-term social innovations & needs

Bridge events & innovation roadshows

Identifying long-term R&I agenda

Water Management & Governance

Living with floods

Where the Dutch approach for dealing with floods has long been to keep the water out, experiences in countries such as Bangladesh show that people can learn to live with and even benefit from fluctuating water levels and river courses. People like the family of Abdul Baki Khan, consisting of seven members, live and farm on temporary islands (chars) in the Jamuna river. They organize their livelihoods around the river levels. They grow maize and rice on the fertile silt deposited by the river, and live in flood-resistant homes. The ever-changing course of the river forces them to relocate their home and farm every two to three years. Over the period 1978 - 2008, the family moved 11 times, as shown in the map below.

Due to population pressure, finding possible places to farm and live has become more difficult for the family. Where in the past they would have access to some 9 ha of land, today their farm only measures 0.5 ha. To complement the harvest from their fields, they therefore also sometimes work as labourers on farms of others. Despite these efforts, their monthly income is only about 50 US dollars, but they grow most of their own food.

Flows of water, flows of people

A flagship research project in the field of water management and governance seeks to understand the dynamic interplay between hydrological processes (flows of water) - such as flooding, riverbank erosion, waterlogging - and social processes (flows of people) - such as migration, flood protection measures and changing livelihoods - in the urbanizing delta of Bangladesh. A focus on such interactions yields very different insights as compared to studies that look at the behaviour of people or the behaviour of the river in isolation.

By showing how people and water continuously react to each other - moving together as in a perpetual and intimate dance - this research on hydro-social deltas challenges the idea that

UNESCO-IHE's research programme on water management and governance focuses on the interplay between social, biophysical and technological processes. Understanding how these processes are interwoven yields useful new insights, that can inform creative solutions for sustainable and equitable water governance. How best to manage floods is one central area of concern and expertise.

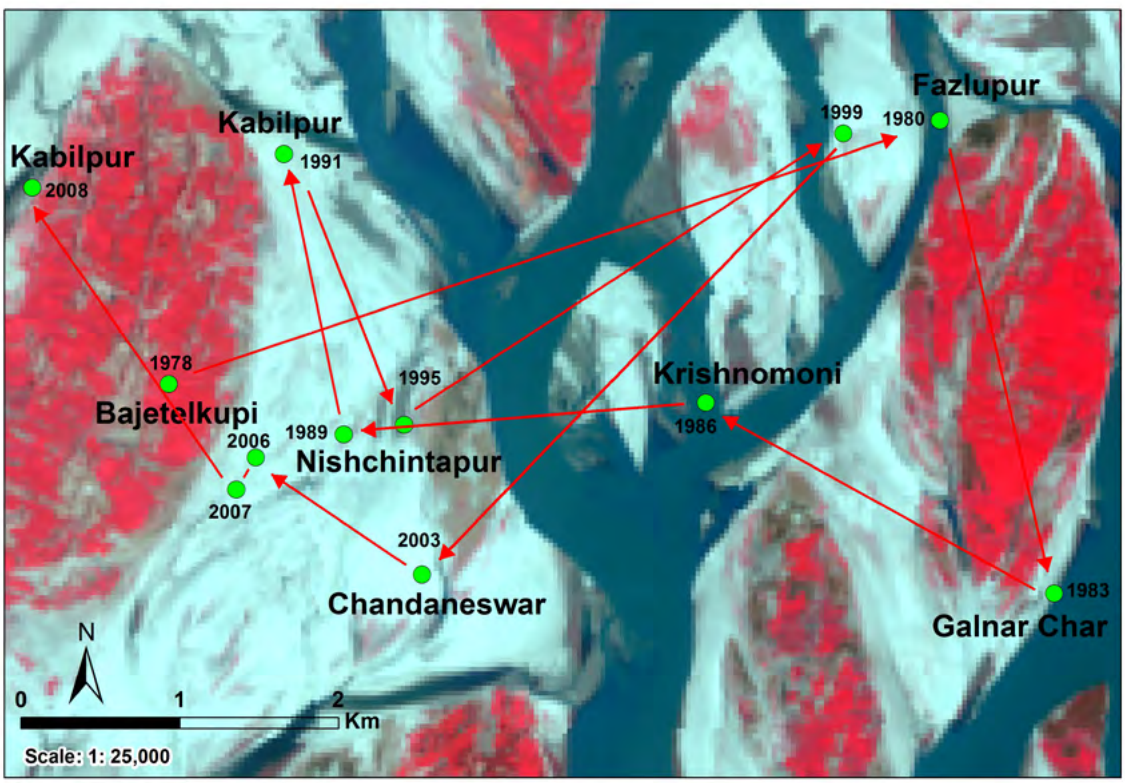
IHE Delft Institute for Water Education in fact emerged from a need for flood protection and delta planning in Bangladesh in 1957. Now, 60 years later, the Institute is still collaborating with the country to understand and improve its hydrological and social processes.

floods always need to be prevented. Fighting floods is not just expensive, but every flood protection effort also generates its own difficulties because a river responds in unpredictable ways, for example by changing its course. Combining sound hydrological knowledge with insights into people's behaviours, the project therefore tries to learn from the amphibious and mobile lifestyle of the family of Abdul Baki Khan and many other char people like them.

The project hypothesizes that there is merit in actively supporting people's possibilities to migrate on a seasonal basis, building on their centuries of experience of living with floods. Rather than trying to prevent floods altogether, which remains the preferred strategy of the Bangladesh government, the project proposes innovations such as flood warning systems, improved housing and shelters and various forms of evacuation support that alleviate difficult living conditions and increase resilience.

It would be interesting if the findings of the project were to travel back to the Netherlands, so that a conversation can take place between amphibious char knowledge and terrestrial dike-and polder ones. Perhaps there is something the Dutch can learn from Abdul Khan, for instance in their efforts to make "Room for the River."

Abdul Baki Khan
Farmer



All relocations of Mr. Abdul Khan and his family mapped onto the current river pattern (satellite image)

Citizen Science

The engagement of non-experts in scientific research

Over the last few years, the increasing availability of portable technologies including smartphones and low-cost sensors, has given rise to 'citizen science'. This allows curious amateurs, such as citizens, to, not only, collect environmental data, but also get involved in cooperative planning and environmental stewardship in new ways. Along with social media connecting people worldwide, this means that researchers can be supported by large, widespread teams of people. Using their own observations and mobile devices, citizens and communities can now provide a new data stream of local information about their environment.This can help to prepare better for extreme weather-related events, such as floods and droughts.

UNESCO-IHE has been actively engaged in citizen science for the past five years through the European Union's Horizon 2020 and FP7 programmes. The three projects below describe the Institute's involvement in the development of citizen observatories in Europe, and recently in Africa.

Implementing citizen observatories for flood risk management

Between 2012 and 2016, three citizen observatories on the topic of flood risk management were designed and implemented in different policy contexts across Europe (UK, Italy and the Netherlands). The WeSenseIt project was finalized in 2016 under the EU FP7 framework. UNESCO-IHE led the work on integrated physical and social modelling, the design of dual traditional-citizen sensor networks and the social science research on governance and social innovation.

Via citizen observatories, citizens - and not just scientists and professionals – can be enabled to share data about their environment and to take on a new role in decision making.

One of the outcomes of the project, was the improvement of hydrological and hydraulic models with citizen data via data assimilation (Mazzoleni et al 2016, 2017), the identification of the optimal crowdsourced contributions in space and time to complement existing in-situ networks (Alfonso et al 2016), and the development of video-based rainfall sensor to enable citizens to complement hydrometric networks (Alfonso et al 2015). Another outcome was access to relevant and specific information between stakeholders in all three cases. Authorities can now make use of the 'eyes and ears' of citizens, while citizens and other stakeholders have gained insight into the data that is used for certain decision-making, for example a road closure. This can improve dialogue and enhance effective participation. At the same time, the accompanying social science research revealed that citizen observatories should not be seen as a 'quick fix' for achieving stakeholder engagement.

The WeSenseIt project had received funding from the European Union FP7 research programme under grant agreement No. 308429.

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Engaging citizens in environmental monitoring

UNESCO-IHE is leading the work package on turning observations into spatio-temporal flooding patterns. The Institute coordinates the development of hydrodynamic and hydrological models for the two pilot areas of SCENT in Greece and Romania.

SCENT engages citizens in environmental monitoring and enables them to become the 'eyes' of the policy makers. In doing so, citizens will support the monitoring of land-cover/use changes using their smartphones and tablets.

A people-led online observation movement will capture land-cover use and changes through user-friendly tools and technologies: The Scent Toolbox. This will complement existing forms of monitoring, such as satellite and remote sensing, which are costly and less dynamic.The Scent Toolbox is at the same time a crowdsourcing platform, gaming applications, an authoring tool, an intelligence engine and numerical models, which allows citizens, policy makers and other users to use Scent technologies freely.

Scent is a European Union research project funded under the Horizon 2020 programme. The project runs between 2016 and 2019 and comprises 10 partner organisations across 6 countries.

Real life interaction between people and technology

"Implementing a citizen observatory is not 'plug and play', but needs attention to local issues, interests and context" - Uta Wehn, project leader of GroundTruth 2.0 and Associate Professor of Water Innovation Studies.

Ground Truth 2.0 is a 3-year project (2016-2019) that is setting up and validating six citizen observatories in real conditions, in four European and two African demonstration cases. It builds on the experience with WeSenseIt, demonstrating that the social dimensions of citizen observatories need to be soundly managed, to ensure the uptake and sustainability of these initiatives.

Via a socio-technical approach based on LivingLabs principles, this project combines the social dimensions of citizen observatories with enabling technologies, so that the customisation and deployment of technology is tailored to the envisaged local, societal and economic impacts of the observatories.

Ground Truth 2.0 has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No.689744. The consortium consists of 14 partner organisations from 7 countries.

Four examples of Capacity Development

UNESCO-IHE strives to strengthen the programmes of universities and research institutes, as well as the knowledge and capacity base of ministries and other water sector organizations in Africa, South-America and Asia. We do this by training water professionals on-the-job, creating water education networks, through joint research, policy advice, distance & e-learning, participation in innovative projects and facilitating knowledge sharing. This section highlights four capacity development projects.

Water tanker truck refilling at WK Plein Water Treatment Plant in Paramaribo; on the right hand side, the old water tower, symbol of SWM.

Strategic Basin Assessment of the Brahmaputra System in Northeast India

Biswa Bhattacharya
Associate Professor in Hydroinformatics

"In this project we are developing a basin model to simulate hydrology and erosion. The simulation model will be used to generate hydrological, hydraulic and sediment information corresponding to different scenarios. We want to help the people in charge of the basin to improve its management."

UNESCO-IHE is currently involved in a World Bank funded project to perform a Strategic Basin Assessment of the Brahmaputra System in Northeast India. The project is delivered by Antea Group (Belgium), UNESCO-IHE and the International Water Management Institute of Sri Lanka.

Training professionals in Surinam on safe drinking water

Giuliana Ferrero
Senior Lecturer in Water Supply Engineering

"Working with highly skilled professionals, committed to improving the safety of drinking water, was a very motivating experience. In the training sessions, we witnessed the transition from training to practice. This is what any capacity development specialist aims for."

In Surinam, a total of 60 water supply systems are operational. The Surinam Water Company (SWM) is in charge of operating 33 water supply systems in the coastal area, with the prospect of operating systems in the whole coastal area by 2024. SWM recently started the implementation of Water Safety Plans.

Dr. Giuliana Ferrero of UNESCO-IHE and Mr. Harold van den Berg of the Dutch National Institute of Public Health and the Environment provided training and technical assistance through two training programmes funded by EP-NUFFIC, Dutch Ministry of Foreign Affairs in 2015 and 2016.

BEWOP researcher Winifred Nabakiibi undertaking an interview for the development of a water operators' partnership case study between Vitens Evides International and the National Water and Sewerage Corporation of Uganda.

Klaas Schwartz
BEWOP project leader and Associate Professor of Urban Water Governance

"The innovative capacity development approach underlying this project addresses changing needs in capacity development in the water sector. Capacity development initiatives undertaken jointly with sector organizations will become more and more important for the Institute in the coming years."

Boosting the effectiveness of Water Operators' Partnerships

The capacity development model underlying Water Operators' Partnerships (WOPs) is based on the interaction of staff of two or more water operators on a not-for-profit and solidarity basis. BEWOP, UNESCO-IHE and UN-Habitat's GWOPA are implementing an innovative capacity development approach, that focuses on identifying the common needs and areas of interest of water operators involved in WOPs. Based on these, UNESCO-IHE and GWOPA are developing tailor-made, user-friendly tools, training packages and guidelines that strengthen the knowledge transfer and change processes in WOPs, in order to maximize the potential of their capacity development programmes. To ensure the adequacy of BEWOP's products for water operators, the topics developed are demand-based, through the active involvement and consultation with Dutch water operators. Upon completion, BEWOP's products will be widely disseminated and free-of-charge so water operators around the world can benefit from this endeavour.

Emanuele Fantini
Senior Researcher

"By looking at media and popular culture in broader terms, we want to create spaces to support mutual understanding and shared narratives on Nile issues. Our Institute offers a unique opportunity to promote such dialogue since it caters for MSc and PhD students from all around the world. We should invest in them because they might be the water diplomats of tomorrow"

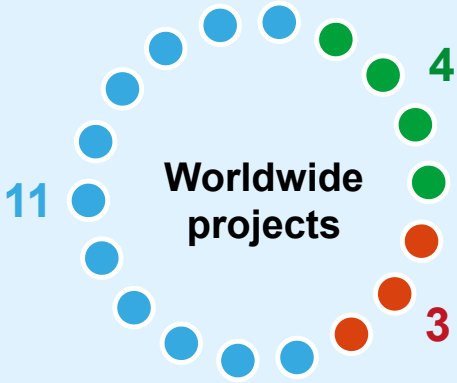
The role of science communication as catalyst for cooperation and peace

The Nile - particularly the Blue Nile, shared by Egypt, Sudan and Ethiopia - is one of the international rivers usually described as on the verge of a "water war", as a consequence of competing claims and projects of water exploitation by the riparian countries. The Open Water Diplomacy Lab aims to reverse this narrative, by boosting the role of science and communication as a catalyst for cooperation and peace.

The Lab is funded by the DUPC programme and aims at studying the role of the media and science in transboundary water negotiations, as well as training journalists and researchers in water science communication. Journalists and researchers from different Nile basin countries will be trained together and will be supported to co-produce original knowledge on Nile waters in a way that facilitates mutual understanding between riparian countries and cooperation on transboundary water resources.

Global partnership for water and development

In 2016, around 50 research and capacity development projects have been initiated within the second phase of the DUPC programme, a four-year cooperation between the Dutch Ministry of Foreign Affairs and the Institute. Our aim is to demonstrate tangible impacts on the ground, through sustained and strengthened partnerships with Southern and transition countries.



Latin America

Sanitation learning alliance between Colombia, Venezuela and Brazil

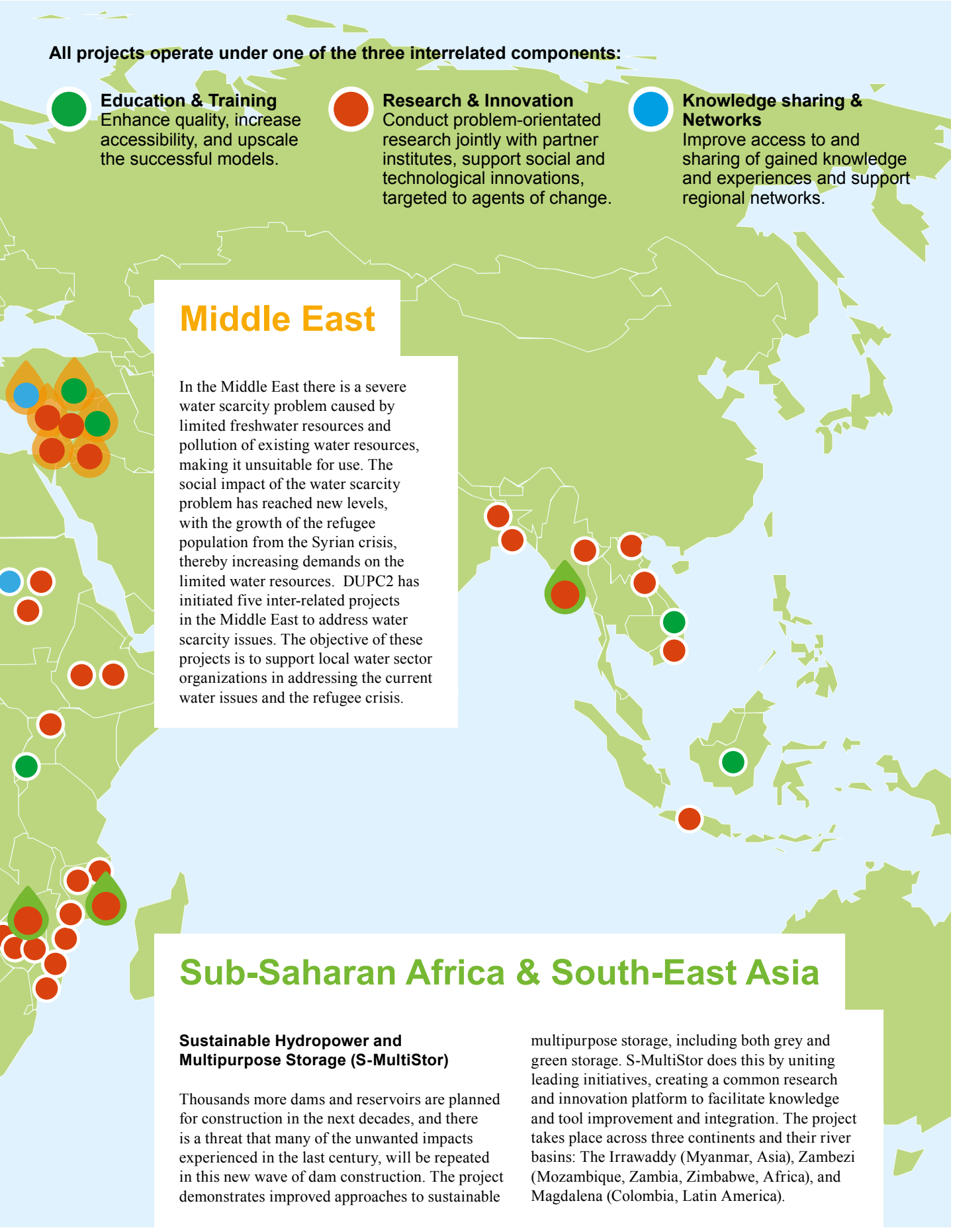
This project will create a ‘golden triangle of sanitation knowledge’. Partners involved will work on intensive knowledge sharing and setting up applied research to improve the situation in each country. The wastewater treatment in Cochabamba, Bolivia, which receives 25% more wastewater than its maximum capacity, will be studied.

All projects operate under one of the three interrelated components:

Education & Training
Enhance quality, increase accessibility, and upscale the successful models.

Research & Innovation
Conduct problem-orientated research jointly with partner institutes, support social and technological innovations, targeted to agents of change.

Knowledge sharing & Networks
Improve access to and sharing of gained knowledge and experiences and support regional networks.



Middle East

In the Middle East there is a severe water scarcity problem caused by limited freshwater resources and pollution of existing water resources, making it unsuitable for use. The social impact of the water scarcity problem has reached new levels, with the growth of the refugee population from the Syrian crisis, thereby increasing demands on the limited water resources. DUPC2 has initiated five inter-related projects in the Middle East to address water scarcity issues. The objective of these projects is to support local water sector organizations in addressing the current water issues and the refugee crisis.

Sub-Saharan Africa & South-East Asia

Sustainable Hydropower and Multipurpose Storage (S-MultiStor)

Thousands more dams and reservoirs are planned for construction in the next decades, and there is a threat that many of the unwanted impacts experienced in the last century, will be repeated in this new wave of dam construction. The project demonstrates improved approaches to sustainable multipurpose storage, including both grey and green storage. S-MultiStor does this by uniting leading initiatives, creating a common research and innovation platform to facilitate knowledge and tool improvement and integration. The project takes place across three continents and their river basins: The Irrawaddy (Myanmar, Asia), Zambezi (Mozambique, Zambia, Zimbabwe, Africa), and Magdalena (Colombia, Latin America).

Capacity building of people and institutions takes time

WaterNet is a capacity building network in Southern Africa and is one of the few UNESCO-IHE projects that has evolved into an independent institution. Programme manager Jean-Marie Kileshye-Onema shares some of WaterNet's recent highlights and successes.

WaterNet has developed a new strategy for the period 2017 to 2021, working closely with UNESCO-IHE, with support from the Dutch Ministry of Foreign Affairs via their Directorate General for International Cooperation (DGIS). For the past 16 years, DGIS has supported WaterNet financially and this commitment has been extended until 2021. It is a great achievement to receive such long standing credit from the Dutch government for being a flagship programme in the region.

Jean-Marie Kileshye-Onema: "The good thing about long term support like the one that WaterNet received from DGIS is that we are now starting to see the impact on the ground. This is not possible with short term interventions. Those who have been trained within the WaterNet system with financial support from DGIS and scientific backstopping from UNESCO-IHE, are now holding decision making positions in the water sector. In almost all of the 15 SADC countries and their ministries, you bump into a WaterNet alumnus who is managing water resources in their country. That is one of the lessons we have learned: capacity building of people and institutions takes time. Now, after almost 20 years we see tangible results taking place on the ground."

Educating and training African water managers

WaterNet operates in four major focus area to educate and train water managers in South and East Africa. Jean-Marie: "We run the Master's programme in Integrated Water Resources Management and recently we have been piloting the PhD programme. The short professional training courses offer participants continuous professional development. Thirdly, we have a collaborative research initiative where we are working together with UNESCO-IHE on projects such as AfriAlliance. The aim is to better prepare Africa for future climate change challenges by having African and European stakeholders work together in the areas of water innovation, research, policy, and capacity development. WaterNet is leading the work package on enhancing knowledge management, innovation and technology transfer. Our fourth focus area is outreach, under which we convene an annual scientific symposium in East and Southern Africa which results in the publication of a special issue of the Journal of Physics and Chemistry of the Earth. The 18th WaterNet Symposium will take place from 25-25 October 2017 in Swakopmund, Namibia."

Capacity building through co-creation

"Capacity building remains central in our strategy, but we are insisting more on co-creation. We believe that sustainable solutions can only take place when ownership of the process is embraced. We don't believe that there is one group holding all the knowledge, and the other one has got none. Water solutions need co-creation," says Jean-Marie.

In addition, climate change will be addressed more strongly in WaterNet's future activities. "Water Resources management, which is complex naturally, has always been studied with limited consideration of climatic variation. However currently, more and more scientific proof of the effects of climate change emerge. We are therefore forced to consider it in any capacity building activity. We are looking forward to continuing our longstanding relationship with UNESCO-IHE to place climate change as a central theme in all our activities," concludes WaterNet's programme manager.

Colophon

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IHE Delft Institute for Water Education (formerly UNESCO-IHE) is the largest international graduate water education facility in the world and is based in Delft, the Netherlands. The Institute confers fully accredited MSc degrees, and PhD degrees in collaboration with partners. Since 1957 the Institute has provided graduate education to more than 15,000 water professionals from over 162 countries, the vast majority from the developing world.

The mission of IHE Delft is to contribute to the education and training of professionals, to expand the knowledge base through research and to build the capacity of sector organizations, knowledge centers and other institutions active in the fields of water, the environment and infrastructure in developing countries and countries in transition.

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