Report

LEARNING EVENT: DRR & Remote Sensing Technology

8th September 201, 09h00-16h30, Swiss Red Cross, Bern

Frame: Technology is advancing rapidly; some of today's accomplishments were not considered possible only a few months ago. Methodologies and tools for linking technology and disaster risk reduction programming are increasingly sought after. Using in-situ data collection and Geographic Information Systems (GIS) tools for risk visualisation is fairly widespread. Many agencies have used remote sensing (RS) technologies such as Unmanned Aerial Vehicles (UAV) and satellite imagery for purposes such as agriculture, surveying and humanitarian aid. However, a better understanding of these applications is needed to optimize the use of new technologies, and ensure they result in actionable information for field-based users at the operational level.

Objective: The purpose of this learning event is to explore connections between remote sensing and the data collection, analysis and decision making process within the DRR cycle. The 'DRR & Remote Sensing Technology' Learning Event will introduce remote sensing applications from theoretical and practical perspectives as well as provide a forum of exchange between the DRR community of practice and technology experts with the aim of clarifying areas where such technology could enhance risk management in the field.

Summary of Learning Event Results: Following is a summary of the key points and main messages from the presentations. Please check the corresponding ppt presentations for more explanation.

I. Technical Brief: Opportunities & challenges using new technologies in DRR (Pierrick Poulenas, Picterra)

The purpose of this briefing was to "unpack" *remote sensing data*: concepts, access and application as a support to DRR managers in taking timely and well-informed decisions along the prevention, mitigation, preparedness, response and rehabilitation cycle.

- RS, machine learning and computer vision: Basic principles
- RS and analytics for Prevention, Preparedness and Awareness
- RS and analytics for response and recovery

Machine learning algorithms can support DRR through object detection, identification and prediction of short and long-term trends. For example, remote sensing data can be used to detect changes in the terrain caused by gradual or abrupt events (e.g. soil creep, land subsidence, landslides). Post processing of images can map the extent and degree/speed of change and be applied to model the probability of further change.

Within a DRR project, it is important to articulate the specific need and the relationship between the accuracy and cost of the technology. Prices will vary considerably as a function of resolution. Suppliers apply different minimum spatial order size. Immediately after a disaster, satellite imagery can provide the location of the strongest damaged areas, allow estimates of the affected population and show the current state of the infrastructure, such as road conditions and accessibility. Pre and post event imagery and derived information can also be used to plan prevention and preparation measures.

Relevant Questions to ask beforehand:

What posting (spatial resolution) do I need? or

Do I need the surface (incl. vegetation and artificial structures) or the terrain? or

Where is my area of interest?

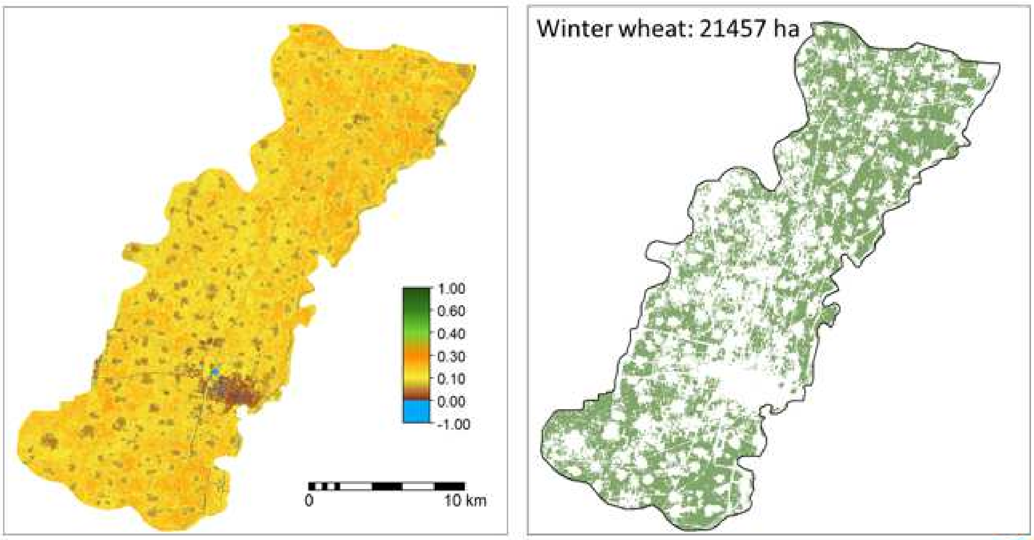
How up-to-date does the data need to be?

What accuracy do I need or what inaccuracy is acceptable?

II. Case Study #1: DROUGHT - Remote Sensing for Groundwater Over-Pumping Control in China Climate Change adaptation for drought risk reduction (Haijing Wang, PhD hydrosolutions LTD)

Innovative technologies including remote sensing, real-time data transfer, real-time modeling can be used to improve water resources management toward sustainable use of groundwater especially in regions facing a changing climate. Satellite remote sensing can contribute to the real-time crop water consumption monitoring and play a role in real time control. In regions of water stress in China, remote sensing contributed to a management strategy for over-pumped aquifers. *hydrosolutions* designed a real-time monitoring, modeling and control system, including groundwater levels and pumping (via electrical transformers). Remote sensing helped to:

- Map crop water consumption through satellite Evapotranspiration mapping.
- Model water balance with evapotranspiration extracted from satellite images
- Monitor and control crop area (ex. winter wheat) through the Normalized Difference Vegetation Index



Landsat 8 NDVI in winter months | Derived winter wheat planting area

The project also developed a groundwater pumping control strategy through real-time monitoring of surface flow in canals via a mobile data collection device. Limitations of remote sensing include:

- Cloud cover and bad weather conditions

- High resolution satellites have long return periods (Landsat: 30m resolution, 16 days return)
- Skills and experience needed for selecting dry and wet pixels for evapotranspiration modelling, making it difficult to implement with local partners having no remote sensing background

III. Case Study #2: UAVs in support of Urban Planning (David Rovira, senseFly/Drone Adventures)

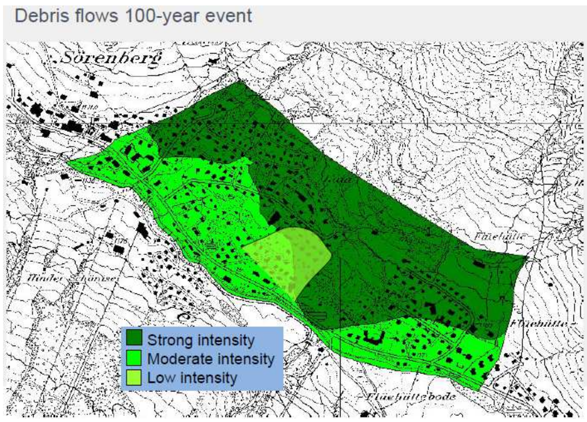
Unfortunately, David Rovira was unable to attend and present the detailed case study in Dar es Salaam, Tanzania on the application of aerial images (UAV) to generate accurate 3D elevation models for run flood simulations in urban areas. This presentation is slated for the Face to Face Event in December on Urban DRR. In David's place, Ana Jesenicnik and Andrea Blindenbacher gave an overview of UAV mapping in Tanzania and Zanzibar and demonstrated a quad-copter flight over lunch.

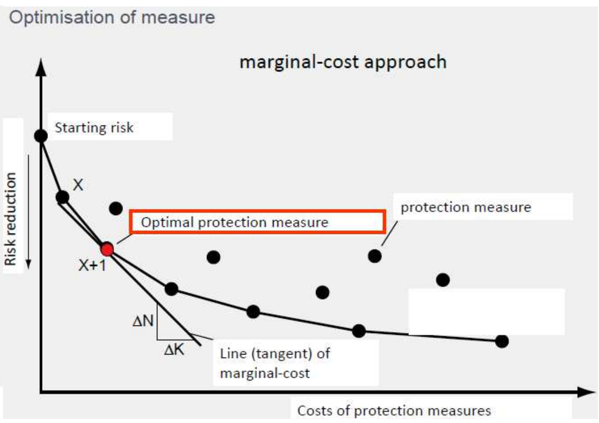
IV. Case Study #3: Application of UAVs in landslide risk reduction (Dr. Bernhard Krummenacher, Geotest AG; Joel Kaiser, Medair)

Perspective from an Expert Consulting Firm (Geotest):
Landslide modelling aims to quickly identify dangerous intersections of hazard processes and land use. Modelling hazard exposure and consequences requires a minimal input dataset and an event register to calibrate the modelling results. The quality of the input defines the quality of the output. The process is a step by step process from general assessment of hazards in large area (hazard indication maps) to more detailed studies (such as slope indication model) of focus areas.

According to GEOTEST, depending on the type of drone, UAV technology can be a rapidly deployable and efficient tool for hazard assessments, calculation of digital elevation models, and documentation of changes in landscape and construction processes. The outputs are images of 12-25MP and HD video that support georeferenced elevation models, 3D models, terrain profiles and volumes.

To decide on protection measures in areas of landslide risk, RS technology helps to model intensity map of debris flow and supports cost-effectiveness calculations for identified "hotspots".

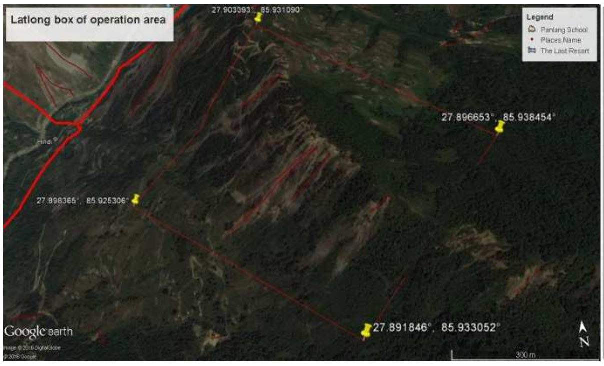


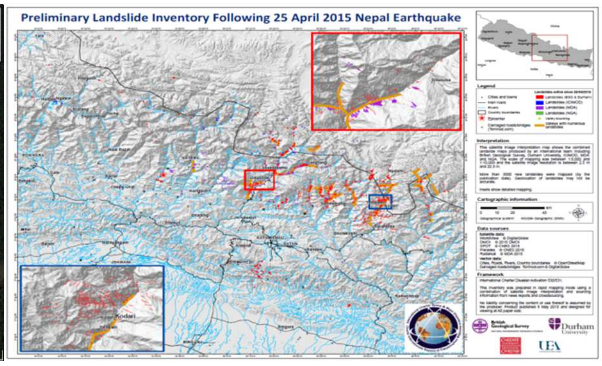


Perspective from an NGO Practitioner (Medair):
Landslides occur on a wide variety of spatial and temporal scales in the mountainous areas of Nepal. The accurate detection and quick identification of small landslides are crucial for adopting appropriate mitigation measures and efficient decision-making strategies that support disaster recovery programming.

As part of a reconstruction programme following the 2015 Nepal earthquake, Medair aims to deploy UAVs to map mountain slopes in order to understand the risk of landslides on nearby communities. Unfortunately, Medair was not able to get government clearance in time to fly the drone to capture images for processing and analysis prior to the learning event. Medair plans team-up with several partners in this project and will continue to share its learning with the Platform.

Remote sensing and GIS are the commonly used tools for risk mapping. UAVs have proven to be the low cost solution for obtaining aerial imagery, particularly if the area is small. A huge potential exists for NGOs and private sector remote sensing experts to partner on the use of drone technology in support of risk mapping as well as derive case studies to share among the humanitarian community.





V. Group Work

Since June 2016, Medair, Terre des hommes, Geotest and Picterra have collaborated on a draft "feasibility checklist" intended for review and group work during the Learning Event:

This Checklist is intended to help articulate the relevance and feasibility of applying Remote Sensing (RS) technology, mathematical modelling, etc. to plan and implement DRR interventions. Its main purpose is to serve as an aide-memoire in determining the practicability of RS technology for various DRR applications and analyzing the potential cost benefit for development and humanitarian agencies.

Specific to DRR, the aim of this Checklist is to foster a common understanding of the acceptable level of risk for a project/community and whether such technology can assist DRR programme design features for prevention and/or mitigation activities.

This draft checklist is not exhaustive. Prior knowledge of as much information as possible may serve to facilitate initial discussions between humanitarian/development *practitioners and companies and/or consultants specializing in RS and associated technologies.*

The aim of the group work was for participants to analyse the tool based on their experience, considering scenarios where RS technology could be applied to their working contexts. Three groups were formed based on hazard (landslide, flood and drought) to review the draft version. The purpose was to debate the tool's relevance and utility—including content and arrangement—from the perspectives of development/humanitarian practitioners and technical firms. The time in groups was allocated to analyse and make recommendations and/or specific edits to the checklist; and also provided an opportunity to pursue hazard-specific Q&A with experts.

Key Messages and Recommendations from the Group Work:

The group agreed that the Checklist is useful as a guide for Agencies (donor, NGO, UN, etc.) on how to approach Experts (firms, consultants) to ascertain the relevance of Remote Sensing technologies in specific scenarios/contexts. Recommendations as follows:

Make the Checklist into a two-step Feasibility Review process: 1. General Context Description and 2. Technical Design.

Step 1 is a concise summary of basic information on to be prepared by the Agency before approaching the Expert. It includes the location, socio-economic /demographic profile of the target population, problem statement, known sources of information on the problem, the purpose of the programme intervention (for which RS is being considered), and available budget (if known).

Per the General Description, the Expert would assist the Agency in determining the relevance and feasibility of RS. In the likely event that more detailed information is needed, the agency and the expert/firm could guide the Agency (or collaborate directly) to obtain required information in Step 2.

Step 2 focuses on specific technical information relevant to the context:

- Known sources of relevant technical information (in-country or global)
- In-country expertise (private, research and governmental),
- Referent authorities/governing bodies (per the intervention concept)
- Historical data relevant to the hazard: precipitation, surface flows, land use changes, land planning, groundwater levels, etc.

NB: If known, the agency could already prepare technical information in Step 2 and present in Step 1.

The Expert could then propose a range of solutions appropriate for the programme with consideration for cost-benefit.

Recommendations for Follow up to the learning event:

The Event raised awareness on challenges that humanitarian and development practitioners face to collect data in the field, and about the importance of analyzing cost benefit among the range of RS applications.

Based on the feedback from the group discussions during the plenary session, participants expressed willingness to review and comment on an updated version of the tool. Terre des hommes and Medair will follow-up with participants to revise the RS Feasibility Review process and share more widely on the Platform and in the community of practice.

While participants gave positive feedback of the Learning Event in written evaluations, one recommendation specified the need for more concrete examples of civil society interventions that successfully applied RS technology for DRR in low/middle income countries. This could be the focus of a "version 2.0" of the event as part of the DRR Platform's next two-year cycle.

VI. Reference List

Picterra Pierrick Poulenas, Managing Director, pierrick.poulenas@picterra.ch www.picterra.ch
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Annexes:

Programme Outline:

Time	Content	Methodology	Responsible
9h	30 min	Meet & Greet, Coffee	Swiss Red Cross
9h30	45 min	NGO DRR Platform Intro Tuning-in: Introducing Speakers and Background of the learning event Participant introductions and experience using technologies in DRR	John Brogan, Terre des hommes
10h15	45 min	Technical Brief: Concepts, access and applications for DRR; Introducing a *Feasibility Checklist* for DRR & Remote Sensing	Pierrick Poulenas, Picterra Joel Kaiser, Medair
11h	15min	Coffee break	
11h15	45 min	Case Study 1: Remote sensing in **drought** risk reduction (including 15 minutes for Q&A)	Dr. Haijing Wang, Hydrosolutions Ltd AG
12h	45 min	Case Study 2: UAVs in support of urban planning—focus on **flood** risk (including 15 minutes for Q&A)	Ana Jesenicnik & Andrea Blindenbacher, senseFly/ Drone Adventures
12h45	60 min	Lunch with interactive UAV demonstration with different models of UAV and imaging capacities	
13h45	60 min	Case Study 3: Application of UAVs/ technologies in **landslide** risk reduction (including 15 min for Q&A)	Dr. Bernhard Krummenacher, Geotest AG and Medair
14h30	60 min	Group Exercise: Reviewing the draft *Feasibility Checklist* in specific hazard groups: drought, flood, and/or landslide	Geotest AG, Picterra, Participants
15h30	30 min	Feedback from the individual groups on the Checklist and group discussions	
16h	30 min	Open discussion on *Feasibility Checklist* next steps & Wrap-up /evaluation	Terre des hommes & Medair

Participants List:

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Terre des hommes

SWISS NGO DRR PLATFORM

MEDAIR

LEARNING EVENT: Technology & DRR

8th September 2016, 9h00 – 16h30
Location: Swiss Red Cross, Werkstrasse 18, Bern

Participant List			Signature
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JOHN	BROGAN	Terre des hommes	

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