



IHE
DELFT

HIGHLIGHTS 2019

Sustainable Development Goals

During an historic UN Summit in 2015, world leaders formally adopted a new set of 17 measurable Sustainable Development Goals (SDGs), plus 169 associated targets, to end poverty, protect the planet and ensure prosperity for all. Although the SDGs are not legally binding, they provide a framework within which all countries are expected to take ownership: it is a social pact between governments and their people. Countries have the primary responsibility for follow-up and review of the progress made in implementing the Goals and are encouraged to conduct voluntary national reviews on a regular basis.

IHE Delft aims to make a tangible contribution to achieving all SDGs in which water is key. We believe that through creating synergies in education, applied research and institutional strengthening we can do so. Our commitment, together with our partners, is to provide mutual learning and strengthened capacity development for the water sector, especially – though not exclusively – in the Global South.

Our UNESCO status and membership of UN Water positions the Institute well to contribute to the monitoring of SDGs. In May 2019, the Institute hosted **Defining a national information strategy in view of reaching SDG 6**, a workshop organized by the Dutch Ministry of Infrastructure and Water Management and advised by UN Water. It addressed SDG targets 6.3 and 6.4, on water quality and the availability of both surface and groundwater. The workshop focused on specific country needs and provided guidance to 14 participating country delegations on how to develop an information system, even with limited availability of resources.

Are we leaving no one behind?



'Leaving no one behind' was the central theme of World Water Day 2019. This is an adaptation of the promise of the 2030 Agenda for Sustainable Development: as sustainable development progresses, everyone must benefit. Sustainable Development Goal (SDG) 6 aims to

ensure availability and sustainable management of water for all by 2030. By definition, this means leaving no one behind. There are still 10 years to go in which the SDGs should be reached, but will we manage to achieve these ambitious goals?

IHE Delft embraced the challenge to contribute to the achievement of the SDGs in which water is key. The IHE Delft 2018-2023 strategy is aimed at deepening and extending the outreach of knowledge and innovation through education, research and institutional strengthening activities.

The water and climate related risks have further increased and are considered by the younger generation to be even more severe than by the older generation¹. The same report and other reports highlight the importance of biodiversity loss and the undervaluing of our natural systems. Added to this the uncertain impact of the outbreak of Covid 19 at the time of writing, the need and challenge to achieve the SDGs becomes even greater.

One key way we address SDGs is through our teaching, and in 2019 we celebrated the first batch of 13 graduates of the Sanitation MSc programme developed in partnership with, among others, the Bill and Melinda Gates Foundation. Exceeding 100 granted scholarships for MSc programmes was a landmark in our partnership with Rotary which started in 2011.

The excellent quality of our MSc programmes was again made clear from the re-accreditation of our four 18 Month MSc Programmes. To further strengthen our education and as part of our strategy, major steps were taken to design a new structure for our MSc programmes, which will allow us to be

more student orientated and further increase interdisciplinarity in our programmes, while maintaining our high quality. Together with the development of our online learning portfolio and life-long learning concept, we will continue to offer a world class quality education programme for the water sector with an emphasis on our partners from the Global South.

To contribute through our research to the achievement of the SDGs, these societal goals were used as a starting point to identify existing gaps and related research questions. These research questions are being further developed and implemented by the six new academic departments (replacing the previous four) as of January 2020.

Examples of outstanding research with a high degree of impact, are Citizen Science projects such as SCENT, Groundtruth and WeObserve and the Water Peace Security programme. The financial backing of our funding partners such as the Ministry of Foreign Affairs of the Netherlands, Ministry of Education, Culture and Science, Ministry of Infrastructure and Water Management, the European Commission and others is, of course, indispensable.

It is clear that IHE Delft can only achieve its mission in strong collaboration with all its partners and alumni. By enabling our alumni to become "Water leaders", we hope to contribute to a better world. Just one example of the influence of our alumni, of whom we are very proud, is our colleague and alumnus, Dr. Yasir A. Mohamed who was appointed minister of Water Resources in Sudan in 2019.

All the above and more was done while achieving a positive financial result in 2019, which will enable us to further support the implementation of our strategy and by this contribute to the achievement of the SDGs.

Eddy Moors
Rector

Research

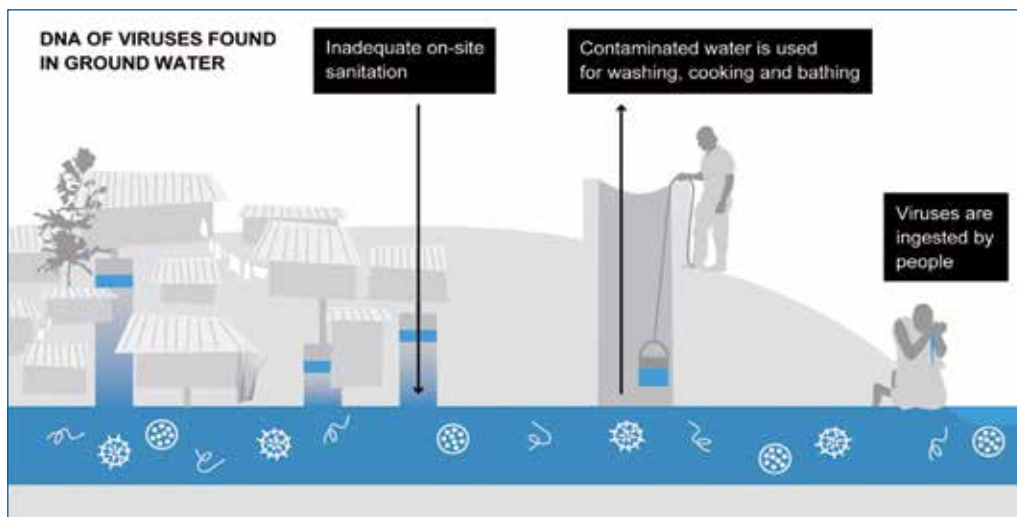
IHE Delft takes a holistic research approach, working with stakeholders and combining fundamental and applied expertise from natural and social sciences, including engineering and design. Combining expertise from IHE Delft staff and their partnerships on most water aspects allows for an explicitly interdisciplinary, problem orientated approach, particularly relevant for finding pragmatic, evidence based solutions.

Water contamination: poor sanitation a viral threat to African slum communities?

Ground-breaking collaborative research between IHE Delft and partners from Ghana, Tanzania and Uganda, has revealed potentially hazardous concentrations of viruses in the groundwater below slums in all three countries. The team found evidence of 25 DNA virus families including several - such as herpesviruses, poxviruses and

papillomaviruses - which can adversely affect human health. The findings, first presented at the European Geosciences Union General Assembly in Vienna, were picked up by media across Europe and Africa, reaching up to 5 million readers.

[More on t-group.science](#)



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WATER RESOURCES

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241 articles in Web of Science-listed journals in 2019

For a relatively small organization IHE Delft produces a high volume of research outputs, publishing 241 articles in Web of Science-listed journals in 2019. The majority of these were in Water Resources and Environmental Sciences, with strong contributions in Engineering, Meteorology, Oceanography,

Green Technology and Energy. The whole 2019 collection was cited more than 300 times in 2019 alone, with a Nature article co-authored by IHE Professor of Ecohydrology, Michael McClain, already reaching the status of a Web of Science top-cited article in its year of publication.

2019 PhD symposium on “Innovations for Sustainability”

The SDGs cannot be achieved without adopting new ways to respond to the interrelated environmental, societal, and economic challenges we are facing today. Overcoming these challenges requires thinking of innovative and smarter solutions that can have positive impact on sustainable development. The PhD symposium, held in October, welcomed presentations corresponding to this theme and had a special focus on water and climate change related challenges. A list of all PhD theses published in 2019 is presented elsewhere in this document.

Open access versions are available through NARCIS: repository.tudelft.nl/ihe/

Study on the location and extent of the planet’s remaining free-flowing rivers

In a paper published in the journal Nature, researchers from an international network of institutions, including IHE Delft, presented a global assessment of the location and extent of the planet’s remaining free-flowing rivers. The team assessed the connectivity of 12 million kilometres of rivers worldwide.

[More on nature.com/articles/s41586-019-1111-9](https://www.nature.com/articles/s41586-019-1111-9)

Open science and innovation

With particular expertise in Citizen Science, and technical innovations in water management and engineering, IHE Delft is actively opening up science to wider participation and turning cutting edge science into innovative solutions for change.

Successful conclusion of SCENT

The 3-year EU funded SCENT project developed a smart toolbox for engaging citizens into a people-centric observation web. Making use of various methods, including serious gaming, the project implemented two demonstration cases: Kifisos River in Attica (Greece) and Danube Delta (Romania). The first one focused on river basin management and the second, in which IHE Delft participated, on flood risk management through preservation of ecosystems by developing flood models incorporating citizens' retrieved information.

[More on scent-project.eu](http://moreon-scent-project.eu)



“Data coming from citizens is used in flood models which will help to improve how decision makers are working.”
Ioana Popescu, Associate Professor of Hydroinformatics at IHE Delft

MOOC on Citizen Science Projects

In November WeObserve launched a MOOC entitled “Citizen Science Projects: How to make a difference”. It is aimed at anyone who wants to find out more about Citizen Science – and about how citizen scientists can effect change – the course is open to anyone and free to pursue. WeObserve is a Horizon2020 “Coordination and Support Action” that aims to move citizen science into the mainstream. It brings together the expertise from a range of European research and Citizen Science organizations, including IHE Delft.

[More on weobserve.eu](http://moreonweobserve.eu),
futurelearn.com/courses/weobserve-the-earth

Ground Truth Week

The Ground Truth Week, held in October, started with webinars, local events and the launch of videos from the citizen observatories in Africa and Europe that Ground Truth 2.0 had helped to set up. In the second half of the week, an event at IHE Delft was held with dynamic sessions and discussions about the journeys of the citizen observatories to setting up their platforms and to achieving impact on decision making.

Ground Truth 2.0, a 3-year EU funded project led by IHE Delft, concluded in 2019. It set up and validated six citizen observatories, in four European and two African demonstration cases. In Kenya for example, the Masai Mara



Citizen Observatory aims to improve the livelihoods of the citizens of the Mara Region and the environment. It is setting up a multi-stakeholder platform for generating and sharing of data, information and knowledge to improve policy making and implementation for sustainable livelihoods and biodiversity management in the Mara ecosystem.

[More on gt20.eu](http://moreongt20.eu)



“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 and cooperative planning.”

Uta Wehn, Project Director GroundTruth and Associate Professor of Water Innovation Studies at IHE Delft

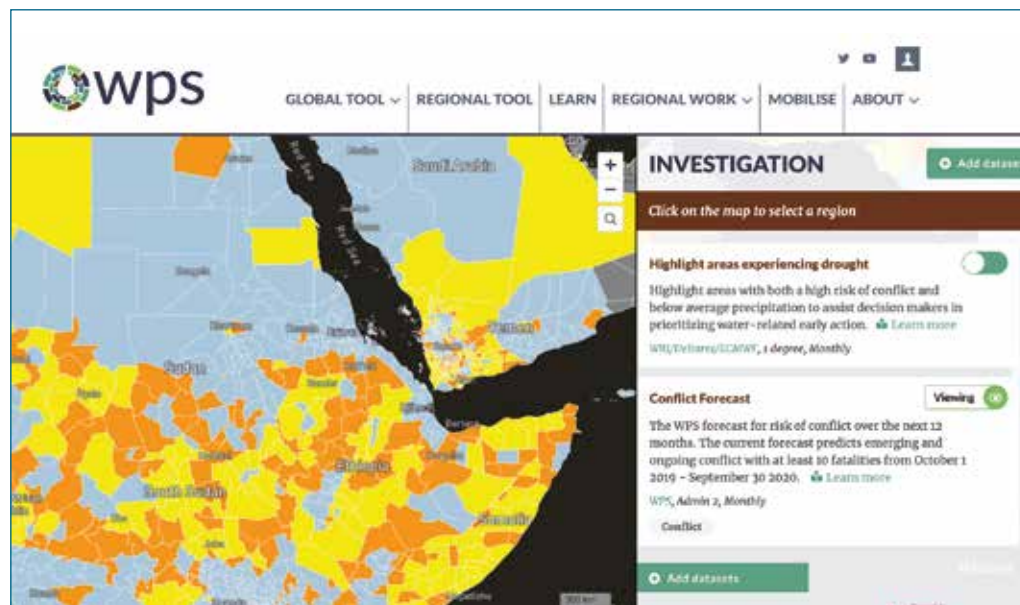
Mapping the area affected by Cyclone Idai

Tropical Cyclone Idai is regarded as one of the worst tropical cyclones on record to affect Africa and the Southern Hemisphere as a whole. The storm caused catastrophic damage in multiple nations, leaving hundreds of people dead, hundreds more missing, and an estimated 400,000 people lost their homes. In March, IHE Delft organized a Mapathon to map the affected areas in Mozambique, Malawi, and Zimbabwe.



Partnerships

At IHE Delft we partner with leaders in the fields of engineering, environmental science and organizational change bringing our unique expertise in interdisciplinary research and innovation, and opening up participation in science, policy development and conflict management.



New Water, Peace and Security tool uses machine learning to predict violent conflicts

The Water, Peace and Security (WPS) partnership launched its Global Early Warning tool in December. The tool applies machine learning to predict possible water-related conflict up to a year in advance. The WPS project, led by

IHE Delft's Susanne Schmeier, promotes dialogue and learning processes where conflicts are likely, to create inclusive, conflict-sensitive interventions.

[More on waterpeacesecurity.org](https://www.waterpeacesecurity.org)

MoU with the Ministry of Environment and Natural Resources of El Salvador

In January IHE Delft signed an MoU with the Ministry of Environment and Natural Resources of El Salvador on joint activities related to knowledge sharing and capacity development in the areas of hydro meteorological forecasting, prediction models, early warning systems, flood risk management, integrated water resources management and climate change.

In 2019 a total of 16 new MoUs were signed, including the above and agreements with the Ministry of Water Resources of Bangladesh, King's College in London, UK and the Department of Irrigation Development of the Government of Zimbabwe.

Universities' Partnership for Water Cooperation and Diplomacy (UPWCD)

In spring 2019 the Memorandum of Understanding for the Universities' Partnership for Water Cooperation and Diplomacy was signed by all the core partners. A joint article that outlines the vision and mission of the UPWCD was published in the journal [Water Resources Development](https://www.waterresourcesdevelopment.com).

A website was launched in December.

[More on upwcd.org](https://www.upwcd.org)

Top-up of DUPC2 approved

Within the framework of the IHE Delft Partnership Programme for Water and Development (DUPC), we work closely with partners in the Global South, as one key approach in contributing to solving water and development challenges.

In 2019 the DUPC2 top-up was officially approved by the Ministry of Foreign Affairs of the Netherlands. The top-up consists of eight activities with a total budget of 11 million Euros. Activities were developed in cooperation with DUPC2 partners, resulting in an ground-breaking new package of education, research and capacity strengthening activities, which will contribute greatly to the overall objectives of the DUPC2 programme: to help making impact on the ground in partnership.

Project activities include supporting water management in Small Island Developing States, the MENA region and Sudan by strengthening capacity and applied research, boosting effectiveness of Water Operators' Partnerships and the application and improvement of a Water-Energy-Food-Nexus Toolbox, to support sustainable and inclusive socio-economic development in water scarce regions.

[More on un-ihe.org/dupc](https://www.un-ihe.org/dupc)



"We work on the entire chain, from identifying conflicts to actually preventing, mitigating or solving conflicts."

Susanne Schmeier, WPS and Senior Lecturer in Water Law and Diplomacy at IHE Delft

Education

Addressing water challenges requires multidisciplinary knowledge and skills. Targeting early-to-mid-career professionals, primarily but not exclusively from the Global South, our education aims at making a difference and contributing to the SDGs.

Confirmation re-accreditation of all four 18 Month MSc programmes

In 2018-2019 the MSc programmes underwent a third accreditation process. By letter of 25 July 2019 the NVAO confirmed the re-accreditation of all four 18 Month MSc programmes.

“ The panel very much appreciates the intensive efforts IHE puts into tutoring and guidance of its students. The teaching and learning environment created by IHE is very inspiring and motivating. Students feel part of a community and are stimulated to achieve a high level.”

Excerpt from final assessment report of the NVAO visitation panel



Sustainable WASH for Rohingya Crisis

IHE Delft conducted a two week tailor made training course on Faecal Sludge Management, which was part of the “Sustainable WASH for Rohingya Crisis” project under the BRAC WASH Programme. Two batches of training were delivered in Cox’s Bazaar, Bangladesh, with field visits to the Kutupalong Refugee Camp site. The training enhanced the capacity of professionals who were mainly from BRAC and several national and international NGOs.

In 2019, 20 different tailor made advice and training courses were conducted both in Delft and in participants’ home countries, a total of 346 participants receiving training.



190, including first cohort of MSc in Sanitation, receive MSc Diploma

190 MSc students graduated in 2019, most of whom received their Diploma at the IHE Delft graduation ceremony on 25 April 2019 in the Old Church in Delft, including

13 students from the first edition of the Master of Science in Sanitation Programme.

Second phase for Flood Risk Master

The Erasmus Mundus Joint MSc in Flood Risk Management received a 4 million Euro grant for the second phase of the MSc programme for the period 2019-2024. The grant will, among other benefits, offer at least 80 Erasmus+ scholarships for students to follow the MSc programme. It is part of three Erasmus Mundus MSc programmes offered by IHE Delft in collaboration with partners, the others being IMETE and GroundWatCh.

[More on floodriskmaster.org](http://moreon.floodriskmaster.org),
imete.eu, groundwatermaster.eu

New Open Education platform

IHE Delft is proud to be embracing the culture of sharing educational materials, openly and free of charge on its Open Education platform. Improvements in 2019, gave a more modern and professional look to the existing online educational materials and expanded the reach from OpenCourseWare to an Open Education platform. The platform can now also be used for preparatory courses for MSc programmes, project-related free online courses and MOOCs.

[More on ocw.un-ihe.org](http://moreon.ocw.un-ihe.org)



“ We learned that water does not have boundaries, we cannot find solutions alone, and cooperation and an interdisciplinary approach are required to face and overcome present and future water challenges.”

Parth Kamath, MSc Graduate from India at graduation ceremony

PHD PROMOTIONS 2019

JANUARY

- *Quantifying Climate Change Driven Environmental Losses in Coastal Areas: a practical framework* - **Mr. S. Mehvai, Islamic Republic of Iran** | Promotors: Prof. R.W.M.R.J.B. Ranasinghe, Prof. T. Filatova (University of Twente)

MARCH

- *Protection of Public Health from Microbial and Chemicals in Swimming Pool Environments* - **Ms. Y. Ekowati, Indonesia** | Promotors: Prof. M.D. Kennedy, Prof. A. de Roda Husman (Utrecht University/RIVM)
- *Integrating Multiple Sources of Information for Improving Hydrological Modelling: an Ensemble Approach* - **Mr. I.M. Hartanto, Indonesia** | Promotor: Prof. D.P. Solomatine
- *Estimating Combined Loads of Diffuse and Point-Source Pollutants into the Borkena River, Ethiopia* - **Mr. E.Z. Belachew, Ethiopia** | Promotor: Prof. K.A. Irvine

MAY

- *Improved Hydrological Understanding of a Semi-Arid Subtropical Transboundary Basin Using Multiple Techniques-The Incomati River Basin* - **Ms A.M.L. Saraiva Okello, Mozambique** | Promotors: Prof. S. Uhlenbrook, Prof. P. van der Zaag
- *Anaerobic Treatment and Resource Recovery from Methanol Rich Waste Gases and Wastewaters* - **Ms. T.G. Madapura Eregowda, India** | Promotor: Prof. P.N.L. Lens
- *Ecological Modelling of River-Wetland Systems: A Case Study for the Abras de Mantequilla Wetland in Ecuador* - **Ms. M.G. Alvarez Mieles, Ecuador** | Promotors: Prof. A.E. Mynett, Prof. K.A. Irvine

JUNE

- *Rethinking Fecal Sludge Management in Emergency Setting* - **Ms. F. Zakaria, Indonesia** | Promotor: Prof. D. Brdjanovic

SEPTEMBER

- *Integrated Pollution Prevention and Control for the Municipal Water Cycle in a River Basin Context. The Three-Step Strategic Approach* - **Mr. A. Galvis Castano, Colombia** | Promotor: Prof. H.J. Gijzen
- *Optimisation of Dynamic Heterogeneous Rainfall Sensor Networks in the Context of citizen Observatories* - **Mr. J.C. Chacon Hurtado, Colombia** | Promotor: Prof. D.P. Solomatine
- *The Value of Using Hydrological Datasets for Water Allocation Decisions: Earth Observations, Hydrological Models, and Seasonal Forecasts* - **Mr. A.J. Kaune Schmidt, Germany** | Promotor: Prof. C.M.S. de Fraiture

OCTOBER

- *Understanding the Impact of Human Interventions on the Hydrology of Nile Basin Headwaters, the Case of Upper Tekeze Catchments* - **Mr. T.G. Gebremicael, Ethiopia** | Promotor: Prof. P. van der Zaag

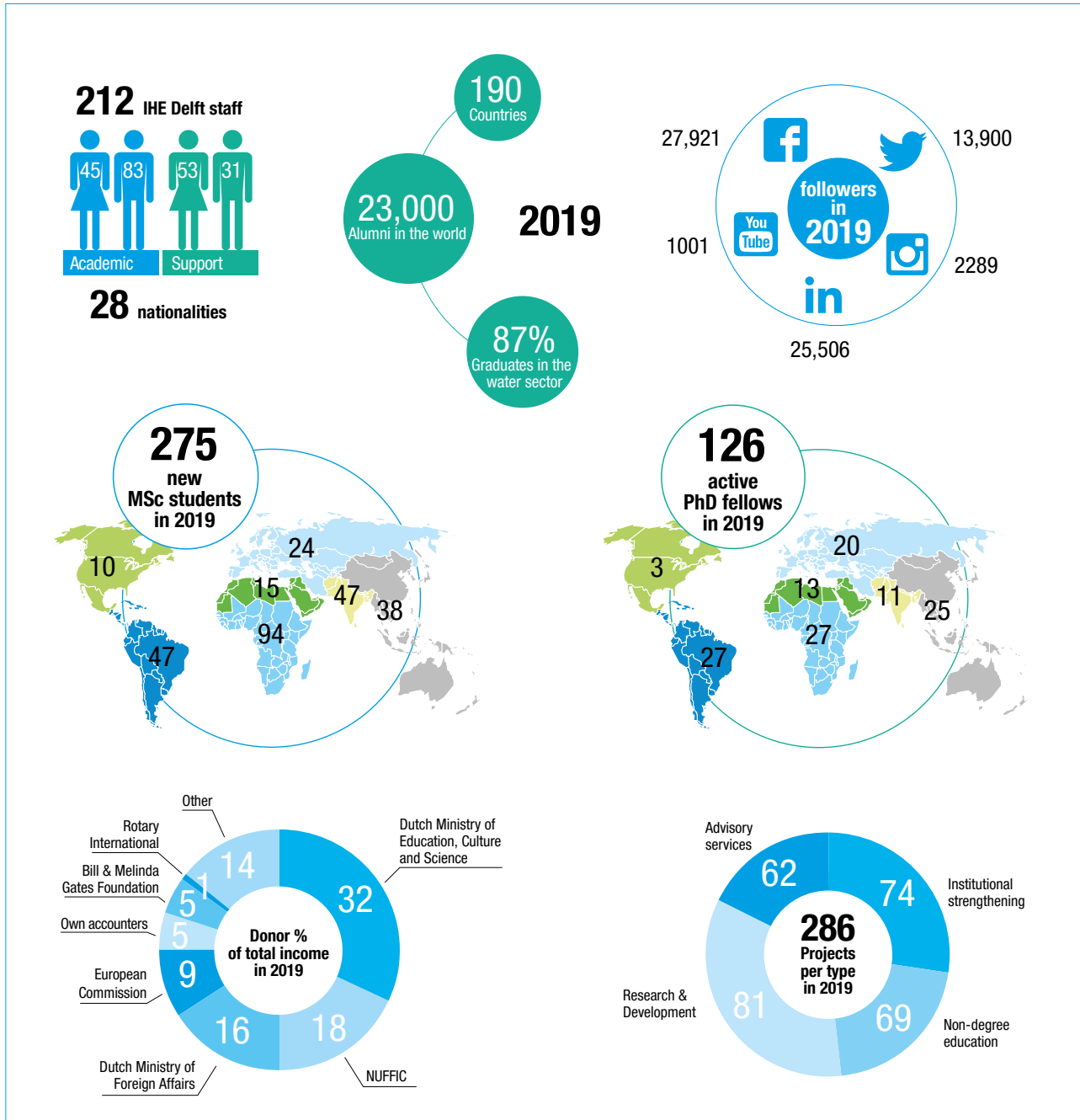
NOVEMBER

- *Effects Of Wetland Conversion to Farming on Water Quality and Sediment and Nutrient Retention in a Tropical Catchment* - **Mr. A. Uwimana, Rwanda** | Promotor: Prof. K.A. Irvine

DECEMBER

- *Assessing Bacterial Growth Potential in Seawater Reverse Osmosis Pretreatment; Method Development and Applications* - **Mr. A.M.J. Abushaban, Palestine** | Promotor: Prof. M.D. Kennedy
- *Compliance Or Defiance? Assessing the Implementation of Policy Prescriptions for Commercialization by Water Operators* - **Ms. M. Tutusaus Luque, Spain** | Promotor: Prof. M.Z. Zwarteveen
- *Bioconversion of CO and CO2 to Biofuels and Bioelectricity* - **Ms. S. Chakraborty, India** | Promotor: Prof. P.N.L. Lens
- *Making Water Security- A Morphological Account of Nile River Development* - **Mr. H. Smit, Netherlands** | Promotor: Prof. P. van der Zaag

FACTS AND FIGURES 2019



Personal awards and recognitions

Arthur Mynett becomes Honorary Fellow IAHR

International Association for Hydro-Environment Engineering and Research (IAHR) awarded IHE Delft Emeritus Professor, Arthur Mynett, an Honorary Membership in recognition of his life-time contribution to the field of computational hydraulics and the application of emerging computational technologies to complex environmental issues.

Dano Roelvink receives Coastal Award

The Coastal Award is handed out every two years, during the alternating Coastal Dynamics and Coastal Sediments conferences in recognition of a lifetime of achievements in the field. Based on the free votes from a long list of distinguished coastal scientists, Dano Roelvink, Professor of Coastal Engineering and Port Development at IHE Delft was elected as 2019 Coastal Award recipient.

Yasir Mohamed appointed as Minister of Irrigation and Water Resources in the Republic of Sudan

In September 2019 Dr. Yasir A. Mohamed was appointed Minister of Irrigation and Water Resources for Sudan, as well as member of the 2019–2022 Transitional Cabinet. Before his appointment, Dr Mohamed was Professor and Director General of the Hydraulics Research Centre in Sudan and Associate Professor of Water Resources Management at IHE Delft. He is also an alumnus of IHE Delft.

Álvaro José da Fátima de Carmo Vaz receives Alumni Award 2019

Alumnus Dr. Álvaro José da Fátima de Carmo Vaz from Mozambique is the winner of the IHE Delft Alumni Award 2019. The award is given annually to an alumna/us who is at the height of her or his career and has proven to be a role model for other water professionals, by demonstrating the impact of her/his work in a water related field, to improve people's quality of life.

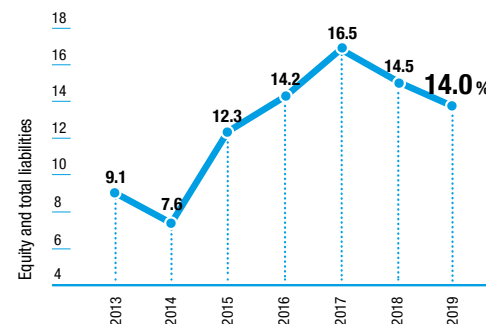
FINANCE

In 2019, the total income of IHE Delft was over €40 million, with an overall positive result of €1,385,000. This is more than the budget for 2019 (€104,000) and a major improvement on the realization in 2018 (-€268,000). These developments are mainly due to the implementation of the limits of growth measures taken during 2018 and 2019. Compared with 2018, staff capacity reduced modestly and compared with the budget, IHE Delft had slightly fewer staff available. In financial terms however, this resulted in a marked reduction in operating costs, both compared with the budget and 2018. With an improved average project rate, an increase in net tuition fee compared with 2018 and the extraordinary income from the settlement of the IHE Delft claim for the building damages due to the Spoorzone construction activities, IHE managed to improve the net income by approximately 3% compared with 2018 and stayed just within budget. A snapshot of the 2019 financial situation of IHE Delft is presented below.

Balance sheet

The balance sheet shows a ratio of 14/86 between equity and borrowed capital, which corresponds to a solvency ratio of 14%. This ratio is comparable with the past five years. Solvency, however, needs to grow towards the targeted 20%. Nevertheless, the significant increase in the progress billing/unbilled receivables, due to advance payments in work in progress projects, compared with the growth of the general reserves, challenges the feasibility of this target. With further savings, improved focus on activities and ambitions and efficiency improvements, IHE Delft is set for further improvement over the coming years.

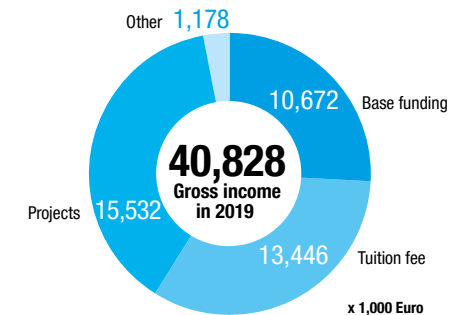
Solvency 2013-2019



About the Income

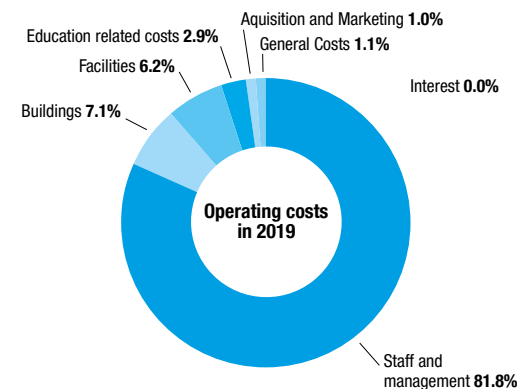
The income of IHE Delft originates from three main sources:

- Base funding from the Dutch Ministry of Education, Culture and Science
- Tuition fees received for MSc, PhD, short course and module students (regular programmes)
- Project revenue (irregular programmes)



Expenditures

IHE Delft makes a distinction between out of pocket costs and operating costs. Out of pocket costs relate to direct output of the Institute's activities and revenue items of education, training and projects. Operating costs concern general costs such as staff, building, facilities and other indirect or overhead costs.



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