



Institute for Crisis, Disaster
and Risk Management



THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON DC

Coordination of Humanitarian Assistance: Implications of GIS-based Analysis & Data Modeling for the UNSDI

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UNGIWG Seventh Meeting, Santiago, Chile

November 2-4, 2006



EU-STREAM





About the ICDRM

- Established in 1994 as an interdisciplinary academic center
- Based within the School of Engineering & Applied Science and linked to GWU's School of International Affairs, School of Public Health, and Department of Geography
- Premier provider of systems-based emergency management training and research (IFRC Model, MaHIMs, MSCC, VMS, etc.)
- ≈ 25 doctoral students & 150 masters and graduate certificate students
- ≈ \$1-2 Million projects/year
- www.gwu.edu/~icdrm



Outline

1. Utility of GIS to support inter-cluster coordination: *should UNGIWG go beyond cartography?*
2. Humanitarian Data Model: *what is the rationale for the UNGIWG to consider object-oriented data models?*
3. Conclusions: *what are the benefits of (1) & (2) to UNSDI?*



Utility of GIS-based Analysis

- Systems-based assessment of how beneficial GIS-based analysis is for coordinating humanitarian operations during UN-led interventions
- Humanitarian applications of GIS have, so far, been primarily cartographic, i.e. map making
- The coordination of humanitarian “clusters” requires information exchange and analysis to create situational awareness
- This research investigates what types of GIS analysis are helpful to decision makers in UN and non-UN agencies during the relief and early recovery phases of an emergency



Literature Review

- GIS-based analysis falls into five categories
- Scholarly research in GIS applications for humanitarian assistance has been sporadic and unsystematic
- Aside from Public Health, there is no rich doctrine of peer-reviewed research or information sharing in humanitarian assistance
- Humanitarian community is weary of techno-centric solutions or any centralized approach which threatens its independence or autonomy
- A new school of thought in coordination is emerging, which abandons ICS idealism in favor of trust-based pragmatism



Research Question

Can GIS-based analysis have a *decisive impact* on the inter-cluster coordination of humanitarian assistance?

Method: Sequential Exploratory Mixed Method, involving:

- Design of several case studies illustrating GIS analysis
- Qualitative survey using focus groups/expert interviews
- Quantitative survey of UN agencies, donors, IOs & NGOs



Humanitarian Clusters

Cluster Coordination (OCHA)

Camp Management (UNHCR)

Early Recovery & Reconstruction
(UNDP)

Education (UNICEF)

Emergency Shelter (IOM)

Health (WHO)

IT & Communication (WFP)

Livelihoods (FAO)

Logistics (WFP)

Nutrition (WFP)

Protection (UNICEF)

Water & Sanitation (UNICEF)

GIS Phenomena

Queries & Measurements

Transformations

Optimization

Statistical Analysis

Geovisualization

Remote Sensing & GPS

Data Availability & Collection

Information Sharing

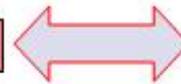
Data Models

Geospatial & Humanitarian Standards

Web-based GIS

Education, Research & Training

Map Templates & Symbology



UNSDI

Boundary Condition A: Limited to UN-led Interventions using the Clusters Approach

Boundary Condition B: Excludes Cartographic (i.e. map making) Applications of GIS

Theoretical Context Diagram



Significance

- Original method to assess utility of GIS-based analysis
- First-ever compilation of methods, experience and state-of-the-art in GIS-based humanitarian coordination
- Identification of theoretical vs. practical application of GIS...answers the question, “Yes, that’s fine in theory but is it really useful and pragmatic in the field?”
- Intended to create a “user-centric” approach within humanitarian GIS – if it doesn’t make a decisive difference, why bother?!
- UNGIWG and non-UN agencies are invited to participate, and to emulate similar studies if appropriate



Some examples

- Promoting UN emergency handbook guidelines and SPHERE standards:
 - Centroid analysis: e.g. SPHERE advocates Supplementary Feeding Centers < 1 day return walk for >90% of the target population
 - Buffer analysis: e.g. UNHCR advocates maximum distance of 50 m between shelters and latrines
- Inter-Cluster Coordination
 - Geovisualization: e.g. Rapid Assessment (estimated needs) versus Who-What-Where (actual relief delivered)
 - Incident reporting: e.g. frequency and trends in occurrence of various phenomena, such as UXO incidents or restoration of basic services



Key Milestones

Winter 2005

Literature Review

Spring 2006

Design of Research Method

Summer 2006

Proposal Defense

Winter 2006

Case study completion

Spring 2007

Survey administration

Summer 2007

Analysis & assessment of utility

Autumn 2007

Preparation & publication of results

tyre, lebanon



Lebanon Analysis Tools

Watsan/Hygiene Kits	
Aalma ech Chaab	
Needed:	1500 units
Delivered:	450 units
<i>30% provisioned</i>	



6.09 mi

©2006 Europa Technologies
Image © 2006 TerraMetrics

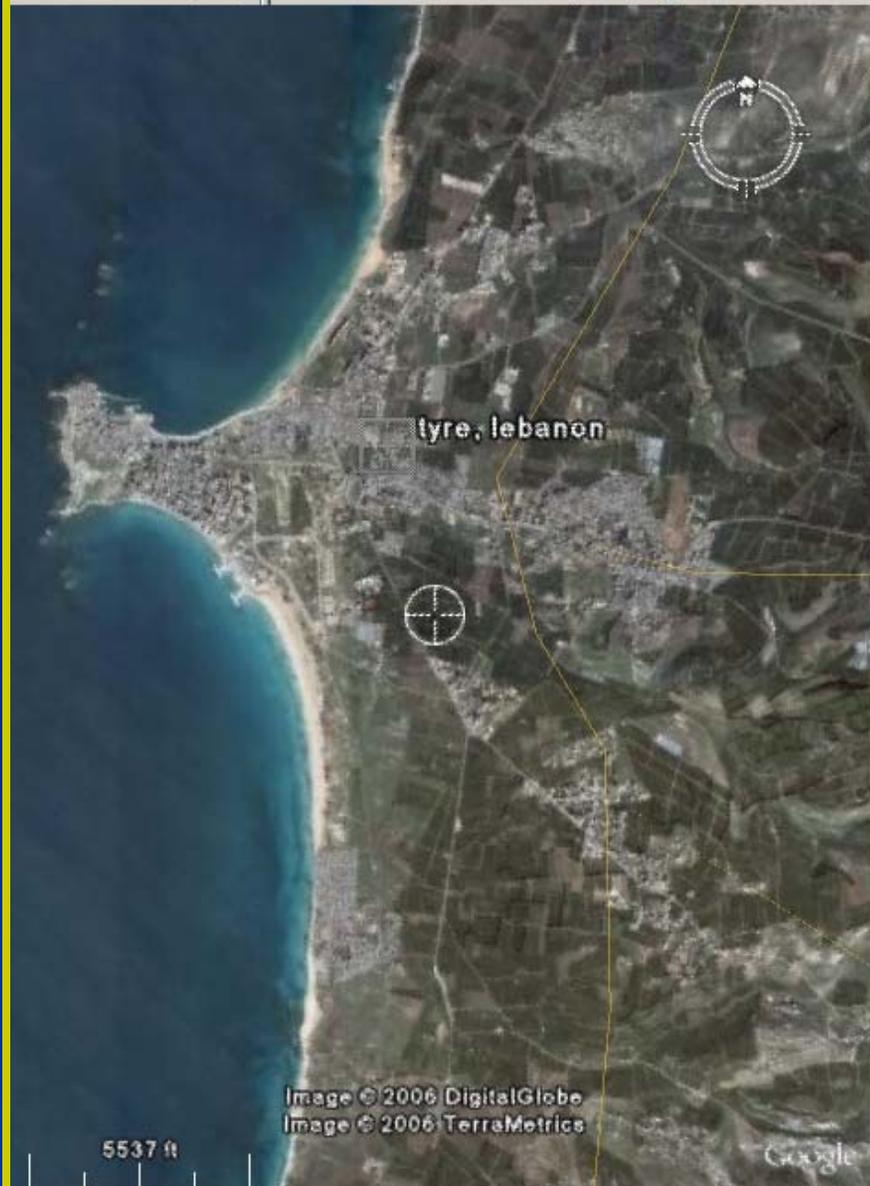
©2006 Google

Center 33°11'45.37" N 34°56'19.27" E elev 0 ft

Streaming 100%

Eye alt 17.35 ft

tyre, lebanon



URL: http://www.thetimoneygroup.biz/brightearth/form_entry.php?lat=38.9594&long=-95.2654

HUMAN RIGHTS INCIDENT REPORT

Latitude: Upload Date:

Longitude: Incident Date:

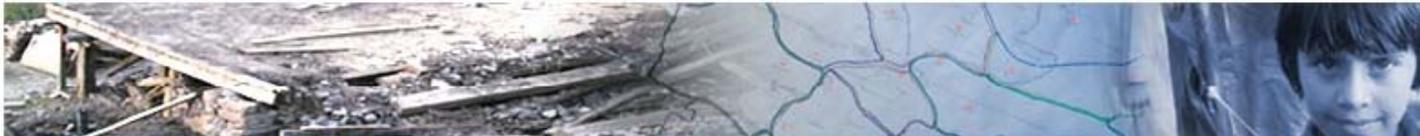
Location Description:

Source: Category:

Heading:

Full Description:

RISEPAK Research and Information System for Earthquakes - Pakistan



Home Village Information Notice Board Publications Picture Gallery Useful Links About

News and Publications

- ❖ **ARTICLE:** Scanned copy of Dr. Sarah Zaidi's Guest Column on organisation and role of ERRA, published in the Herald, October 2006, available [here](#).
- ❖ **REPORT:** [District Level Data Procedures for Oct 8 Earthquake. A Case Study of District Mansehra](#) by Batool Zaidi, Syed Ali Asjad Naqvi and Ahsan Kamal
- ❖ **REPORT:** [RISEPAK-LUMS January Household Survey in the Earthquake Affected Areas of Mansehra and Muzaffarabad](#) by Dr. Sarah Zaidi
- ❖ **ARTICLE:** Improved and printable version of the article [Accountability and Transparency, Anyone?](#) by Dr. Sarah Zaidi, is now available.
- ❖ **REPORT:** [The Appraisal of the Government Compensation Scheme for Citizens of AJK Affected by the October 8 Earthquake.](#) by Moeen Cheema, May 2006, Lahore, Pakistan
- ❖ **UPDATE:** [Glossary](#) of Political and Administrative Structures in the Earthquake-Affected Areas

Messages Received: **2508** Villages Updated: **1220** [More News and Publications](#)

Three Most Recent Messages from the Notice Board

[View All](#)

Message	Village Info
Total Number of Schools Supported 185 Number of Private Schools 17 Number of students enrolled... full message	
CARAVAN is a regional NGO working in Norther Pakistan in the field of community development. The NGO had an immediate... full message	
Taraqee Foundation has been rendering support to earth quake victims in both several areas. Its main activities include... full message	

Find Information

Search the village, the population data, disaster-index data and relief data With in a Tehsil

Select a Tehsil

[View Summary](#)

[View Detailed](#)

[Advanced Search](#)

[Search Through Map](#)

Relief Organisation Search

[Search](#)

Submit Information

Let us know where you are going, what you are seeing, and what you are doing. Before you contact us, please do make sure to have the official village name.

- Complete and submit this [Web Form](#)
- Call at 0301-4573531 or +92-42-5895119
- Fax the form to 042-5894990 (PDF, MS WORD)
- Email us at info@risepak.com

[Join our Mailing List](#)

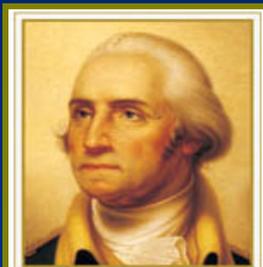


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Humanitarian Data Model (HDM)



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The Challenge

- Humanitarian GIS applications are primarily cartographic – very few NGO's or UN agencies really do “spatial analysis”
- International humanitarian assistance is decentralized, chaotic, under-resourced, and not technology-centric
- International vector data is weak and inaccessible
- Humanitarian Information Centers depend upon voluntary reporting in order to produce 3W and identify gaps
- Geospatial standards for humanitarian coordination are not stable, and GIS doctrine is still developing
- Therefore interoperability and data sharing are weak!



The Opportunity

- Provide UN agencies, Governments, NGOs and other humanitarian organizations with a schema which “really works”
- Exploit expertise in domestic emergency management doctrine *where applicable*
- Creation of a forum to advance geodatabase exploitation – UNGIWG & UNSDI is part of the solution
- Develop & embed humanitarian standards within GIS
- Improve quality of situational awareness throughout the disaster management cycle, by promoting *de facto* compliance with standards
- Facilitate broader use of GIS by humanitarian organizations



What's a GIS Data Model?

A framework (“schema”) built upon accepted standards that:

- Models the behavior of real-world objects in a geodatabase
- Reduces the barriers to data sharing and interoperability
- Dramatically improves the integrity of geospatial data
- Ultimately promotes effective GIS exploitation

Key Point: A data model is the foundation for managing data objects (points, lines & polygons), inter-relationships between those objects, and associated attributes within a geodatabase

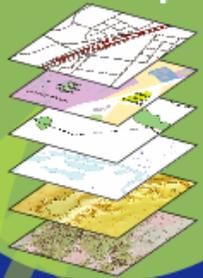
How? Object *encapsulation*, *polymorphism* and *inheritance*

Why HDM? It allows UNGIWG to pre-identify and rapidly build essential objects, attributes and topologies that are needed to support core geospatial analyses

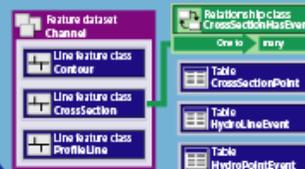


Data Modeling Cycle

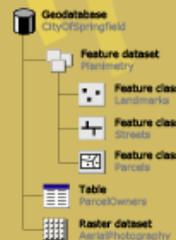
Conceptual model
understand information requirements
driven by domain expert



Logical model
use geodatabase elements
driven by GIS expert



Physical model
tune schema for deployment
driven by data administrator



**Pilot
Prototype
Production**

(Courtesy: ESRI)



Conceptualization of the Humanitarian Data Model (HDM)

- ✓ **Base Map** (e.g. hydrology, boundaries, raster, etc.)
- ✓ **Transport & Logistics** (e.g. roads, warehouses, fuel depots, etc.)
- ✓ **Infrastructure** (e.g. hospitals, schools, utilities, etc.)
- ✓ **Risk Management** (e.g. hazards, incidents, vulnerabilities, etc.)
- ✓ **Response Coordination** (e.g. assets, organizations, activities, etc.)

Key Point: Each data theme supports core geospatial requirements of UN OCHA, and dovetails with data models that could be developed by other UN agencies and NGO's.

But Wait: Why not just use the Clusters?!!



Conceptualization of the Humanitarian Data Model (HDM)

- Principle advocates are the Humanitarian Information Centers (HICs), UNJLC and other coordinating bodies
- Key applications support the HIC's inter-cluster coordination of humanitarian assistance:
 - ✓ Who-What-Where Maps
 - ✓ Gap Analysis (i.e. Needs Assessment)
 - ✓ Relief Distribution & Optimization
- Applies existing and proposed humanitarian and geospatial standards, including symbology
- Integral to UNSDI, and cluster-specific data modeling



HDM Status

- Project conceived in Q2 2005, and HDM Design Team formed in Q4 2005
- 43% of total project budget (\$441K) now committed by non-UN agencies (primarily GWU and ESRI)
- Remaining 57% being pursued through UN OCHA FIS
- New Design Team participants are welcome, as is funding!
- Peer Review process is anticipated to begin 6-9 months after the project is 100% funded, and once core GIS applications have been identified and promoted through UNSDI (Q4 2007)
- Visit the HDM website: www.humanitariangis.com



Timelines

Summer 2007

Complete Application Analysis

Winter 2007

Complete Preliminary Modeling Cycle

Spring 2008

Begin 1st Peer Review

Summer 2008

Release Beta Version & 2nd Peer Review

Winter 2008

Release Version 1.0 & Documentation

Thereafter

Support & update core model

Develop version for NGO community?



Conclusions & Relevance to UNSDI

- GIS-based analysis should create an even stronger justification for UNSDI...cartography is still crucial, but how can we get even better value from the effort?
- Data models may help by promoting UNSDI compliance, but this shouldn't imply inflexibility!
- Non-UN players want to participate:
 - ✓ NGOs are keen for guidance on how to collect, share and exploit geospatial data
 - ✓ Academia can assist with tasks that can be outsourced – the UNSDI franchising concept is very exciting to us!
 - ✓ Vendors have a commercial interest in supporting the UNSDI, and are remarkably keen to support humanitarian application