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ALUMNI MAGAZINE
FACULTY OF GEO-INFORMATION SCIENCE AND EARTH OBSERVATION
UNIVERSITY OF TWENTE

ITC NEWS

SPECIAL FEATURE
DISASTER MANAGEMENT

INACHUS

STARS PROJECT

OPENING THE GALLERY

LIFE AFTER ITC

MY TOUCH
PREDICTING EARTHQUAKES

"I chose ITC because it's the best, or one of the best institutes for studying remote sensing worldwide. I focus on earthquakes. I already became fascinated by this subject during my master's programme. Ultimately, I hope that we can use the method I am developing to predict earthquakes, but otherwise there are many other applications for my work."

As Effie Pavlidou has discovered, the faculty of Geo-Information Science and Earth Observation (ITC) of the University of Twente in Enschede, the Netherlands, is one of the world's foremost education and research establishments in the field of geo-information science and earth observation. We offer a wide range of the world's best degree courses in the following fields:

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EFFIE PAVLIDOU,
MASTER'S STUDENT GEO-INFORMATION SCIENCE AND EARTH OBSERVATION AT ITC

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HIGH TECH HUMAN TOUCH

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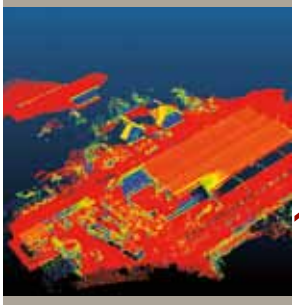

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INACHUS is a project for the development of "Technological and Methodological Solutions for Integrated Wide Area Situation Awareness and Survivor Localization to Support Search and Rescue Teams". Crisis incidents result in difficult working conditions for Urban Search-and-Rescue (USaR) crews. INACHUS aims to achieve a significant time reduction and increase efficiency in USaR operations.

INTRODUCTION

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As the new academic year is starting it might be good for the new students to check the story of Ms Lucy Chepkosgei (page 30) who gives new students the advice to utilize the opportunity at ITC in order to develop further in life. She probably gave the new Kenyan students the same advice as Lucy met them during their pre-departure meeting at the residence of the Dutch Ambassador in Nairobi (page 31).

As the Dutch King opens the Gallery, a new centre of innovation at the UTcampus (page 25), researchers at ITC are looking into ecosystems, animals and vegetation as many forests are being cut down to create land for agriculture or for the sale of timber (page 22). Agriculture is the predominant occupation of the world's poorest people in sub-Saharan Africa and South Asia, but many struggle to produce crops consistently and sustainably year-by-year, and the large persistence of subsistence farming deters economic development at the household scale. A consortium led by ITC has received a large grant for a project that will identify how earth observation data products may help improve current information and decision support systems (page 23).

This edition of the ITC News magazine will look deeper into the disaster management domain. The number of people threatened by earthquakes, floods, landslides, volcanic eruptions, erosion and other natural hazards has dramatically increased over the last decades. In this magazine you can read about many different aspects of disaster management at ITC. From hiding for hurricanes (page 5), helping find survivors after a disaster (page 13). Training professionals in disaster reduction (page 7) and the reconstruction and recovery planning after a disaster has struck (page 10).

ITC firmly believes that spatial information plays an important role in many phases of the disaster management cycle. If you are interested in one of the phases of disaster management please feel free to return to ITC to boost your degree in disaster management and make a difference in your country!

Virtually yours, Jorien Terlouw
Editor

Disaster Management

The number of people threatened by earthquakes, floods, landslides, volcanic eruptions, erosion and other natural hazards has dramatically increased over the last decades. Climate change and variability, urbanization and environmental degradation further increase our exposure and vulnerability to natural hazards. We firmly believe that spatial information plays an important role in many phases of the disaster management cycle.
Natural hazard assessment and monitoring, hazard process modeling, geo-technical engineering, elements at risk mapping, vulnerability and risk assessment, risk reduction planning, disaster preparedness, damage assessment and post-disaster rehabilitation are typical themes in the natural hazards and disaster risk management domain at ITC.

Contribute to Improved Prediction of Earthquakes

Joost Bruysters itcnews@utwente.nl

Efthymia Pavlidou came to Faculty of Geo-Information Science and Earth Observation (ITC) for a two-year master's programme, but became so fascinated by research into earthquakes she decided to stick around. Now she is working on doctoral research that hopefully will contribute to the improved prediction of earthquakes. "Performing research can sometimes be frustrating or overwhelming, but it gives me a lot of energy. Especially when you start making discoveries."

After obtaining her bachelor's degree in Greece, Efthymia Pavlidou worked as a researcher in the field of environmental science for a few years. In order to continue to grow in her field of work, she decided to follow the master's programme Geo-information Science and Earth Observation for Natural Hazards and Disaster Risk Management at ITC. "I wanted to focus on remote sensing. It enables you to perform research in the field of environmental science much more efficiently. In fact, it is not only more efficient, it is essential."

"I chose ITC because it's the best, or one of the best institutes for studying remote sensing worldwide. Furthermore, the Netherlands has a very good reputation in the field of risk management. That is why I came to ITC in the first place, but there are many reasons that have kept me here: the people I work with are very inspiring. My supervisors are not only brilliant and demanding, they are also very enthusiastic and not afraid to explore new things. The collaboration is really fantastic!"

After completing the master's programme, Pavlidou started her doctoral research, also at ITC. "I am still concerned with disasters, but now I focus on earthquakes. I already became fascinated by this subject during my master's programme."
"We think we know a lot about earthquakes, but many processes are still unknown. We are still not able to properly predict earthquakes. However, there are many signals that are known to be harbingers of earthquakes."

In her research, Pavlidou focuses on one of these possible harbingers. She looks for anomalies in the thermal radiation emitted by the earth. These anomalies may be related to earthquakes, but there are many other possible causes, such as the weather, seasonal cycles, forest fires and man-made 'heat islands'. Pavlidou: "I study whether the anomalies that we can observe with satellites from space can be linked to the earth's tectonic activity. Ultimately, I hope that we can use the method I am developing to predict earthquakes, but otherwise there are many other applications for my work."

Pavlidou loves working and studying at ITC. "It is a very inspiring multicultural environment. It's amazing to see how much you have in common with people who have a completely different background. I have met many people here who I really regard as my 'family'."
Pavlidou is not exactly sure what she wants to do after her PhD. However, what she does know is that she has been seized for life by science in general, and earthquake research in particular. "Performing research can sometimes be frustrating or overwhelming, but it gives me a lot of energy. Especially when you start making discoveries." ■

Efthymia Pavlidou

"I CHOSE ITC BECAUSE IT'S THE BEST, or one of the best institutes for studying remote sensing worldwide. I focus on earthquakes. I already became fascinated by this subject during my master's programme. Ultimately, I hope that we can use the method I am developing to predict earthquakes, but otherwise there are many other applications for my work."

Hiding for hurricanes: Shelter Allocation for Dominica with GIS and Remote Sensing

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Wietske Bijker w.bijker@utwente.nl

Following a request from the World Bank in December 2013, a team of ITC staff including Wietske Bijker and Ellen-Wien Augustijn developed a tailor-made training called "Spatial Data Management and Identification of the most Vulnerable Schools and Shelters in Dominica." The Commonwealth of Dominica is an independent Caribbean island state of about 800 km^2 land area, including 7 volcanoes and 365 rivers, and home to 70 thousand inhabitants. Dominica is periodically plagued by hurricanes, the most dramatic of which being Hurricane David that struck Dominica in 1979, just one year after independence, leading to many deaths and significant economic damage.

Ever since, Dominica has tried to improve on hurricane preparedness. In this two-week World Bank course, given between 12 and 23 May 2014 in Roseau, Dominica, 14 Dominican government officers received training on how to apply Remote Sensing and GIS for hurricane shelter planning. ArcMap software was used throughout the course, because this is what the participants have access to in their daily work.

Course participants, senior government officials and teaching staff

Base data

To plan the location of shelters, a good set of base data is required. This would include topographic maps, road network, urban areas (preferably up to the level of individual buildings) and risk zones. Up until now, these data are only partly available. One way to acquire and update base data would be with high resolution remotely sensed images. However, the only imagery available on the island were outdated aerial photographs. Even in the archives of image data providers, there was hardly any recent imagery available, because of the frequent cloud cover on the island. This is why in the context of this training a set of high resolution Pléiades images has been acquired, which became available after an intensive acquisition campaign of the Pléiades satellites in the first 4 months of 2014, covering the complete area of Dominica. Deriving information from these images was an important aspect of this course, both for acquiring new data and for updating existing datasets.

Image analysis

During the course, all analyses were focused on the area of Saint Paul's Parish (one of the regions of Dominica), which could then serve as an example to carry out similar analyses for the other parishes of the island. Image enhancement and visualization was used to prepare image data for visual analysis and interpretation, followed by on-screen digitizing of roads or buildings. Next step was digital classification of land cover mapping, which also included fieldwork for collecting training and validation data. Newly extracted data were integrated with existing datasets, available via the national web portal Dominode (http://dominode.net/). Because the quality of the existing datasets is very diverse, course participants learned how to improve the quality of existing data using the newly acquired remote sensing images.

Shelter Planning

The planning of hurricane shelters used Location-Allocation techniques. A spatial layer with the locations of the current 135 shelters was available via Dominode, but information on shelter capacity, and means and mode of travel of evacuees were missing. During the fieldwork, we had the opportunity to visit some shelters, see their

size and speak to the managers. Walking and driving experiments supplied information on the possible speed of movement during evacuations. Together, this allowed for a critical evaluation of service areas of the current shelters and finding locations for new shelters.

Other results

For the planning of hurricane shelters, the buildings (location of the evacuees), roads (network) and locations of shelters were important datasets. However, the interest of the course participants extended further. Staff members of several different ministries participated in the course, including foresters, planners and professionals from public works, and each group had their own data requirements. As this course was tailor made, it was possible to also address other data and analysis needs of all these groups.

The next steps

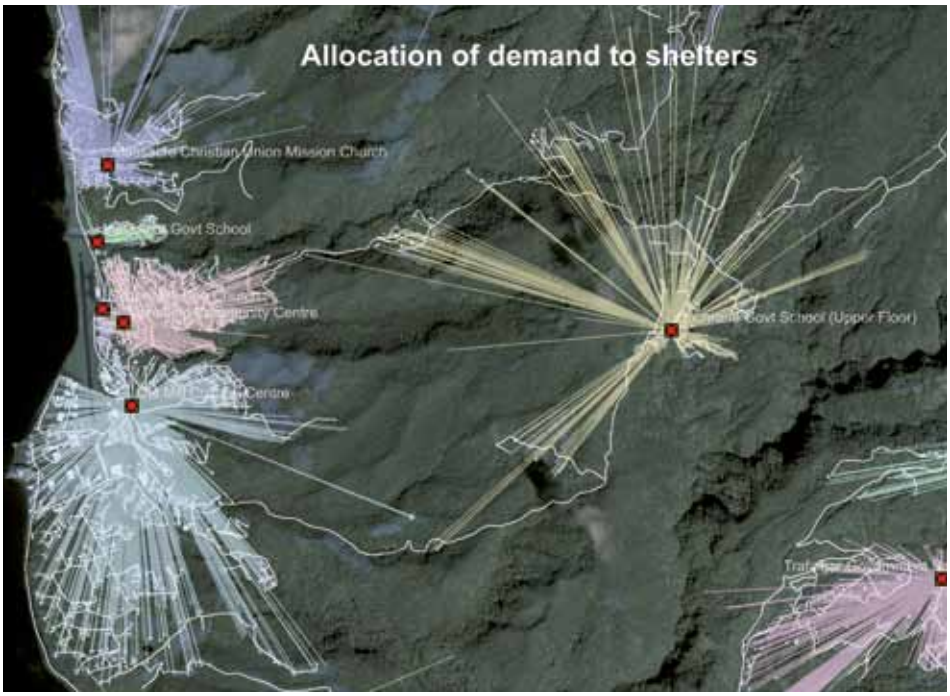
On the last day of the course, all participants presented the potential use of the new knowledge and skills to an audience of senior government officers, in an array of smaller and larger project ideas, with a much larger scope than just shelter planning. Dominica is a very small country and the number of trained spatial data specialists is small. Expertise is spread over multiple ministries and working together seems to be essential to move forward.

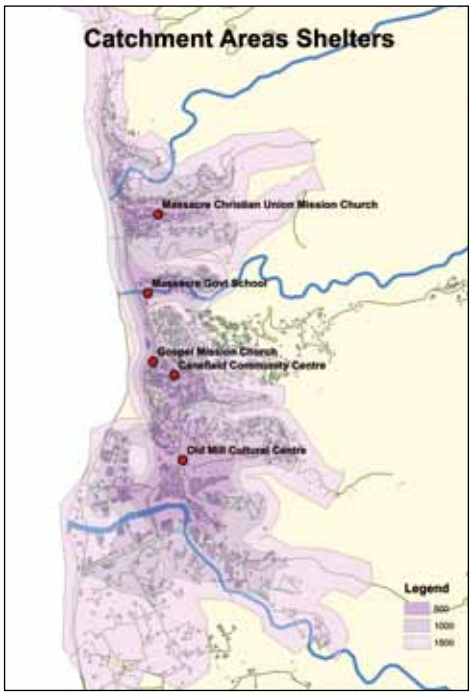
A GIS working group was established which will meet on a regular basis and for the coming months, the ITC teaching staff will be involved through different modes of communication to help develop plans to move to a Spatial Data Infrastructure.

Because Dominica is small, opportunities for further study and more specialist knowledge need to be found abroad. ITC can play an important role in furthering the education of this enthusiastic group of pioneers, to help Dominica develop a consistent set of base layers, but also derive information by conducting analysis of existing data and the newly acquired remotely sensed images for many different applications. One of the bottlenecks for sending staff to ITC courses is limitation of funding opportunities, as well as the shortage of professionals in this field, which makes it hard to send staff abroad for a longer time. It would be worthwhile to explore whether a combination of distance education and a shorter time spent at ITC would be a viable construction for the further professionalization of this group. The newly formed GIS working group will assure that the knowledge gained can be further disseminated, and individuals do not have to work in isolation. The support of the senior government officers, voiced after the presentation of the results of the course, is a further assurance that the knowledge gained will be further applied and developed.

This training is part of a number of World Bank projects that are currently being undertaken, focussing on different areas, including environmental risk assessment, monitoring of climate change and other important research areas. ■

Church also appointed as shelter





Regional Action Programme Central America

Communication Department itcnews@utwente.nl

In Central America, information for disaster reduction (technical studies, geographical data, etc.) usually exists, but is not (readily) available to local authorities and other stakeholders. The information is also almost never available in a form that facilitates decision-making. With the use of GIS and remote sensing the possible effects on human and physical infrastructure of natural phenomena such as earthquakes, landslides, volcanic eruptions and floods can be mapped and made visible. If this is done in a proper way, GIS and remote sensing can be used as a powerful tool for analyzing hazards, vulnerabilities and risks, resulting in the development of different scenarios and concrete measures for disaster prevention. To achieve this, professionals in developing countries need to be trained in the application of GIS and remote sensing for disaster reduction.

The United Nations Educational, Science and Cultural Organization (UNESCO) and the Central American Centre for Natural Disaster Prevention (Centro de Coordinación para la Prevención de los Desastres Naturales en América Central (CEPREDENAC), have developed the Regional Action Programme Central America (RAPCA) since 1999, with technical support from the International Institute for Geo-Information Science and Earth Observation (ITC), and financial support from the Dutch government.

Objectives of the UNESCO RAPCA project are:

- Training professionals from Central America in the use of Geographic Information Systems (GIS) and Remote Sensing techniques for natural disaster prevention.
- Development of a training package on the use of GIS and RS for Natural Hazard, Vulnerability and Risk Assessment,
- Development of a series of pilot studies in Central America which can be used as illustrative case studies on the use of GIS and RS for disaster prevention at the local level.
- Transfer of the results (case studies and training package) to other professionals through CD-ROMS and Internet

Almost 15 years after the start of the Regional Action Programme the alumni who executed the national projects are still active in the field. ■

ALVARO CLIMENT

is a civil engineer who has been working at the Costa Rican Electricity Institute (ICE) since 1980. His work is related to studies in the field of seismology and earthquake engineering applied to the development of power generation projects in Costa Rica.

He has participated in many studies of seismic hazards, both locally and regionally in his country and in other parts of Central America. He has also participated in several international cooperation projects in the field of seismology, seismic hazards and seismic risk.

During the RAP-CA project all participants received training in the use of Geographic Information Systems (GIS) and its use and application in assessing natural hazards, vulnerabilities and risks.

As part of this project Eng. Climent had the opportunity to participate in the field of seismology using GIS methodologies to develop seismic hazard maps in the city of Turrialba, Costa Rica, as well as the issue of vulnerability and risk by a specific study location in the city of Cañas, Costa Rica.

His participation in this project helped him improve his working platform (specialized software+GIS), as well as his knowledge to estimate natural hazards.

MY NAME IS ESTUARDO LIRA

and I was born in Guatemala in 1976. I work as the GIS Specialist in the Medfly Program in Guatemala and I am also a professor of Risk Management at the San Carlos University of Guatemala. RAPCA was one of my best experiences in life and it opened different doors for my personal and professional development.

At the beginning of 2000, while conducting my Supervised Practice of the University, my supervisor asked me two questions: "Lira, do you speak English? Do you want to go to Holland?" Immediately I answered "Yes" to both, without knowing that those "Yes" were about to change my life.

Couple of months after, and one week after I turned 24 years old, I was travelling to Enschede, the Netherlands for 2 months to attend the course "Geo-Hazard Zonation using GIS for the Central American Region". This course has been one of the most important learning experiences for me. Not only because of the understanding of Risk Management, but mainly because of the experiences I had in the Netherlands and Costa Rica.

After the course, which was only the first step of RAPCA, we organized and conducted several activities related to Risk Management, some as part of the RAPCA, others as a consequence of the strong relationship established with ITC. These activities included:

2001 – Course: "Natural Hazards mapping using GIS for Guatemala".

2003 – Course: "Natural Hazards Zonation and Vulnerability Analysis with the support of Geographic Information Systems (ILWIS)".

Pilot Project: "Natural Hazards Zonation in the Samalá River Basin, and Vulnerability Analysis in San Sebastian Town, Retalhuleu, Guatemala." From this project a publication was made which can be considered a Methodological Handbook for Hazards and Risk Zonation.

2005 – Course: "Flood Risk Management in Central America".

2008 – Course: Early warning and Risk Assessment for Landslides in Guatemala.

The knowledge I gained on Risk Management allowed me to work in the USGS Hurricane Mitch Programme on the Municipal GIS component. This component consisted of providing training on GIS and Risk Management to municipality personnel from 23 Municipalities in Guatemala, El Salvador and Nicaragua. And basically, our training package consisted of the materials developed during RAPCA.

From a personal perspective, I built up a very close friendship with the RAPCA participants which lasts until now. Also, with the knowledge of RAPCA I was able to finish my Bachelor Degree Thesis, which was related to Risk Management, and obtained the Award as the best thesis of the Year in the Agriculture Faculty of San Carlos University.

In 2012, I was invited to teach the Risk Management Course in the Agriculture Faculty of San Carlos University, and I have been teaching the thematic information ever since. I am still using the teaching materials of RAPCA, mainly because I haven't found better teaching materials on Risk Management.

From 2000 to 2014, RAPCA has been a Capacity Building process in my country through the education on Risk Management. I estimate that at least 200 people have been reached by the knowledge of RAPCA.

THIS IS EDY MANOLO BARILLAS,

Guatemalan, currently 45 but 31 when taking the "Geo-hazard zonation using GIS" course at the ITC facilities in Enschede, The Netherlands. Besides experiencing tremendous emotions by being in the central core of European football in 2000 (Belgium and The Netherlands share the Euro Cup), ITC provided me with solid and updated concepts about GIS technology and its application to zoning hazards, vulnerabilities, and risks.

Equally valwuable, the RAPCA Programme allowed several Central American professionals and institutions to network and contribute to promote scientific and valid methodologies to analyze geo-data and risk phenomena. These two major pillars of RAPCA, knowledge and networking, were crucial to facilitate my tasks and duties in the last decade of my professional career: from the government to the International Cooperation, through my MSc. in Geological Engineering in Colorado, down to my current post as the National Disaster Response Advisor for the United Nations Representation in Guatemala.

As we are celebrating 15 years of this positive RAPCA programme, it is is fair to thank UNESCO, ITC, and all of our professors and friends in Enschede for such a huge impact on our professional development.

MY NAME IS GIOVANNI MOLINA

and I participated in the RAPCA special course in 2000 at ITC. Currently, I work at the Environment and Natural Resources Ministry of El Salvador as a Manager of Geo-environmental Information Systems. My unit is in charge of support geospatial information management of the ministry using Geographical Information Systems and Remote Sensing Technologies, to develop applications about Risk Management, Early Warning Systems and Natural Resources Monitoring. Also, my unit is in charge of the implementation of Environmental Statistical and Indicators, the development of National Greenhouse Inventories and its system, and the implementation of Monitoring, Reporting and Verification (MRV) System of National REDD+ Strategy (Reduced Emissions from Deforestation and Forest Degradation) under de UNFCCC.

In my opinion, the RAPCA was the most successful experience of the region on the application of GIS and Remote Sensing to Assessment of Natural Hazards, Vulnerability and Risk. I consider it an excellent capacity-building project at the national level in each country; important pilot projects and local and regional training courses were developed, which were the base of subsequent investigations.

The training package developed by ITC and the Group had been used to infuse knowledge at different academic levels, for example, Regional and National Projects, Diploma Courses, Short Courses, Master Degree Courses, etc. In my case I used the training package at a Risk Management Diploma Course at National University of El Salvador (2002, 2003 and 2004). Also I presented the RAPCA Project in several forums like Follow Mitch+5 Meeting (Panama, 2003 funded by JICA) and World Information Technologies Forum (WITFOR) in the Environment Commission in Addis Ababa, Ethiopia, 2007.

Most of the people who participated in the initial course in 2000 still continue to work in this field at a national level and participate in Regional Initiatives such as CAPRA (Central America Probabilistic Risk Assessment), the GIZ-BGR Project, UN SPIDER and others, and are still sharing and expanding the knowledge in Risk Management, GIS and Remote Sensing. However, the most important thing thatwe still share is a good friendship between us and ITC teachers.

I will always be grateful to Cees Van Westen, Niek Rengers, Koert Sijmons, Mark Noort, Sabine Maresh and the rest of the ITC people that helped us during the course and beyond

RAPCA Group 2002

RAPCA Excursion

RAPCA Training 2000

RAPCA Training 2005

RAPCA Training 2008

Reconstruction and Recovery Planning

Rapid and Continuously Updated Construction Damage, and Related Needs Assessment

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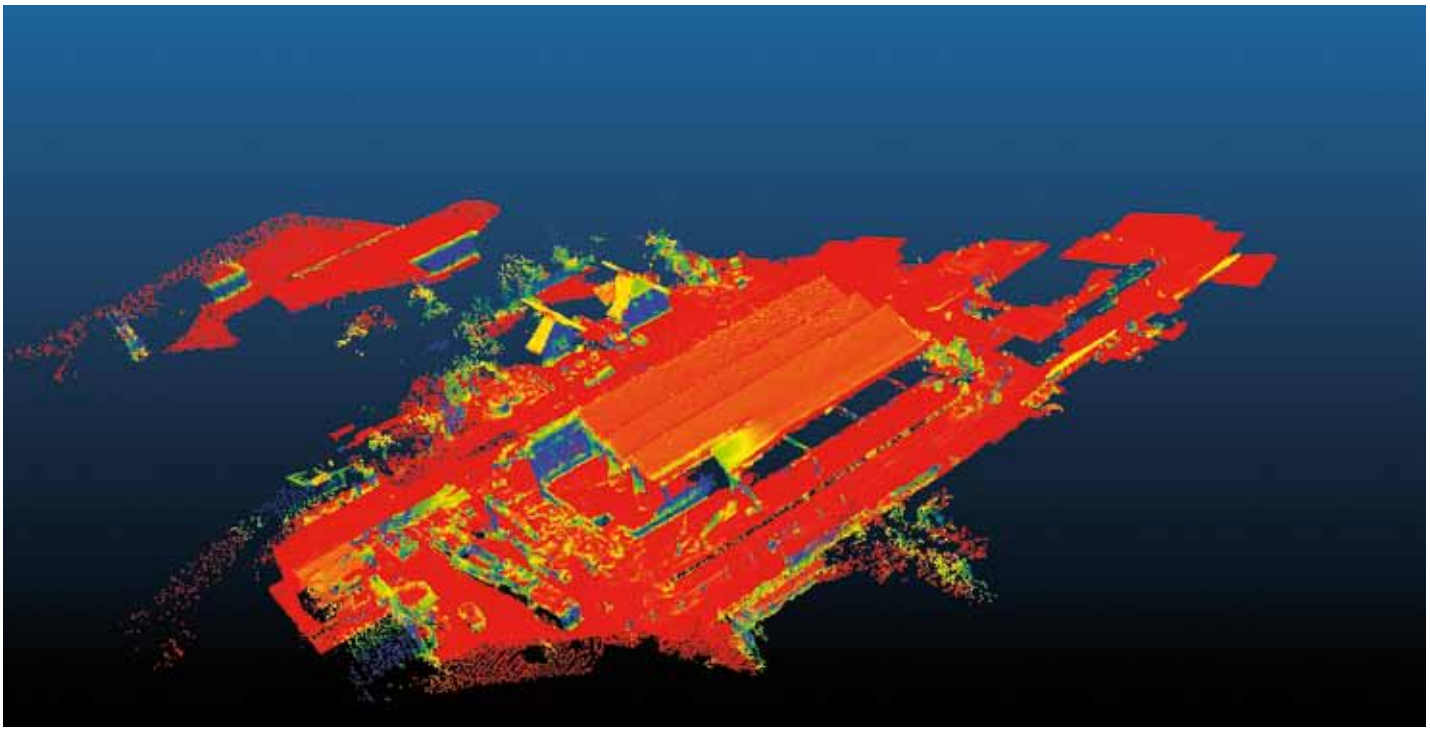
Terrorist actions often strike critical building and civil infrastructures of strategic interest, such as government buildings, airports, harbours, bridges, and head offices of large corporations. The same buildings and critical infrastructures are often among the facilities damaged in a natural disaster. During such events the facilities mentioned above may exceed their functional or structural limits in a visual way. However they can also suffer enormous damage to their capacity without showing any apparent visible signs. For instance, in the case of an earthquake, such damage can render the facility incapable of surviving consecutive aftershocks. These aftershocks take place within few hours of the earthquake and can have an intensity of up to 90% of the original shock.

The post-crisis damage assessment process for constructed facilities is mainly based on on-site inspection by experienced engineers. When the visible signs of damage are not of a kind that points to a definitive damage or non-damage state, further analysis is necessary. This problem is compounded by the shortage of experienced inspectors and the inevitable time delay caused by an in-depth structural analysis, during which time a conservative position has to be taken and the facility has to remain closed. This is extremely painful in the case of critical facilities, such as, for instance, buildings necessary for the planning and management of early and full recovery (e.g., the Ministry of the Interior, or civil protection agencies), or hospitals, police and fire stations, bridges and tunnels essential for the passage of emergency vehicles.

In case of large-scale events (e.g. an earthquake or regional conflict), recent advances in Information and Communication Technologies, including Earth Observation, can shorten the time for an initial inspection to identify damaged constructed facilities.



However, this information is still based exclusively on what can be seen from outside the facility. It can replace an initial, rapid inspection, which usually lasts several days and is intended to quickly screen out the obviously safe and the obviously unsafe facilities, but it cannot replace the detailed inspection that follows, which usually lasts several weeks and is intended to provide a more reliable estimate of the structural condition of the facility. Recent advances in accurate positioning inside constructed facilities, in smaller, less expensive and lower power wireless sensors, and in computation present the opportunity to combine these developments into the capability to make anautomatic, reliable, in near real-time estimation of the structural condition and damage of monitored building and civil infrastructures following a hazardous event.

In this context, REcovery Planning: Rapid and Continuously Updated COnstruction Damage, and Related Needs ASSessment (RECONASS) aims to provide a monitoring system for constructed facilities that will provide a near real-time, reliable, and continuously updated assessment of the structural condition of the monitored facilities after a natural or man-made disaster (e.g. an earthquake or explosive device), with enough detail to be useful for early and full recovery planning. The above assessment will be seamlessly integrated with an automated, near real-time and continuously updated assessment of physical damage, loss of functionality, direct economic loss and needs of the monitored facilities and will provide the required input for the prioritization of their repair.

Another aim of RECONASS is to provide seamless interoperability among heterogeneous networks in order to secure that the required information from the monitored facility can reach, in near real-time, the base station even after difficult conditions, such as post-crisis situations (e.g. in a post-earthquake situation).

RECONASS is a project co-funded by the European Commission under FP7 that launched its activities in December 2013. www.reconass.eu

The detailed monitoring provided in RECONASS is only economical for selected facilities that are essential for response and recovery or facilities that have a high value as a target for terrorist attacks. In case of spatially extended events, in order to assess the physical damage in the whole affected area, the detailed assessment of damage in the monitored facilities will be used for the speedy local calibration of satellite and oblique aerial photography, thereby dramatically reducing the required time to inform the post disaster/crisis needs assessment process and provide base data for reconstruction efforts.

All of the above will be part of the RECONASS next generation post-crisis needs assessment tool in regards to construction damage and related needs. This tool will enable the fusion of external information, provide international interoperability between the involved units for reconstruction and recovery planning, and support the collaborative work between these actors.

RECONASS will have significant social and economic consequences that include the following:

- Relief organizations, insurers and banks can begin funding restoration efforts at a much earlier date
- Reconstruction activities will start earlier
- It will be easier to obtain international financing soon after the disaster, when the disaster is still in the news.
- Emergency response crews will be provided with critical and timely information on damage in monitored facilities so that

danger can be pinpointed and emergency response directed with precision.
- Disaster cost will be reduced by preventing monitored structures from collapsing, to limit damage to adjacent structures and additional loss of life when explosive devices impact highly populated urban centers.
- Disaster costs will also be reduced by providing shoring to weakened monitored buildings, to protect them from the aftershock sequence.
- Safety will be promoted when dangerous monitored buildings or portions thereof will be demolished.
- Knowledge of the structural condition of monitored buildings will reduce likely building-closure durations and consequent business interruption costs.
- Identification of the safe monitored buildings for immediate use will help the government find the physical infrastructure needed to provide essential services.
- Knowing the functionality of hospitals immediately after the disaster will help the government direct injured victims to available hospital capacity.
- RECONASS information to all major recovery stakeholders (in the form that they need it) will help them acquire a common picture of the situation.
- Use of the RECONASS system will provide better situational awareness in case of any disastrous event and will help save lives, the environment and culture
- Communication in case of disaster, such as guaranteed by the proposed communication gateway, in addition to helping the recovery efforts, which can save lives.
- Early, effective handling of the reconstruction and recovery process will have long term financial repercussions.

ITC is leading a RECONASS work package

The Faculty of Geo-Information Science and Earth Observation (ITC) of the University of Twente is leading a RECONASS work package that focuses on synergistic damage assessment with air and spaceborne remote sensing.

Researchers of the University of Twente use a new method to map structural damage after disasters. A remote-controlled drone with a regular high-quality camera takes a large amount of pictures of a building. From this, a 3D model is created, a point cloud from which the researchers can read geometric information. The drone can be employed after natural disasters or terrorist attacks in order to map damage to important infrastructural places, such as government buildings, hospitals, airports or bridges.

Dr Norman Kerle is a researcher at the ITC Faculty of the University of Twente: "We use the drone - a remote-controlled multicopter with six rotors - to examine the exterior of the damaged building. This multicopter takes a large amount of overlapping pictures that we combine to form a 3D point cloud. From this, we can read geometric information. The images are so detailed that you can recognize small tears, holes, crooked walls and debris. With sensors in buildings or on satellites this cannot be achieved. We analyze the information in order to come to an objective assessment of the damage. With the drone, even 'invisible' damage can be determined, like shifted or inclined walls or a distortion of the roof. After an earthquake, this type of damage can cause the building to collapse during aftershocks."

Current situation

Currently after a disaster, buildings are inspected through satellite data and with the help of investigators, but there is a shortage of experienced investigators and this type of inspection is very time-consuming. Moreover, the building cannot be used in the meantime. This is very inconvenient if it concerns important buildings such as ministries, hospitals, police stations or bridges and tunnels that have to be accessible to emergency services.

Benefits

Inspection by drone is faster, more efficient, cheaper and more objective than current methods. Kerle: "With satellites, all you typically see is the roof of the building, while an investigator sees the building from the ground only; the drone shows the entire exterior of the building, including the roof." Because the correct information is available quickly, lives can be saved. Aid, emergency measures and measures for rebuilding can be provided and taken more quickly and more precisely. Whether a building is safe is determined more quickly, ensuring that the building can be used for important work sooner. In the long-term, too, the method is more cost-efficient because it makes it clear where exactly the building requires repairs.
Kerle: "In Italy we tested the method on buildings that were damaged during an earthquake (www.itc.nl/resume/pdf/Gerke_leaflet_RECONASS_March2014.pdf). We came to a detailed three-dimensional geometric information model from which we could read the damage in great detail." Kerle and his colleague, Dr Markus Gerke, are performing follow-up research to develop an algorithm that calculates exactly which parts of a building are safe and which are not. ■

FOR MORE INFORMATION feel free to contact the ITC RECONASS project coordinator Norman Kerle at n.kerle@utwente.nl

Helping to Find Survivors after Disaster Events

providing increasingly refined information to response forces

ITC News itcnews@utwente.nl

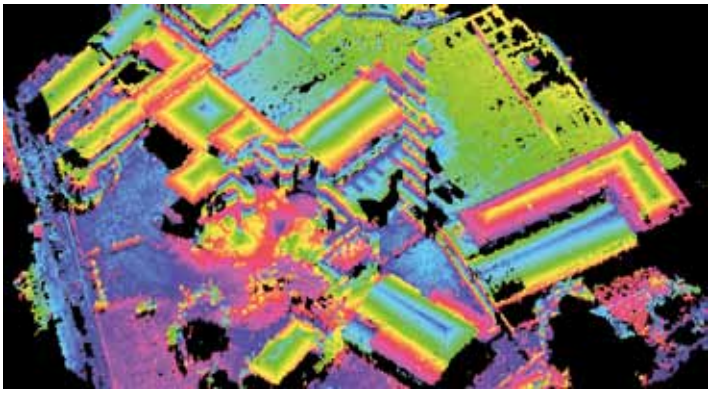
The INACHUS project is a four-year R&D project aimed at achieving time reductions and increased efficiency in urban search and rescue operations.

The overall aim of INACHUS, a project for the development of "Technological and Methodological Solutions for Integrated Wide Area Situation Awareness and Survivor Localization to Support Search and Rescue Teams", is to provide increasingly refined information to response forces following a disaster event to assist in-searching for survivors. This will start with an initial situation assessment based on satellite imagery and a damage simulation with synthetic models, followed by 3D data generation based on imagery from unmanned aerial vehicles (UAV) and ground-based laser scanners, and eventually by deploying robots and other suitable instruments to find survivors in the field.

Crisis incidents result in difficult working conditions for Urban Search-and-Rescue (USaR) crews. INACHUS aims to achieve a significant time reduction and increase efficiency in USaR operations by providing:

- Simulation tools for estimating the locations of survival spaces (after a structural collapse) and identifying the location of survivors for different construction types and building materials
- Decision and planning modules for advanced casualty and damage estimation that will be based on input coming from airborne and ground-based laser-scanning and imaging data (ITC contribution)
- Integration of i) existing and novel sensors (electromagnetic, vision, chemical) for detection and high-accurate localization and ii) mobile-phone signals for estimating the number of trapped humans
- A snake robot mechanism (integrated with the sensors) to penetrate the rubble in order to more accurately locate trapped victims
- A robust, resilient and interoperable communication platform to ensure that

Crisis incidents results in difficult working conditions for Urban Search-and-Rescue crews



Decision and planning modules for advanced casualty and damage estimation that will be based on input coming from airborne and ground-based laser-scanning and imaging data

the sensors data can reach the command centre
- Enhanced data analysis techniques and 3D visualization tool of the mission location to be operated by the crisis managers and the decision makers. A suitable decision support system will be used for planning and managing complex USaR operations
- System Integration of all the aforementioned software and hardware subcomponents (INACHUS platform)
- Contribution to standards: interaction with international organizations and public authorities in the fields of USaR, through an early defined and developed User Group, to ensure strong links with the user communities and standardization bodies
- Consideration of societal impacts and legal/ethical issues of the proposed solution at the onset of the project feeding into the technical solutions
- Numerous field and simulated tests properly designed and executed to present the capabilities of the INACHUS integrated platform
- Appropriate training package and extensive training courses to the first responders (ITC contribution).

INACHUS forms part of a large-scale integrating research project funded through the 7th Framework of the European Commission. The project has 21 participating organizations from 13 European countries. ITC is one of two partners focusing on the remote sensing-based aspects. The project is a cross-departmental effort between the ITC departments Earth Systems Analysis (ESA) and Earth Observation Science (EOS). The project is expected to start in the third quarter of 2014 and will run for four years. It builds on a related ongoing FP7 research project called RECONASS (www.reconass.eu). ■

Illustrations Courtesy of Aibotix GmbH

MORE INFORMATION

For more information feel free to contact the ITC-INACHUS project coordinator Norman Kerle n.kerle@utwente.nl
(works best with Chrome or Firefox)

In the online version of the newsletter article you could also put the link to the YouTube video: http://youtu.be/bM0TZu_5LYs
Online 3D model, to interactively work with https://skfb.ly/zqAt (works best with Chrome or Firefox)

RiskChanges: A Spatial Decision Support System for the Analysis of Changing Risk to Natural Hazards

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The Spatial Decision Support System, called RiskChanges, is composed of a number of integrated components. The Risk Assessment component allows the user to carry out spatial risk analysis with different degrees of complexity, ranging from simple exposure (overlay of hazard and asset maps) to quantitative analysis (using different hazard types, temporal scenarios and vulnerability curves). This analysis results in risk curves.

The aim of the spatial decision support system is to analyze the effect of risk reduction planning alternatives on reducing the risk now and in the future, and support decision makers in selecting the best alternatives. The SDSS is made in synergy with the InCREO project and the CHANGES project. The INCREO project is an EU FP7 project under the GMES/Copernicus programme. The objective of IncREO (www.increo-fp7.eu/) is to provide actors responsible for disaster management, risk prevention, civil protection and also spatial planning with EO-based solutions contributing particularly to an improved preparedness and mitigation planning for areas highly vulnerable to natural disasters and already noticeable climate change trends. These solutions will be adjusted to the users' and end-users' needs and will also reflect on short-term climate change scenarios and related legislature – both on national, supranational and European level. As a multi-risk oriented concept per se, any type of natural disaster is addressed. However, selected use cases (dam failure, storm surge and wave height, flood, earthquake and landslide) and the transfer of solutions to a specifically multi-risk prone test site will also be covered. From a technical point of view the IncREO solutions will be based on state-of-the-art methodologies, implemented by means of up-to-date mapping and modelling procedures and finally appropriately disseminated to the relevant stakeholder groups. The EU FP7 Marie Curie ITN Network "CHANGES: Changing Hydro-meteorological Risks, as Analyzed by a New Generation of European Scientists (www.changes-itn.eu)". The CHANGES network develops an advanced understanding of how global changes, related to environmental and climate change as well as socio-economical change, may affect the temporal and spatial patterns of hydro-meteorological hazards and associated risks in Europe; how these changes can be assessed, modelled, and incorporated in sustainable risk management strategies, focusing on spatial planning, emergency preparedness and risk communication. The CHANGES network consists of 11 full partners and 6 associate partners, of which 5 are private companies, representing 10 European countries. The CHANGES network has hired 12 Early Stage Researchers (ESRs) that are carrying out their PhD research and another 5 researchers for the implementation of the SDSS.

Framework of the RiskChanges SDSS

A Spatial Decision Support System (SDSS) is an *"Interactive computer system designed to support a user or a group of users in achieving a higher effectiveness of decision-making while solving a semi-structured spatial decision problem"* (Sugumaran et al. 2007). An SDSS has an explicit geographic component; it is supporting rather than replacing the user's decision-making skills, and facilitates the use of data, models and structured decision processes in decision-making.

The RiskChanges SDSS should be able to analyze the effect of risk reduction planning alternatives on reducing the risk now and in the future, and support decision-makers in selecting the best alternatives. Figure 1 (page 16) shows a concept of the SDSS. This Figure displays several colours and their meaning is explained below:
Central to the SDSS are the stakeholders. There are different stakeholders with different objectives:

- The envisaged users of the platform are organizations involved in the planning of risk reduction measures, and that have staff capable of visualizing and analyzing spatial data at a municipal scale. These users have staff who are able to work with spatial data and have GIS knowledge. The SDSS should be able to function in different countries with different legal frameworks and with organizations with different mandates. These could be subdivided into:
  - Civil protection organization with the mandate to design disaster response plans.
  - Expert organizations with the mandate to design structural risk reduction measures (e.g. dams, dikes, check-dams etc).
  - Planning organizations with the mandate to make land development plans.
- Data providers:
  - Another set of users are those working in organizations responsible for providing hazard maps related to flooding and landslides. These are different from the end users, and they should provide relevant information on request of the end users. These users are information providers and are not using the system to make new hazard maps.
  - A third set of users are those that provide data on elements-

at-risk (called assets in the rest of this document). They are working for organizations related to cadastral data, transportation organizations, etc.

- Risk modeling. This is the central component of the SDSS. It could be carried out by the main stakeholders or by special organizations that deal with risk assessments. In the SDSS design both options are possible.

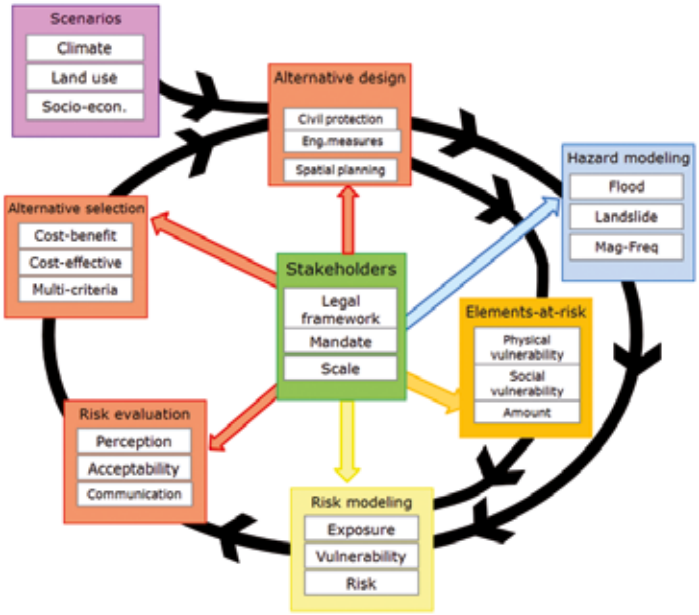

Figure 1: Conceptual design of the RiskChanges SDSS

Different colours refer to different components:

- Green = stakeholders;
- Blue = organizations responsible for providing hazard maps;
- Orange = organizations responsible for providing elements at risk maps;
- Yellow = organizations responsible for providing risk modelling;
- Violet = organizations that are working on the analysis of trends related to climate changes, land use change and population change;
- Red = end users of the platform that use the information provided by the others.

The SDSS can be used in different ways:

A. **Analyzing the current level of risk.** In this workflow the stakeholders are interested in the current level of risk in their municipality. They ask expert organizations to provide them with hazard maps, asset maps, and vulnerability information, and use this information in risk modeling. They use the results in order to carry out a risk evaluation.

B. **Analyzing the best alternatives for risk reduction.** In this workflow the stakeholders want to analyze the best risk reduction alternative, or combination of alternatives. They define the alternatives, and request the expert organizations to provide them with updated hazard maps, assets information and vulnerability information reflecting the consequences of these scenarios. Note that we do not envisage in the SDSS that these maps are made with the system, as they require specialized software and expert knowledge. Once these hazard and asset maps are available for the scenarios, the new risk level is analyzed, and compared with the existing risk level to estimate the level of risk reduction. This is then evaluated against the costs (both in terms of finances as well as in terms of other constraints) and the best risk reduction scenario is selected.

C. **The evaluation of the consequences of scenarios to the risk levels.** The scenarios are focused on possible changes related to climate, land use change or population change due to global and regional changes which are not under the control of the local planning organizations. The systems will evaluate how these trends have an effect on the hazards and assets (again here the updated maps should be provided by expert organizations) and how these would translate into different risk levels.

D. **The evaluation of how different risk reduction alternatives will lead to risk reduction under different future scenarios** (trends of climate change, land use change and population change). This is the most complicated workflow in the SDSS, as it requires a calculation of the present risk level, the effects of different risk reduction alternatives, and the effect of these on the scenarios. For each of these combinations of alternatives & scenarios new hazard, asset and risk maps need to be made.

Important components

The SDSS is composed of the following integrated components:

- **Data input component.** This module allows the users to create their own study area, upload maps representing the current situation of hazard maps and elements-at-risk. The users can create projects that deal with the generation of possible risk reduction planning alternatives and/or future scenarios in terms of climate change, land use change and population change, and the time periods for which these scenarios will be made. The component defines the input maps for the effect of the specific combinations of alternatives, scenarios and future years in terms of the hazard and asset maps.
- **Risk modeling component.** This component allows the user to carry out spatial risk analysis, with different degrees of complexity, ranging from simple exposure (overlay of hazard and asset maps) to quantitative analysis (using different hazard types, temporal scenarios and vulnerability curves). This analysis results in risk curves. Note: the platform will not include a component to calculate hazard maps. Hazard maps are input data for the risk component.
- **Cost-benefit analysis component.** This component uses the projects defined in the data input component and the risk results from the risk assessment component. The user can define the costs for the alternatives, and carry out cost-benefit analysis for the alternatives, which also takes into account how the costs and benefits might change in future years depending on the possible future scenarios.
- **Multi-criteria decision component.** This module supports the users in determining the most optimal risk reduction alternative, based on the results of the risk assessment and the cost-benefit analysis, and on user-defined criteria. These indicators are standardized and weighted, and the optimal

alternative under different possible future scenarios is determined.

- **Communication and visualization component.** Visualization is a very important component within the SDSS. The SDSS can use many scenarios and alternatives, and the organization of the data should be properly designed. The visualization does not only come in the form of maps, but also in other forms, such as risk curves, tables, and graphs. The methods for visualizing changes of maps through time should also be properly designed. This is an integrated component within the SDSS.

The envisaged **users of the platform are organizations involved in the planning of risk reduction measures that have staff capable of visualizing and analyzing spatial data.**

The planning of risk reduction measures (alternatives) involves:

- **Disaster response planning,** focusing on analyzing the effect of certain hazard scenarios in terms of number of people, buildings and infrastructure affected. It can also be used as a basis for the design of early warning systems.
- **Planning of risk reduction measures,** which can be engineering measures (such as dikes, check-dams, sediment catchment basins), but also non-structural measures such as relocation planning, strengthening/protection of existing buildings, etc.
- **Spatial planning,** focusing on where and what types of activities are planned and preventing future development areas from being exposed to natural hazards. Here, some attention has to be paid to the specific characteristics of the planning systems and cultures in the case study areas.

It is not likely that the same organizations are involved in the three types mentioned above, so we expect that different user organizations will make use of the tool in the same area. We therefore would like to make the SDSS generic enough to accommodate them.

Current outlook of the system

Although the system is still under development, a trial version is already online, and can be accessed through the following URL: http://changes.itc.utwente.nl/CHANGES-SDSS/
The start page of the system is shown in Figure 2.

The users can now only work with a demo dataset, which is based on a (partly) hypothetical case study from Italy that demonstrates the analysis of different risk reduction alternatives, in combination with several possible future scenarios .

Once the input module has been completed, users can generate their own study area, upload the required hazard maps and elements-at-risk maps, calculate the risk, define risk reduction scenarios, carry out cost-benefit analyses, and select the optimal alternative using the multi-criteria evaluation tool. The system is expected to be completed by the end of 2014. ■

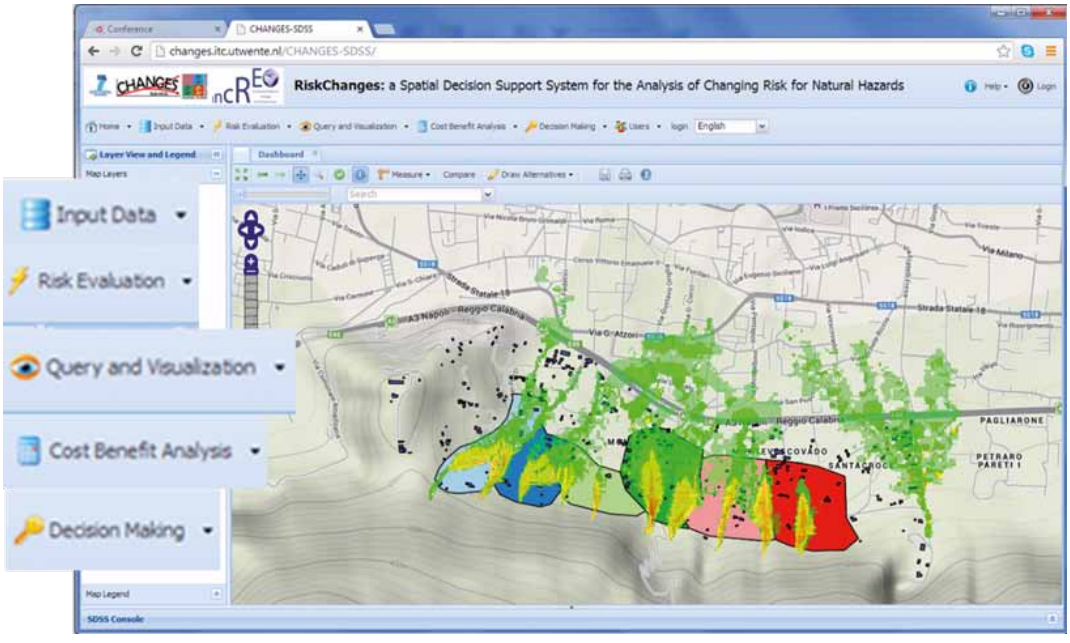

Figure 2: Opening screen of the RiskChanges SDSS

Developing a Handbook for Disaster Information Management in the Caribbean: the World Bank CHARIM project

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In 2014 the World Bank initiated the Caribbean Risk Information Program with a grant from the ACP-EU Natural Disaster Risk Reduction Program. A consortium led by Faculty ITC of the University of Twente will be responsible for conducting capacity-building workshops, generating training materials, and creating hazard maps to expand the capabilities within participating infrastructure and spatial planning ministries to use hazard and risk information for decision-making. The main objective of this project is to build the capacity of government clients in the Caribbean region, and specifically in the countries of Belize, Dominica, St. Lucia, St. Vincent and the Grenadines and Grenada, to generate landslide and flood hazards and risks information and apply this in disaster risk reduction use cases focusing on planning and infrastructure (i.e. health, education, transport and government buildings) through the development of a handbook, hazard maps, use cases, and data management strategy.

Introduction

The Caribbean region is highly impacted by natural hazards (See Figure 1). In the last two decades the region suffered over 5 billion US$ losses due to natural disasters. Its location within the path of the Atlantic hurricanes exposes the small island states and countries in the Caribbean to extreme wind conditions and torrential rains. This, in combination with steep terrain, makes them extremely susceptible to landslides, floods and storm surges. Their location along the edges of tectonic plates adds tectonic hazards to their threats as well, including earthquakes and tsunamis for the whole region as well as active volcanism on some islands. On a longer time scale, a rise in sea level is expected to make the hazard situation worse for the coastal areas.

The small island states and countries in the Caribbean – especially those of volcanic origin with rugged and steep terrain – have a limited suitable surface area for development and agricultural production. Most of the population lives along the coast and most economic activities are concentrated there as well. These areas are affected by floods (flash floods, drainage floods and coastal floods), which disrupt the socio-economic systems. Vital infrastructure that traverses the mountainous areas can be severely damaged by landslides, thereby isolating parts of the islands and disrupting the distribution of goods (and relief). Because of their size, there is very little robustness in the system to deal with these impacts. As a consequence these events have a severe impact on the relatively small economy of these countries.

The national governments have limited human and financial resources to cope with these hazards and generally lack the expertise for hazard and risk assessment in their territory. This is aggravated by the lack of geospatial data that is needed to carry out these analyses. As a consequence new development activities are often carried out with limited considerations for these hazards. It also hampers the authorities in developing pro-active hazard mitigation plans, such as early warning systems, preparedness planning and risk-reduction strategies.

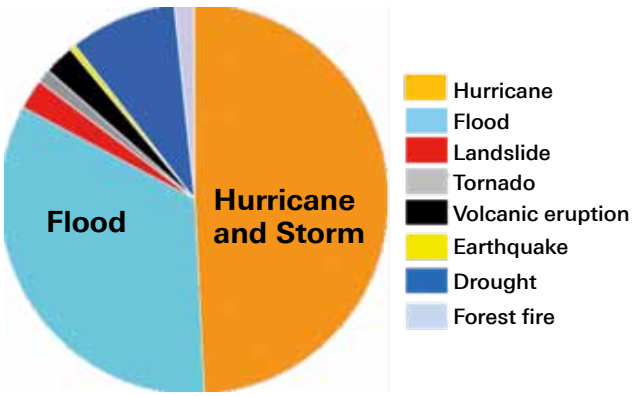


Figure 1: General division of natural disaster occurrences in the Caribbean region. *Source: CRED database*

Objectives

In 2014 the World Bank initiated the Caribbean Risk Information Program with a grant from the ACP-EU Natural Disaster Risk Reduction Program. A consortium led by the Faculty ITC of the University of Twente was selected to implement the project. The consortium consists of ITC, the University of the West Indies (Trinidad and Tobago), the Asian Institute of Technology (Bangkok), and the University of Bristol. The project is carried out within 5 Caribbean target countries: Belize, Dominica, Saint Lucia, Saint Vincent and the Grenadines and Grenada (See Figure 2). Table 1 gives a summary of a number of relevant aspects related to natural hazards and disaster risk management in the 5 countries involved in this study. The countries are all members of the Caribbean Disaster Emergency Management Agency (CDEMA: www.cdema.org). In most of the countries previous activities have been carried out related to the mapping of flood and landslide hazards. For flood related hazard assessment, CDEMA has been collabo-

Figure 2: There is a large difference between Belize and the island states in the Eastern Caribbean in terms of topography, physiographic setting and natural hazards

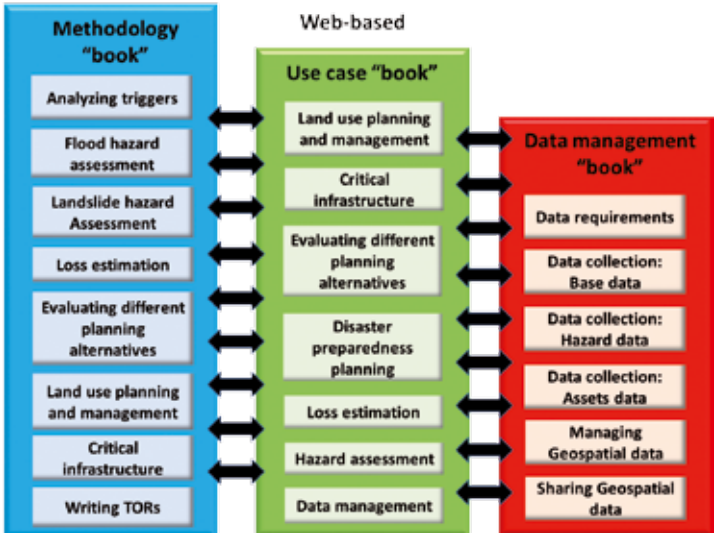


Table1: Simplified structure of the handbook, consisting of three parts: 1: the use case book forms the entry point for the users and consist of examples; 2: the methodology book contains explanations on methods; 3: the data management book contains technical information on the spatial data types, data collection and web-based databases. The system will be web-based and will have many links between the three components.

rating with the Caribbean Institute for Meteorology and Hydrology (CIMH, www.cimh.edu.bb/), and with the University of the West Indies (Trinidad) on the application of GIS for flood hazard assessment, and with the UWI (Jamaica) for community based flood hazard assessment.

The CHARIM project (Caribbean Handbook for Disaster Information Management) has the following objectives:

- To make an inventory of the needs of each target country in terms of their capacity for spatial data collection, analysis and management, (landslide and flood) hazard and risk assessment, and integrate this information in spatial development planning and risk reduction planning;
- To make an inventory of the tools available worldwide in terms of technical training manuals linked with practical applications and in terms of methodologies applied for flood and landslide hazard and risk assessment at different scales, as well as open source modelling tools for these hazard types;
- To develop a theoretical framework for landslide and flood hazards and risks assessments, based on the review of existing quantitative and qualitative assessment methods and their appropriate use;
- To develop nine national hazard mapping studies in the five target countries. One in Belize related to floods and two on each island for landslides and floods;
- To develop a handbook to support the generation and application of landslide and flood hazard and risk information;
- To develop a number of use cases of the application of hazard and risk information to inform projects and programmes by planning and infrastructure sectors. The methodology provides the overall framework for the use cases. The TOR states that there should be 10 generalized use cases for each of the two sectors: the ministries of works & transport and the ministries of physical planning, resulting in at most 20 use cases
- To make the handbook, data and methodology available through a pdf document and through a web-based platform, consisting of web-based databases, and a Decision Support system set-up for risk reduction planning;
- To provide training courses based on the materials and the handbook, that is made available to the entire region through a web-based platform and distance education course in collaboration with the University of the West Indies;
- To contribute to knowledge exchange between the target countries as well as to the regional and international expert community.

Workshops

Initial workshops were organized in each of the five target countries. After the workshop, the participants' e-mail adresses were checked and they were gathered into groups based on their countries. The participants were invited to join a Google Drive where the relevant information for their country would be stored.

Developing the Handbook

The development of a handbook for the assessment of landslide and flood hazards and risks is one of the main deliverables in this project. This book will comprise three components:

- **a methodology book,** which focuses on the methods for generating landslide and flood hazard and risk information for different scales (nationwide, and for detailed areas) and taking into account different situations of data availability. The methodology book is aimed to be used by technical staff from government organizations and private consultants;
- **a use case book,** which illustrates the steps required to use the hazard and risk information in so-called use cases for planning of infrastructure, planning of risk reduction measures, emergency preparedness and emergency response. The use case book is aimed to be used by representatives from government sectors, specifically from the Ministries of Physical Planning and Public Works;

- **a data management book,** which indicates the aspects related to use collection, management and sharing of spatial data related to landslide and flood hazard and risk and planning. This book will detail the types and quality of data needed for activities at different scales and methods for data creation and sharing. The data management book is targeted towards technical staff from government organizations and consultants that work on geo-spatial data management & GIS.

In practice these will be three individual parts which can also be joined together in an overall handbook. The handbook will be designed to provide technical guidance to government officials about the generation and use of information regarding landslide and flood hazards as well as risk assessment. Emphasis will be put on its use for planning and critical infrastructure (health, education, transport and government buildings). Although the handbook will be developed targeting the specific needs of the five beneficiary countries, the scope will be sufficiently generic to extend its use to the wider region. In general, the handbook should be easy to use and support government institutions in quickly identifying which information is required for their work. The handbook will consist of three separate components that will be strongly interlinked.

A detailed table of contents for the handbook has been developed andwill be presented to the stakeholders from the 5 target countries in a workshop in Grenada in September, where examples of the use cases will also be presented. The development of the handbook will take place in the second half of 2014 and the final handbook will be presented in the first quarter of 2015.

Data Collection and Analysis

The partners from the University of the West Indies will proceed with follow-up visits to the 4 island countries in the coming month with the aim to complete the data acquisition phase, and collect the data that is still missing. For each of the countries a list was made with the missing data and reports, which were mentioned in the workshops but which we do not yet have. They will also provide the stakeholders with very high-resolution satellite images, and a homogenized dataset. In the period from mid-September to mid-October, 8 MSc students will be carrying out their MSc research fieldwork in relation to the CHARIM project. The aim is to form two groups of 4 MSc students, who will do 2 weeks of fieldwork on one island, and 2 weeks on another. This way, they would cover the four islands and their work can be used for further developing the case studies.

ESA and the World Bank (WB) have been collaborating under the umbrella of the "Earth Observation for Development" initiative. The aim of this collaboration has been to develop, produce and deliver limited-scale examples of EO-based information products that respond specifically to the geo-information requirements of on-going World Bank projects. ESA provides the financial and technical capacity to procure the information products on an open competitive basis from the leading European and Canadian EO service providers. Within this cooperation, a pilot study for the five Caribbean countries has been defined by the European Space Agency (ESA) and the World Bank. Within this ESA project the British Geological Survey is developing landslide inventory maps, land cover maps, and Digital Elevation Models for some of the target countries.

Two representatives from each of the five target countries will be invited to come to the Netherlands in the period October-November 2014 to work together with ITC and the other partners on the national scale flood and landslide hazard maps, and on the development of the use cases for the use of hazard and risk information in planning. This will be combined with training so that the methods and materials that are developed within the project can be properly utilized once the project has been completed. ■

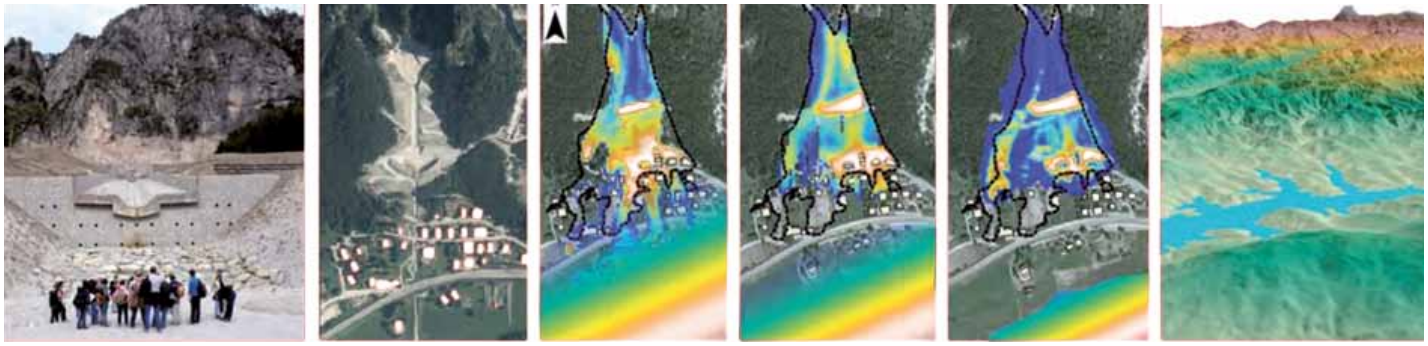
International Conference on Analysis and Management of Changing Risk for Natural Hazards

Cees van Westen c.j.vanwesten@utwente.nl

Introduction

Hydro-meteorological hazards such as landslides and snow avalanches, debris flows, flash floods and river flooding have severe impact on society and the economy, especially in mountain areas. The observed increase in disastrous events over the last decade, associated with an often low perception of most natural risks by the communities involved, along with the lack of efficient, socially accepted and environmentally sound remedial measures are amongst the driving forces behind the increasing effects of hydro-meteorological risks. It is also evident that the effects of land use changes have to be taken into account not only within the risk analysis, but also in the planning strategies. Considering such challenges, it is important to continue to develop an advanced understanding of how environmental, climate and socio-economic changes will affect the temporal and spatial patterns of hydro-meteorological hazards and associated risks, and how these changes can be assessed, modelled, and incorporated into sustainable risk management strategies (focusing on spatial planning, emergency preparedness, risk communication and early warning systems).

The conference provides an opportunity to discuss multi-hazard risks and multi-disciplinary research results on the effects of changing hydro-meteorological risks and their effects on planning strategies. The conference focus is put on both 1) technical sessions presenting the state of the art research in the understanding of the natu-



Hydro-meteorological hazards such as landslides and snow avalanches, debris flows, flash floods and river flooding have severe impact on society and the economy, especially in mountain areas

Conference Venue

ral processes and in the development of innovative methodologies for quantitative hazard and risk forecasts, and 2) the practical integration of natural, engineering, economical and human sciences within multi-scale methodologies for risk management and prevention planning.

The conference represents the culmination of the EC's co-funded projects CHANGES (Changing Hydro-meteorological risks as Analysed by a New Generation of European Scientists, www.changes-itn.eu), and IncREO (Increasing Resilience through Earth Observation, www.increo-fp7.eu/) and will provide a forum for the exchange of ideas related to effective risk management strategies. Case studies as well as conceptual approaches are most welcome.

Conference topics

The following conference topics are planned:

- Hydro-meteorological changes and forecasting
- Generating assets maps using Remote Sensing techniques
- Modelling changes in exposure and vulnerability of societies
- Modelling changes in natural risks and estimate risk scenarios
- Risk management strategies adopting to future changes, including risk perception and insurance
- Policy relevance and implications related to changing risk
- Risk communication and risk governance aspects of changing risk
- Earth Observation data, geo-information and visualization tools for risk assessment
- Lessons learned and transferability of multi-hazard risk assessment methods to developing countries
- Ecosystem-based approaches to disaster risk management

Venue

The conference will be held from 18 – 19 November 2014 at: Centro Culturale San Gaetano, Via Altinate nr. 71, Padua, Italy, which has been the City Court of Padua for 140 years, after which it was renovated to become a large cultural centre that also houses the Municipal Public Library. Padua is a very ancient city in the Northeast of Italy, which is famous for its monuments and churches. The Padua University was established in 1222; Galileo Galilei was a professor there from 1590 to 1610. Padua's treasure is the Scrovegni Chapel, with the famous frescos of Giotto;

Abstract submission and registration

The deadline for submission of abstract has been extended to 15 September 2014. Instead of full paper submission we now accept extended abstract submissions, with a deadline of November 1 2014. You can register on the following website: www.changes-itn.eu ■

Supporting organizations

RESEARCH NEWS

‘We Try to Prevent Deforestation and Protect Animal Species’

Communication department itcnews@utwente.nl

During the last 50 years, nearly half of the original forests on earth have disappeared. Deforestation is responsible for approximately twelve percent of the greenhouse gas emissions worldwide. It is therefore a major cause of climate change. “Deforestation results in an increase of CO2 in the air. We want to reduce these carbon emissions”, says Thomas Groen, lecturer at Faculty ITC of the University of Twente.

wwThomas uses this geo-information for research into ecosystems, animals and vegetation: “You see that many forests are being cut down to create farmland or for the sale of timber. We aim to reduce this. We provide training courses on the subject to landowners in countries like Nepal and Ghana. We then teach people techniques that enable them to determine the amount of carbon contained in forests. They are often well aware of the negative consequences of deforestation, but still lack the proper knowledge to establish the extent of these consequences.”

Human influences have a lot of effect on ecosystems. Deforestation leads to the reduction and fragmentation of the habitats of animal species. As a result, escape routes for species to, for example, move with the climate zones disappear. “Within our department, we examine various models that say something about the conditions in which animals live. Where are the animals to be found? Satellite images provide us with information about, for example, temperature, altitude, climate and whether the surface is heavily wooded. In that way, we examine exactly why the animal is found there. We want to know which factors are important for the animal and which are less so. This enables us to determine which protective measures we can take. Bodies such as ministries of agriculture and nature conservation organizations are interested in such research results.”

The models that Thomas uses can also be applied to predict the spread of diseases transmitted by animals. “We then create maps showing risk areas. In the Netherlands, for example, we can look for ticks in order to map the risk of Lyme disease. In practice, we mainly conduct research in less densely populated countries. The Netherlands is built-up and very tidy. We have mapped every postage stamp here. Our research focuses on countries where the landscape is untouched, where we can study natural influences.” In answer to the question whether he is a true idealist, Thomas replies: “I think it’s important that we handle nature and ecosystems with care, because we are dependent upon them.” And then, laughing: “But I’m not a vegetarian.” ■

FOR MORE INFORMATION on this research feel free to contact Thomas Groen: t.groen@utwente.nl

“I think it’s important that we handle nature and ecosystems with care, because we are dependent upon them.”

PROJECT NEWS

Leverage Smallholder Agriculture with Remote Sensing

A unique research project on the application of satellite images in African and Asian agriculture

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ITC received a research grant of 7.5 million US$ from the Bill & Melinda Gates Foundation to help the world's poorest people. The project, called STARS, which stands for Spurring a Transformation for Agriculture through Remote Sensing, will identify how earth observation data products may help improve current information and decision support systems in the smallholder economies of sub-Saharan Africa and South Asia. The project will be executed in close collaboration with research institutes in West and East Africa, Bangladesh, Australia, Mexico and the United States.

Agriculture remains the predominant occupation of the world's poorest people in sub-Saharan Africa and South Asia, but many struggle to produce crops consistently and sustainably year-by-year, and the large persistence of subsistence farming deters economic development at the household scale. Earth observation technology has become a regular tool in the large-scale agricultural production systems of industrialized and emergent countries; its use in context of African and Asian smallholder farmers comes with substantial challenges, however.

Technological advances

Smallholder farmers often use small cropland plots with variable boundaries, they often grow multiple crops and crop varieties on the plot at the same time, and there is a rich variety of farm practices in place that add to the heterogeneous mosaic that African and Asian farmland often is. These conditions make it hard to discriminate cropping systems, crops and cropping practices from the skies, and this presents a fundamental barrier to accurate information, timely crop monitoring and forecasting, and improved agricultural advisories. In recent times, technological advances have brought us improved satellite image resolution, improved revisit frequency that allow better monitoring during the growing season, and improved spectral characteristics in those data products.

"Our research timeline first focuses on cropland delineation," says ITC project lead Rolf de By, "as we need to know first where farming takes place." *(Photo: Gijs van Ouwerkerk)*

Consortium

Led by ITC, a consortium of international research institutes will test a number of hypotheses about the use of earth observation data.

This should identify which farming stakeholders are best served with which information, and how that information should be provided to optimally inform decision-making. Stakeholders are not only farmers, but also the private sector that delivers farm inputs (for instance, seeds, fertilizers and tools) and governmental decision-makers, such as staff of ministries of agriculture and food security.

"Our research timeline first focuses on cropland delineation," says ITC project lead Rolf de By, "as we need to know first where farming takes place. Next, we will seek to detect, always using remote sensing, which is the cropping system that the farmer applies on the delineated plots: are they pure maize systems, or is the farmer also growing beans? Subsequently, we will want to know about crop health and crop growth progress."

STARS project

In the STARS project, ITC collaborates with the Commonwealth Scientific and Industrial Research Organisation (CSIRO, Australia), the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT, Mali and Nigeria), the University of Maryland (USA), and with the International Maize and Wheat Improvement Center (CIMMYT, Bangladesh and Mexico). These partners bring their own suite of local partners to the scene, providing a wide international collaboration network for joint work on the problem domain.

STARS, which will last for 20 months, will develop open data products to be used by the wider research community. ■

EVENTS

King Willem-Alexander opens The Gallery

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Innovative, technological, high-tech, cooperation, cross-pollination, Silicon Valley of the Netherlands, largest incubator, source of new jobs, largest display window. This is only a selection of all the terms used to describe The Gallery. Last April, King Willem-Alexander officially opened this new centre for innovation on the University of Twente campus.

Five pupils who won the Lego Solar Race earlier this year presented the King with a key freshly printed by a 3D printer just before. The tower of The Gallery was wrapped in orange cloth for the occasion, which was supposed to fall down after the King had turned the key. The suspense of the audience became almost unbearable when the cloth did not drop immediately, but after about thirty seconds it finally happened and The Gallery was officially opened.

Before the King performed the opening there was a special guest who entertained the crowd that had flocked to the campus en masse: the new Campus robot of the University of Twente. This robot, with its own personality, is capable of exploring the environment and independently guiding small groups of people around cultural places. Later this year the robot will independently move around the UT campus.

Innovation and entrepreneurship

Earlier in the day King Willem-Alexander and a hall filled with invitees were welcomed by host Roelof Hemmen. He presented a programme in which innovation and entrepreneurship were key. The visitors were welcomed by Rob de Koning of company technology centre BTC Twente and by Victor van der Chijs, President of the Executive Board of the University of Twente. According to Van der Chijs, The Gallery is an accession for the UT and the region. "The UT is the entrepreneurial university. Entrepreneurship is part of our DNA. This development is a perfect fit."

After an interview with Kees Eijkel, Director of Kennispark Twente, and Wim Boomkamp, President of the Executive Board of Saxion, who explained the added value of The Gallery to those present, it was time for the entrepreneurs. Hemmen interviewed several Twente entrepreneurs on stage: from starting entrepreneurs to entrepreneurs who have already won their spurs twice over. The conclusion of the interviews was that entrepreneurship requires perseverance and persistance after any setbacks. Because of all The Gallery's facilities, the UT and Saxion in the vicinity, and the presence of other entrepreneurs, The Gallery can function as an ideal ecosystem to spur on and get the best out of entrepreneurs and companies.

The Gallery

The Gallery offers accommodation and high-quality facilities for knowledge-intensive companies, open innovation centres and service desks for innovative companies. With that, the building is a 300-metre long landmark for innovation in Twente. The Gallery is located in the former building for Chemical Engineering of the University of Twente. The building is a display window for knowledge-intensive industriousness at the 'Lane of Innovation' in Enschede. Phase I has been officially opened today and consists of over 13,000 m^2. The largest part of this space has already been rented out. In total, The Gallery will be expanded to 45,000 m^2. ■

King Willem-Alexander together with Frog, the new campus robot of the university

ANNOUNCEMENTS

GLTN International Advisory Board's Member visits Mathare Slums

Jaap Zevenbergen j.zevenbergen@utwente.nl

Nairobi, Kenya, 17th July 2014: Over the last year and with support from GLTN, Pamoja Trust and the Technical University Kenya (TUK), the Mashimoni No. 10 community within the Mathare slum area in Nairobi, Kenya, has been implementing the Social Tenure Domain Model (STDM), one of the GLTN land tools, in their informal settlement. Data on all the structures, its owners and possible tenants have been collected, including photographs of each person in front of his/her structure. Based on a 10 cm resolution ortho-rectified aerial image, the structures have been digitized and numbered.

STDM was used as the platform to link the mapping information and the personal information, whereby the data entry was done by trained (young) community members, with the assistance of fourth-year Land Administration students from TUK. Formal letters were sent to the relevant government bodies to request the land to be granted to the community, and a CD with the information was added to these letters. The Kenyan Department of Defense, the original owner of the land, has already agreed to release the land.

On 17 July 2014, prof. Jaap Zevenbergen from Faculty ITC of the University of Twente, who sits on both GLTN's International Advisory Board and the STDM Advisory Committee, visited the community, together with the students and Pamoja Trust representatives. The great accomplishments and impact of STDM were demonstrated and discussed, and the remaining challenges as well. It is clear that STDM really helps to catalyze community mobilization, clarifies which members will profit from future upgrading and helps inform and convince government officials. The question whether and when the land will be granted, however, also depends on political and administrative goodwill. ■

SOURCE: GLTN 2012

www.gltn.net/index.php/our-news/gltn-news/472-gltn-international-advisory-board-s-member-visits-mathare-slums

Community members, students, Pamoja staff and prof. Zevenbergen (at the back) in the Mashimoni Resource Centre. *(Photo: Mashimoni Community Member)*

Anaglyph Stereo Image of Enschede

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The anaglyph image is showing the central part of the city of Enschede, Netherlands, including the ITC building (northeast corner), the railway station south of ITC, the old town centre with its characteristic curved street pattern and the ITC hotel in the south. Of course you will have a better view if you zoom in at details.

For stereo vision you will need 3D glasses (blue filter on right side, red filter on left). You can easily make this yourself by following the instructions given by the Paper Project (http://paperproject.org/3dglasses.html).

The data processing has been done by the Stereo Pair from DTM functions of ITC's ILWIS programme, version 3.4. The used images are (1) a Google Earth aerial photograph of January 2005 in grey colours, and (2) a very high resolution surface model (Actual Height Model of the Netherlands, AHN2). Both image layers have been given the same geo-reference: resolution in XY direction: 50 cm; in Z direction (AHN2): 1.0 cm. Light Detection And Ranging (LiDAR) is a modern remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light.

The AHN2 dataset has been made available to selected users by the Dutch Ministry of Infrastructure and the Environment in March 2014. It covers the topography of the Netherlands, measured by air-borne LiDAR sensors from 2011 through 2012. With the AHN viewer (http://ahn.geodan.nl/ahn/) you can browse through elevations in the Netherlands yourself (Dutch only). In the viewer you can measure locations in Holland that lie below sea level. Or zoom in to the ITC building and in AHN2 mode determine the height of the rooftop relative to the parking-lot in centimetres. Have fun! ■

Anaglyph Stereo Image of the central part of the city of Enschede

MY TOUCH CONTRIBUTING TO URBAN PLANNING DECISION PROCESSES

JOSE ANDRES MORALES,
MASTER'S STUDENT GEO-INFORMATION SCIENCE AND EARTH OBSERVATION AT ITC

"I chose ITC because of the education's focus on geo-information systems and because it is one of the most renowned institutes in this field. I am especially interested in two broad subjects: design and urban planning. To design in such a way that architecture really starts to interact with its urban context is my passion"

As Jose Andres Morales has discovered, the faculty of Geo-Information Science and Earth Observation (ITC) of the University of Twente in Enschede, the Netherlands, is one of the world's foremost education and research establishments in the field of geo-information science and earth observation. We offer a wide range of the world's best degree courses in the following fields:

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HIGH TECH HUMAN TOUCH

Menno-Jan Kraak presents New Book

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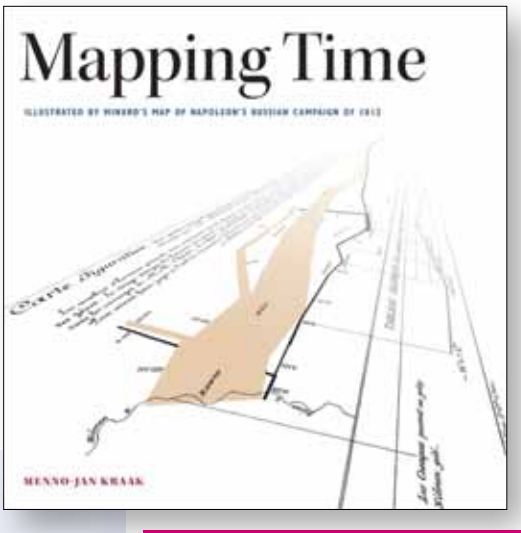
'UT professor tries to improve the best map of the world'

From 23 May, the book 'Mapping Time' will be available from Amazon.com. The book was written by Menno-Jan Kraak, Professor of Geovisual Analytics and Cartography at ITC. The book is about the processing of the time factor in a map. Kraak was inspired by Charles Minard's classical map that visualizes the disastrous French invasion of Russia in 1812

"Mapping changes is a real challenge. Many of our existing systems are very good at dealing with the *what* and the *where*, but not yet with the *when*", according to Kraak. Mapping Time is inspired by what, according to many, is best map of the world ever: Minard's Map. This map visualizes the disastrous French invasion of Russia over time: Napoleon's Russian campaign of 1812. With this hand-drawn map, Minard visualized both the movement of the army and the dramatic decrease in the number of soldiers. Kraak vow to improve Minard's map was inspired by a combination of both professional and personal interests, since Minard's map actually contains a piece of family history. Gerrit Janz Kraak, his great-great-grandfather's uncle, served in the French army. During the harsh retreat, he was killed at the crossing of the Berezina on 27 November 1812.

Kraak took a six-month sabbatical to write the book. During that period, he covered the entire campaign route. In answer to the question whether he has managed to improve Minard's map, Kraak replies: "The perfect map does not actually exist. Whether it is a good map depends on the questions you want to see answered on a map."

Kraak previously wrote a textbook in the field of cartography that is used internationally. It has, for example, been translated into Chinese, Russian, and Indonesian. Kraak expects that Mapping Time will ultimately also be used as a textbook. The book contains a combination of historical and geographical analyses with cartographic visualizations of changes to maps over time. Mapping Time is illustrated with more than 100 informative full-colour graphics. ■



Professor Menno-Jan Kraak at the Berezina Monument

MENNO-JAN KRAAK

started at the faculty of Geo-Information Science and Earth Observation (ITC) as Professor of Cartography in 1996. He is currently head of the department of Geo-Information Processing. In addition, he is vice-president of the International Cartographic Association. His fascination with maps emerged as a child on his grandfather's lap: "My grandfather could not travel himself, but with his stories took me, with the atlas on his lap, to many countries around the world."

LIFE AFTER ITC

'I Became Eager to Explore Opportunities in Geo-Information Science'

Lucy Chepkosgei Chepkochei clucyke@yahoo.com

My name is Lucy Chepkosgei Chepkochei from Mogotio, Baringo County, Kenya. It was while studying Cartography at Kenya Institute of Surveying and Mapping (KISM) in Nairobi, Kenya, that my interest in Geographical Information Systems (GIS) grew and I became eager to explore opportunities in Geo-Information Science. My vision had always been to use this knowledge and these skills to help in developing Geo-information systems and solutions for the purposes of managing resources and boosting economic development. In the course of my studies, I learnt of the Faculty of Geo-Information and Earth Observation (ITC) at the University of Twente in the Netherlands.

I chose ITC because it offers all-round skills and knowledge that I needed in order to advance my geo-Information career goals. University of Twente - ITC has over 60 years in broad geo-information experience, a multicultural environment and experts from diverse backgrounds around the world. I studied Geo-information and Earth observation for Geo-Informatics to develop capabilities for designing systems and tools for the acquisition, processing, transformation, analysis, storage, presentation and use of geo-information. Moreover I acquired knowledge in identifying and responding to development problems and in drafting development policies as well as developing research skills.

ITC Library is largely digital and online. It is also linked to other World-best libraries and international journals. I always preferred working at night and the online facility made that possible for me. It's not always about studying at University of Twente – ITC, it's also about interaction with the international community and having fun. ITC receives students from all corners of the world, with different backgrounds, languages and cultures. International cultural evenings always gave us opportunities to appreciate songs and dances from various countries. The international food festival always gave us a chance to taste food from all over the world.

Kenya is a developing country, endowed with great resources and has been at the forefront in using GIS and remote sensing tools. Back in Kenya, after completion of Diploma in Geo-Informatics, I worked at Survey of Kenya as a ISO geo-data standardization

MY ADVICE to those currently studying; always know what you want. ITC has the most sought after world-best professionals in Geo-Information. Its up to you to utilize this opportunity and learn from them.

Lucy Chepkosgei Chepkochei

counterpart to the JICA-funded project Kenya National Spatial Data Infrastructure (KNSDI). Kenya's interest in the use of geothermal energy to generate electricity saw me move to Kenya Electricity Generating Company and Geothermal Development Company to employ spatial analysis, utilizing GIS, cartography, land survey, remote sensing and other required spatial and database tools in geothermal resource assessment in Naivasha (Okaria) and Nakuru (Menengai).

Desire for more skills and knowledge in GIS and Remote sensing drove me back to ITC for further studies. It was at ITC again that I developed interest in water resources management which led to me join the Young Water Expert Programme (YEP) as a Young Local Expert in GIS and Remote Sensing at Lake Naivasha Basin, Kenya. I currently support the Integrated Water Action Plan Programme (IWRAP) activities in Lake Naivasha Basin, Kenya in transferring fundamental Geo-Informatics knowledge required to the staff of the Water Resource Management Authority (WRMA) and IMARISHA Naivasha in order to execute the activities required for the migration and implementation of the new Water Information System; Orchestrate and manage the various workflows that have been designed to structure, edit, clean and upload legacy data to the newly deployed databases; generate new products and services; and finally help in identifying, together with the project team, appropriate best practices to address the challenges that arise from the implementation of the project activities. ■

Pre-departure Meeting Kenya

Lucy Chepkosgei Chepkochei clucyke@yahoo.com

On Monday, 18 August, we were hosted by Joost Reintjes, Ambassador of the Kingdom of the Netherlands at his residence in Muthaiga, Nairobi for the pre-departure briefing for the forty-three Kenyans who have received Dutch scholarships to obtain a master's degree and short courses from the Dutch government. The Ambassador of the Kingdom of the Netherlands told the students traveling to the Netherlands to be good Kenya ambassadors as they study, and return to Kenya on completion of training to support Kenya development activities.

The Ambassador told the students traveling to the Netherlands to be good Kenya ambassadors as they study, and return to Kenya on completion of training to support Kenya development activities

More than thirty ITC Alumni were in attendance. We briefed the six new students coming to ITC who managed to attend the event about life and studies at the UT. We answered all their questions on, amongst other things, ITC Hotel accommodation, winter challenges, where they can go to Church, Laptops purchase, likely breaks/holidays during studies. We gave them the contact information of the Kenyans currently studying at at ITC.

The Kenyans granted the Dutch scholarships work in the public and private sector, civil society, NGO's & Universities and will be going to study in the fields of Agriculture, Water Resource Management, Urban Planning, Governance and Journalism. They will continue their studies at various universities: University of Twente, Wageningen University and Research Centre, Erasmus University Rotterdam (IHS), IHE Delft, TU Delft, Utrecht, PTC+, Institute of Social Studies & Radio Netherlands (RNTC) and other Dutch universities and institutions. ■

THE NEXT ALUMNI EVENT is visit to a Needy Children's Home in Nairobi on 20th October 2014 together with a team from the Dutch Embassy.

Check the website http://naakenya.wordpress.com/ or www.itc.nl/alumni for more details

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