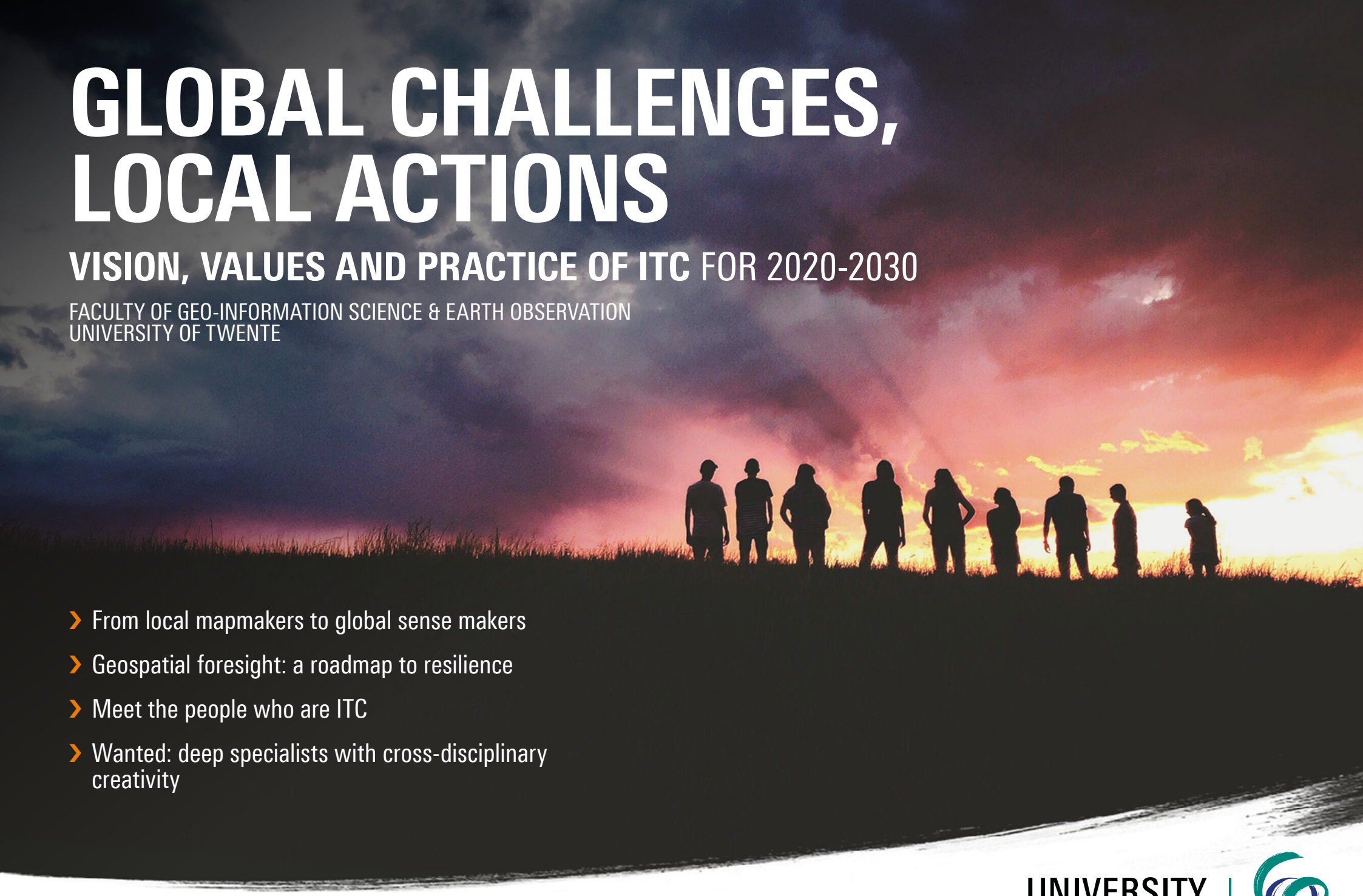
GLOBAL CHALLENGES, LOCAL ACTIONS

VISION, VALUES AND PRACTICE OF ITC FOR 2020-2030

FACULTY OF GEO-INFORMATION SCIENCE & EARTH OBSERVATION
UNIVERSITY OF TWENTE



- From local mapmakers to global sense makers
- Geospatial foresight: a roadmap to resilience
- Meet the people who are ITC
- Wanted: deep specialists with cross-disciplinary creativity

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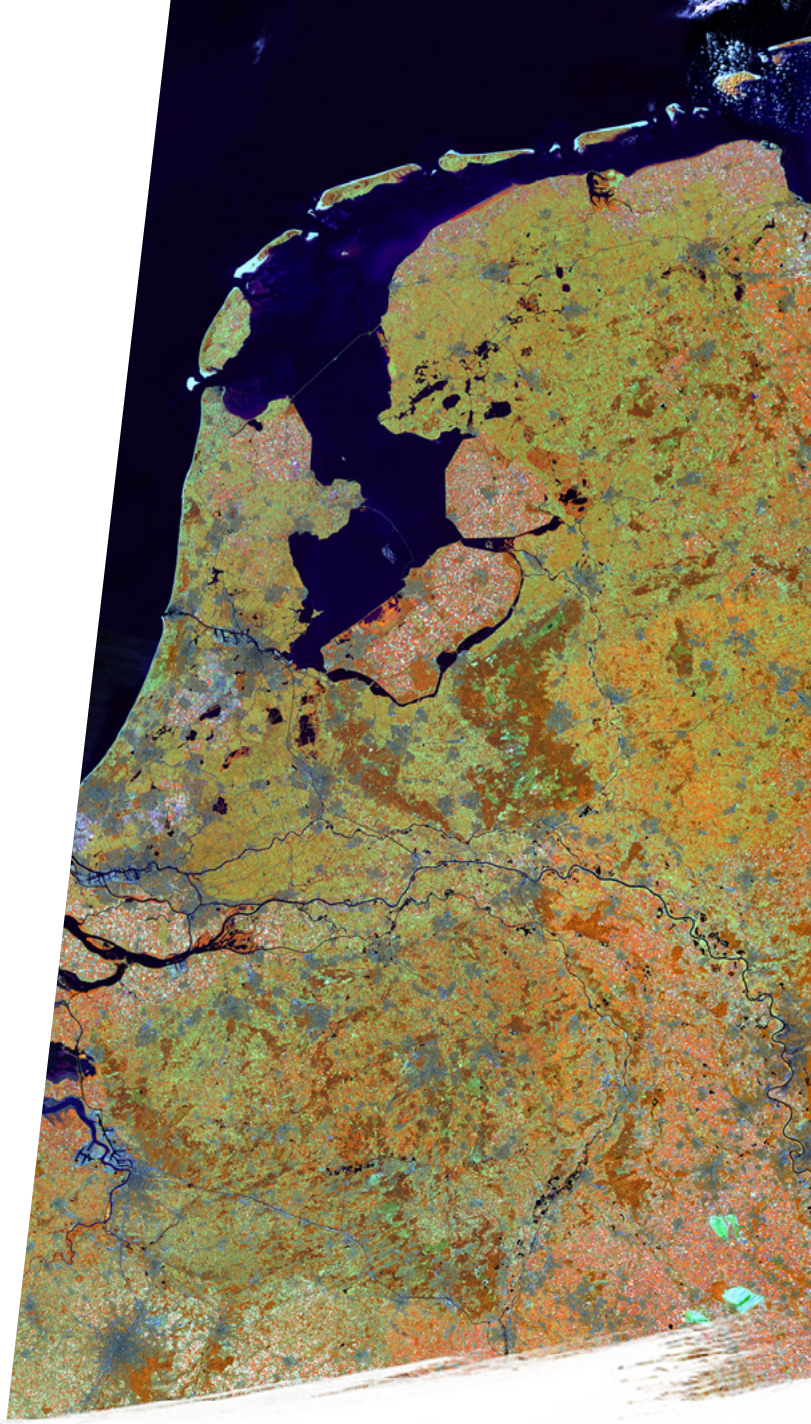

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FOREWORD BY FREEK VAN DER MEER, ITC DEAN

FROM LOCAL MAPMAKERS TO GLOBAL SENSE MAKERS

It has never been easier than it is today to put the finger on the perils our planet faces. Climate change. Depletion of natural resources. Demographic shifts. Migration. Deforestation. Endangered ecosystems. Geopolitical and societal tensions. In our line of work, we daily stand eye to eye with these issues, and the very real threats they pose to mankind.

In fact, the multiple layers of data and insights our work yields are like a magnifying glass: they reveal to us that the challenges are even greater than many people realise. For example, the combination of population growth and technological advancements have created greater interconnectivity and unpredictability: in our networked societies, a local spill can cause a global mess. Think of COVID-19. Think of a bursting market bubble causing worldwide economic fallout. Think of human-caused global warming and how it is giving rise to more destructive hurricanes.

VULNERABILITY TO RESILIENCE

Yes, we live in a world of constantly changing, and increasingly systemic, risks. And yes, it's worrying. The good news is that the same tools and insights that help us to understand today's 'wicked problems' offer us exciting opportunities to surmount them. The interconnectivity that makes us so vulnerable can also make us more resilient. The technologies helping us to lay bare the very fabric of our planet can be used to care for the planet – and all the people and living things inhabiting it. Our increasingly noticeable footprint on the environment can help us find the way to a sustainable future.

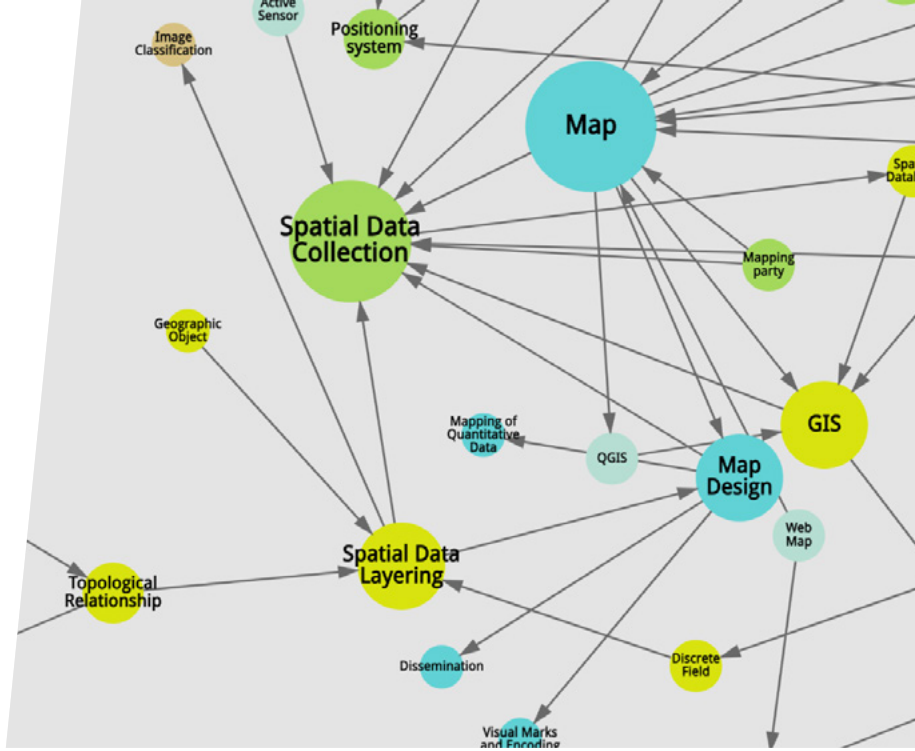
> **"OUR WORK IS CHARACTERISED BY FEET-IN-THE-MUD CHARTING – AND TACKLING – OF GLOBAL CHALLENGES.**

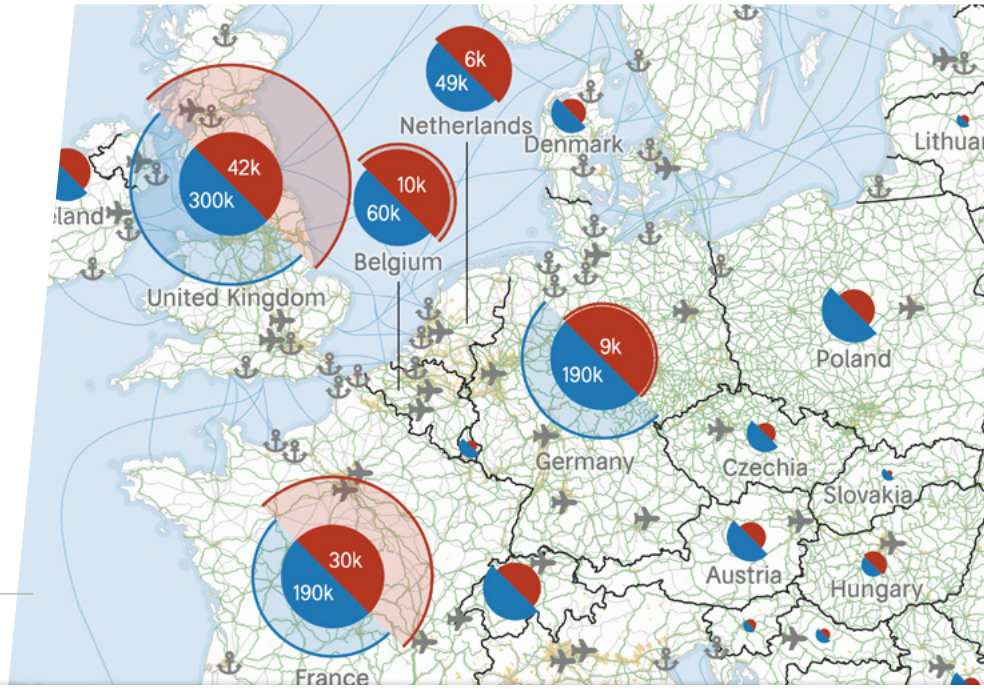
CHARTING TODAY'S GLOBAL CHALLENGES

ITC was founded in 1950 by then Prime Minister Schermerhorn of the Netherlands as the country's contribution to the United Nations Development Assistance Programme (UNDAP). Originally named the International Training Centre for Aerial Survey, its focus was on aerial photography and map making, with the goal of establishing base maps for countries without a spatial infrastructure.

Over the years, the institute kept pace with technological and societal developments in the field of remote sensing and Geographic Information Systems (GIS). In 2010, ITC became a faculty of the University of Twente with a focus on geo-information science and earth observation. Today, ITC covers many more subject areas than in the early years.

Our work is characterised by feet-in-the-mud charting – and tackling – of global challenges. Our people are engaged around the world in the realisation of the United Nations Sustainable Development Goals (SDGs) in food security and agriculture, the energy transition, geohealth, climate change adaptation, urban development and smart cities, disaster risk reduction, and land administration. We are among the world's top ten institutes for academic education, scientific research and technology development in earth observation and geo-information – a position we aim to hold and strengthen in the years ahead.





FB Mocnik et al.: Epidemics and pandemics in maps – the case of COVID-19. Journal of Maps 16(1), 2020. 144–152. doi: 10.1080/17445647.2020.1776646

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MAPMAKERS TO SENSE MAKERS

The world has changed since our founding over 70 years ago. What has remained is our mandate to contribute to round-the-world development and resilience, with a focus on technologically advanced, multidisciplinary geospatial solutions.

We started out as local mapmakers. The knowledge, tools and network we developed along the way have turned us into global sense makers.

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ITC is a key dynamic and forward-thinking player in the geospatial community and is connected globally to a wide range of stakeholders in various application domains. The faculty’s excellence in science and networking provides you with unique opportunities to grow and reach your full potential in a supportive environment. This allows everyone to actively contribute to the larger societal impact of our work.

PARYA PASHA ZADEH,
PROJECT OFFICER AT ITC

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UNDERSTANDING AND CARING FOR THE FABRIC OF OUR PLANET: VISION, MISSION & STRATEGY

- What do wild boar migration, urban construction and Ethiopian farm insurance have in common?
- Our mission in today's world
- Our vision of tomorrow's world
- Tapping into the ambition of our university
- From vision and mission to strategy and action

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photo: Kees de Bie

WHAT DO WILD BOAR MIGRATION, URBAN CONSTRUCTION AND ETHIOPIAN FARM INSURANCE HAVE IN COMMON?

Citizen-aided, smart camera traps that help nature managers to monitor animal populations. Indoor mobile mapping systems and indoor 3D model reconstruction to support disaster management in large buildings. An insurance scheme that gives Ethiopian farmers a financial basis for overcoming droughts and investing in sustainable growth.

What do these three activities have in common? Apart from the fact that they are all projects in which ITC is, or has been, involved? The answer is simple: **each of these projects relies on the magic of geospatial solutions**. Together, they illustrate what geospatial solutions can do, highlight the scope, complexity and cross-disciplinarity of our work, and exemplify our focus on 'local action for global impact'.

DRONES, CITIZENS, WILD BOARS AND DATA ANALYSTS

UT researchers were asked by the province of Overijssel, the Netherlands, to find out more about wild animal populations in the region. Soon after, a pilot study was launched, focusing on wild boars in the Engbertsdijkvenen Natura 2000 area. In addition to using innovative new technology, the project is to lead to better ways of combining existing data. For example, the researchers plan to use drones fitted with thermal cameras, and to compare the resulting data collected with data from smart hidden cameras placed on the ground. Citizen science also comes into play, with a website on which walkers, bikers and other people moving about outdoors can register their sightings.

'Wild boars are very good at hiding and are mainly active at night. That makes them an interesting species to focus on in this pilot,' explains Provincial Executive for Overijssel Gert Harm ten Bolscher. The project, he adds, is providing 'a more accurate picture of the numbers of certain species in our nature reserves, without disturbing the area.' The project exemplifies the cross-disciplinary nature of geospatial solutions, with image technology and data analysis meeting stakeholder communication and nature management. It also illustrates the relevance of geo-information and earth observation in almost any part of the world or society.

Read more about the wild boar observation project in the Netherlands.

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INDOOR MAPPING HELPS DISASTER MANAGERS AS WELL AS INTERIOR DESIGNERS

Indoor mobile mapping and modelling applications range from disaster management to virtual tourism and interior design. Researchers at ITC have made major contributions by designing indoor mobile mapping systems and developing modeling algorithms.

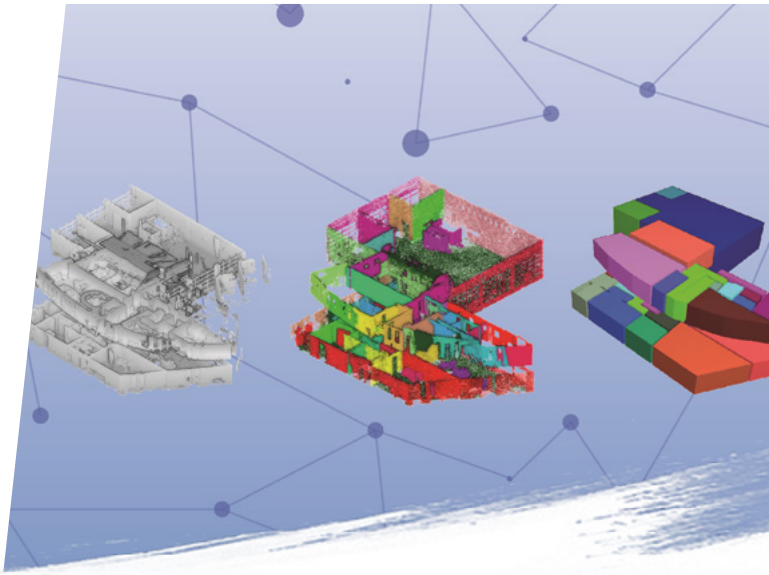
'ITC' BACKPACK

Samer Karam from Syria developed a wearable indoor mobile mapping system nicknamed 'ITC Backpack'. It combines low-cost Light Detection And Ranging (LIDAR) scanners with an Inertial Measurement Unit (IMU) sensor to map building interiors. As Global Navigation Satellite Systems (GNSSs) do not work indoors, the ITC_Backpack employs a Simultaneous Localization And Mapping (SLAM) algorithm for positioning. The system can access any location the operator can physically reach. It generates vital data for indoor modelling in a LIDAR point cloud shape.

INDOOR 3D RECONSTRUCTION

When ITC student Shayan Nikoohemat from Iran wrote a PhD dissertation on 'Indoor 3D reconstruction of buildings from point clouds', he was tapping into a growing need among engineers, architects and managers for quick, accurate digital representations of buildings.

Among the challenges involved in collecting data on building interiors are the constant changes many buildings undergo, for example, through renovation. There is also the difficulty of collecting accurate data due to the presence of reflective surfaces, impermanent objects like furniture, and unusual floor and wall angles. Whether it is used in disaster management, building management, tourism or interior design, this data collection involves many different technologies and offers a lot of potential value!



Read more about ITC's work on smart cities around the world

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REMOTE SENSING DRIVES MICRO-INSURANCE SCHEME FOR ETHIOPIAN FARMERS

The majority of farmers in Ethiopia have less than 0.5 ha of land, which makes them very vulnerable to risks, such as droughts. In order to avoid the risk of losses, these farmers tend to avoid investments in improved crop management that might substantially increase their yields and income. As a result of this risk aversion, they get caught in a poverty trap. A micro-insurance solution is helping around 200,000 Ethiopian farmers to experience less risk when deciding on crop growth investments.

The insurance scheme is part of the GIACIS project (Geo-data for Innovative Agricultural Credit Insurance Schemes). ITC provided the technological input for the satellite-based geo-data application. We developed a method for identifying each farmer's fields using printed high-resolution satellite imagery and an app that enables mobile phones to extract a position through triangulation techniques. We prepared the logic, method and algorithms to process and interpret the satellite imagery into a sound business-oriented micro-insurance scheme.

Read more about the ITC-supported micro-insurance scheme for Ethiopian farmers

"We use advanced geo-data to detect local occurrence of adverse weather conditions that impact crop development and productivity. Using probabilities, we then construct very objective indexes, that can be marketed at very low costs. Risk transfer tools provide financial inclusion to farmers, promote agricultural investments, and broker sustainable production methods.

KEES DE BIE,
ASSOCIATE PROFESSOR OF SPATIAL INFORMATION FOR SUSTAINABLE AGRICULTURE AT ITC

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OUR MISSION IN TODAY'S WORLD

Our mission is capacity development, where we apply, share and facilitate the effective use of geo-information and earth observation knowledge and tools for tackling global wicked problems. Our purpose is to enable our many partners around the world to track and trace the impact – and the shifting causes and frontiers – of today's global challenges. We are here to identify and understand vulnerability, and to use geospatial solutions for converting it into resilience, thereby contributing to the establishment of sustainable living environments anchored in an inclusive society.

OUR VISION OF TOMORROW'S WORLD

Our vision is of a world in which researchers, educators and students collaborate across disciplinary and geographic divides with governmental and non-governmental organisations, institutes, businesses and local populations to surmount today's complex global challenges and to contribute to sustainable, fair, digital societies.

> **WE ARE HERE TO IDENTIFY AND UNDERSTAND VULNERABILITY – AND TO CONVERT IT INTO RESILIENCE BY DEVELOPING, APPLYING AND SHARING GEOSPATIAL SOLUTIONS.**

OUR DNA

Our faculty is part of the University of Twente, 'the ultimate people-first university of technology', here to 'empower society through sustainable solutions'. UT's mission and vision – presented in detailed in Shaping2030 – is a natural part of our DNA. We take the wellbeing of people in a sustainable world as our guiding principle. This means we deliberately use our knowledge, tools and resources for capacity building to help identify and reduce poverty, inequality, environmental destruction and risk.

Through our work, we contribute to thriving resilient communities in different parts of the world, especially in locations where people and ecosystems are at their most vulnerable. We operate with an eye for innovative geospatial solutions, and a keen and inclusive sensitivity to societal needs and development agendas. We stand at the forefront of the scientific domain of earth observation and geo-information, as both pioneers and facilitators: pushing forward to explore uncharted territory, while also making sure that others out on the frontlines of vulnerability, hazard and risk have access to the resources already available.

OUR UNIVERSITY'S VALUES

ENTREPRENEURIALISM

Big challenges call for courageous solutions from wise leaders. We believe these bold answers can be found by leaders through experimenting, pioneering, innovating, risk-taking and venturing. We pioneer new forms of education and collaboration. We constantly test the limits of technology, science and design through new synergies between scientists, designers, industries, research and development, universities, governments and citizens.

INCLUSIVENESS

Our faculty's thriving, talented community of unique individual students, staff members and alumni from all over the world is our most crucial asset in serving society. As capacity builders, we focus on both the personal empowerment of these individuals, and the growth in knowledge and effectiveness of the institutes and locations they represent and serve around the world.

OPENNESS

Collaboration is vital to the fulfilment of our mission. Science and real-world problem-solving are teamwork. Be it locally or globally, physically or virtually, we strive to connect with vulnerable people and their needs and wishes, as well as with those eager to help. We cherish the power of our worldwide alumni network, leveraging it for the advancement of science, and for addressing societal challenges. A crucial factor in this openness is trustworthiness. We believe trust makes us and all those we work with adaptive, sustainable and resilient.

"I consider the spatial perspective key to understanding almost everything regarding social and environmental matters.

Read Alejandra's story

ALEJANDRA TORRES RODRIGUEZ,
FROM MEXICO, GRADUATED IN SEPTEMBER 2020,
NOW A PHD CANDIDATE AT ITC

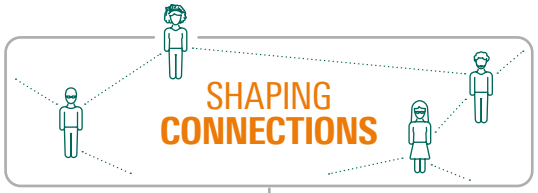
TAPPING INTO THE AMBITION OF OUR UNIVERSITY

In Shaping2030, the University of Twente presents its vision and mission for the coming years. Our university aims to 'shape' the present decade at three levels:

1. Shaping **individuals** (fostering ownership and talent);
2. Shaping **connections** (outside in & inside out);
3. Shaping **society** (a quest full of challenges).

The overarching vision of UT is to contribute to the development of a digital, fair, and sustainable society. In this article, we look at how the UT vision is anchored in the work of ITC.

- Innovative geospatial research that focuses on societal impact and fuels education and training
- Challenge-based learning and working
- Sustainable organisation



- Partnerships and networks, setting the policy agenda
- An open approach to education, research and institutional strengthening including citizen science and living labs
- Lifelong learning
- Involve alumni as professionals

- Professionalisation and rewarding of staff

A DIGITAL SOCIETY

Geospatial information and technology have a substantial digital component. With that in mind, our contribution to the 'digital society' envisioned by our university is to develop, apply and share geospatial information and technology that is open and fit for purpose. In this way, we enable transparent, inclusive and collaborative decision-making for sustainable solutions.

Our education also continues to evolve with our digital society. We continuously adapt our educational methods and programmes, syncing our research and capacity development with the digital innovations that are reshaping our world.

A FAIR SOCIETY

We are well aware that today's growing volumes of accessible data can fuel polarisation, so we aim to be open and transparent in our research and education, offering equal opportunities to all, and always considering potential ethical implications. We use cross-disciplinary approaches in our work to strengthen and guide future decision-makers and leaders in the development of fair solutions to global problems. As capacity developers, we naturally seek to make the knowledge and tools available to us also available to those operating on the frontlines of vulnerability, hazard and risk. Many of our alumni belong to this group and we know that supporting them, and listening attentively to the feedback they give, is a vital part of working towards a fair society.

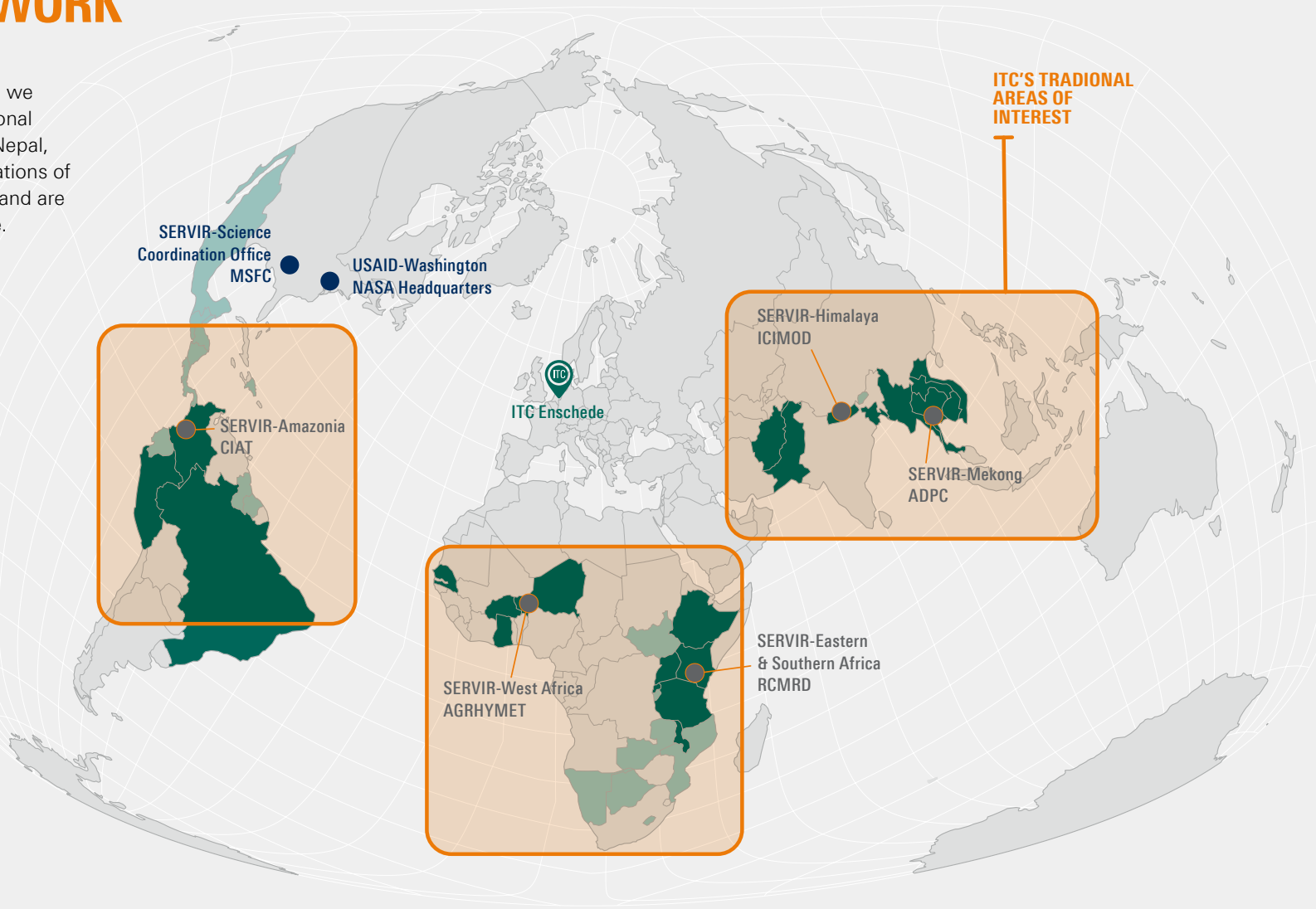
A SUSTAINABLE SOCIETY

In an era in which unsustainable ways of living have become the biggest threat to humanity, we use geo-information and earth observation to trace the causes of today's problems and to create viable solutions. We share our university's mission to respond to societal needs by developing sustainable, proactive measures to support our planet and the people to which it is home. Our education, research, innovation and organisation are centred around environmental, social and economic sustainability. We take up our responsibility in understanding and caring for the fabric and the future of our planet.

Read more about the strategy of UT

ITC TRADITIONAL AREAS OF INTEREST AND THE SERVIR NETWORK

In collaboration with the NASA SERVIR programme, we have worked on institutional strengthening and regional capacity building through hubs in Kenya, Thailand, Nepal, Niger, and Colombia, aiming to firmly embed applications of earth observation in society. These hubs have been and are part of our partner network for over a very long time.



"As our planet and people face serious challenges due to climate change, empowering countries to use earth observations and geospatial technologies is more important than ever. NASA is excited to work with world-class partners, like ITC, to help develop this capacity and jointly address complex challenges in often data scarce environments. By working together we are able to solve problems, improve lives and prepare for the future.

DANIEL IRWIN,
GLOBAL PROGRAM MANAGER
SERVIR SCIENCE COORDINATION OFFICE

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WANTED: DEEP SPECIALISTS WITH CROSS-DISCIPLINARY CREATIVITY

TO HELP US DISCOVER NEW SOLUTIONS IN THE GAPS BETWEEN DOMAINS

The vision that guided us in the previous decade was titled 'Vision 2020: More space for global development'. In our vision for 2030, it is our ambition to scale up our local activities and case studies to address today's global challenges. An important part of this is that we will place still greater emphasis on cross-disciplinary research, education and capacity building. This means we will strengthen our presence in individual domains, while also investing in cross-overs between domains. These gaps between domains, we believe, are precisely where global issues occur – and where societal needs are most urgent.

It is our vision that by combining knowledge from a growing range of fields, and by strengthening our expertise in their integration, we can create futureproof solutions. In doing this, we will focus on novel modelling approaches, including artificial intelligence and machine learning, to combine multi-scalar and multi-dimensional (volunteered geographic) big (sensor) data and information for the planning of sustainable living environments.

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The researchers, students and field workers we attract typically combine deep specialism in a particular field with a broad view and the ability to cross over into other disciplines, or at least to work closely with specialists in those fields. Many of us are highly specialised scientists, but our real specialisation, increasingly, is that cross-disciplinary interest and creativity that leads to new perspectives and solutions.

TOM LORAN,
COORDINATOR OF INTERNATIONAL COOPERATION AT ITC

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FROM VISION AND MISSION TO STRATEGY AND ACTION

SECURING AND EXPANDING OUR GLOBAL POSITION

ITC is a global leader with a strong brand name in the scientific domain of geo-information science and earth observation, and a solid, global reputation in capacity development.
In the Shanghai subject ranking (engineering – remote sensing) in 2020, ITC ranks **7th in the world, 2nd in Europe** and **1st in the Netherlands**.

Our education is top-rated in the Netherlands' 'Keuzegids Universiteiten' of 2020. It is our aim to maintain this top-rated position in education and research. We are doing this through strategic collaboration with lead partners worldwide, and by developing a stronger presence in Europe and the Netherlands, evidenced by high-impact projects, prizes and awards, and personal grants. Needless to say, societal relevance and impact will remain our key drivers in securing and expanding our leading position. In this article we look at some opportunities and threats, and share three strategic pathways we are pursuing.

STRENGTHS AND OPPORTUNITIES

ITC has several clear strengths:

- We are **the world's largest expertise centre** – and one of the 10 most influential – when it comes to geo-information science and earth observation, and we have the ambition to gain a steady position among the top five;
- We have a **unique global network** of alumni and institutional partners;
- We offer a degree of **multidisciplinarity**, covering the entire chain of geo-information science;
- We have a clear focus on capacity development, which means we connect science and education with **hands-on, feet-in-the-mud problem-solving and development in vulnerable locations**.

"

Since graduating from ITC, I have worked hard to strengthen the position of women living in rural areas of Zimbabwe by developing reusable sanitary pads that can be distributed by a drone-based distribution system. Since 2020, I am also a Senior Lecturer at the University of Cape Town.

Read Moreblessings' story

MOREBLESSINGS SHOKO,
FROM ZIMBABWE

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Building on these strengths, we see many opportunities for our involvement in upcoming new programmes, such as: the Sector plans for Earth Sciences and Environmental Sciences presented by Dutch Research Council NWO the Dutch Ministry of Education, Culture and Science, in which science sectors are requested to outline trends and developments on the basis of which funding decisions can be made; Horizon Europe, the research and innovation framework programme of the European Union (EU) for the 2021-2027 period; (inter)national policy alignments; and the EU's Earth Observation Programme, Copernicus, which is linked to the European Space Agency (ESA).

THREATS AND WEAKNESSES

We also face challenges of our own. For example, we rely in part on politically motivated funding, which means our stability and effectiveness can face pressure from changing political preferences. We acknowledge this as a weakness, and are actively sharpening our strategy and raising our profile, particularly in the Netherlands and Europe, where our visibility and reputation are relatively a lot lower than they are in most of the developing world. As we describe in other sections of this document (see, for example, 'Our DNA'), we see ourselves in a dual role of pioneer and facilitator: at one moment we may be forging new pathways into the future, at another we will be supporting other pioneers in their work. This ties in with the recognition that we are no longer the world's only experts in geospatial solutions and capacity building: many of the people we have trained, along with the organisations we have helped to develop, are now leaders in their own right. We celebrate this development as a shared success – and as part of our reason for being.

THREE STRATEGIC PATHWAYS

Taking the above into account, we are currently unfolding three strategic pathways toward the fulfilment of our mission:

1. The development and definition of a long-term research profile that links the Research Themes of the University of Twente with the main themes in our domain: Hazard, Risk & Resilience, Food Security & Biodiversity, Geohealth, Big Geodata & Governance;
2. The development of procedures, platforms and tools for continuously demonstrating the long-term economic and social value of our work, especially of our research-based capacity development;
3. The further refinement of our academic programme along the lines of 'challenge-based' research, education and innovation, which ties in with the challenge-based approached championed by the European Consortium of Innovative Universities (ECIU), of which our university is a member.

Combining research, education and capacity development, ITC has **the perfect mix** for pursuing this strategy.

THE PERFECT MIX: **EDUCATION, RESEARCH, CAPACITY DEVELOPMENT**

- How science, learning and capacity development fuel each other
- What is our scientific domain?

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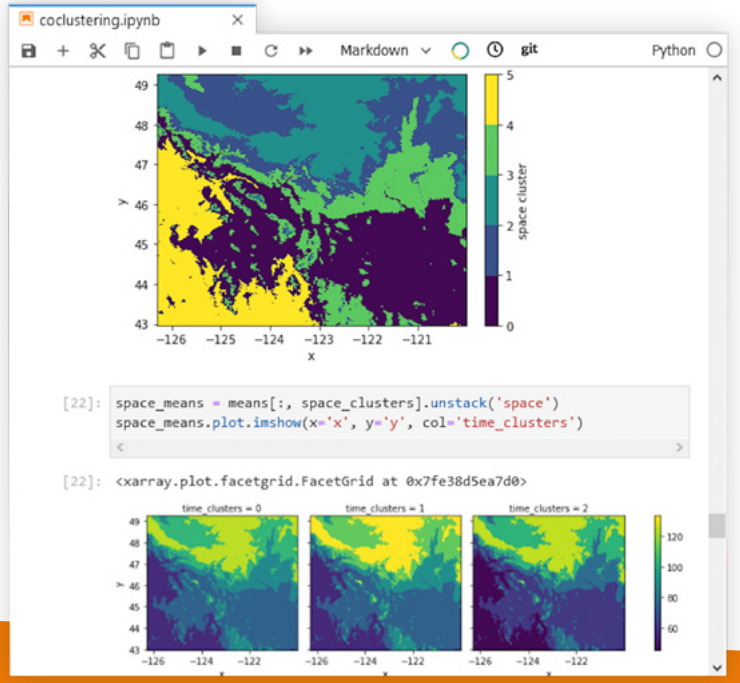
HOW SCIENCE, LEARNING AND CAPACITY DEVELOPMENT FUEL EACH OTHER

“The three primary processes on which ITC runs – education, research and institutional strengthening – make us different from most university faculties,” says ITC’s Coordinator of International Cooperation, Tom Loran. “They also fuel a constant cycle of growth in knowledge and application. Our science feeds into our educational programmes. The education then spills over into capacity development, as our graduates spread out over the world and engage in all kinds of local challenges. And because of our active network, their work in the field feeds back into our scientific research and education, ensuring its relevance and societal impact.”



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TO ME ITC STANDS FOR INNOVATION THROUGH CREATIVITY

Raúl Zurita Milla,
Professor of Spatio-temporal Analytics at ITC

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Over the past seven decades, ITC has been one of the most important centers for geospatial education and learning in the world. Their programmes have supported the advancement of thousands of professionals with practical and high-quality technical skills as well as science-based instruction. The graduates of ITC play significant roles in universities and geospatial agencies around the world. They continue to advance the fields of mapping, surveying, GIS and related applications. In my experience, ITC is an exemplary organisation.

JACK DANGERMOND,
PRESIDENT AND FOUNDER OF ESRI

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CREATING AN INTRICATE MAP OF SOCIETAL CHANGE

Our aim at ITC is always to integrate and balance the three primary processes of education, research and institutional strengthening. This is how we ensure that relevant, game-changing geospatial solutions for global challenges are developed (through research), taught (through training and education) and made useful to society (through institutional strengthening). It is important to recognise that capacity development involves activities which affect capabilities at three levels: individuals, organisations, and the institutional context within which the former two operate. This, again, underlines the importance of integrating education, research and institutional strengthening.

CAPACITY DEVELOPMENT AT 3 LEVELS

Because of the nature of today's global challenges – and the way in which our scientific domain intersects with them in many different ways – we see ourselves as serving all of society. This means that our integrated approach to capacity development targets all types of societal actors, from individuals and communities to corporate, non-governmental and governmental organisations. We do this at three levels:

1. **Individual level:** education, research, training
2. **Organisational level:** change management, development of strategic alliances, curriculum development, the development of quality assurance systems, research programme development
3. **Societal, or institutional, level:** policy adjustment and global agenda setting within our scientific domain

Read more about geospatial foresight: a roadmap to resilience

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Working at ITC means working at a faculty that really can make a difference in society and in people's lives. Everyone here feels part of the impact ITC can make in many different areas and is proud to belong to this community. All staff and students are treated with respect for who they are and what they can contribute. To me, these are some of the most important reasons why I really like my job at ITC.

MICHIEL BRESSER,
COORDINATOR OF BUREAU EDUCATION AND RESEARCH SUPPORT AT ITC

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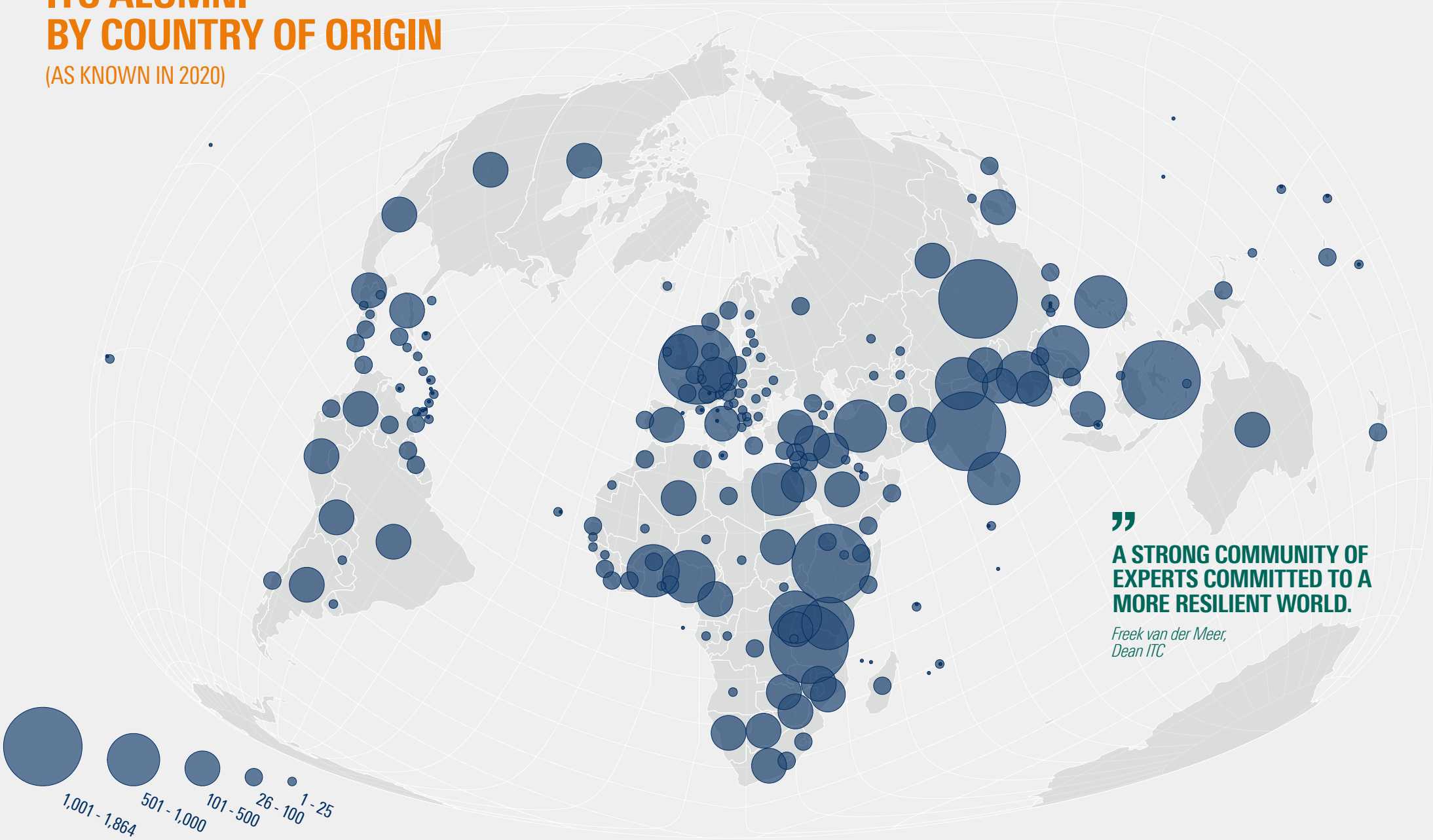
ITC ALUMNI BY COUNTRY OF ORIGIN

(AS KNOWN IN 2020)



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A STRONG COMMUNITY OF EXPERTS COMMITTED TO A MORE RESILIENT WORLD.

Freek van der Meer,
Dean ITC

UNIVERSITY OF TWENTE. | ITC

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What attracted me to ITC and convinced me to get on board, is the institute’s combination of outstanding academic education with on-the-ground capacity development in vulnerable locations – and a truly vast network of alumni and partners in virtually every corner of the world, that provides a channel for sharing expertise in the field and feeding back urgent questions and challenges to the ITC community. They are like ITC’s feelers in the remotest parts of the world.

MAARTEN VAN AALST,
PRINCESS MARGRIET CHAIR IN CLIMATE & DISASTER RESILIENCE AT ITC;
DIRECTOR OF THE INTERNATIONAL RED CROSS RED CRESCENT CLIMATE CENTRE

”

To me, the ITC faculty is like a gateway to the world. Together with colleagues from different backgrounds, we work at delivering societal impact around the world. ITC is an institute of world-wide renown in the field of remote sensing and we keep expanding our network to stay relevant and in step with current issues in the geospatial field. I am proud to be part of the ITC community.

TIA DEN HARTOG,
PROJECT MANAGER AT ITC

WHAT IS OUR SCIENTIFIC DOMAIN?

The world faces serious and complex challenges: population growth and unsustainable use of resources is accelerating climate change and urbanisation, resulting in problems such as decline of food security, biodiversity loss, increasing impact of natural disasters, and health and development problems. For instance, global warming causes extreme weather events to occur more rapidly and more severe, leading to larger cyclones, more floods, more heat waves, more droughts. In addition, our vulnerability to such events is changing, as the world population is growing, and urbanisation takes place more and more in coastal zones, floodplains and through the occupation of marginal lands.

THE SDGS, PARIS AND SENDAI

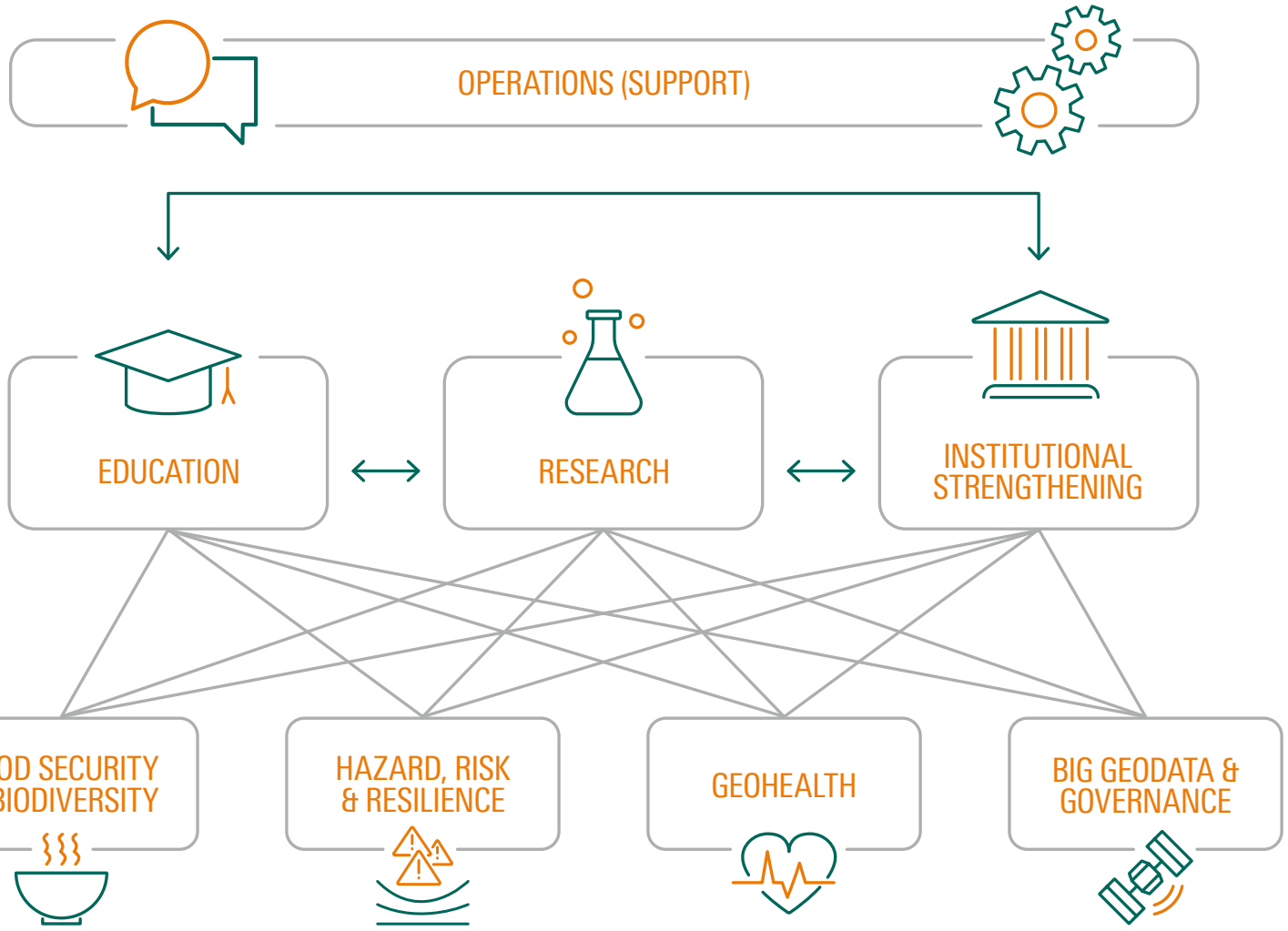
Numerous global initiatives have been undertaken to counteract these complex challenges. On September 25th 2015, the United Nations (UN) adopted a set of 17 Sustainable Development Goals (SDGs) to protect the planet and to ensure prosperity for all as part of a new sustainable development agenda. Also in 2015, the Paris Agreement was signed during the 21st session of the Conference of the Parties meeting, COP21, of the United Nations Framework Convention on Climate Change (UNFCCC). An agreement was ratified aiming 'to achieve a legally binding and universal agreement on climate, with the aim of keeping global warming below 2°C.' Combatting global warming requires a transition to a CO_2-neutral society, or from fossil fuels to renewables: the energy transition. Cities play a crucial role in this transition. Another UN initiative, the Sendai Framework for Disaster Risk Reduction (2015-2030) outlines targets and priorities for action to prevent new disaster risks, and reduce existing ones.

"Our students are the future leaders of our global society. We care deeply about their well-being and provide them with the best possible in terms of academic environment, staff expertise and training in geo-information science and earth observation. We prepare and inspire our students to tackle the challenges humanity faces, from climate change, water and food security and environmental issues to other emerging challenges that call for spatial solutions.

BOB SU,
PROFESSOR OF SPATIAL HYDROLOGY AND WATER RESOURCES MANAGEMENT AT ITC

EMPOWERING SOCIETY THROUGH CAPACITY DEVELOPMENT

HOW ITC IS STRUCTURED AND HOW OUR PROCESSES INTERACT WITH EACH OF ITC'S FOUR MAIN DOMAINS



THE ROLE OF GEOSPATIAL SOLUTIONS

ITC's research, education and institutional strengthening activities are closely linked to these international agendas of the SDGs, Paris, and Sendai. **We believe that the development of tailored geospatial solutions is a vital integral part of addressing these complex challenges.** Our domains of expertise include:

FOOD SECURITY & BIODIVERSITY

We focus on the management, productivity and sustainability of current and alternative agricultural land use systems.

HAZARD, RISK & RESILIENCE

We are experts in integrating hazard assessment and disaster risk management into strategic planning and sustainable development. This is closely related to research in areas including flood prediction, ground-water recharge, drought monitoring and prediction, water quality monitoring, and climate studies.

GEOHEALTH

Health and disease are complex and understanding the drivers behind their patterns requires a dynamic approach. Geospatial technologies and GiScience play a vital role in visualising where and when diseases occur in space and time, providing context and helping us understand why they may be prevalent, who may be affected, and how to potentially address the problem. We have developed a collaborative research and learning environment that enables us to address a variety of health and disease issues all over the world.

BIG GEODATA & GOVERNANCE

To deal with large and diverse amounts of data we further develop and integrate new geoinformatics and earth observation methods and techniques related to machine learning, geospatial artificial intelligence, augmented reality and virtual reality. We investigate highly complex issues around land as land often forms a cause for conflict at regional, national, local and personal level in view of its value as an economic resource in relation to social, political, cultural and often religious systems. In the area of 'smart cities', we develop geotechnologies embedded in urban governance, planning and management processes, the daily lives of urban residents and private sector analytics

"ITC is recognised for its excellence in creating international linkages in its core expertise of remote sensing and GIS. Undertaking research with an international impact, while translating this knowledge into practical solutions and teaching materials, is what ITC is all about. Our alumni network continues to inspire, and is like a huge family. It has developed over 70 years across all continents of the world, thanks to progressive and substantial Dutch commitments to international development cooperation in technology, the environment, resources and governance policy. This is why I was attracted to ITC and why I have stayed here for 25 years (and counting!).

ANDREW SKIDMORE,
PROFESSOR OF SPATIAL ECOLOGY AT ITC

UNIVERSITY OF TWENTE. | ITC

TECH-ENABLED SPATIAL INFORMATION

As we described in our article on wild boar migration, urban construction and Ethiopian farm insurance, the spatial dimension is a common denominator in all of this. One reason is that the science needed to overcome today's 'wicked problems' is not always available, and partial solutions developed in one domain often generate problems in other domains. This is especially true where technical solutions collide with societal pressures.

By combining multiple layers of data, geo-information and earth observation, we can help chart these unknown territories. Increasingly, our experts are reinforcing and expanding these data layers with the aid of artificial intelligence, big geodata and other promising technologies. The geospatial advancement that this is generating will help us more than ever to trace causes and effects, shifts and trends, and potential solutions.

"WE SEE SO MANY EXCITING WAYS OF SUPPORTING OUR RESEARCH. FROM INNOVATIVE CITIZEN SCIENCE TO COOL GEO-TOOLS, VIRTUAL REALITY, SPACE-TIME SIMULATIONS, AND VOLUNTEERED GEOGRAPHIC INFORMATION MAPPING.

"Zambia's forests and agricultural sector play a vital role in the country's economy. They represent the lifeline of rural economies and daily subsistence. The knowledge I will gain at ITC will help me to promote sustainable use of the forests and other natural resources. I hope to use remote sensing techniques soil resources analysis and crop performance monitoring at a large scale to increase crop yield and reduce production costs. This will help ensure food security, water and biodiversity conservation and environmental protection.

MISHECK LESA CHUNDU,
FROM ZAMBIA,
ITC STUDENT SPECIALISING IN NATURAL RESOURCE MANAGEMENT

UNIVERSITY OF TWENTE. | ITC

GEOSPATIAL FORESIGHT: **A ROADMAP TO RESILIENCE**

- Tie-ins with our university's research themes
- A living laboratory on campus: the ITC-ET Living Innovation Lab

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Fighting climate change requires a worldwide effort. By combining our complementary strengths, the Royal Netherlands Meteorological Institute (KNMI), and ITC are able to further research and education, both nationally and internationally. The Early Warning Center currently being developed by KNMI in the Netherlands serves as an example. The know-how developed for this purpose at home can be brought to a majority of countries worldwide through the unique capacity development network of ITC

GERARD VAN DER STEENHOVEN,
DIRECTOR ROYAL NETHERLANDS METEOROLOGICAL INSTITUTE (KNMI)

UNIVERSITY OF TWENTE. | ITC

TIE-INS WITH OUR UNIVERSITY'S RESEARCH THEMES

The University of Twente's research portfolio centres on five themes:

- Digital Society
- Resilient World
- Personalised Healthcare Technologies
- Smart Materials
- Intelligent Manufacturing Systems

ITC's contribution relates primarily to the first three. Our work on big geodata, open science, artificial intelligence and citizen science and governance is related to the **Digital Society** theme, and links us to UT's Digital Society Institute.

Our work in geohealth ties in with **Personalised Healthcare Technologies**, as does our close collaboration with UT's Technical Medical Centre.

Our contribution to the **Resilient World** theme is visible in our work on Hazard, Risk & Resilience and on Food Security & Biodiversity. In both areas, we have close ties with the 4TU Centre for Resilience Engineering and its Designing Systems for Informed Resilience Engineering programme (DeSIRE).

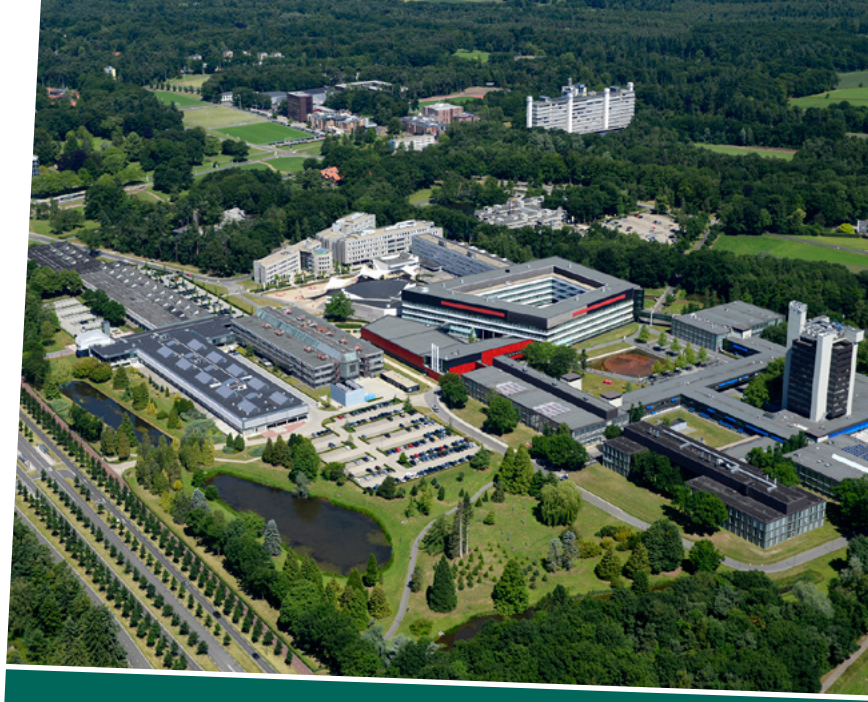
In addition to this, we will join hands to acquire funding for large programmes on the topics below, for example, from Horizon Europe, to expand our knowledge and visibility in these focus themes.

A CENTRE FOR DISASTER-RELATED ACTIVITIES

There is a lot of knowledge and expertise available on disaster risk management at ITC as well as at other UT faculties. Individual researchers as well as scientific departments have good reputations and networks that deserve far greater visibility in the outside world – and even within our own university. One way of raising visibility and creating greater societal impact is to develop and strengthen our collaboration on disaster-related topics, both internally and internationally. With a new Centre for Disaster-Related Activities, we aim to bring together the expertise from all relevant disciplines within UT. This will create greater visibility for the theme, while promoting UT's broad capacity for dealing with disaster-related issues from different, complementary perspectives. The Centre will contribute to UT's Resilient World theme, focusing on the relations between hazards, risk and resilience.

A GEOHEALTH COMMUNITY

Health has always received a lot of attention in society, and the COVID-19 pandemic has raised its urgency. Subjects such as primary healthcare, the outbreak of pandemics, and the spread of neglected tropical diseases, are top-of-the-agenda for the Dutch Ministry of Foreign Affairs and many donor organisations. ITC has the ambition to develop a faculty-wide specialisation in the emerging domain of geohealth, with input from staff from several departments. Geohealth is a typical example of a new domain that straddles several conventional domains. The appointment of a full Professor in the domain, and the recruitment of staff in related fields, will offer us the possibility to develop a solid, UT-wide focus on geohealth and the related cross-connections between water, climate change and health. We will do all of this in close collaboration with relevant health-related programmes and expertise groups within UT – such as the TechMed Centre – as well as beyond.



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As a medical geographer I address wicked global health problems in the context of water and health and strive to understand predicaments from a community and grassroot perspective. At ITC – and this is what is very unique and what I enjoy most – we face these issues with a strong multidisciplinary community of students, staff, alumni, and collaborators from all around the globe. I am particularly proud of our students, the hard work and enthusiasm that they invest into their projects while overcoming diverse challenges along the way.

CARMEN ANTHONJ,
ASSISTANT PROFESSOR OF GEOHEALTH IN EARTH OBSERVATION SCIENCE AT ITC

A COMMUNITY OF PRACTICE ON GEO-E-LEARNING

By initiating a Community of Practice On Geo-E-Learning, we aim to capture the learning that has taken, and is still taking place in the transition towards on-line teaching and learning. It will serve as input for ITC's new policy on distance, blended and on-line education. This Community of Practice will be a joint effort of staff and students. We will share good practices, reshape courses and interaction among students and colleagues, and publish course content on learning platforms for the benefit of ITC, our partners and the broader geospatial community. The Community of Practice will be all about sharing good educational practices, co-development with partners, and open access to educational resources for society at large. It will also tie in with the interest of the Ministry of Foreign Affairs in the digitalisation of higher education and of capacity development. This initiative will also fuel our ambitions in the area of lifelong learning and pave the way for more blended learning in our on-campus programmes.

CENTRE OF EXPERTISE IN BIG GEODATA SCIENCE (CRIB)

Our Centre of Expertise in Big Geodata Science (CRIB) is a new cross-disciplinary ITC facility, linked to UT's Digital Society Institute. Its goal is to support all departments in improving their use of big geodata technology in education, research and institutional strengthening activities. The mission of CRIB will be to collect, develop and share operational know-how aimed at solving large-scale geospatial problems involving big data. CRIB will help to position UT, along with ITC, as a globally renowned centre of excellence in this field. Its activities will be grouped under knowledge development, infra-structure development, project services, monitoring, networking, and creating visibility.

A LIVING LABORATORY ON CAMPUS: THE ITC-ET LIVING INNOVATION LAB

Shaping2030 envisions our university as an open meeting place, where opportunities exist for new collaboration, and where we fulfil our responsibility for impacting society as a university of technology. In order to design and test new solutions for future complex challenges, and to acquire new professional skills, our university aims to empower students and staff to experiment on real testing grounds on campus, and to create a living lab for innovation and education, while also collaborating in a dedicated experimental research facility.

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The Living Innovation Lab is a unique facility in which we can take years of collaborative research between faculties to the next level. In addition, it offers unique opportunities for education. Because of the type of projects we do, strongly linked to current issues in society, it is also a great place to give the public an insight into what our university is doing in a lot of areas.

MARK VAN DER MEIJDE,
PROFESSOR OF EARTH STRUCTURE AND DYNAMICS AT ITC

UNIVERSITY OF TWENTE. | ITC

MEET THE PEOPLE
WHO ARE ITC

› From ITC student to Minister

UNIVERSITY OF TWENTE. | ITC

MEET THE PEOPLE WHO ARE ITC

ITC is a close-knit community of people with a passion for identifying and understanding vulnerability and converting it into resilience. Graduates leaving our campus or programmes tend to remain in close contact with us and we, in turn, actively cultivate our alumni network. We see our alumni as our hands, feet and feelers in the far corners for the world.

We invite you to get to know some of them!

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I expected to start my Master's at a typical Dutch university. I was completely unaware of the fact that I would be only one of the four Dutch students, and I was overwhelmed from the first day by the diversity of people, cultures, values and norms. This made me realise that things I thought were normal, are only normal because I was living in an environment with people of the same culture.

KAS VAN 'T LOO,
FROM THE NETHERLANDS

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My expectations when I started my Master's actually changed significantly during the programme, and in an amazing way. Initially I just expected to learn new things but it ended up that I started to pursue the career that I always dreamed about. I liked having to maintain a personal development portfolio. This helped me to reflect and be more specific on my goals. I also enjoy working with students from different cultural and professional backgrounds, and to learn new knowledge from my classmates.

MAI NGUYEN,
FROM VIETNAM

UNIVERSITY OF TWENTE. | ITC

FROM ITC STUDENT TO MINISTER

Many ITC graduates return home to make a huge impact in their home countries and/or work areas. Here are six examples of alumni appointed ministers in their respective countries:

- **Daryll Matthew,**
  Minister of Education, Sports and the Creative Industries in Antigua and Barbuda
- **Laurent Sedogo,**
  Former Minister of Agriculture, Water and Fisheries Resources (2008–2013) of Burkina Faso
- **Mary Goretti Kitutu Kimono,**
  Minister of Energy and Mineral Development of Uganda
- **Siti Nurbaya Bakar,**
  Minister of Environment and Forestry of Indonesia
- **Wilber Ottichilo,**
  Governor of Vihiga, Kenya
- **Amon Murwira,**
  Minister of Higher Education, Science and Technology Development, Zimbabwe

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My time studying at ITC in Enschede has been a tremendously rewarding period for my development as a professional and as an individual. The experience of living in the Netherlands opened my eyes to an environment totally foreign to the one where I was born and raised. One of the first things that I learned upon my arrival at ITC was the need to have an open mind and appreciate persons who may come from different cultures and experiences than I have. The ability to expose our students to different cultures has been at the forefront of my thrust to advance the sector in Antigua and Barbuda. Also, the commitment to quality education and the attention to detail have prepared me for the role I play in the Cabinet of Ministers.

DARYLL MATTHEW,
MINISTER OF EDUCATION, SPORTS AND THE CREATIVE INDUSTRIES IN ANTIGUA AND BARBUDA

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What I value a lot at ITC is the sense of community we share: working together is the norm here, not an exception. It makes for an inspiring, multi-disciplinary and international academic culture, in which cutting-edge research and education in geo-spatial sciences and technology are combined with applications that matter to society. Think of high-resolution images that support the management of disaster risks in urban infrastructures. With global problems becoming more complex, working in an environment with such a variety of knowledge and perspectives is a privilege.

KARIN PFEFFER,
PROFESSOR OF INFRASTRUCTURING URBAN FUTURES AT ITC

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Working at ITC is rewarding because you have the feeling that everybody is working towards a common goal, which makes that the commitment of everybody is high and goes beyond the individual interest. Working in the international ITC environment seems just normal but remains a gift and an opportunity every day.

EMILE DOPHEIDE,
COORDINATOR OF EDUCATION AT ITC

UNIVERSITY OF TWENTE. | ITC

A SUSTAINABLE COMMUNITY OF PARTNERSHIPS FOR CHALLENGE-BASED OPEN SCIENCE AND EDUCATION

- A sustainable community for challenge-based open science
- Merging research and education
- A sustainable organisation
- An active network of partnerships

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People need nature. With our modern lifestyles, it can be easy to forget that our well-being depends on pollinators for our food, vegetation for cooling our cities, and green places to recreate and enjoy. At ITC, one of the things we do is to put all these benefits of nature – ecosystem services – on the map. In order to do this, we combine satellite information with fieldwork and citizen science, and we keep track of changes in ecosystem services to learn about the impacts of our decisions.

WIETEKE WILLEMEN,
PROFESSOR OF SPATIAL DYNAMICS OF ECOSYSTEM SERVICES AT ITC

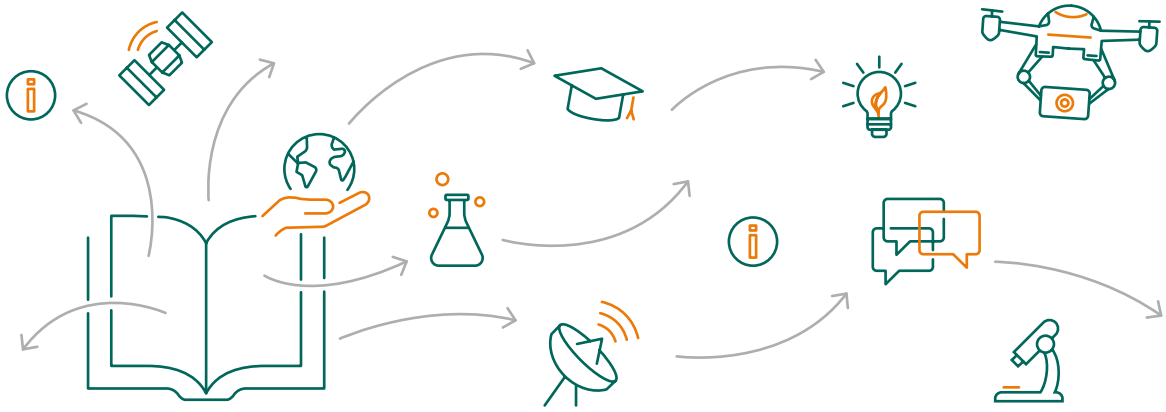
UNIVERSITY OF TWENTE. | ITC

A SUSTAINABLE COMMUNITY FOR CHALLENGE-BASED OPEN SCIENCE

At ITC, we are purpose-driven people: we will do whatever it takes to fulfil our mission. In our understanding, our success depends on several factors: open science, challenge-based learning, a sustainable organisation, and active partnerships and networks. Here, we take a closer look at these distinguishing characteristics, together with our Open Science Officer, Dr. Markus Konkol.

FACING THE RIGOURS OF OPEN SCIENCE

UT's vision document, Shaping2030, identifies the Open Science transition as one of its goals: our university aims to make 100% open-access publishing the norm by 2023. This shift is already taking place at ITC, and the first signs are visible in our international network. Initiatives such as the Digital Earth Africa project, in which ITC is a partner, are setting the stage with open data platforms and open access to processing facilities.



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The overarching goal of open science is to cultivate a scientific environment, in which everyone – including those outside the scientific community – can gain scientific literacy and verify, understand, and apply new scientific findings. It is all about embracing the practices needed to open up research to everyone who might benefit from it. It can mean, for example, making scientific articles, data, and methods as well as educational resources accessible to the public. Or using open-source software and infrastructure. It also includes considering societal aspects, such as diversity and engaging citizens in research.

MARKUS KONKOL,
OPEN SCIENCE OFFICER AT ITC

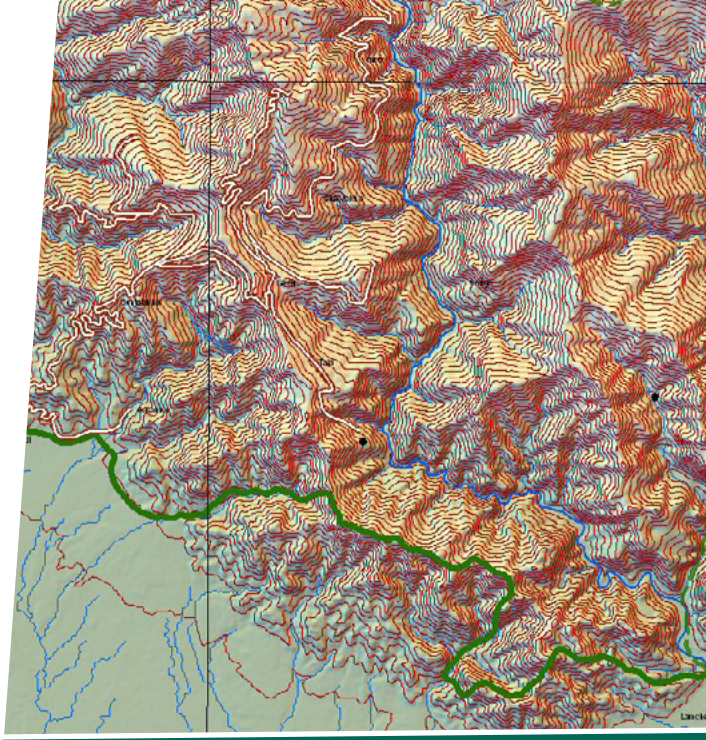
OPENNESS DOES NOT JUST HAPPEN

In all the excitement about openness, however, we must also be realistic: the world anno 2021 is not open, and in our Global South network there is resistance to openness and sharing. The fear that openness will lead to 'asymmetric benefits in North-South collaboration' is real. There is a concern that one of the consequences of adopting an Open Science agenda would be accelerated data migration from the Global South to Northern scientists.

Our aim at ITC is to develop an open science business model based on equal partnership and mutual trust. The intrinsic motivation is that Open Science is not only a good scientific practice, but a fundamental requirement for achieving the ambitious aims set by ITC", says our Open Science Officer, Markus Konkol.

The extrinsic motivation is that more and more funding organisations are pushing for Open Science." Konkol's job is to support and coordinate Open Science at ITC. "We are exploring the open concept further, connecting to Dutch and international open science communities, and defining what the concept means for ITC and how it can be integrated," he explains. "The goal, of course, is to further guide the introduction of the open concept into our education, research and institutional strengthening. The more we succeed, the closer we will get to realising our goals in society."

Konkol stresses that the ambition to make education, research and institutional strengthening more visible, accessible, diverse and inclusive calls for greater effort and more coordination. "It fits in with our mandate, and will help us attract students and staff, while also strengthening partnerships," he says.



"Looking at the impressive list of organisations where our students carry out their internship assignments, I can only be extremely proud. Our students show a professional attitude throughout their Master's programme and that contributes to the fact that they are offered assignments at Red Cross, TNO, ADPC, United Nations and other pioneering organisations in the geo work field.

BELINDA JAARSMA-KNOL,
INTERNSHIP COORDINATOR AT ITC

WHAT WE MEAN BY 'OPEN'

Open science encompasses a lot of different things:

- Open data
- Open research
- Open peer review
- Open access
- Open education
- Open networks
- Open resources
- Citizen science

"Open Science is on the rise and increasingly on the agenda of many students and early-career researchers," says Markus. "If we want to attract these people in the future, we need to make sure that ITC becomes a place where Open Science valued and supported. The traditional metrics for evaluating a researcher's performance foster competition, and stand in the way of creating a collaborative, transparent research culture. It needs to be clear that we cannot expect researchers to do Open Science, and carry on assessing them on the basis of traditional metrics."

CHALLENGE-BASED LEARNING & RESEARCH

Another vital aspect of our approach is that we research and educate on the basis of real challenges. "Challenge-Based Learning is part of our university's educational model. It is a pedagogical approach that actively engages students in a situation that is real, relevant and related to their environment," explains ITC Dean Freek van der Meer. "The same applies to Challenge-Based Research. Both are driven by challenging, open-ended problems that have multiple solutions. For ITC, this means bringing together students and scientists with government, businesses and citizens to identify urgent, definable problems – and then to tackle those problems in multidisciplinary teams."

CHALLENGE-BASED LEARNING AND WORKING

In line with the ambitions of the University of Twente, ITC will further explore and exploit the virtues of challenge-based learning (also through its lead position in the UT Shaping Expert Group Innovation of Education and the ECIU UT steering committee). We see challenge-based learning as a vehicle for lifelong learning. It also offers us a means of strengthening our ties with society, the private sector and other relevant stakeholders.

MERGING RESEARCH AND EDUCATION

Merging research and education is a vital part of our vision and of achieving the goals we're out to achieve in society. We are working hard to further strengthen the ties between our research themes and the thesis research carried out by our Master's students. Joint research with partners and in partnerships are also adding strength and impact. Think, for example, of our work with Digital Earth Africa, the NASA SERVIR programme, and UN-Habitat. This is where the link with institutional strengthening becomes part of the equation.

THE GOAL OF OUR EDUCATION

As we push ahead with challenge-based learning in both the regular and specialised modules within our Master's programmes, we are critically reviewing all our courses. Wicked problems and societal challenges that humanity faces are to become an integrated part of how we contribute to a better society.

The overarching goal of our education is clear: **to equip our students with state of the art knowledge on geo-information science and earth observation, and with the skills and competencies they will need to be change leaders in a changing society – including innovative, inspiring and self-critical leadership.**

Challenge-based learning and research help us to achieve this, with a heavy emphasis on cross-disciplinary approaches involving external stakeholders, or 'challenge owners', who represent our public and private partners. In our Master's Geo-information Science and Earth Observation and Spatial Engineering, we are strengthening the challenge-based foundation by linking the degree programmes with our experiences in institutional strengthening projects and with our research themes.

LIFELONG LEARNING HOLDS THE FUTURE

Lifelong learning is not only the future, it is a vital force for change in today's society. At ITC, we consider it a focus topic.

The Lifelong learning concept means that learning does not only take place in a classroom, but also in society, at home and at work – and not just during one's student days, but on and on into one's career and later life. We've introduced the concept into our teaching and learning activities in different ways, for example, by removing the boundaries between learning and real-world challenges.

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Working at ITC is like getting into a warm bath. The people at ITC are caring and dedicated to working hard at making a difference in the world. The shared ambition to daily improve the livelihoods of people and the world we live in makes it a pleasure to work here. At ITC, there is a clear feeling that our work makes a lasting difference, particularly in the majority world - and without having to sacrifice on scientific excellence.

JELLE FERWERDA,
COORDINATOR OF RESEARCH AT ITC

BLENDED, INCLUSIVE, AND INTERNATIONAL

The societal relevance and impact of our education does not only result from the fact that it is challenge-based. Our early adoption of blended learning, inclusiveness, international classrooms, and mobility incentives are also important contributors.

- At ITC, we see blended learning – defined as education that combines face-to-face classroom methods with computer-mediated activities – as a flexible answer to the changing demands of the world we live in. As part of a university of technology, we are eager to operate and experiment on the leading edge of this area.
- With a view to having an international classroom, we benefit from our global reputation and ability to indeed attract students (and staff) from all over the world. In our Master's programmes, we aim for a balanced student mix in terms of countries of origin, because we believe in the power of cross-cultural interaction, and in an attitude of inclusivity that leaves no one behind. Our Bachelor's ATLAS, and our Master's Spatial Engineering are open to all. We are investigating the possibility of opening up our Master's Geo-information Science and Earth Observation – which for historical reasons is not yet accessible for Dutch and European students. Also, we are looking into the development of a related Bachelor's programme.
- We attach high value to connecting our educational programmes and research to the labour market. One way in which ensure this is our professional advisory board with members from the professional field. We also regularly connect with our alumni. We also actively maintain connections with external Bachelor's programmes and relevant Master's programmes at universities of applied science.

A SUSTAINABLE ORGANISATION

ITC is changing its way of working. We are incorporating many sustainable solutions in our activities, both on campus and in international projects and activities. For example:

- A **smaller environmental footprint** on campus, thanks to the new ITC building
- **Careful resource management** (paper, plastics, energy, etc.)
- Reduced flight movements and **reduced travel and international meetings**, with more attention for sustainable alternatives for interacting with network partners and students in target countries, building on the experiences we gained during the first year of the COVID-19 pandemic (the projected Community of Practice for Geo E-learning will be a part of this development)
- Integration of platforms for different forms of **online education and webinars** in our project operations, replacing at least part of our on-site activities (setting up platforms like this will become an integral part of our structural and strategic partnerships)

AN ACTIVE NETWORK OF PARTNERSHIPS

At ITC we cherish our active network of partnerships in education and research in the Netherlands, Europe and around the world. Those working with us benefit from these networks in many different ways. Here are some examples:

EDUCATION PARTNERS

- We offer students double-degree Master's programmes, and have joint-diploma courses with partner universities in various low-income countries, because we believe that in capacity building it is important to cater for education across the entire qualification framework
- In the Netherlands, we offer the Master's Geographical Information Management and Applications (GIMA) with Delft University of Technology, Utrecht University and Wageningen University and Research
- In Europe, we offer two Master's under the Erasmus Mundus programme: one in Cartography, with the Technical Universities of Munich (TUM) and Dresden (TUD), Germany, and the University of Technology of Vienna (TUW), Austria; and a second, Master's Geo-information Management for Environmental Modelling and Management, with Lund University (Sweden), UCLouvain University (Belgium), and University of Tartu (Estonia)
- Under the European Consortium of Innovative Universities (ECIU), we participate in experiments with micro-credentials and the use of a competence passport in the context of joint education

RESEARCH PARTNERS

- While cherishing our existing research collaborations, we also aim at expanding our research networks at UT, national and European level. The goal here is to build capacity for upcoming, more complex grant schemes, such as Horizon Europe.
- We are also working hard to become more visible in the policy field, by strengthening existing connections, and building new ones, for example, among climate networks or United Nations associations, such as UN-Habitat.
- We have established a visiting scientist programme as a breeding place for new knowledge and sharing of experiences.
- This is made extra attractive by our in-house laboratories – including the Geo-Science Laboratory, the Group Decision Room, and the Visualisation and Usability Laboratory - that function as magnets.
- Outside we are developing Living Labs on the UT campus, and slightly further away we are also exploring the Zwolle delta as a natural field laboratory, and as an opportunity to link with the private sector as well as with broader academic networks, while simultaneously making the UT campus a more vibrant place.

> **GAINING INCREASED VISIBILITY AND STRONGER TIES WITH OUR ACADEMIC, SOCIAL, AND INDUSTRIAL PARTNERS MEANS DEVELOPING A STRONGER PRESENCE OUTSIDE OUR UNIVERSITY'S CAMPUS, IN REGIONAL, NATIONAL AND EUROPEAN RESEARCH NETWORKS.**

CAPACITY BUILDING PARTNERS

We are agenda setters in our domain and aim to continue to be proactive in this role, especially when it comes to capacity development and institutional strengthening. For example:

- We co-chair the capacity building coordination working group within the Group on Earth Observations (GEO). This is a partnership of more than 100 national governments and over 100 other organisations involved in earth observation;
- We are also are co-authors of GEO's capacity building strategy, and responsible for rolling it out in flagship activities. One of these is the Digital Earth Africa initiative, which 'provides a unique platform that would democratise the capacity to process and analyse satellite data' for the whole continent of Africa.

ADDITIONAL PARTNERSHIPS AND NETWORKS

- Initiatives that may play an experimental role in helping us to establish virtual locations, and to strengthen our off-campus presence and visibility, include the European Consortium of Innovative Universities (ECIU) and the SERVIR Academy.
- Partnership and network examples include the European Union's earth observation programme, Copernicus, the European Space Agency (ESA), the Netherlands Space Office (NSO), as well as the Netherlands Water Partnership (NWP) and the Netherlands Fellowship Programmes (NFP).
- We also encourage staff to actively participate in learning societies, such as ICA, FIG, ISPRS and others. Active memberships include that of the International Cartographic Association (ICA), the International Federation of Surveyors (FIG), and the International Society of Photogrammetry and Remote Sensing (ISPRS).
- Tying in with our internal talent management efforts, we will stimulate successful applications for prestigious research grants, such as Veni-Vidi-Vici and ERC, as well as leading or participating in national and European consortia for multi-disciplinary research.

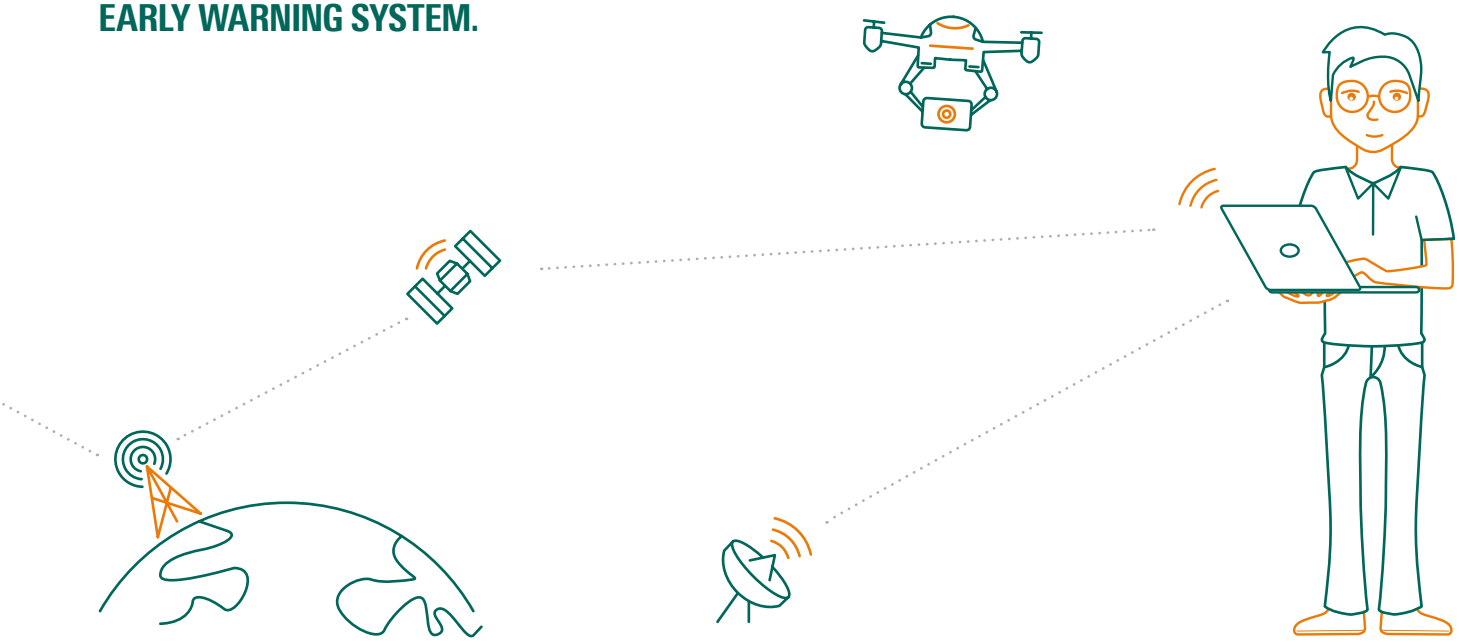
"OUR WORK IN CAPACITY DEVELOPMENT IS VERY REWARDING, IT MAKES US AND OUR PARTNERS LEARN EVERYDAY.

Menno-Jan Kraak,
Professor of Geo-Visualisation at ITC

SOCIETY'S SIXTH SENSE

IN AN INTERCONNECTED AGE OF CHANGING RISKS AND HAZARDS,
our expertise – in geo-information science and earth observation – can alert the global community to what is happening on our planet, and to what we can do to positively impact the future. Our research, tools and network enable us to track and trace the impact – and the shifting causes and frontiers – of today's global challenges. We have the sensitivity, the reach, the science & technology and the human drive to monitor the movements taking place on our planet and among the people and ecosystems that inhabit it. We are here to identify and understand vulnerability, and to use geospatial solutions for converting it into resilience.

WE ARE THE WORLD'S EARLY WARNING SYSTEM.



"As Geo experts, we are key players in guiding sustainable development. The world as a whole will benefit, since the world is an interconnected system.

Read Priscilla's story

PRISCILLA KABIRU,
FROM KENYA, ITC CLASS OF 2021 GEO-INFORMATION SCIENCE AND EARTH OBSERVATION, SPECIALISATION URBAN PLANNING AND MANAGEMENT

UNIVERSITY OF TWENTE. | ITC

ITC IN NUMBERS

1950
FOUNDING YEAR

>23,900
ALUMNI

>500
STUDENTS

>90
NATIONALITIES

VISITING ADDRESS
University of Twente
Faculty ITC
Hengelosestraat 99
7514 AE Enschede
The Netherlands

MAILING ADDRESS
University of Twente
Faculty ITC
P.O. Box 217
7500 AE Enschede
The Netherlands

T +31 (0)53 487 44 44

info-itc@utwente.nl

itc.nl
utwente.nl

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