

Challenges in data management during disasters

Sisi Zlatanova

Associate Professor section GIST technology

Leader Theme Group “Geo-information for Crisis management”

OTB Research Institute for the built Environment

Delft University of Technology, The Netherlands

Chair ISPRS IV/8 “3D spatial data integration for Disaster Management and Environmental Monitoring”



International Society for Photogrammetry and Remote Sensing



- www.isprs.org
- The International Society for Photogrammetry and Remote Sensing (ISPRS) is a non-governmental organization devoted to the development of international cooperation for the advancement of photogrammetry and remote sensing and their applications.
- Photogrammetry and Remote Sensing is the art, science, and technology of obtaining reliable information from non-contact imaging and other sensor systems about the Earth and its environment, and other physical objects and processes through recording, measuring, analyzing and representation.
- Centenary celebrations, 4th of July, 2010 Vienna, Austria
- Member of the JB of GIS

Structure 2008-2012



- 8 commissions
- 55 working groups
- Every 2 years commission symposiums (2010)
- Every 4 years a congress (XXII, 25 August - 1 September 2012 Melbourne)

www.isprs.org

- Conferences, workshops, working meetings
- ISPRS proceedings (to be indexed)
- ISPRS book series (Taylor&Francis)
- ISPRS journal, open-access GIS journal



GENERAL ASSEMBLY

89 National Member Organizations
10 Associate Member Societies
13 Regional Member Associations

2008-2012

Decisions and Funding

81 Sustaining Members

COUNCIL

TURKEY, CHINA,
AUSTRALIA, UK,
ISRAEL, USA

FINANCIAL COMMISSION;
REGIONAL REPRESENTATIVES;
COMMUNICATIONS -
(Journal; Highlights; Home Page, Book Series)
AD HOC GROUP- STANDARDS ;
AD HOC COMMITTEE - KNOWLEDGE TRANSFER
COMMITTEES - (ISAC; IPAC; ICORSE; CIPA;
STUDENT CONSORTIUM)

Policy, Execution,
Management,
Coordination and Directives

Technical Commissions

I
CANADA

II
HONG KONG

III
FRANCE

IV
USA

V
UK

VI
NETHERLANDS

VII
AUSTRIA

VIII
JAPAN

1 2 3 4 5 6
ICWG I/IV

1 2 3 4 5 6 7
ICWG II/IV

1 2 3 4 5
ICWG III/VII

SCIENTIFIC RESEARCH
1 2 3 4 5 6 7 8 1 2 3 4 5 6
ICWG IV/II ICWG IV/VIII ICWG VI

1 2 3 4 5 6

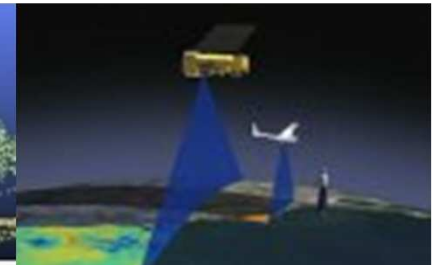
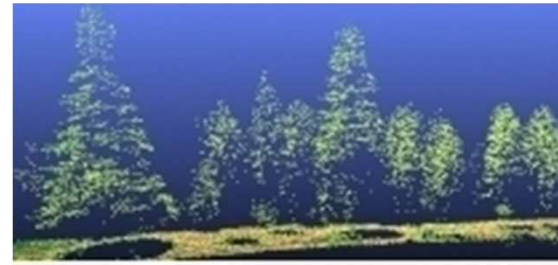
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1 2 3 4 5 6 7 8 9 10

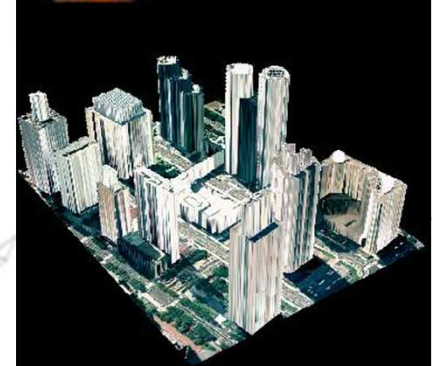
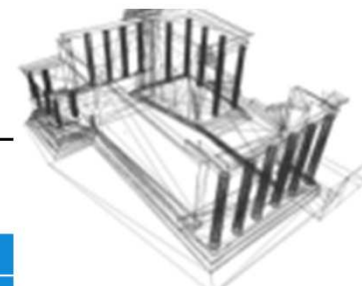
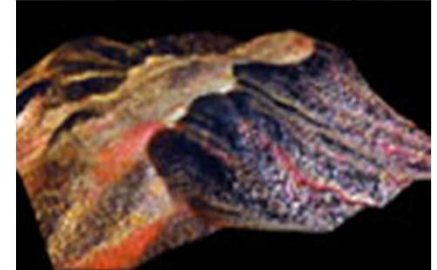
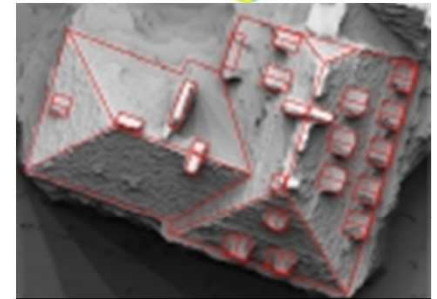
Working Groups


“ISPRS is a Society of National Societies and Organizations”

ISPRS and 3D geoinformation



- Com I: Image Data Acquisition - Sensors and Platforms
- Com II: Theory and Concepts of Spatial Information Science
- Com III: Photogrammetric Computer Vision and Image Analysis
- Com IV: GSeodatabases and Digital Mapping
- Com V: Close-Range Sensing: Analysis and Applications
- Com VI: Education and Outreach
- Com VII: Thematic Processing, Modeling and Analysis of Remotely Sensed Data
- Com VIII: Remote Sensing Applications and Policies





ISPRS WGIV/8 (2008-2012)

3D Spatial Data Integration for Disaster Management and Environmental Monitoring

- 3D models (geometry, topology, semantics, appearance) for sharing data from different domains (topography, geology, climate, ocean; BIM, AEC, GIS)
- 3D models for seamless (indoor/outdoor) navigation and evacuation
- 3D models for management of geo-sensor data and their integration with other 3D information
- Analysis DM&EM needs for 3D models (use and update of spatial information)

3D models in DM&EM



E-Semble, The Netherlands

National Geographic



Brisbane, 18 January, 2011

Industrial interfaces, Ireland



Gi4DM 2005 -2011 ...
ISPRS WGIV/8, ISPRS WG VIII/1
JB GIS, UNOOSA, ICA, OGC, EC



- Geo-information is important (no-doubts)
- All kinds of data have been used in last 5 years
- Spatial Data Infrastructure: legal/policy, standardization, technological issues
- Many systems are developed
- 3D/4D Data representations
- Volunteer Geographic Information systems
-

Developments are visible in the books



JB GIS and UNOOSA

Orhan Altan, Robert Backhaus, Piero Boccardo and Sisi Zlatanova



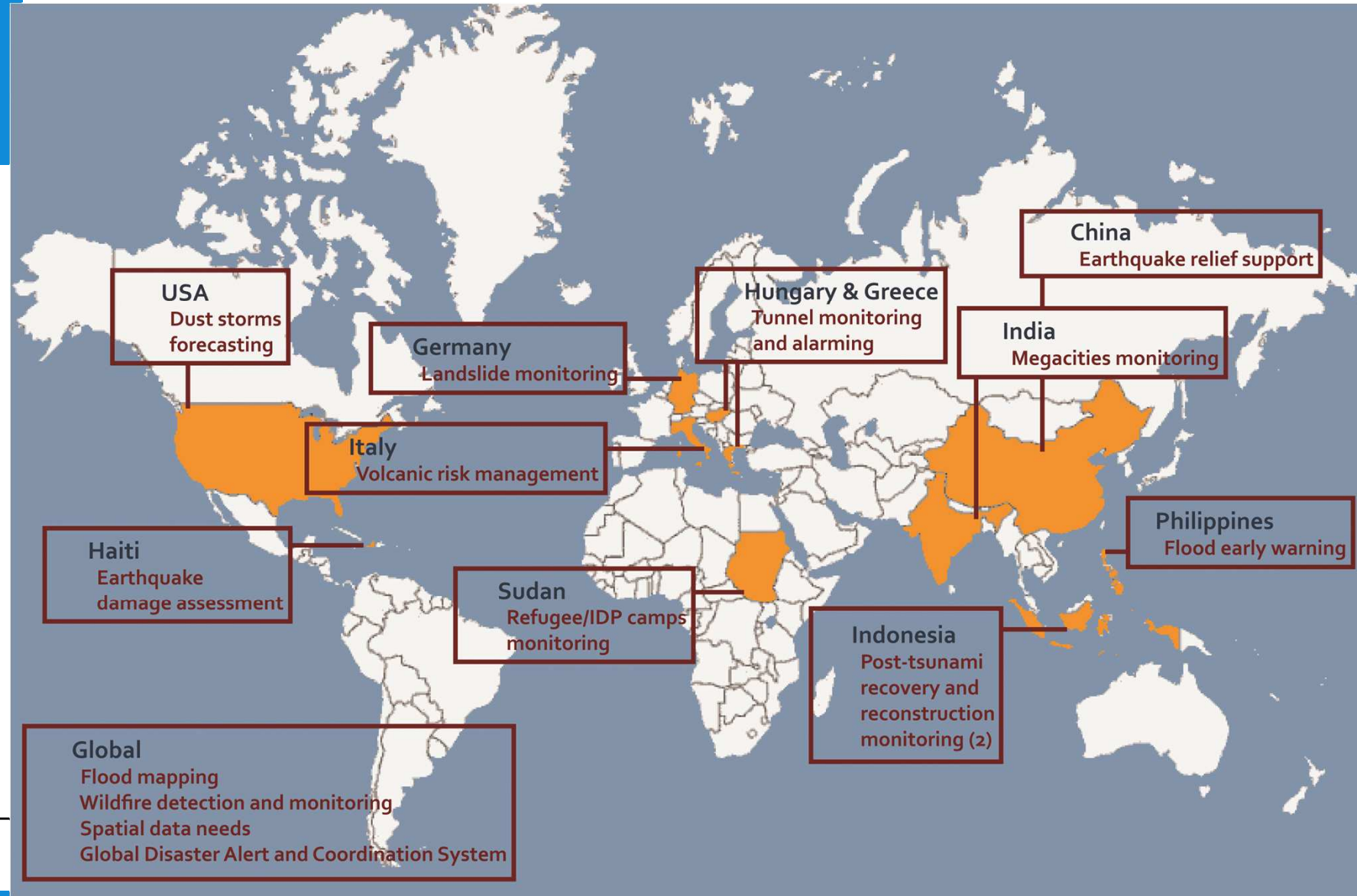
Joint Board of Geospatial Information Societies

United Nations Office for Outer Space Affairs

Geoinformation for Disaster and Risk Management *Examples and Best Practices*



Geographical Distribution of Papers



VALID

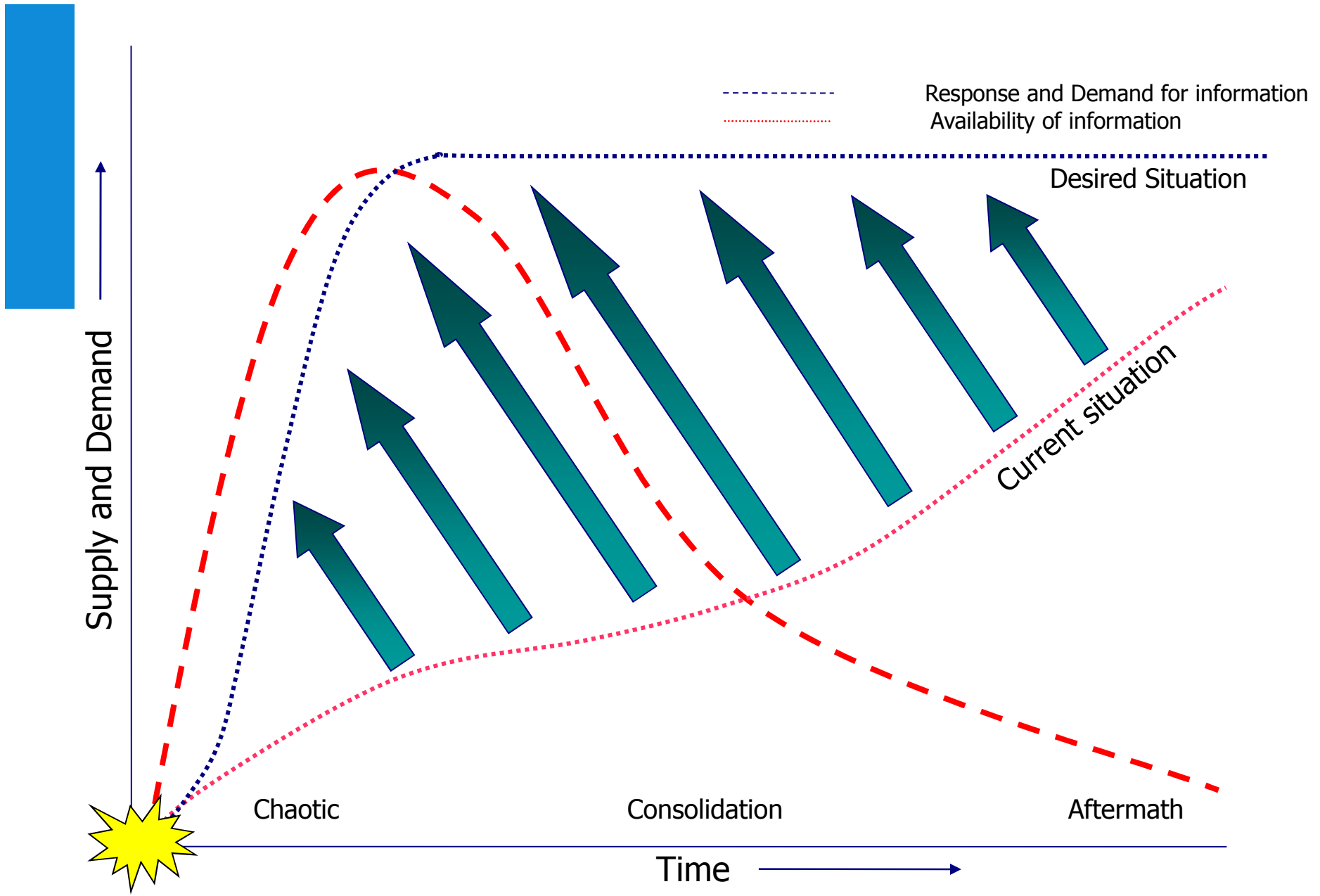
The Value of Geo-Information for Disaster and Risk Management
(VALID)
- Benefit Analysis and Stakeholder Assessment -

A publication to that end would further help:

- to raise awareness in the political and programmatic environment and
- to set priorities in research and development.

Geo-Information is mostly applied where it is cheap and less efficient!

<http://www.un-spider.org/VALID-stakeholder-assessment-I>

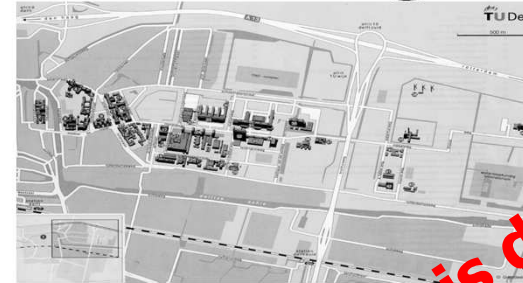


Information is not used efficiently!!

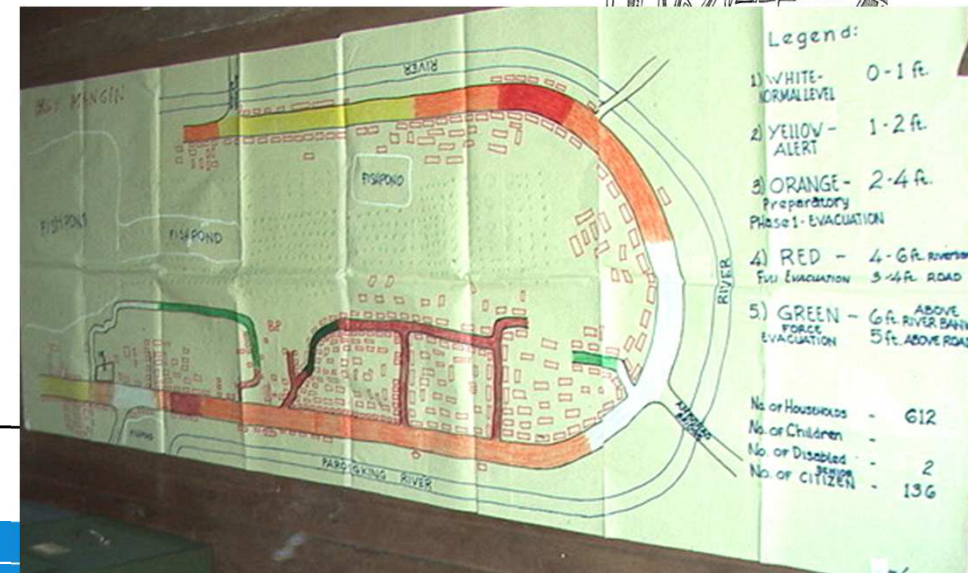
- Data integration is problematic
- Data filtering with respect to the context (task, procedure, occupancy..) is still wish

Data challenge: data heterogeneity

- Data exist in many applications
 - Dependent on the view of the user
 - Objects of interest
 - Scale
 - Resolution
 - Generalisation criteria
 - Theme
 - Time
 - Language
- Dynamic data
 - Raw data (measurements, images)
 - Processed data
 - Unstructured
 - Owner



A lot of work is done!



Chaos in the first hour after a disaster



Pieter Breugel de Oude, 1556, Museum Boijmans van Beuningen, Rotterdam

- Much information could be confusing!!!!
 - Subdivision of tasks
 - Experience to work together
- => context-aware systems!

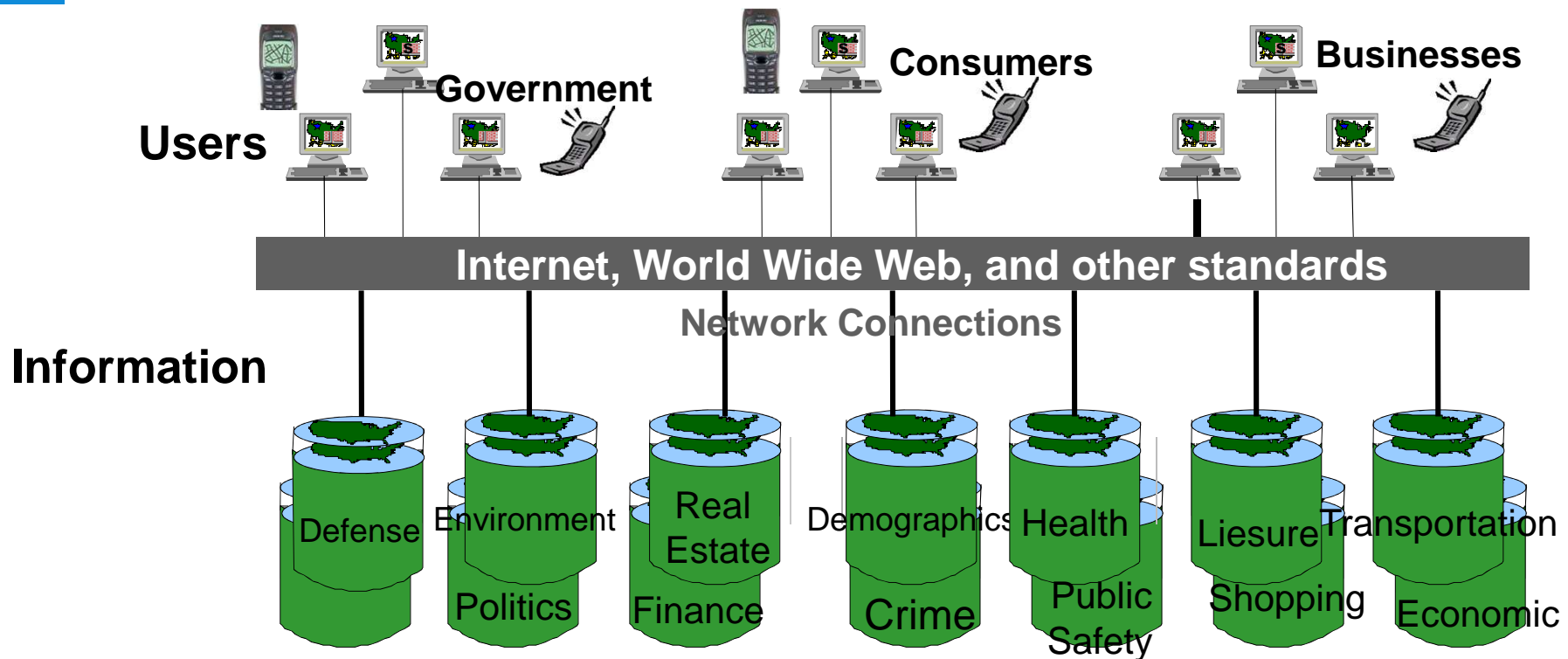
User-centered systems?

- Many different systems developed
 - Command and control
 - Early warning (for a specific disaster or groups of disasters)
 - Simulation and prediction
 - Task-oriented (e.g. Patient tracking)

.....none of them are user-oriented

OGC concept

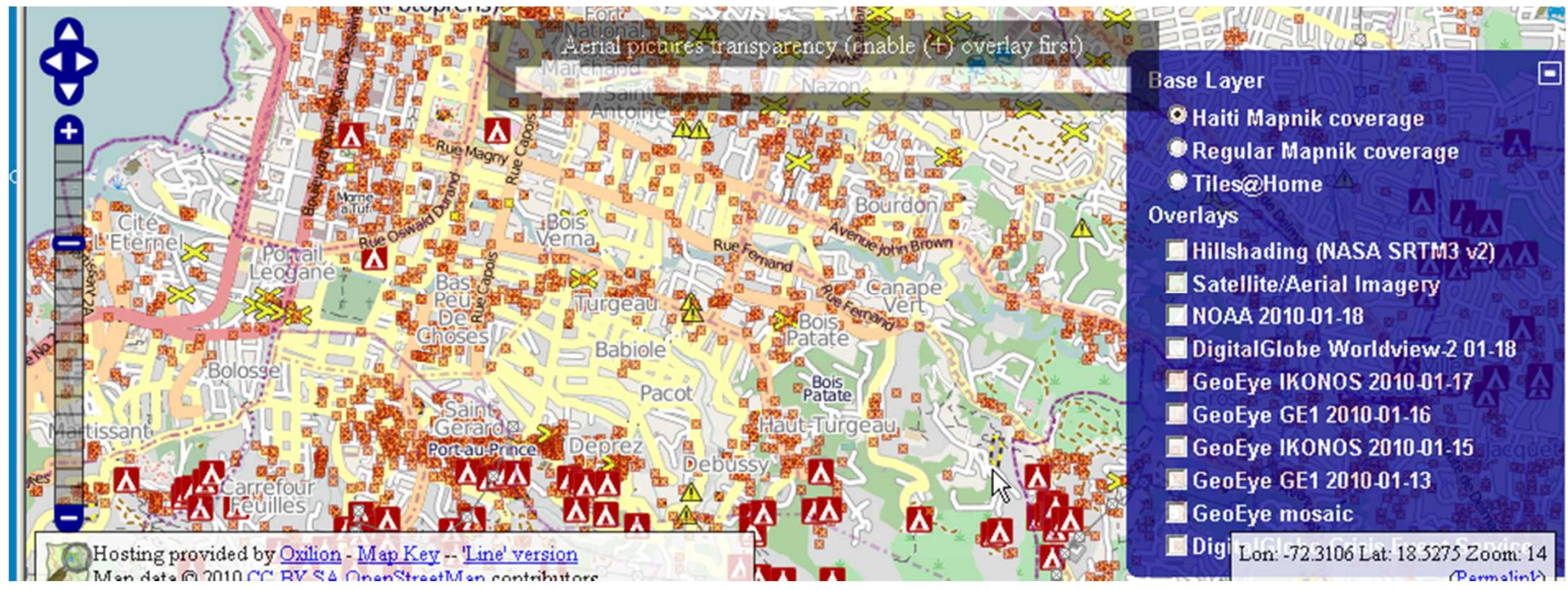
...infrastructures rely on a variety of technology
“standards” and network connections.



Reed 2002

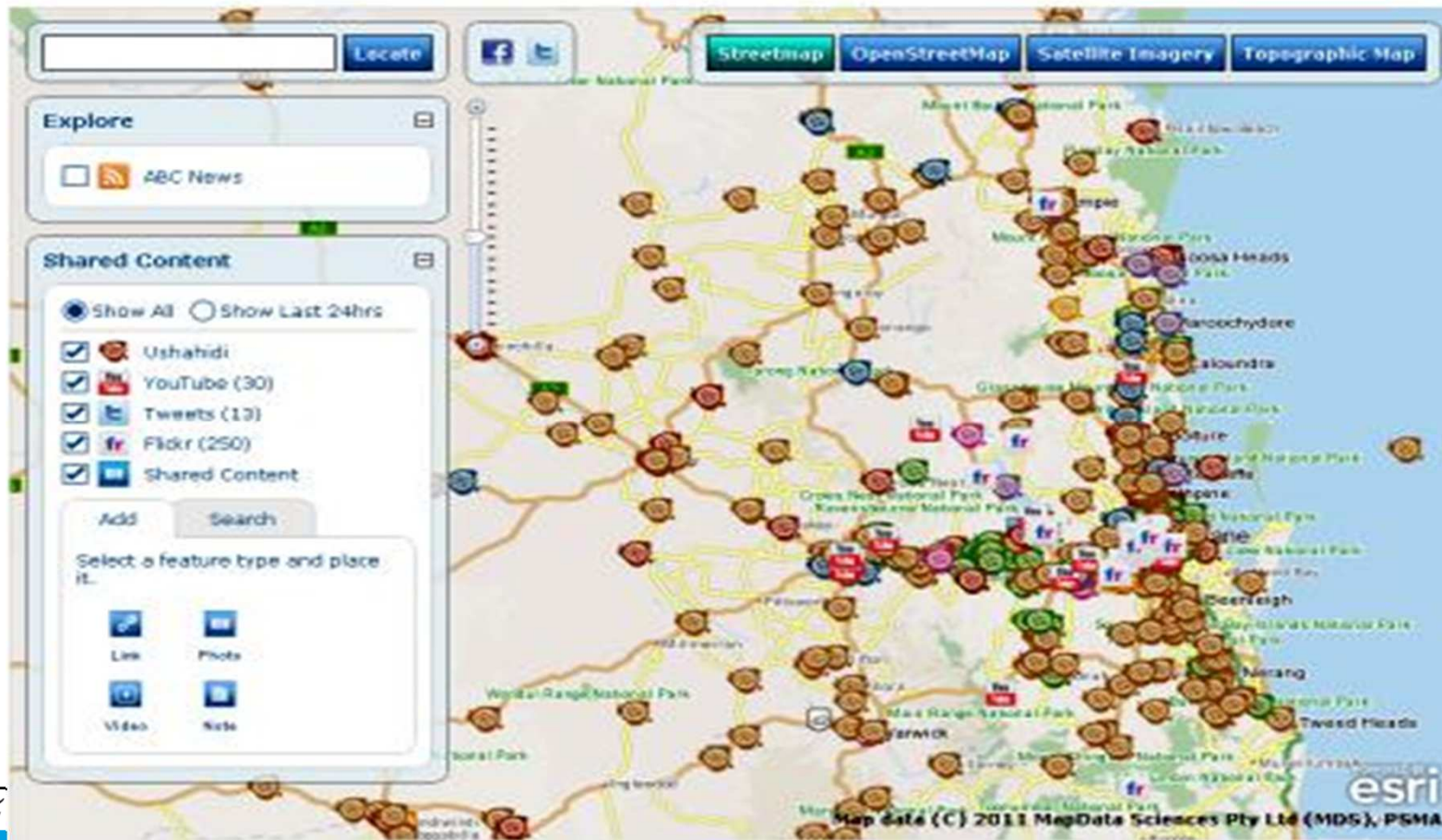
Community sites

Open Street Map <http://haiti.openstreetmap.com>

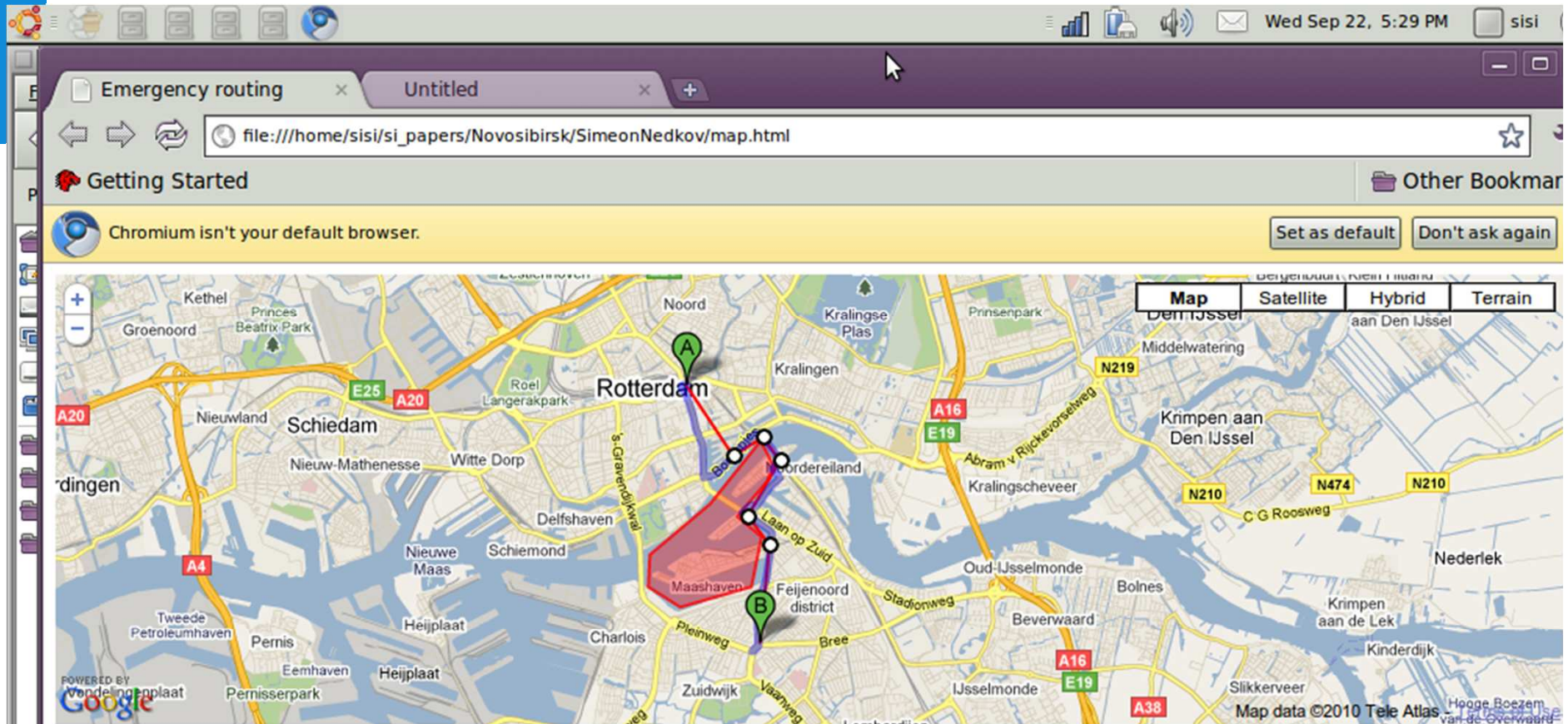


Community sites

Ushahidi & ESRI



Community sites



Step 1: Define an obstacle

Left click defines a vertex of the polygon.
Right click defines the last vertex and creates the polygon.

Step 2: Define a route

Left click defines start point.
Right click defines end point.

Step 3: Process

Cells defines the number of grid cells.
Threshold defines the Douglas-Peucker threshold.

Step 4: Tweak

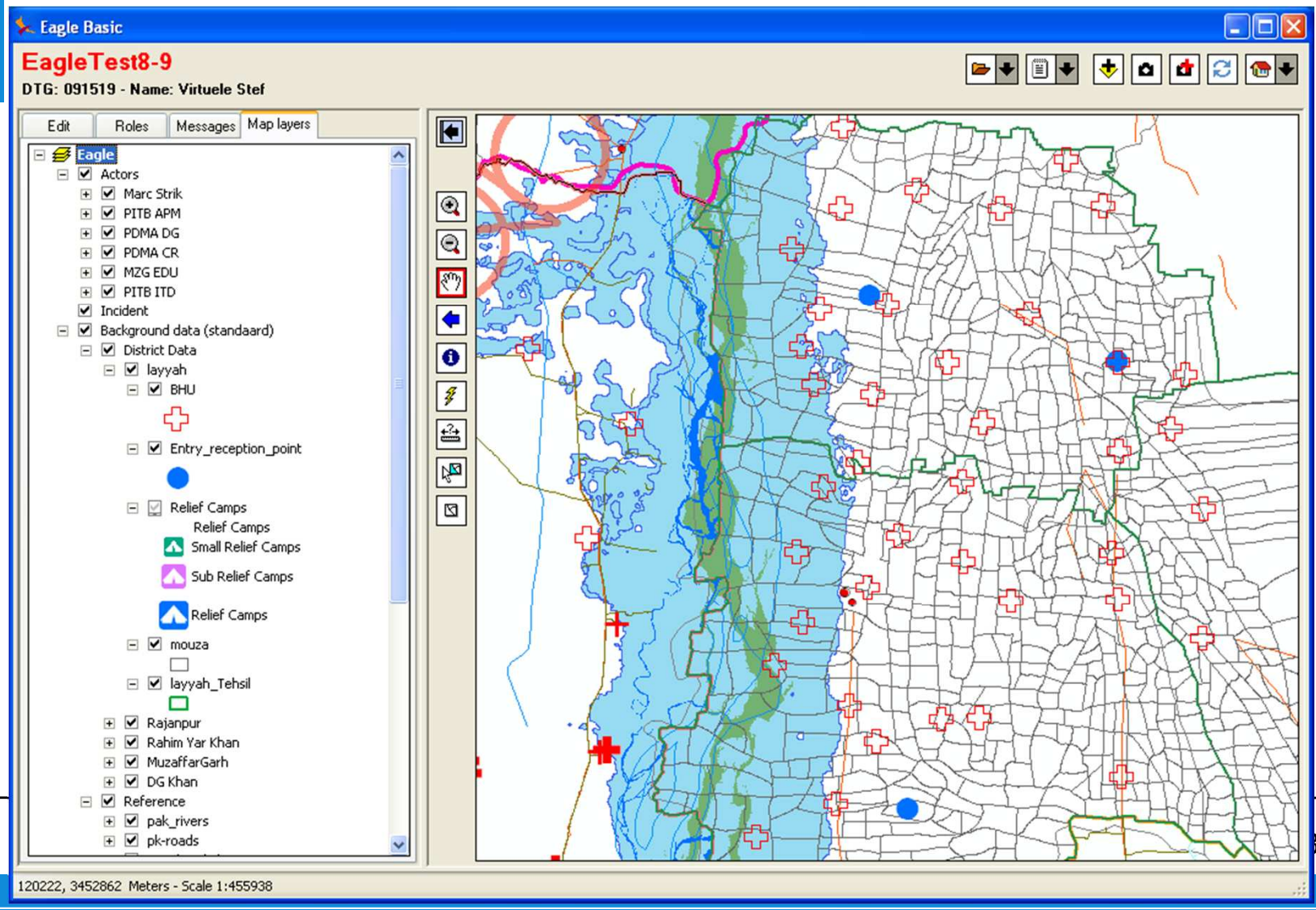
Hovering over the red polyline will provide you with handles to tweak the route.
You can drag these to a better

Netcentric: Eagle (Geodan, ESRI, Microsoft)

The screenshot displays the ArcMap interface with a map of Arnhem, Netherlands. The map is overlaid with several colored zones: a yellow zone in the north, an orange zone in the center, and a red zone in the south. The zones are labeled with alphanumeric codes such as 12E, 12D, 11D, 11C, 11B, 11A, 12C, 12B, 12A, 1A, 2A, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 4D, 5A, 5B, 5C, 5D, 6A, 6B, 6C, 6D, 7A, 7B, 7C, 7D, 8A, 8B, 8C, 8D, 9A, 9B, 9C, 9D, 10A, 10B, 10C, 10D, 11E, 12A, 12B, 12C, 12D, 12E, 13A, 13B, 13C, 13D, 13E, 14A, 14B, 14C, 14D, 14E, 15A, 15B, 15C, 15D, 15E, 16A, 16B, 16C, 16D, 16E, 17A, 17B, 17C, 17D, 17E, 18A, 18B, 18C, 18D, 18E, 19A, 19B, 19C, 19D, 19E, 20A, 20B, 20C, 20D, 20E, 21A, 21B, 21C, 21D, 21E, 22A, 22B, 22C, 22D, 22E, 23A, 23B, 23C, 23D, 23E, 24A, 24B, 24C, 24D, 24E, 25A, 25B, 25C, 25D, 25E, 26A, 26B, 26C, 26D, 26E, 27A, 27B, 27C, 27D, 27E, 28A, 28B, 28C, 28D, 28E, 29A, 29B, 29C, 29D, 29E, 30A, 30B, 30C, 30D, 30E, 31A, 31B, 31C, 31D, 31E, 32A, 32B, 32C, 32D, 32E, 33A, 33B, 33C, 33D, 33E, 34A, 34B, 34C, 34D, 34E, 35A, 35B, 35C, 35D, 35E, 36A, 36B, 36C, 36D, 36E, 37A, 37B, 37C, 37D, 37E, 38A, 38B, 38C, 38D, 38E, 39A, 39B, 39C, 39D, 39E, 40A, 40B, 40C, 40D, 40E, 41A, 41B, 41C, 41D, 41E, 42A, 42B, 42C, 42D, 42E, 43A, 43B, 43C, 43D, 43E, 44A, 44B, 44C, 44D, 44E, 45A, 45B, 45C, 45D, 45E, 46A, 46B, 46C, 46D, 46E, 47A, 47B, 47C, 47D, 47E, 48A, 48B, 48C, 48D, 48E, 49A, 49B, 49C, 49D, 49E, 50A, 50B, 50C, 50D, 50E, 51A, 51B, 51C, 51D, 51E, 52A, 52B, 52C, 52D, 52E, 53A, 53B, 53C, 53D, 53E, 54A, 54B, 54C, 54D, 54E, 55A, 55B, 55C, 55D, 55E, 56A, 56B, 56C, 56D, 56E, 57A, 57B, 57C, 57D, 57E, 58A, 58B, 58C, 58D, 58E, 59A, 59B, 59C, 59D, 59E, 60A, 60B, 60C, 60D, 60E, 61A, 61B, 61C, 61D, 61E, 62A, 62B, 62C, 62D, 62E, 63A, 63B, 63C, 63D, 63E, 64A, 64B, 64C, 64D, 64E, 65A, 65B, 65C, 65D, 65E, 66A, 66B, 66C, 66D, 66E, 67A, 67B, 67C, 67D, 67E, 68A, 68B, 68C, 68D, 68E, 69A, 69B, 69C, 69D, 69E, 70A, 70B, 70C, 70D, 70E, 71A, 71B, 71C, 71D, 71E, 72A, 72B, 72C, 72D, 72E, 73A, 73B, 73C, 73D, 73E, 74A, 74B, 74C, 74D, 74E, 75A, 75B, 75C, 75D, 75E, 76A, 76B, 76C, 76D, 76E, 77A, 77B, 77C, 77D, 77E, 78A, 78B, 78C, 78D, 78E, 79A, 79B, 79C, 79D, 79E, 80A, 80B, 80C, 80D, 80E, 81A, 81B, 81C, 81D, 81E, 82A, 82B, 82C, 82D, 82E, 83A, 83B, 83C, 83D, 83E, 84A, 84B, 84C, 84D, 84E, 85A, 85B, 85C, 85D, 85E, 86A, 86B, 86C, 86D, 86E, 87A, 87B, 87C, 87D, 87E, 88A, 88B, 88C, 88D, 88E, 89A, 89B, 89C, 89D, 89E, 90A, 90B, 90C, 90D, 90E, 91A, 91B, 91C, 91D, 91E, 92A, 92B, 92C, 92D, 92E, 93A, 93B, 93C, 93D, 93E, 94A, 94B, 94C, 94D, 94E, 95A, 95B, 95C, 95D, 95E, 96A, 96B, 96C, 96D, 96E, 97A, 97B, 97C, 97D, 97E, 98A, 98B, 98C, 98D, 98E, 99A, 99B, 99C, 99D, 99E, 100A, 100B, 100C, 100D, 100E.

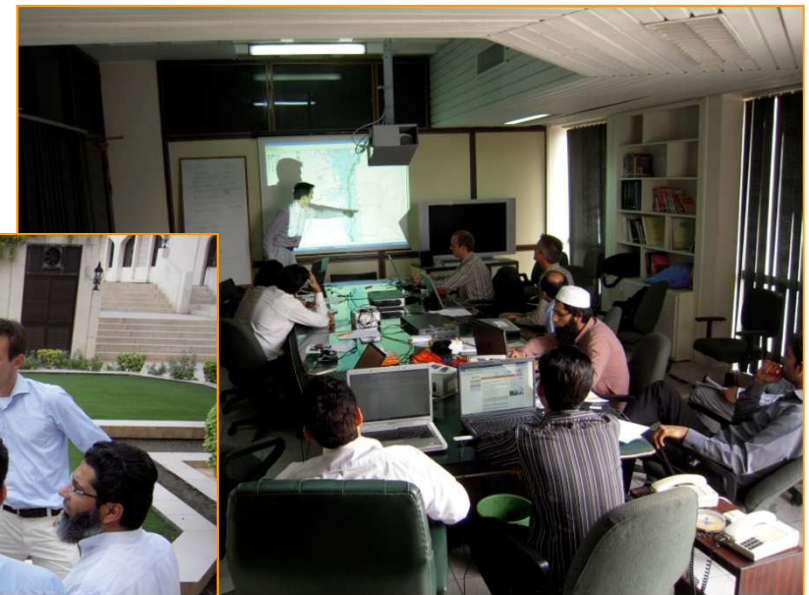
The interface includes a menu bar (File, Edit, View, Insert, Selection, Tools, Window, Help), a toolbar, and a Layers panel on the left. The Layers panel is expanded to show various data layers, including Incident, Actoren, BEVOLKING, LANDBOUW, MOBILITEIT, VEILIGHEID, RECREATIE, WATER, and REFERENTIE DATA. The right side of the interface features an Incident report window for 'Hoogwater' (DTG: 081051) and a list of reports for 'Data in laag Sectoral gewijzigd'.

Eagle4Pakistan



Eagle4Pakistan

- Team in Amsterdam
- Involve geo-network via social media
- Donation of Eagle software worth \$ 500.000
- Team to Lahore
- Installation and training
- Geo-data collection



Eagle: a lot of information!

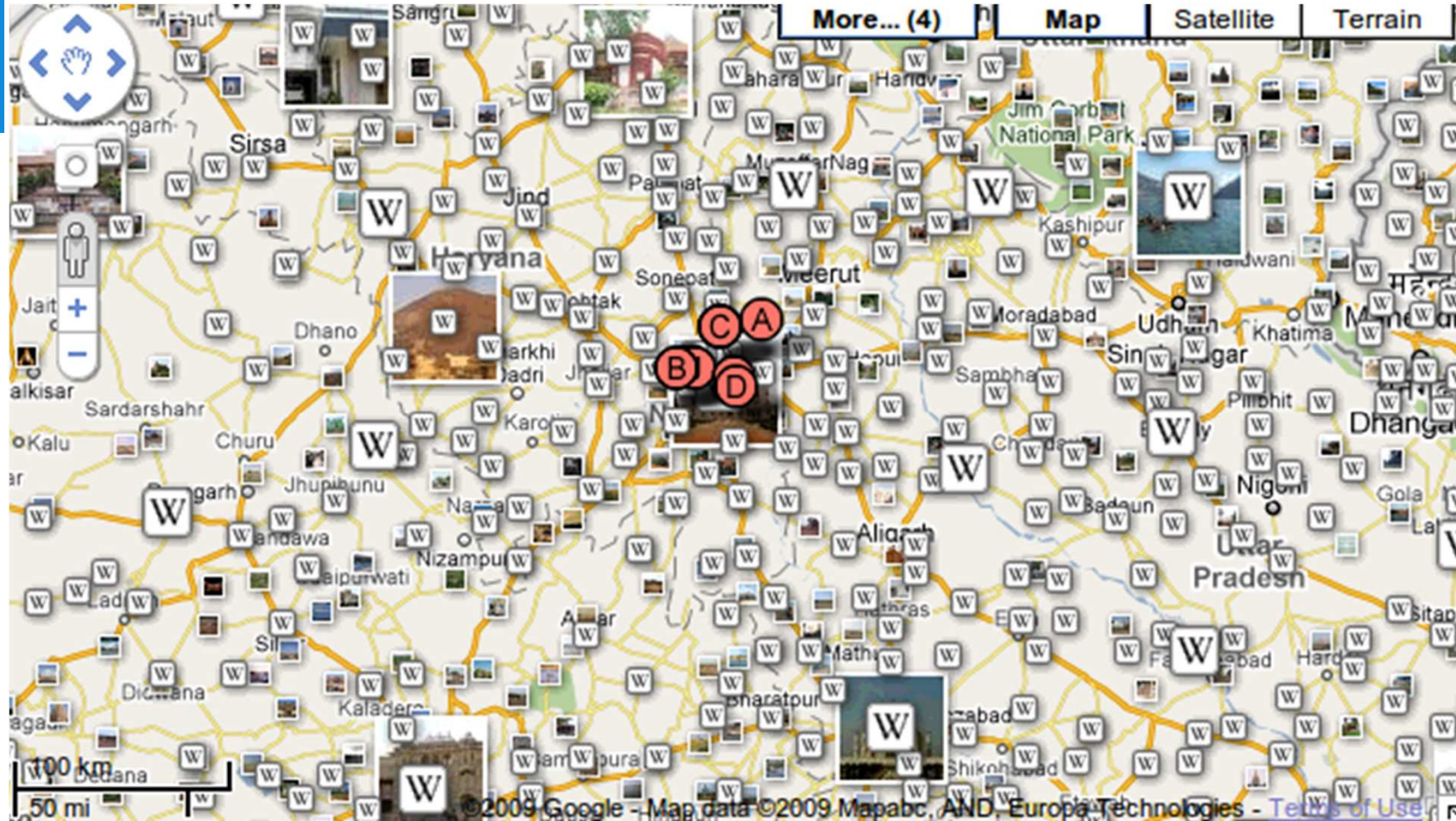
The screenshot displays the ArcMap interface with a flood risk map of Arnhem. The map is overlaid with several colored zones: a yellow zone in the north, an orange zone in the center, and a red zone in the south. The map is divided into grid cells labeled with alphanumeric codes such as 12E, 12D, 11D, 12C, 11C, 12B, 11B, 12A, 11A, 10A, 9A, 8A, 7A, 6A, 5A, 4A, 3A, 2A, 1A, 3B, 2B, 1B, 3C, 2C, 1C, 3D, 2D, 1D, 3E, 2E, 1E, 3F, 2F, 1F, 3G, 2G, 1G, 3H, 2H, 1H, 3I, 2I, 1I, 3J, 2J, 1J, 3K, 2K, 1K, 3L, 2L, 1L, 3M, 2M, 1M, 3N, 2N, 1N, 3O, 2O, 1O, 3P, 2P, 1P, 3Q, 2Q, 1Q, 3R, 2R, 1R, 3S, 2S, 1S, 3T, 2T, 1T, 3U, 2U, 1U, 3V, 2V, 1V, 3W, 2W, 1W, 3X, 2X, 1X, 3Y, 2Y, 1Y, 3Z, 2Z, 1Z.

The interface includes a top menu bar (File, Edit, View, Insert, Selection, Tools, Window, Help) and a toolbar with various navigation and analysis tools. On the left, the 'Layers' panel is circled in red and contains the following categories and sub-items:

- Incident
- Acties
- BEVOLKING
 - Adres Coördinaten Nederland
 - BridGIS Adreslocaties
 - CBS
- LANDBOUW
 - Agrarische bedrijven
 - Basisregistratie Percelen 2007
 - Compartimenten
- MOBILITEIT
 - AUTOWEGEN
 - SPOORWEGEN
 - UITGAANGSSTELLINGEN
 - VAARWEGEN
 - EVACUATIE
 - Opstapplaatsen Arnhem
 - Opstapplaatsen Overbetuwe
 - Evacuatierroutes
- VEILIGHEID
 - RECREATIE
 - Transparantiefilter
 - WATER
 - BUSWATER
 - OPPERVLAKTEWATER
 - Dijkningen
 - Overstroming Brespunten
 - Dijkpalen Waterschap Rijn en IJ
 - OVERSTROMINGSSCENARIOS
- REFERENTIE DATA
 - BESTUURLIJKE GRENZEN
 - Cyclomedia locaties gemeente Arnh
 - GBKN
 - Sherpa : Fallplan
 - HOOGTE
 - GDI : Kadaster
 - GeoStreets
 - GDI : Luchtfoto
 - GDI : Topografie

On the right, the 'Incident' panel shows details for 'Hoogwater' (DTG: 081051) and a list of 'Benichten' (notifications) for various grid cells, all indicating 'Data in laag Sectoraal gewijzigd'.

Google Maps



Distribution of tasks

Law for Disasters and Large Accidents (WRZO,
<http://wetten.overheid.nl/>, 30 januari 1985)

19 types of disasters (e.g. aircraft crash, flooding, etc.)

4 levels of emergency on North sea (Categories I-IV)

7 levels of emergency in Schiphol (VOS 1-7)

5 levels of emergencies on land (GRIP1 to GRIP5)

25 processes (e.g. traffic control, disinfection of vehicles,
measurements and observations)

4 primary responsible units (fire brigade, police, paramedics,
municipality)

Processes describe tasks

Responsible: Fire brigade (Regional chief)		Responsible: Fire brigade (Regional chief officer)	
1.	Fighting fire and emission of dangerous substances	1.	Fighting fire and emission of dangerous substances
2.	Rescuing and technical assistance	2.	Rescuing and technical assistance
3.	Decontaminating people and animals	3.	Decontaminating people and animals
4.	Decontaminating vehicles and infrastructure	4.	Decontaminating vehicles and infrastructure
5.	Observations and measurements	5.	Observations and measurements
6.	Alerting the population	6.	Alerting the population
7.	Making accessible and clearing up	7.	Making accessible and clearing up
Cluster B: Medical Assistance		Cluster D: People care	
Responsible: GHOR (Regional Medical Officer)		Responsible: Municipality (Mayor)	
8.	Medical aid chain	18.	Advice and information
9.	Preventative public health and promotion	19.	Relief and care
10.	Psycho-social aid and care	20.	Funeral arrangements
Cluster C: Public order and Traffic		Cluster B: Medical Assistance	
Responsible: Police (Corps chief) and/or		Responsible: GHOR	
11.	Clearance and evacuation	8.	Medical aid chain
12.	Fencing off disaster area	9.	Preventative public health and promotion
13.	Traffic control	10.	Psycho-social aid and care
14.	Maintaining the legal order	Cluster C: Public order and Traffic	
15.	Identification of fatal casualties	Responsible: Police	
16.	Giving directions	General supporting processes	
17.	Criminal investigation	Responsibility: all sectors	
Cluster D: People care		11.	Clearance and evacuation
Responsible: Municipality (Mayor)		12.	Fencing off disaster area
18.	Advice and information	13.	Traffic control
19.	Relief and care	14.	Maintaining the legal order
20.	Funeral arrangements	15.	Identification of fatal casualties
21.	Registration of victims	16.	Giving directions
22.	Providing primary needs	17.	Criminal investigation
23.	Damage registration	General supporting processes	
24.	Environment protection	Responsibility: all sectors	
25.	Follow-up care	11.	Clearance and evacuation
General supporting processes		12.	Fencing off disaster area
Responsibility: all sectors		13.	Traffic control
Alerting		14.	Maintaining the legal order
Care/logistics of disaster recovery		15.	Identification of fatal casualties
Connection/communication		16.	Giving directions
Registration and reporting/archiving		17.	Criminal investigation
Evaluation			

Explosion fireworks storage, 13 May 2000, Enschede



Fire in TUDelft

13th may, 2008, Delft

Faculty of Architecture

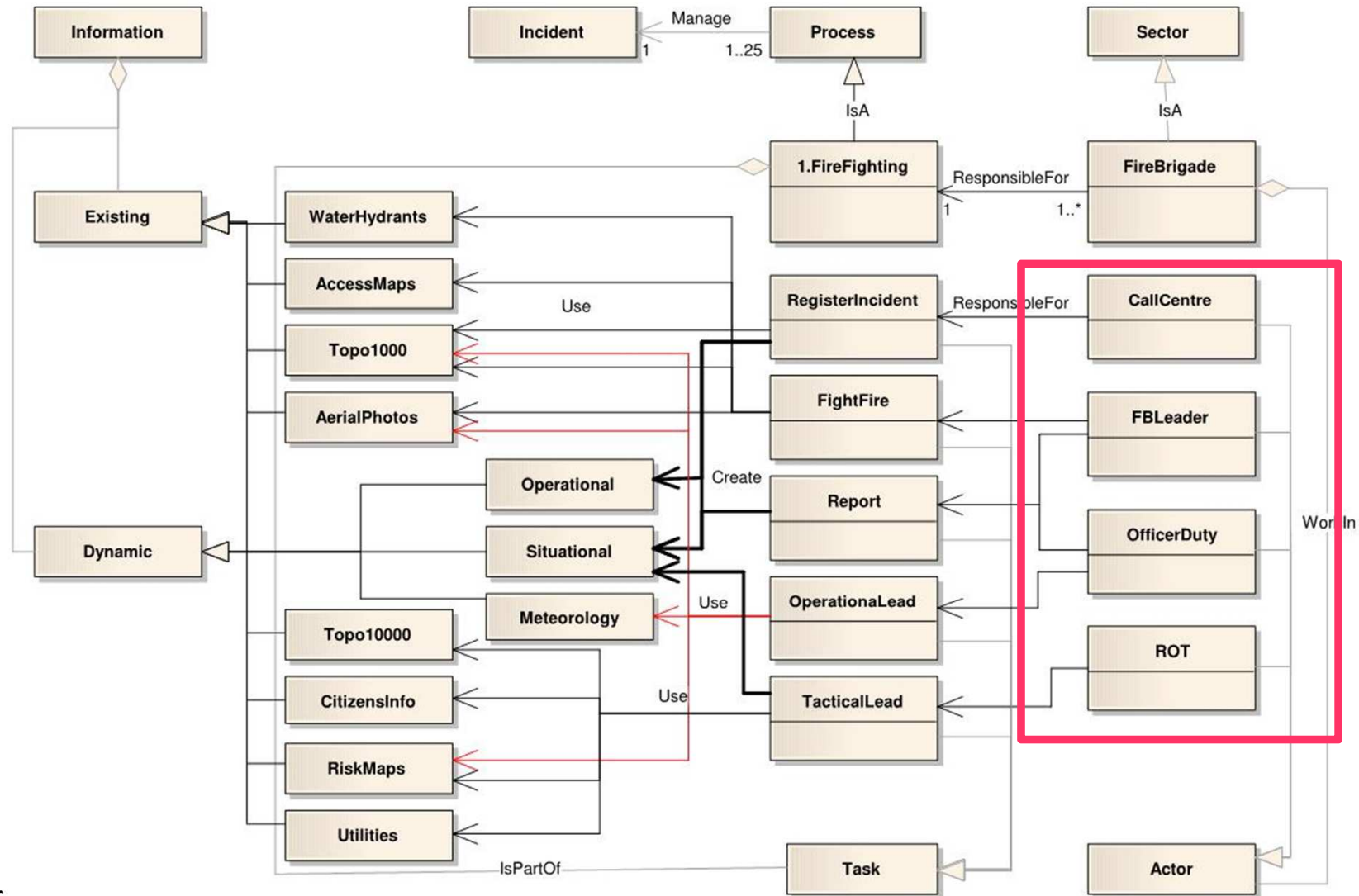


Approach

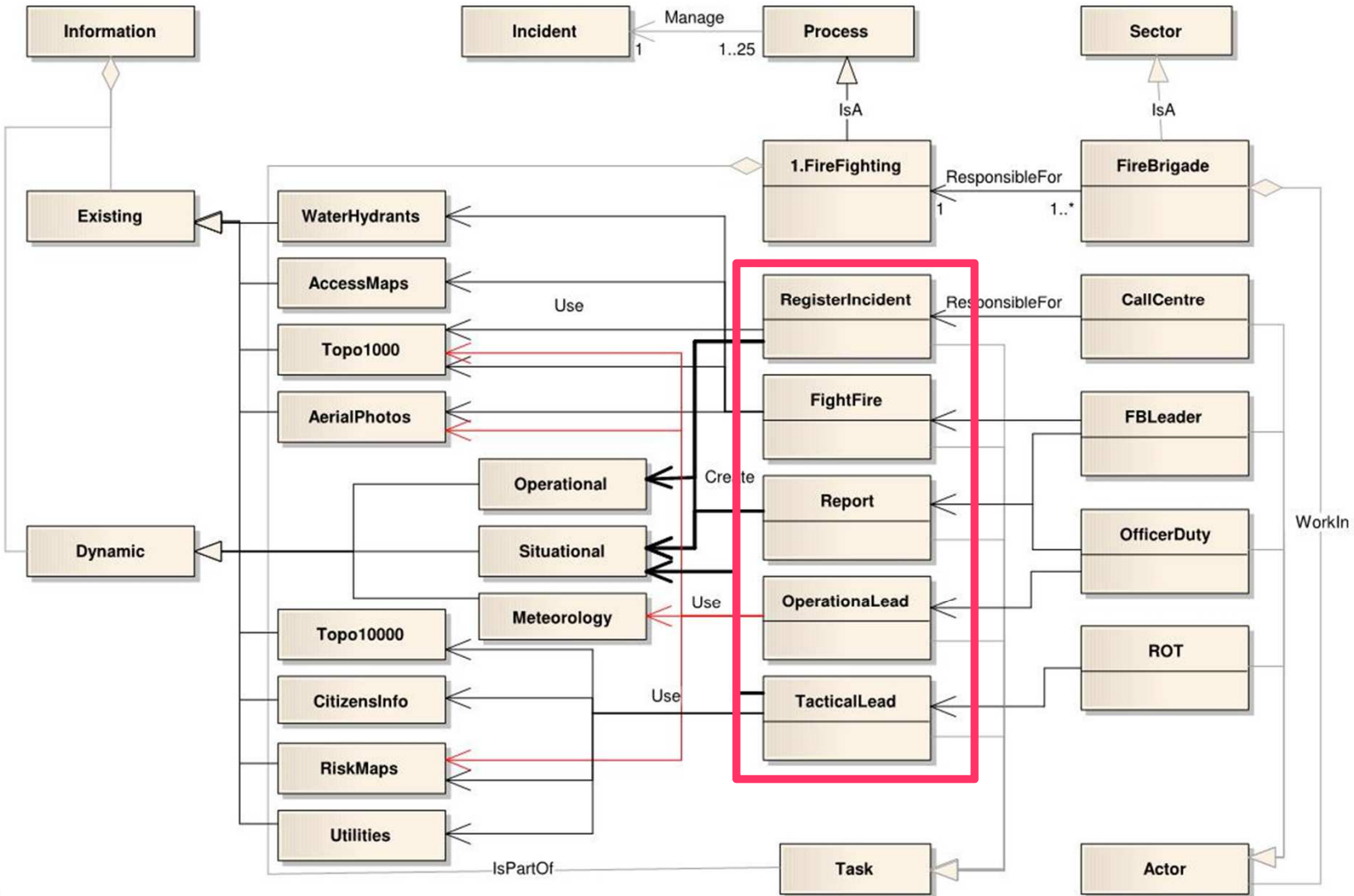
- Formally model all the tasks
- Define which tasks need what data
- Define which tasks produce data
- Define which objects are of importance
- Allow search of objects

a fireman on the field wants 'buildings' and the systems gives him the highest resolution (scale) buildings for his area (and only the buildings)

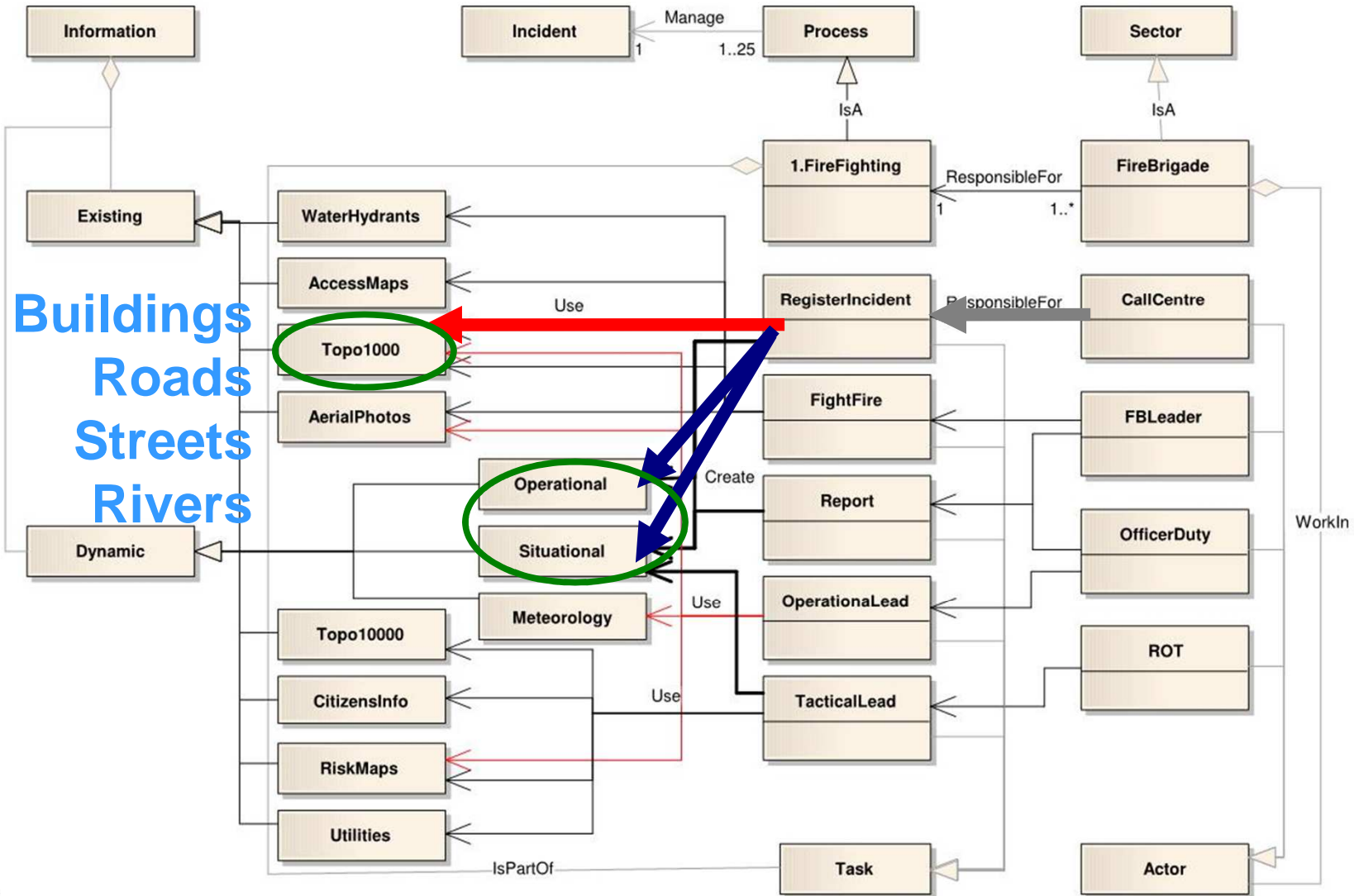
Process 1: fire fighting



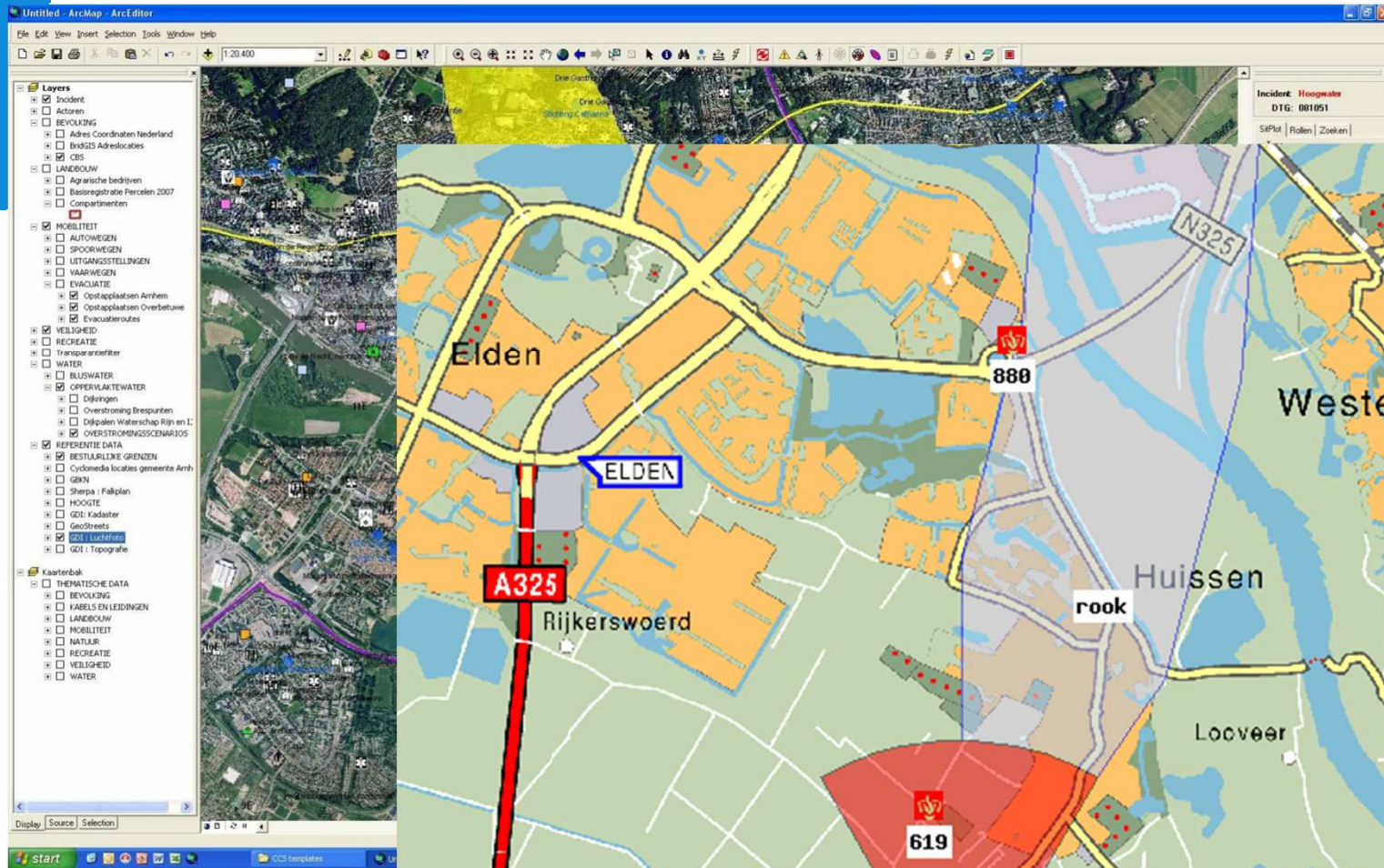
Process 1: fire fighting



Process 1: fire fighting



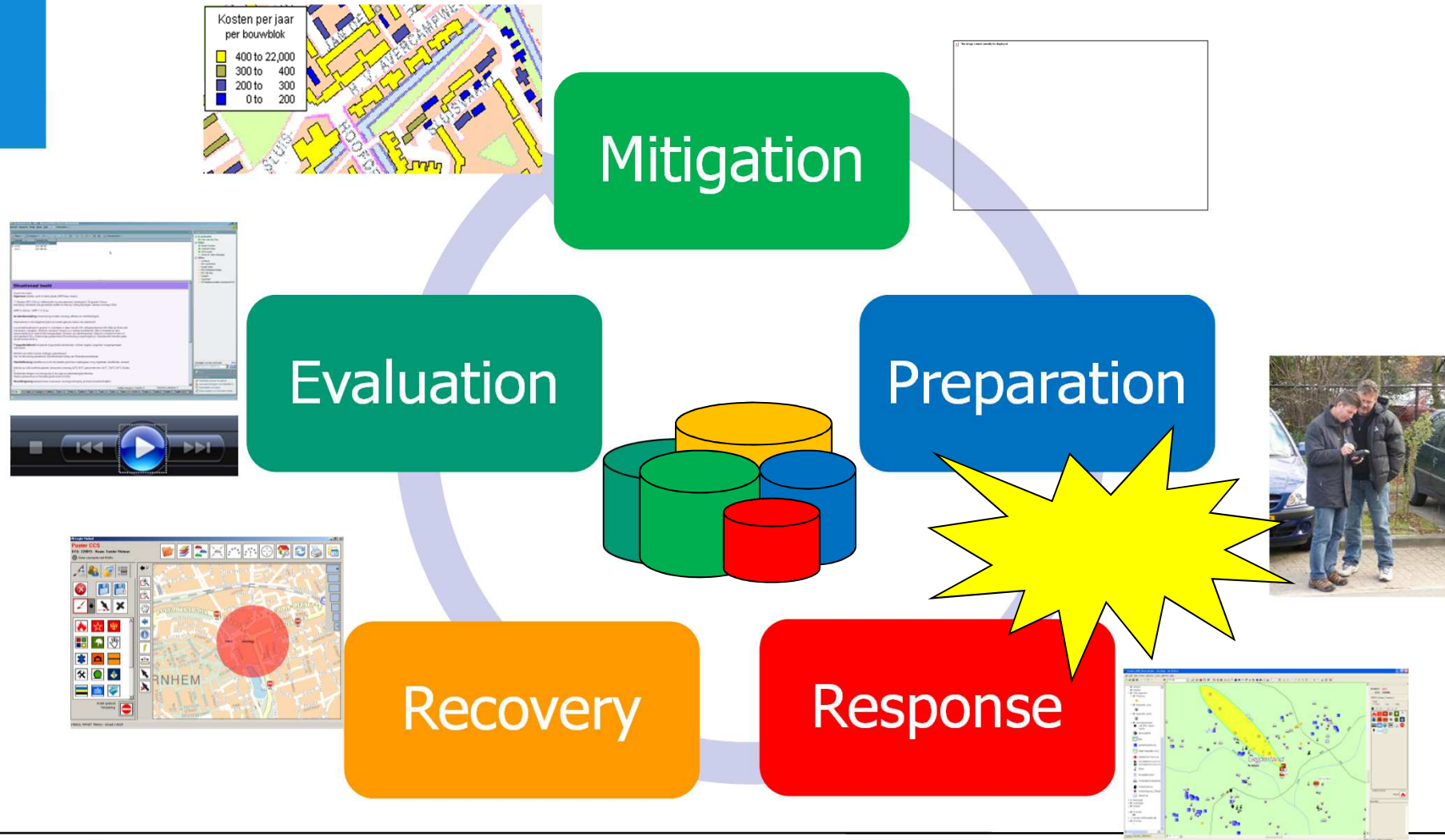
Different views (field,CC)



Field view

Operational view

Part of Disaster management cycle



Concluding words

- Data integration
 - Data Models (huge data sets, large amounts of sensor information)
 - Standards for exchange of data
- Context-aware systems
 - Investigate/establish processes and procedures
 - Semantic web

=> increase the trust in the system => **training!**

=> decision support systems

*Thank you
for your attention*



<http://www.commission4.isprs.org/>
<http://www.gdmc.nl/zlatanova>