Low-cost mapping tools for managing water hazards at the community level: the case of developing countries

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Content

The Matagalpa project experience

The Chad project experience
The Matagalpa project

A short movie will tell better this long (still on-going) story

A practical approach to convert a disaster into a progress opportunity

A highly decentralized cooperation project between 2 cities

An UN inter-agency effort (ISDR, UNITAR, UNOPS, UNDP and more will join

Strong support from space agencies

Integrated learning, operational and training concept
The Chad project objectives

UNHCR is in charge of more than 200,000 refugees, who are located along Chad/Sudan border, and refugees continue to arrive every day in Chad.

UNOSAT has been requested to prepare maps based on satellite image analysis to assist UNHCR office in exploring potential for water in the refugee hosting areas in Eastern Chad.

Over an area of 650 x 150 km, a hydro-geological study-based satellite imagery interpretation is carried out in order to:

- Improve water potential of existing camps
- Identify new potential sites
Role of UNOSAT

1. Managing the project
2. In-depth discussions with UNHCR about the needs
3. Identification of potential specialized partners
4. Selection of expert specialist and contracting
5. Selection and ordering of satellite imagery, digital elevation model and complementing geo-data
6. Accountable for the quality of deliverables
7. Database cleaning, and GIS processes
8. Map’s layout finalization
9. Longer term commitment with UNHCR, including follow up work (capacity building at the local level, transition and cooperation with development agencies)
Phase 1 - 2004

- 11 March → first meeting UNHCR-UNOSAT
- 12 March → Written proposal ready
- 20 April → Reception of Landsat imagery
- 16 June → Reception of JERS imagery
- 21 June → Reception of ERS imagery
- 25 June → Reception of 250k topo maps of the area of interest
- 2 July → Meeting in Geneva UNHCR-UNOSAT – Implementing partner: presentation of results
- 8 to 27 July → Ground truth and training fieldwork
- 28 July → final presentation and recommendations at UNHCR office
Data and methods used

- 2 Landsat 7 images → October 2000
- 9 JERS SAR images → 6 images November 1996
  → 3 images August 1996
- 4 ERS SAR images → November 1998
- SRTM Elevation data → 2002
- 1:50,000 scale topographic maps from Bern University
- Water exploration process developed by implementing partner
How can radar detect underground water?

Buried moisture can be detected:
- up to 20 m with L band
- 50 cm with C band
Buried water is not visible in optical imagery
It can be detected underground by radar satellite.
Buried water storage detected in alluvial deposits up to 20 m
Water input is more than $10^3$ M$^3$/year: much of it is lost or hidden.
Operational map targets buried water in alluvial deposits
Site case: Iridimi Refugee Camp
The Iridimi wadi is controlled by dykes and faults
Mapping the best water potential spot in the wadi
Only the productive NCA boreholes are located in the red zone
Target proposed: 2 wells and 2 boreholes (yellow dots)
Conclusion
There is no shortage of water just a lack of watershed management

Key recommendations

For crisis management, drilling target are:
- Within alluvial sediments along wadis.
- Under fractured basalt layers for tapping in hidden water reservoirs

Long term sustainable development:
Build dams in selected locations to reinforce water reserves and increase the faults storage potential for the associated wells.
Phase 2 - 2005

Extension of the coverage
Updating and upgrading of the hydro geological map
Phase 3 – 2006 onwards: an open partnership

1/ Creation and consolidation of remote sensing and GIS within the regional and local offices of the National Water Authority

2/ Helping water management to be at the core of the regional, municipal and committee political and technical agenda
Final comments on new technologies

Key points are

• Low cost, but reliable and easy access
• Take internet connection bandwidth into account
• Recent years have seen a significant increase in available tools, data and user-friendliness
2 examples

• GPS linked to digital camera tool

• Flatness index modeling tool for geological-based ground water potential
Low cost software synchronizes GPS data with digital photos to ensure each GPS point is recorded with photo.

Can transfer lat/long coordinates, direction etc. onto photo.
Flatness index modeling based on free SRTM data and free algorithm.

Red indicates high level of erosion and low ground water potential. Blue indicates flatter geological structures with higher potential for exploitable ground water reserves.
Many thanks for your attention

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