



Geodatenmanagement und -dienste am Beispiel des Tsunami-Frühwarnsystems für den Indischen Ozean

Workshop "Datenmanagement in interdisziplinären Umwelt-Forschungsprojekten"
11. / 12.04.2007, Göttingen

Christian Strobl – Ralph Kiefl – Torsten Riedlinger – Günter Strunz



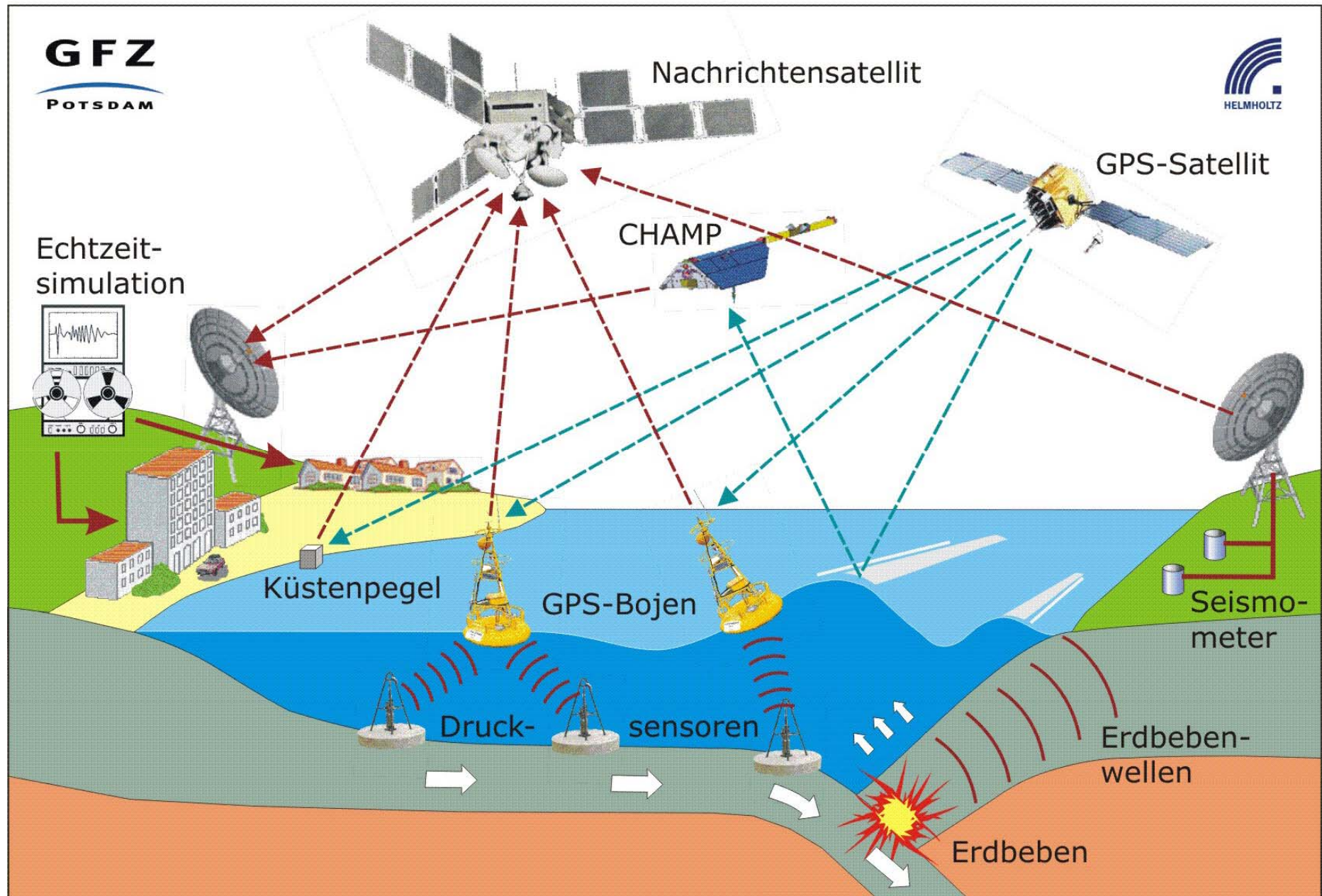


GITEWS

- 7 Überblick
- 7 Einführung GITEWS-Projekt
- 7 Geodatenmanagement
- 7 Geodatendienste
- 7 Systemintegration
- 7 Ausblick und Diskussion



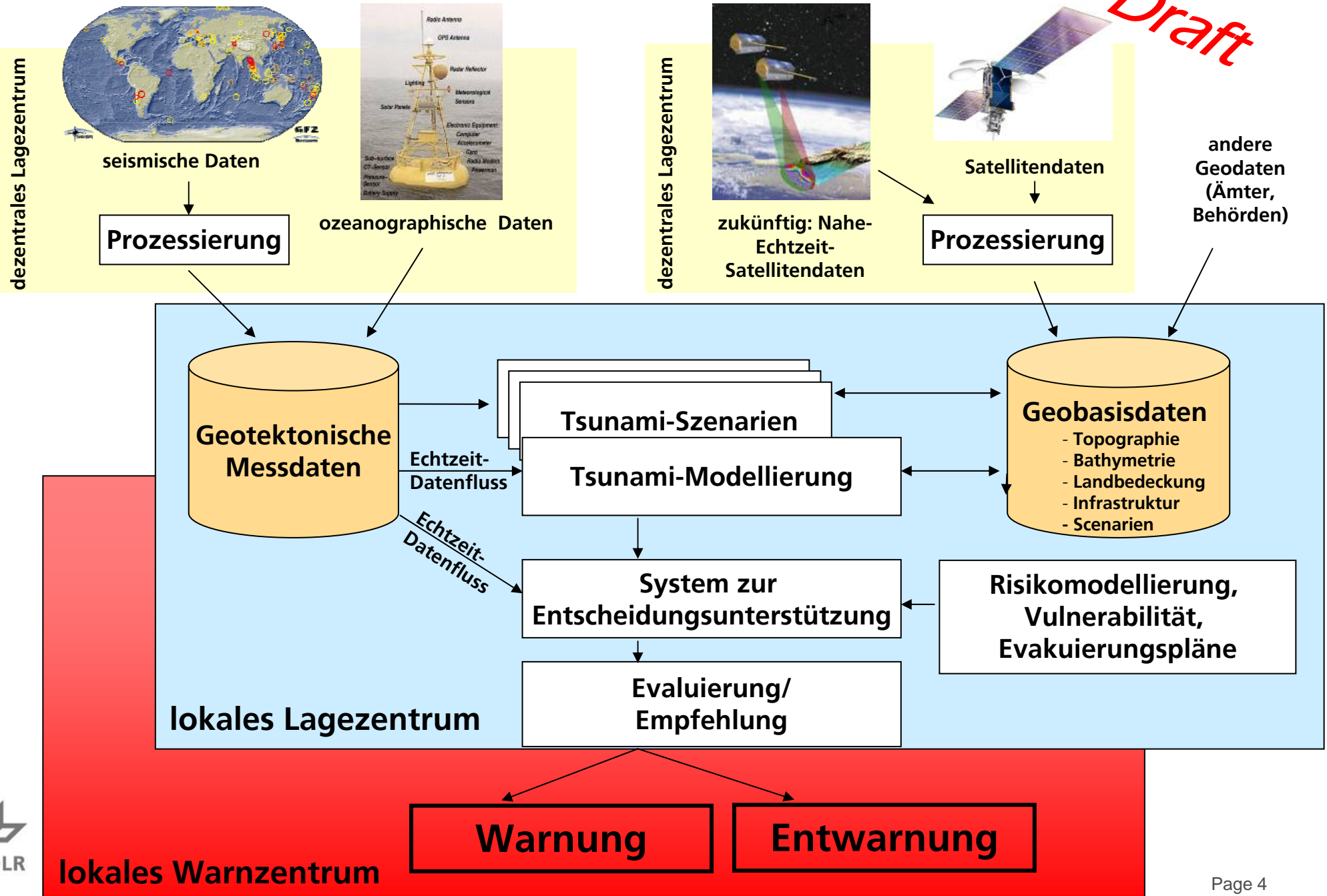
Tsunami Frühwarnsystem





Einführung GITEWS

Draft





Deutschland

- ↗ BmBF (Finanzierung)
- ↗ GFZ (Projektleitung, Sensorsysteme)
- ↗ DLR (Erdbeobachtung, Kommunikation, Datenmanagement, Vulnerabilität)
- ↗ AWI, GKSS (Tsunami-Modellierung)
- ↗ BGR, IfM Geomar (Bathymetrie)
- ↗ UNU (Capacity Building, Vulnerabilität)
- ↗

Indonesien

- ↗ RISTEC (Forschungsministerium)
- ↗ BMG (Geophysikalischer Dienst)
- ↗ LAPAN (Raumfahrt)
- ↗ BAKOSURTANAL (Landesvermessung)
- ↗ ...



Geospatial data analysis (geospatial data needs and availability)

- ↗ Requirements Analysis based on [Questionnaire](#)

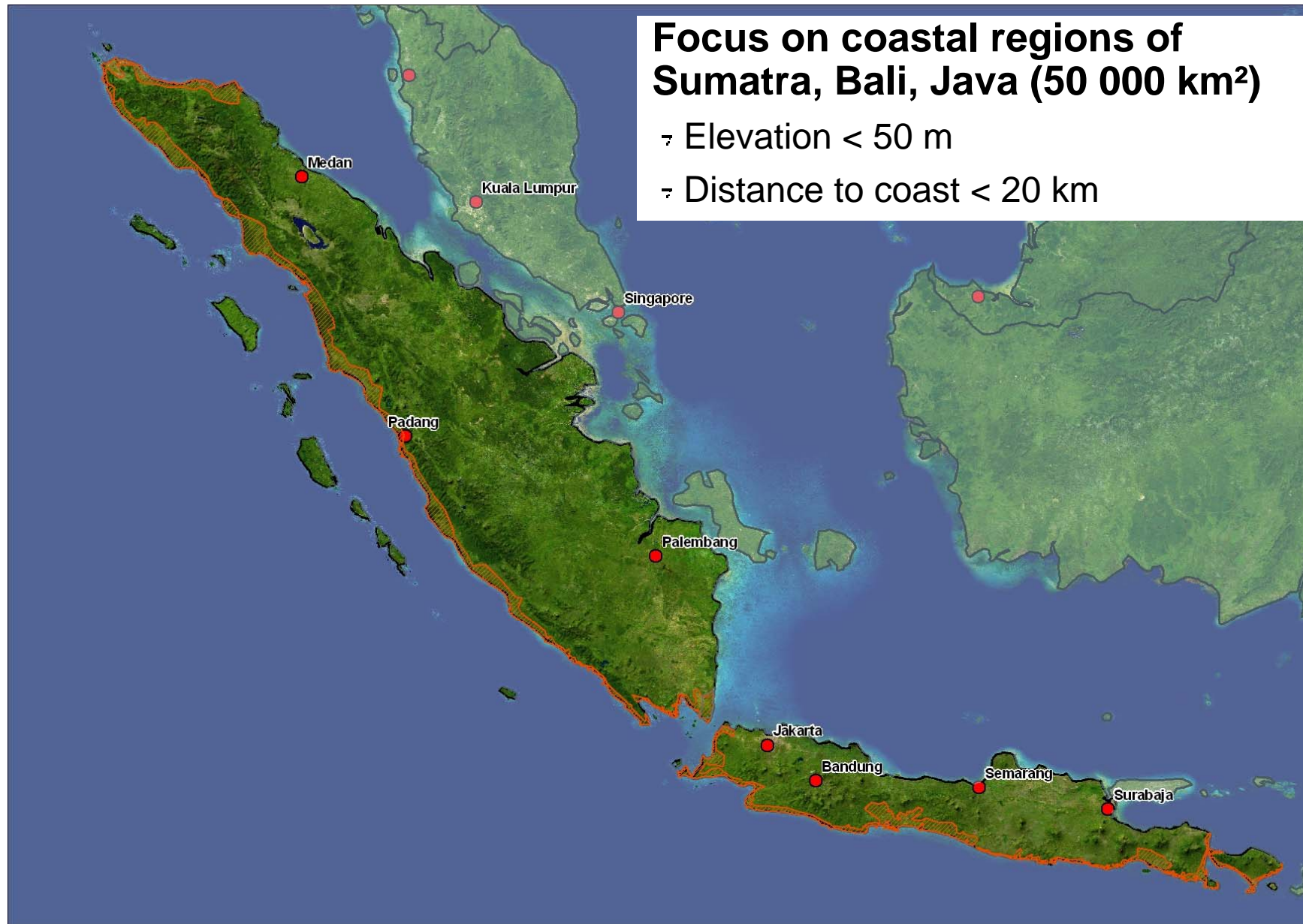
Geospatial data catalog

Scale based approach

- ↗ 1 : 10 000
- ↗ 1 : 25 000
- ↗ 1 : 50 000
- ↗ 1 : 100 000
- ↗ 1 : 250 000
- ↗ 1 : 1 000 000
- ↗ 1 : 3 000 000

Thematic content

- ↗ Bathymetry
- ↗ Boundary Data
- ↗ Elevation Data
- ↗ Infrastructure Data
- ↗ Maps
- ↗ Physiography
- ↗ Population
- ↗ Satellite Data





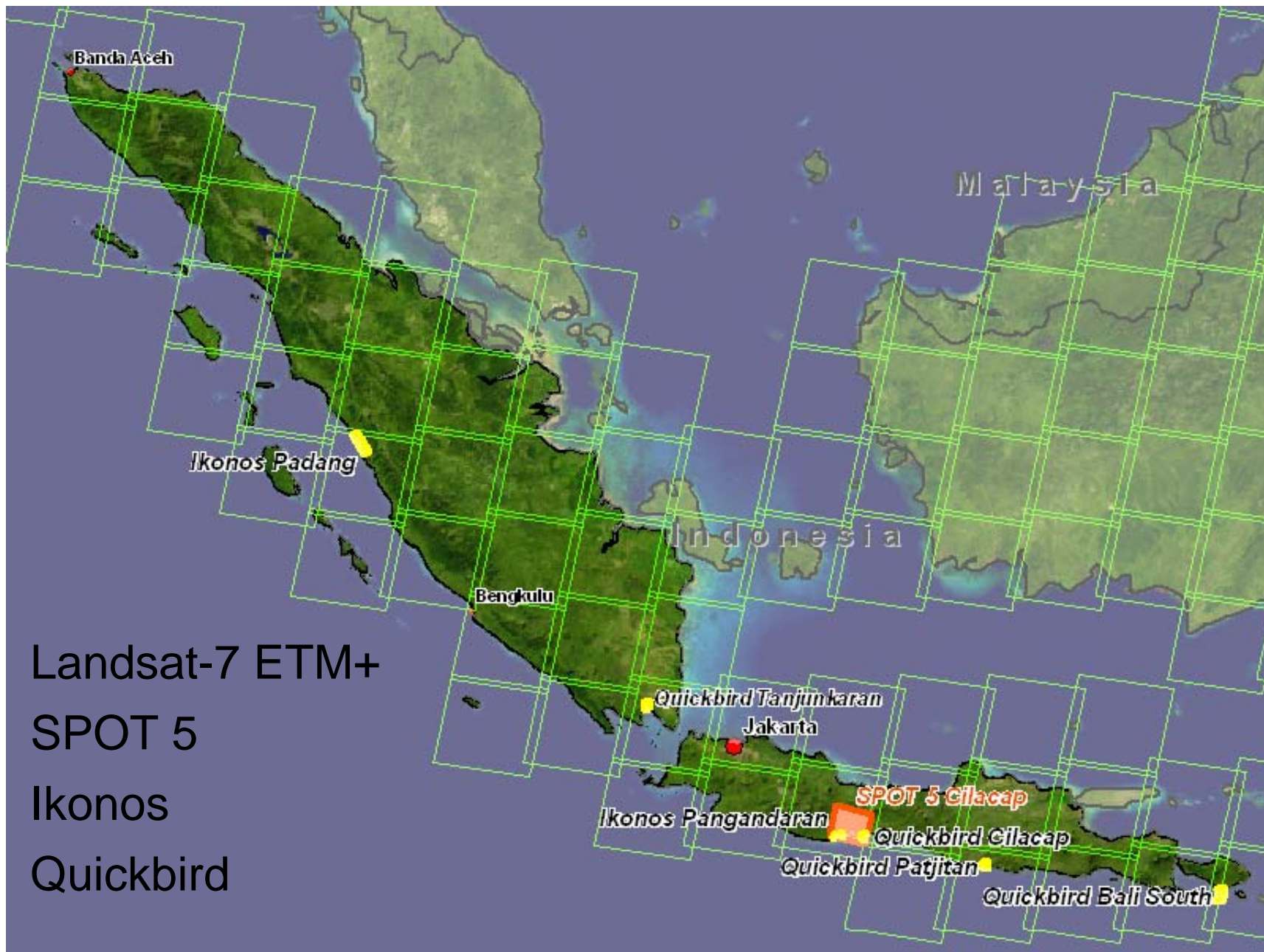
Geospatial data collection: Satellite data

	Data source	Description	Coverage in GITEWS	Example*
Landsat-7 ETM+	Global Land Cover Facility (GLCF)	<ul style="list-style-type: none"> ↪ Resolution (resampled): 28.5 m (multispectral) 14.5 m (panchromatic) ↪ 7 bands, 8 bit 	<ul style="list-style-type: none"> ↪ Complete coverage; image acquisition 1999 - 2002 	
SPOT 5	SPOT IMAGE	<ul style="list-style-type: none"> ↪ Resolution: 10 m (multispectral), 2.5 m (panchromatic) ↪ 4 bands, 8 bit 	<ul style="list-style-type: none"> ↪ Cilacap (2006-01-22) 	
Ikonos	<ul style="list-style-type: none"> ↪ Geoeye ↪ CRISP 	<ul style="list-style-type: none"> ↪ Resolution: 4 m (multispectral), 1 m (panchromatic) ↪ 4 bands, 11 bit 	<ul style="list-style-type: none"> ↪ Padang (2005-04-12) ↪ Pangandaran (2006-07-22, 2003-09-24) 	
Quickbird	DigitalGlobe Inc.	<ul style="list-style-type: none"> ↪ Resolution: 2.4 m (multispectral), 0.6 m (panchromatic) ↪ 4 bands, 11 bit 	<ul style="list-style-type: none"> ↪ Tangjunksaran (2006-07-08) ↪ Patjitan (2006-09-26) ↪ Bali South (2006-05-16) ↪ Cilacap (2006-06-23) 	

* Chip size: 2 km x 2 km



Geospatial data collection: Satellite data



Landsat-7 ETM+
SPOT 5
Ikonos
Quickbird





VHR satellite data example: Pangandaran



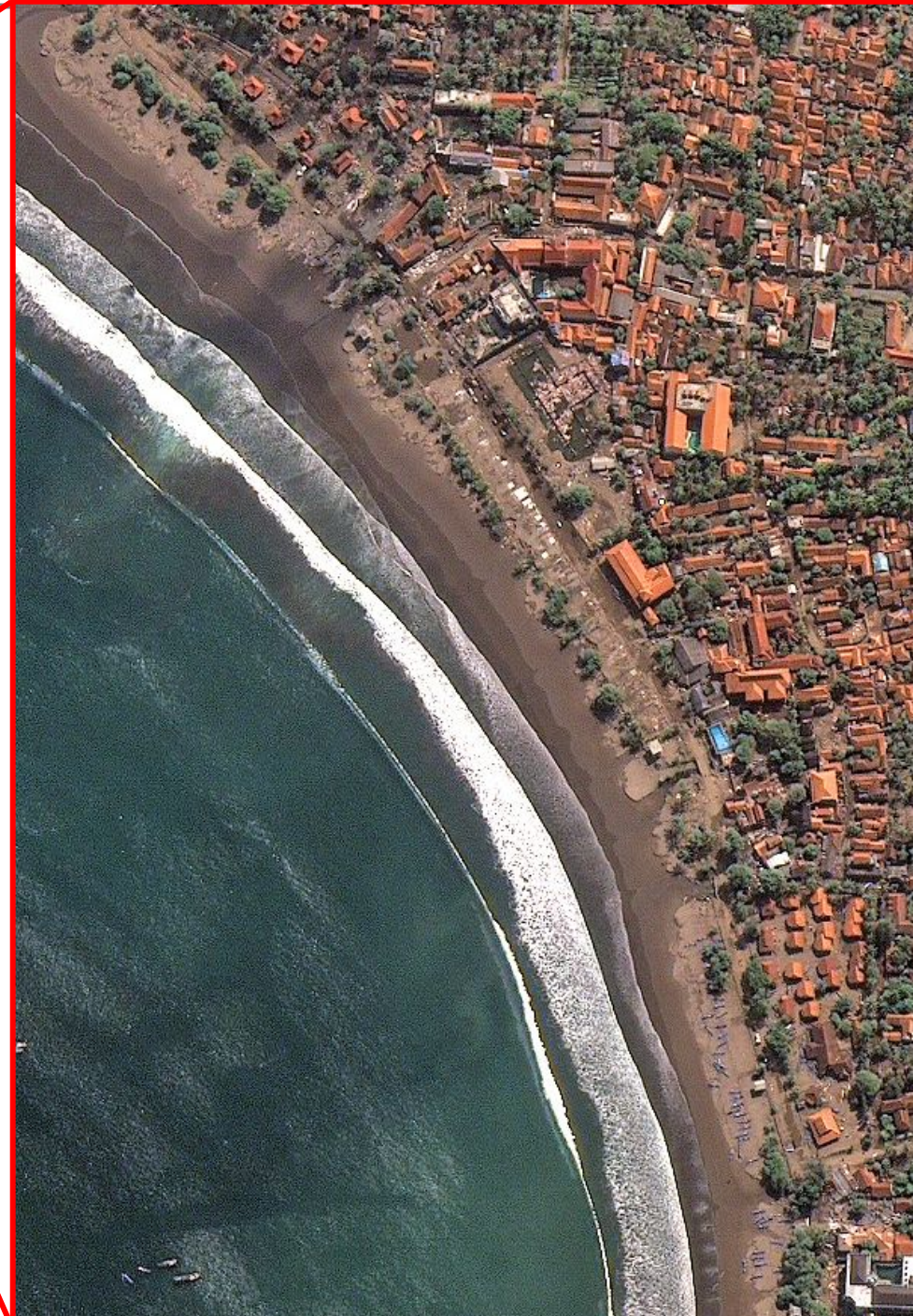
Pre-desaster:
IKONOS
2003-09-24
© GEOEYE, 2003

Pre-desaster:
IKONOS
2006-01-24





VHR satellite data example: Pangandaran



Post-disaster:
IKONOS
2006-07-19
© CRISP, 2006



Geospatial data collection: Elevation data

	Reference	Description	Coverage in GITEWS	Example*
GTOPO30	USGS EROS Data Center, 1996: Global Digital Elevation Model (GTOPO30)	<ul style="list-style-type: none"> Resolution: 30 arc sec. (~ 1km) Heterogenous data sources 		
SRTM-C	USGS EROS Data Center, 2005: SRTM-C, version 2	<ul style="list-style-type: none"> Resolution: 3 arc sec. (~ 100m) 		
SRTM-X	DLR, 2006: SRTM-X DEM	<ul style="list-style-type: none"> Resolution: 1 arc sec. (~ 30m) 		



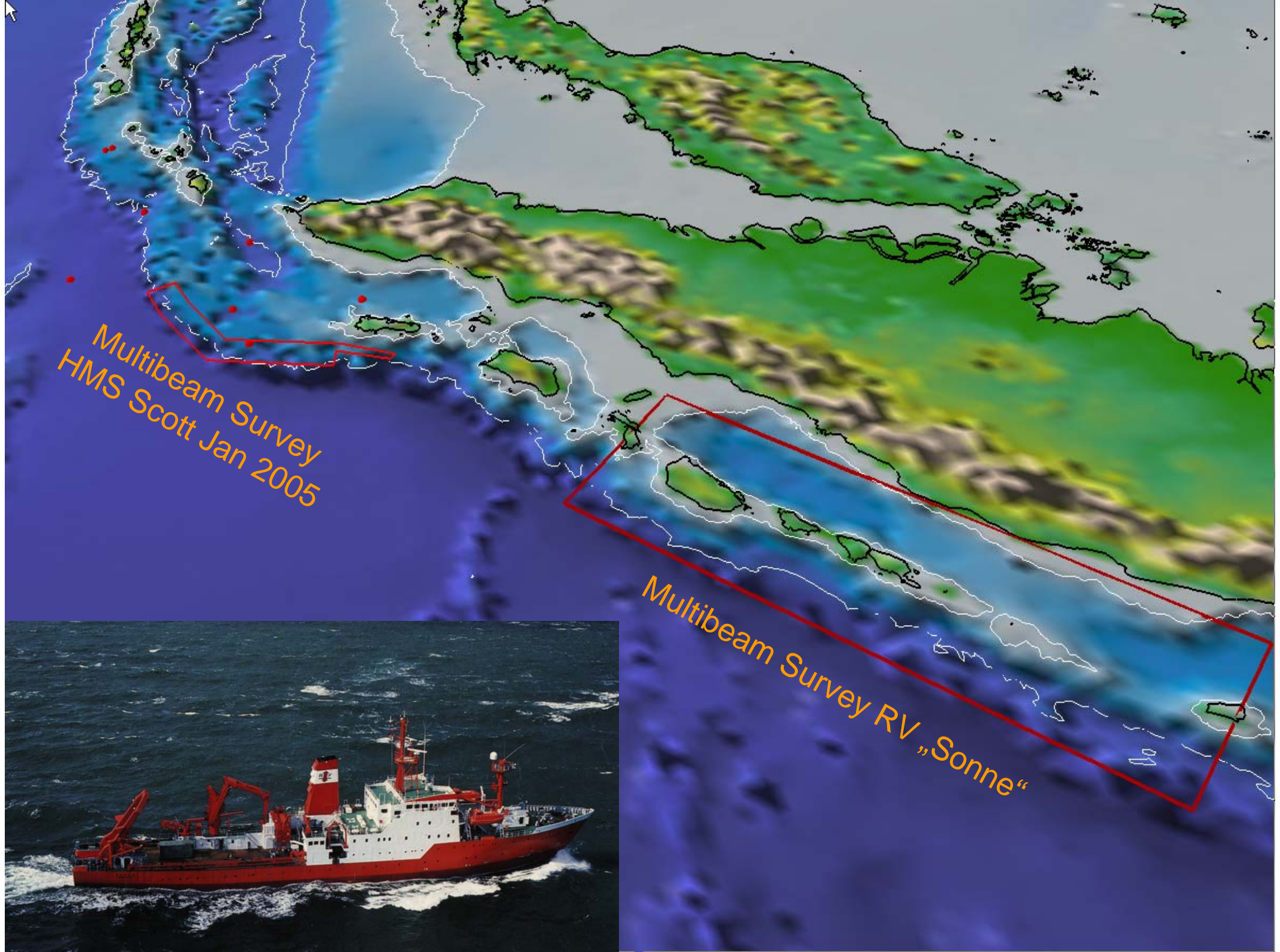
* Chip size: 25 km x 25 km



Geospatial data collection: Bathymetry

	Reference	Description	Coverage in GITEWS	Example*
ETOPO2	National Geophysical Data Center (NGDC / NOAA), 2001: ETOPO2 Global 2' Elevations	<ul style="list-style-type: none"> ↗ Res.: 2 arcmin. (~3,7 km) ↗ Derived from satellite altimetry observations and echo-soundings by Smith & Sandwell (1997) 		
GEBCO	IHO / IOC, 2003: General Bathymetric Chart of the Ocean	<ul style="list-style-type: none"> ↗ Res.: 1 arcmin. (~1,85 km) ↗ Gridded contour line information derived from oceanic soundings ↗ Mainly for deep water 		
SeaCause ("Sonne")	IFM-GEOMAR, 2006: Bathymetry data gathered during Sonne cruise SO-186	<ul style="list-style-type: none"> ↗ Res.: 400 m (~13 arcsec.) ↗ Gridded deep-water multibeam echosounder measurements 		
C-Map	C-Map Norway: CM-93 Edition 3.0	<ul style="list-style-type: none"> ↗ Irregular distributed point information ↗ derived from paper charts (1 : 5000 to 1 : 3500000, by various Hydrographic offices) → heterogeneous resolution ↗ Mainly for shallow water 		 gridded: 15 arcsec shallow water area

* Chip size: 68 km x 68 km



Multibeam Survey
HMS Scott Jan 2005

Multibeam Survey RV „Sonne“



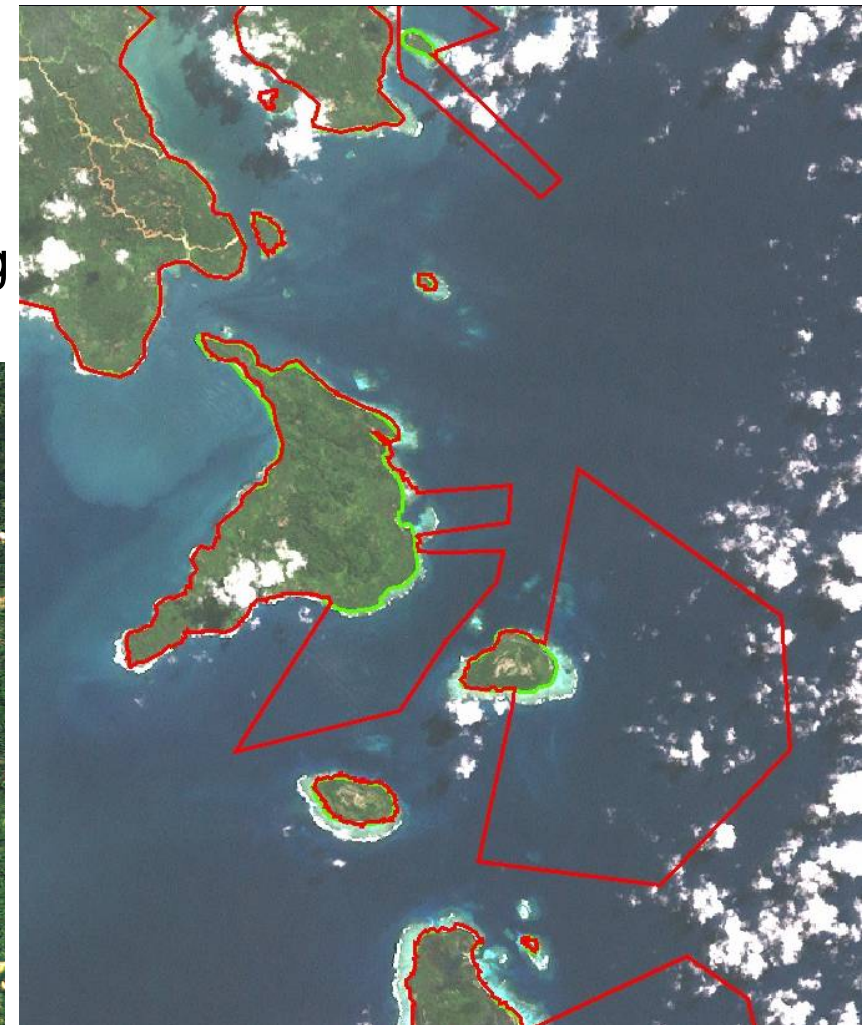


Geospatial data collection: Physiography

	Reference	Description	Coverage in GITEWS	Example*
VMap0 - Coastline	NIMA (2000): Vector Map Level 0 (Digital Chart of World) - Coastline	<ul style="list-style-type: none"> ↗ Reference scale 1 : 1 000 000 ↗ Based on ONC map series ↗ Geometric accuracy: 2000 m 		
SWBD	USGS (2003): SRTM Water Body Data	<ul style="list-style-type: none"> ↗ Reference scale 1 : 100 000 ↗ Derived from SRTM-C and Landsat TM data 		
Garis- Pantai 25	Bakosurtanal (1999): Garis Pantai – Coastline data	<ul style="list-style-type: none"> ↗ Reference scale 1 : 25 000 		

Value added product generation

- Coastline derivation by using SRTM-C derived watermask (USGS) and Landsat 7 ETM+ data:
 - Removal of artefacts and false classifications
 - More precise delineation of small islands
- Stepwise enhancement in priority regions using vhr satellite data



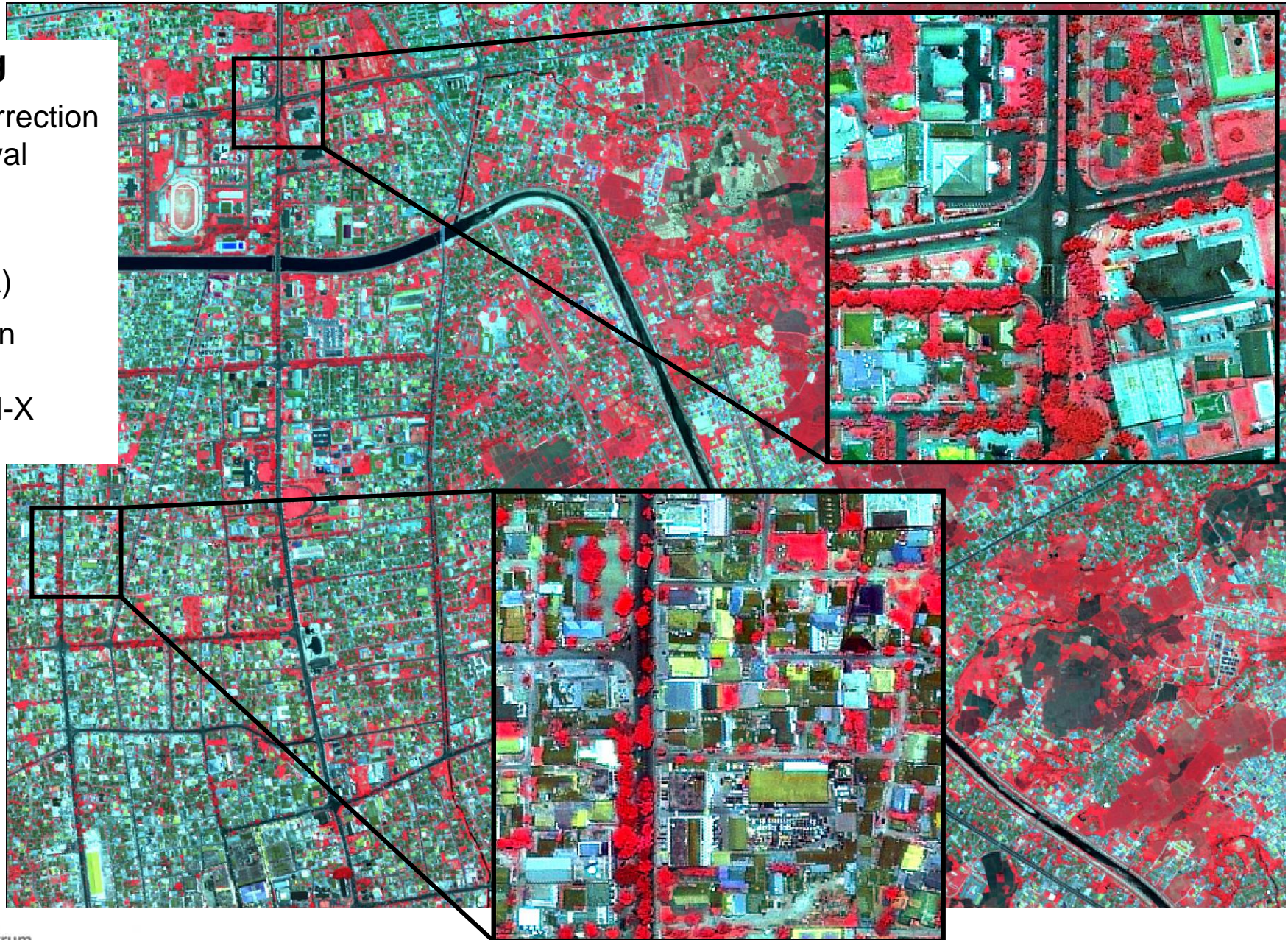
- USGS watermask
- Corrected / Enhanced coastline



Satellite data processing

Pre-processing

- Atmospheric correction and haze removal (ATCOR)
- Pansharpning (PCI Geomatica)
- Orthorectification (X-Dibias using RPC and SRTM-X DEM)

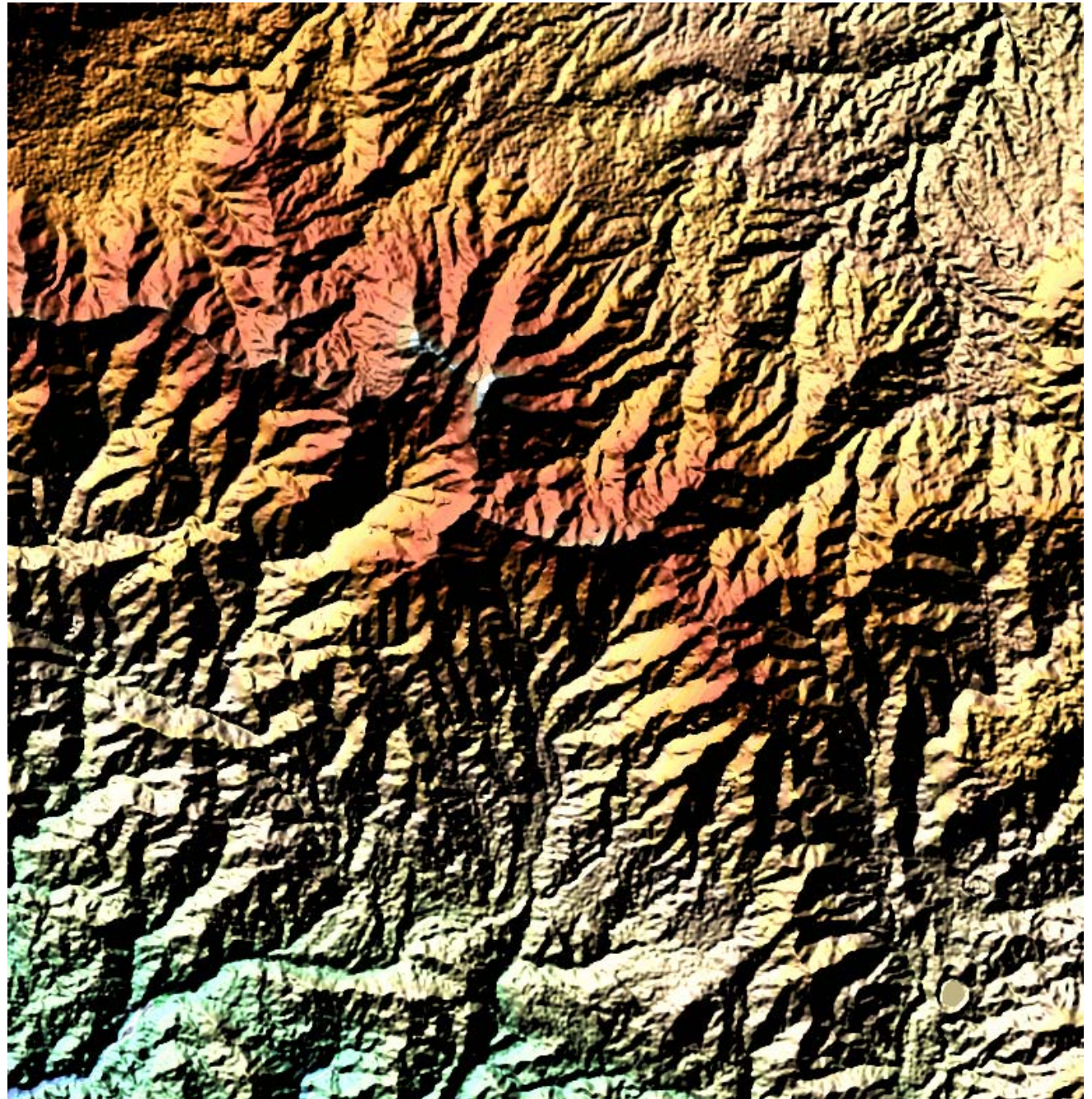


Ikonos, 2005-04-12
Padang, city center



SRTM-X DEM filtering

- 7 Detection of radar shadows and outlier values
- 7 General smoothing and noise reduction
- 7 Interpolation of missing values





Creation of GITEWS overview maps

SUMATRA north - Overview Elevation Map

1:1 600 000



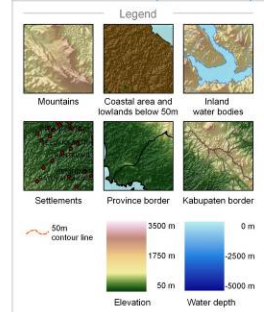
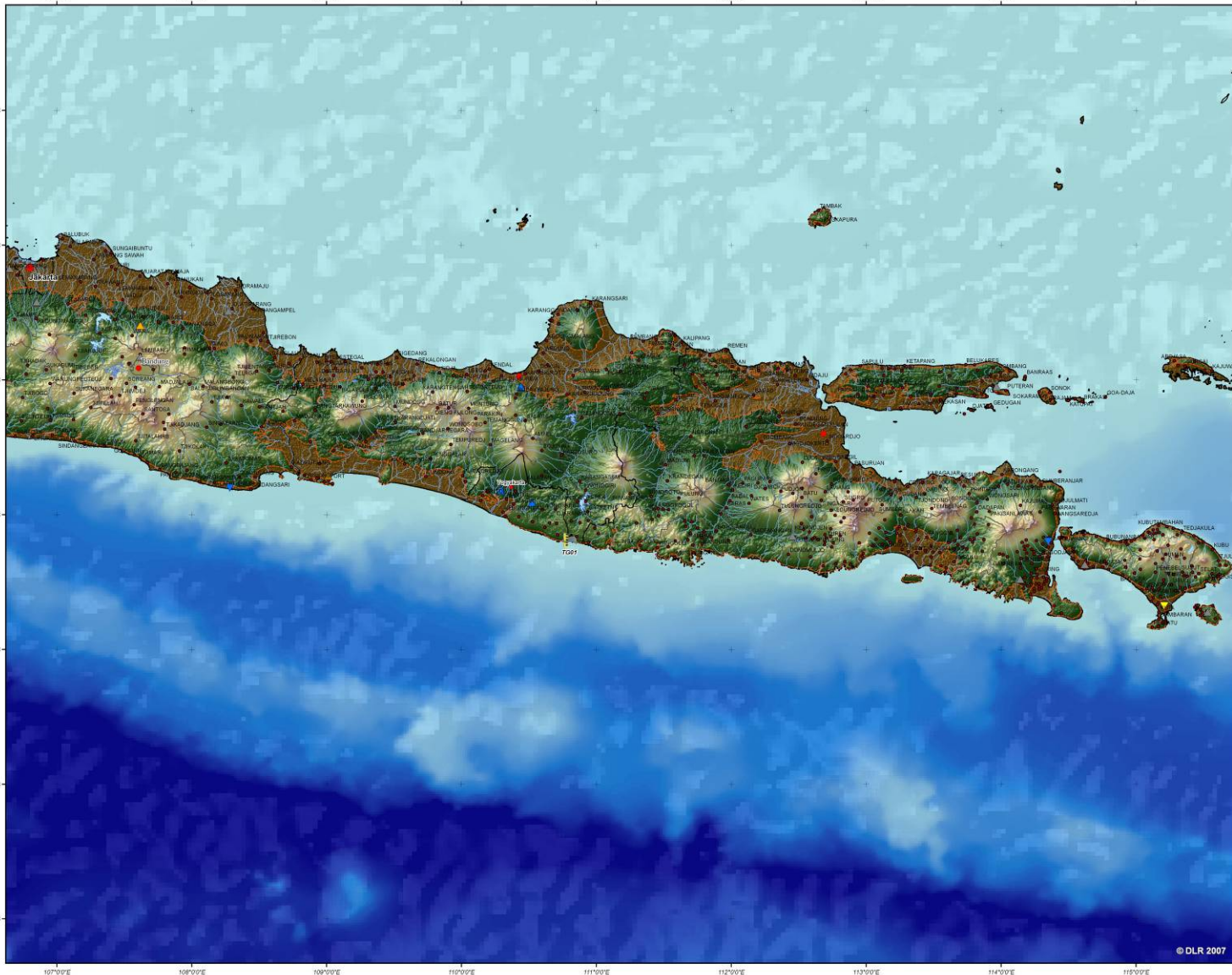
SUMATRA south / JAVA west - Overview Elevation Map

1:1 600 000



JAVA central-east / BALI - Overview Elevation Map

1:1 600 000



Interpretation
This overview map shows the central and eastern part of Java and Bali. It shows a combination of elevation, bathymetry and shaded relief. The elevation is derived from Shuttle Radar Topography Mission (SRTM) X- and C-band data. Additionally locations of installed or planned seismic stations, installed tide gauges and busy locations are displayed.



Geographic coord. info:
Projection: Geographic (DMS)
Spheroid: WGS 84
Datum: WGS 84

Data Sources
SRTM X-band © DLR 2005
SRTM C-band © USGS 2005
GEBCO Bathymetry © ICHHO 2003
VMAPO boundaries, water bodies and settlements © NGA
Sensor locations provided by GFZ and JFM-GEOMAR

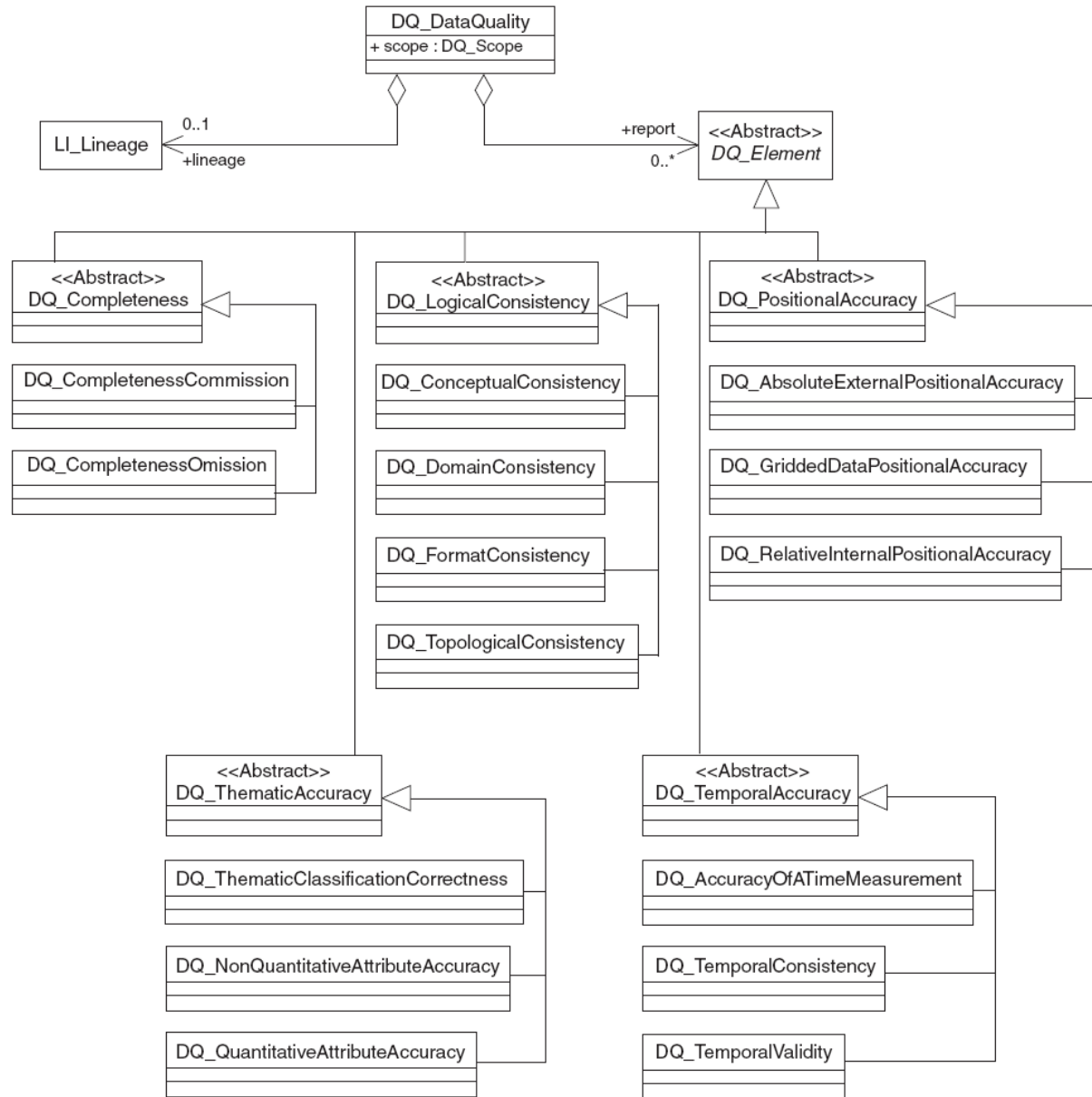
Processing/Analysis
Map creation by DLR-DFD:
- Derivation of 50m contour line based on SRTM X- / C-band data
- Derivation of hillshade based on SRTM X- / C-band and GEBCO data
Map created: January 23, 2007



- ↗ Heterogenous file formats (DWG, MapInfo, ESRI Shape, WMF)
 - ↗ Heterogenous data quality
 - ↗ Geometric inconsistencies
 - ↗ Self intersections (→ “clean”)
 - ↗ Gaps and overlaps between features (→ “clean”)
 - ↗ Vectorization artefacts (→ Generalization)
 - ↗ No two data sets fit to each other! (→ “Spatial adjustment”)
 - ↗ No metadata available for most data sets
 - ↗ No information about pre-processing levels of base data for value added data sets
 - ↗ Systems corrected?
 - ↗ Georectified?
 - ↗ Orthorectified?
- No information about geometric accuracy
- ↗ No information about suitable scales

Described by

- ISO 19113
- ISO 19114
- ISO 19115





- 7 Geospatial data repository ftp-service
- 7 Geospatial data catalogue service
- 7 ISO 19115 compliant metadata
- 7 System Architecture and OGC Standards
 - 7 OGC compliant geospatial database
 - 7 Web Map Service
 - 7 Web Feature Service
 - 7 Web Coverage Service
- 7 Integration of geospatial data repository into DSS
- 7 Operation of geospatial data repository



Web site and ftp-service: Launched on September 29, 2006

der VMware-T... Sys ...: Encyclopedia of Geographical Informati... Chapter 4. Using PostGIS NaDiNe: Helmholtz-EOS Vernetzung...

Home Imprint Contact Deutsch Login

**Natural Disasters
Networking Platform NaDiNe**

**EOS
HELMHOLTZ**

GITEWS Geospatial Data Repository

WP 4100 is responsible for the collection, harmonization and provision of available geospatial data within the GITEWS project.

**GITEWS
Geospatial
Data
Repository**

Work Package 4100
provided by DLR

Contact:

- Ralph Kiefl (DLR)
- Christian Strobl (DLR)

First update of the Geospatial Repository
November 29, 2006

- ◆ IKONOS Satellite Data of the Padang Region
- ◆ 1:25.000-Topographic Maps of Bakusurtanal (Pangandaran Region / Southern Java and Southern Bali)
- ◆ 1:250.000-Topographic Maps of Bakusurtanal (Padang Region)
- ◆ 1:250.000-Topographic Maps of the Departement Pekerjaan Umum (Area of whole Indonesia)

Geospatial Repository for the GITEWS-Projekt launched
September 29, 2006

- ◆ Satellite Data
- ◆ Topographic Maps
- ◆ Digital Elevation Models
- ◆ Bathymetric Data





Terms of Use for the GITEWS Geospatial Data Repository

Conditions and Rights of Use:

- (1) The right to use the data of the GITEWS Geospatial Data Repository is given herein exclusively for non-commercial purposes.
- (2) The permitted field of work in which the data of the GITEWS Geospatial Data Repository are to be used is the GITEWS-Project i.e. the build-up of a Tsunami Early-Warning System for the Indian Ocean ("purpose"). The project partners to the GITEWS project have therefore agreed upon a special "Non Disclosure Agreement" beforehand.
- (3) The disclosing party gives the receiving party the one-time, nonexclusive, nontransferable right to use the delivered data.
- (4) Copying or duplicating the data is permitted only in the framework of the above declared use as outlined in provision (2). A transfer to third parties or any further publication of the data is not permitted. The applicant will provide any kind of access to the data solely to his/her own employees and/or contract partners in the framework of the declared objectives.
- (5) The delivered data may be used only temporarily for the above declared purpose. The right of use ends when this purpose has been achieved.
- (6) The applicant agrees that the user registration information can be stored in a database at DLR-DFD and used by DLR-DFD for purposes of analyzing the range of users and applications and for product development only, and is otherwise treated as confidential.
- (7) The applicant will include the references in publications which are based on the delivered data products which are described by the accompanying metadata.

Liability/Warranty

- (1) The data is delivered to the applicant without any kind of warranty.
- (2) Regardless of the legal basis, the applicant is liable to the delivering institution for harm caused intentionally or through gross negligence. A liability of the applicant for minor negligence exists only if essential obligations of this agreement are violated by the applicant.
- (3) The disclosing institution assumes no obligations on the basis of this agreement towards third parties. There is no liability of the delivering institution for any harm arising from the delivery and subsequent processing of the data products. The applicant exempts the delivering institution from any liability towards third parties.

- I agree
 I don't agree

Continue



- **GITEWS Geodata**
 - 1:10.000
 - 1:25.000
 - 1:50.000
 - 1:100.000
 - 1:250.000
 - 1:1.000.000
 - 1:3.000.000
- **Shortcuts**
 - General remarks
- NaDiNe Home
- Helmholtz Home
- Helmholtz EOS Home
- Risks
 - Earthquakes
 - Floods
 - Oil Spills

GITEWS Geodata – Scale Based Overview

1:10.000

- ◆ [Satellite Data](#)

1:25.000

- ◆ [Maps](#)

1:50.000

- ◆ [Maps](#)

1:100.000

- ◆ [Elevation Data](#)
- ◆ [Maps](#)

Index von

ftp://gitews@ftp.dlr.de/download/geodata/scale1_10k/sat_data/ikonos/padang

[In den übergeordneten Ordner wechseln](#)

iko padang0 2005-04-12 pan ortho utm47s.tif	1013120 KB	29.11.2006 12:11:00
iko padang0 2005-04-12 ps-1234 ortho utm47s.tfw	1 KB	29.11.2006 11:55:00
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iko padang1 2005-04-12 ps-1234 ortho utm47s.tfw	1 KB	29.11.2006 12:35:00
iko padang1 2005-04-12 ps-1234 ortho utm47s.tif	3001243 KB	29.11.2006 13:09:00
iko padang 2005-04-12 metadata.txt	7 KB	29.11.2006 12:11:00

▼ Population





Next step: OGC compliant Catalogue Service

The screenshot shows the GITEWS web application interface. At the top, there is a navigation bar with links for Home, Last results, Administration, Contact us, Links, About, and Help. The user is logged in as 'Strobl Christian'. The main content area is titled 'Find Maps, GIS datasets, Satellite Imagery and Digital Elevation Data for the GITEWS project'. It features a search form with fields for Title, Abstract, Free Text (containing 'Bali'), Keywords (containing 'Quickbird'), Location (overlaps, Indonesia), Group (GITEWS), Category (Datasets), Site (Local), Map type (Digital checked, Hard copy unchecked), Template (Search for templates unchecked), and Hits per page (10). To the right of the search form is a 'Search' button with a gear icon. Below the search form, there is a section titled 'GeoNetwork's purpose is:' with a bulleted list of goals. Further down, there is a 'Featured map' section showing a satellite image of Bali South with the caption 'Quickbird satellite image of Bali South, acquired on 2006-05-16'. To the right of the featured map is a 'Recent Additions' section with a list of items, including 'Quickbird Bali South', 'Physiographic Map of North and Central Eurasia (SAMPLE DATA!)', 'Hydrological basins in Africa (SAMPLE DATA!)', 'Forests and Drylands Programme: Forests Homepage (SAMPLE DATA!)', 'Globally threatened species of the world (SAMPLE DATA!)', 'Original Forest Cover: Global Distribution of Original and Remaining Forests (SAMPLE DATA - PLEASE REMOVE BEFORE FINAL DEPLOYMENT!)', and 'Natural polar ecosystems (SAMPLE DATA - PLEASE REMOVE BEFORE FINAL DEPLOYMENT!)'. To the right of the recent additions is a 'Categories' section with a list of categories including Applications, Video/audio, Case studies, best practices, Datasets, Directories, Interactive resources, Maps & graphics, Other information resources, Photographs, and Conference proceedings.



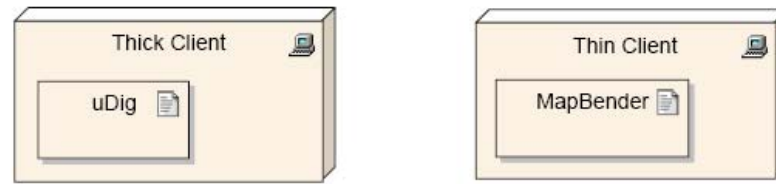
ISO 19115 compliant metadata:

Metadata according ISO/TC211, 2003

Metadata field	Description	Value
General Metadata		
Metadata Creation Date	Date that the metadata was created	2006-09-28
Language	Language used for documenting metadata	English
Identification		
Title	Identifies the location (URL) of the dataset to which the metadata applies	SRTM best-of DEM Tile 1 (Sumatra north)
Abstract	Brief narrative summary of the content of the resource(s)	SRTM best-of DEM is a fusion product of digital elevation models derived from SRTM-X and SRTM-C-band data. Fusion, filtering of SRTM-X derived DEM and land mask is applied. Missing value -9999 is assigned to ocean pixels
Descriptive Keywords	Provides category keywords, their type, and reference source	Digital elevation model, SRTM, DEM fusion
Citation	Citation data for the resource(s)	DLR (2006): SRTM best-of DEM Sumatra North
Date	Reference date for the cited resource	2006-09-22
Dataset	Identifies the location (URL) of the dataset to which the metadata applies	ftp://gitews@ftp.dlr.de/download/geodata/scale4_100k/elevation/srtm-tile1/dem100_srtm-best-of_tile1_v1_ll-wgs84.tif
Lineage	Non-quantitative quality information about the lineage of the data specified by the scope	<p>Several processing steps were performed to optimize the DEM fusion product.</p> <ol style="list-style-type: none"> 1. A filtering of SRTM-X derived digital elevation models (DEM) were applied. Several filtering steps were performed including a detection of radar shadow and (radar-dark) water areas in the amplitude information, a detection of outlier values that may represent unwrapping errors, a general smoothing to reduce elevation noise and an interpolation of regions of missing data. The process is described in: <ul style="list-style-type: none"> J. Hoffmann (2005): DemDelight: fixdem. Editing tool to optimize SRTM-X data for geocoding TerraSAR-X data. Version 1.1. DLR-internal Technical Note. Examples for image chips before and after the filtering process are given in the file "dem_x-band_filter-demo.ppt" 2. Fusion process of SRTM-X and -C, which is described in: <ul style="list-style-type: none"> A. Roth, W. Knöpfle, G. Strunz, M. Lehner, P. Reinartz (2002): Towards a Global Elevation Product: Combination of Multi-Source Digital Elevation Models. In: Proc.



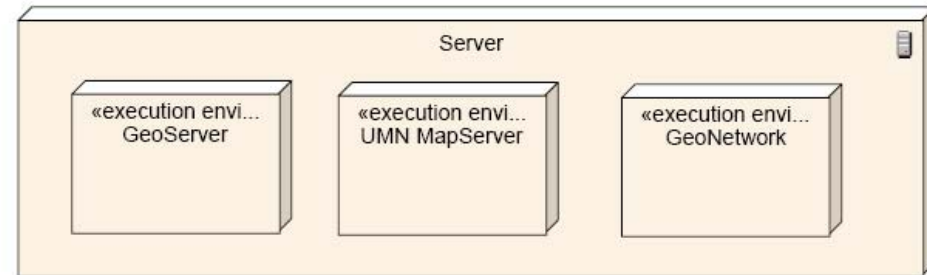
Client Layer



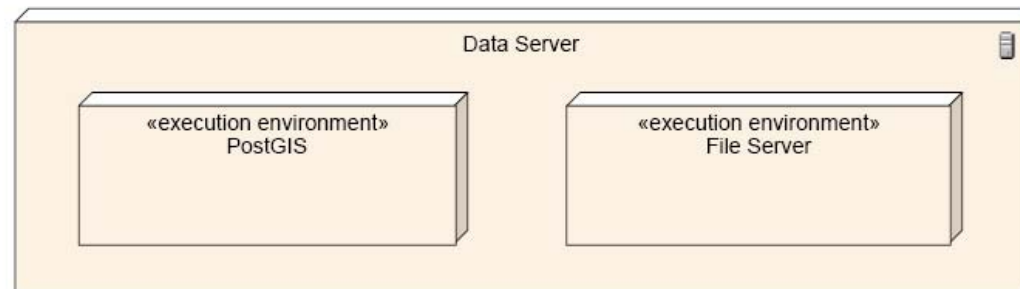
OGC-Interfaces



Service Layer

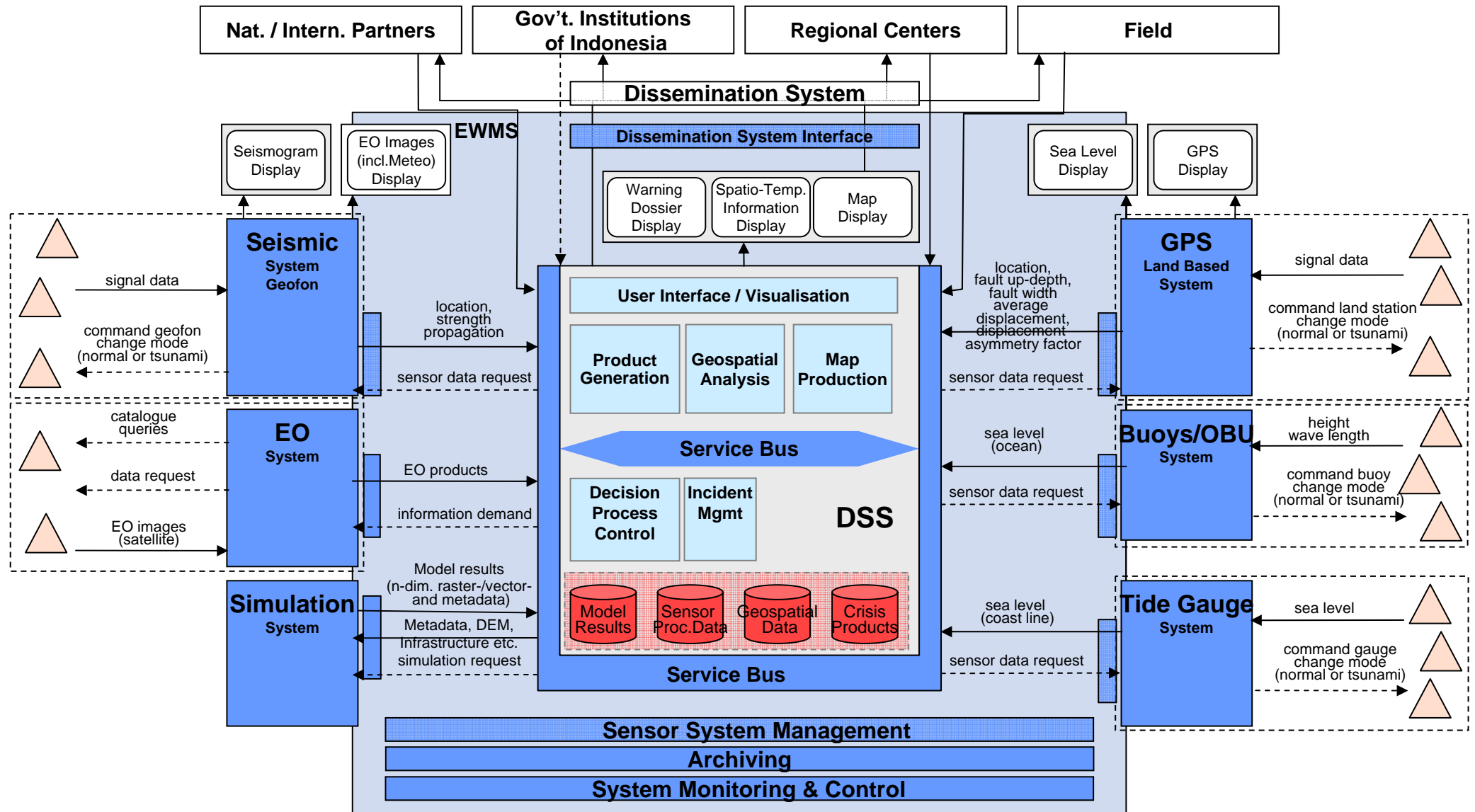


Data Layer





Functional overview of DSS





- 7 Geospatial data repository ftp-service
- 7 Geospatial data catalogue service
- 7 ISO 19115 compliant Metadata
- 7 System Architecture and OGC Standards
 - 7 OGC compliant geospatial database
 - 7 Web Map Service
 - 7 Web Feature Service
 - 7 Web Coverage Service
- 7 Integration of geospatial data repository into DSS
- 7 **Operation of geospatial data repository at 2008**

