Collaborative Geo-Information Service for Disaster Management

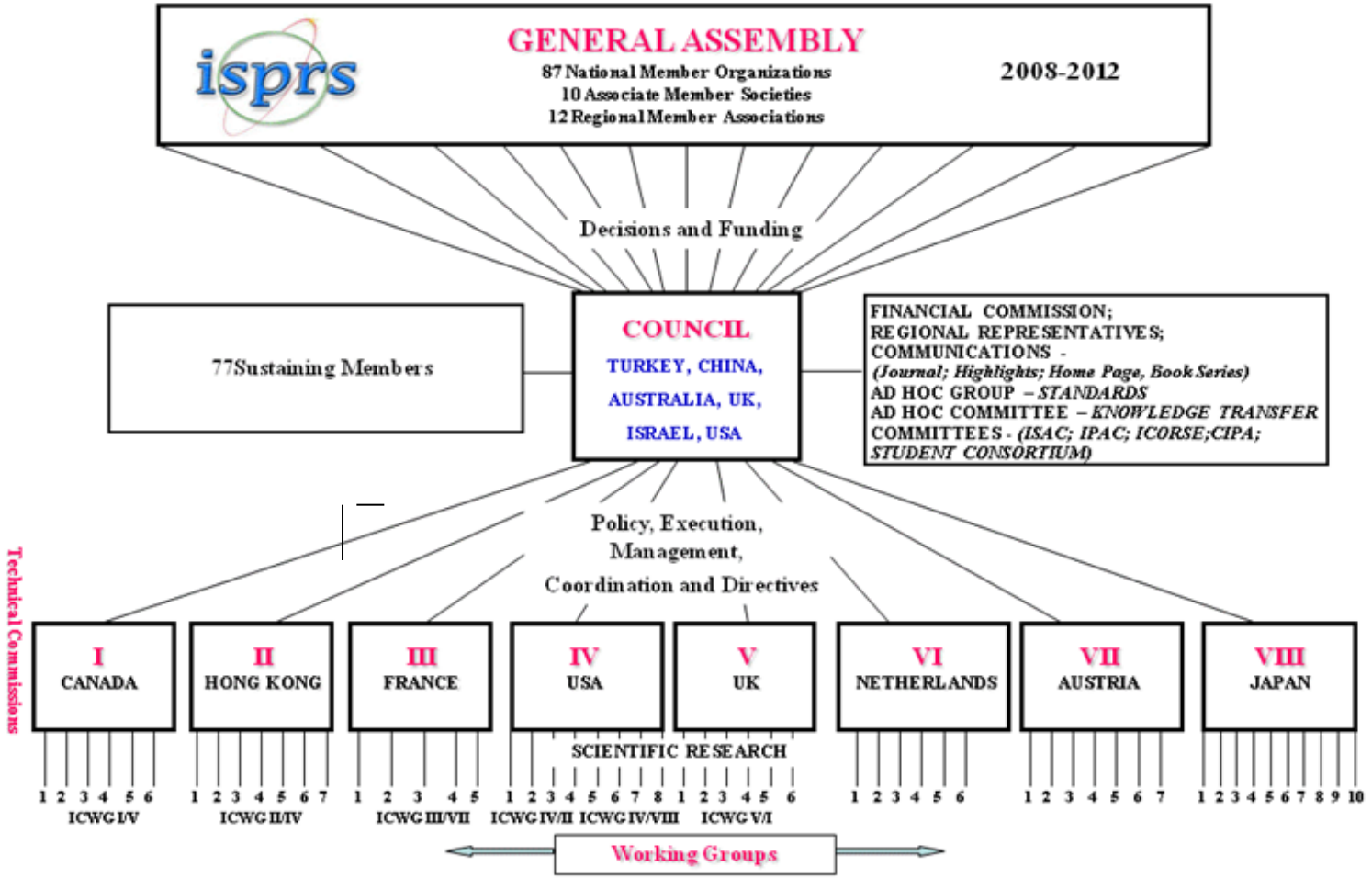
Chen Jun [1,2]

1 International Society of Photogrammetry and remote Sensing (ISPRS)

2 National Geomatics Center of China

Nov. 22, 2011, Beijing, China

ISPRS: 101th year of Serving the Society with Information from Imagery



"ISPRS is a Society of National Societies and Organizations"

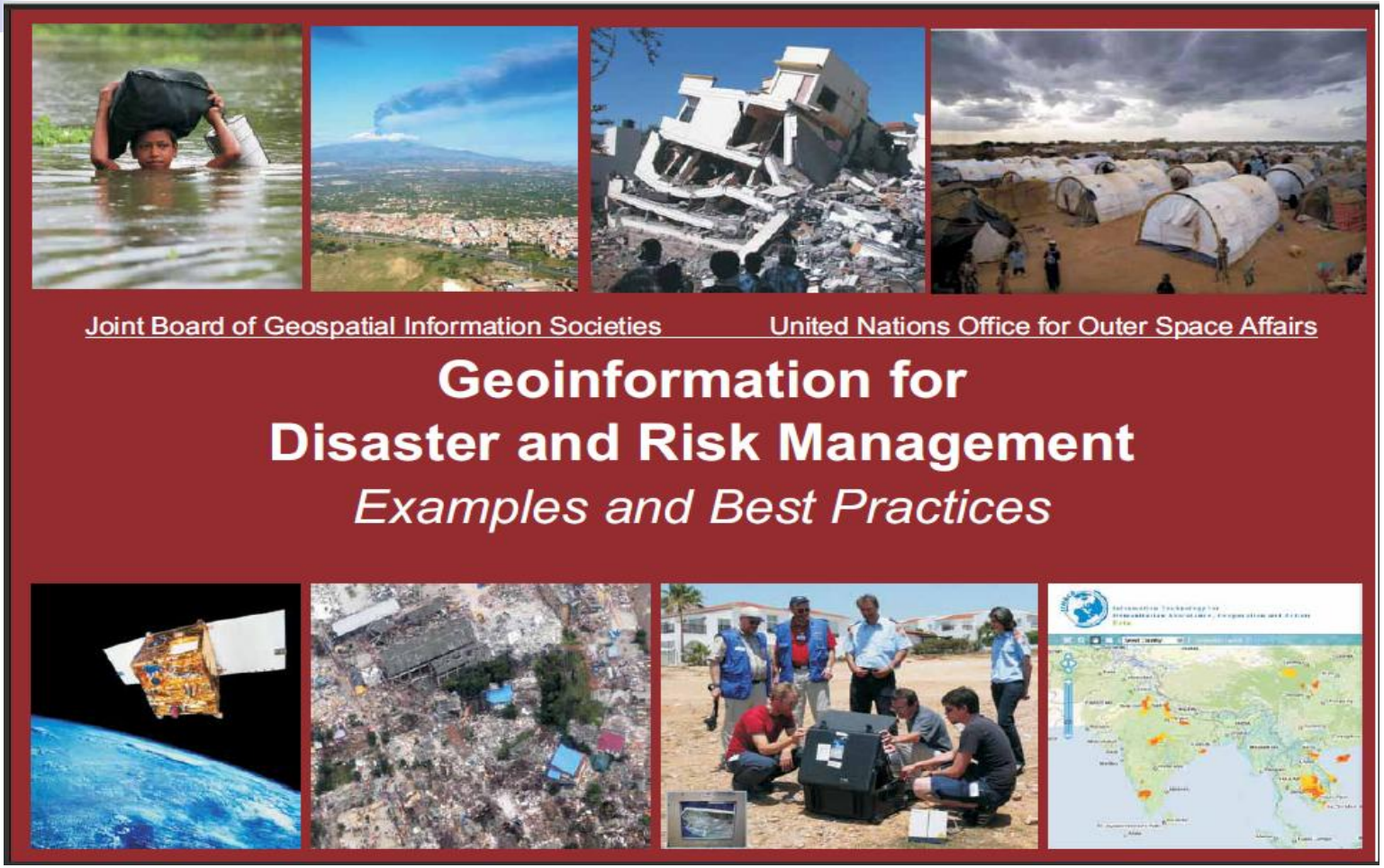
Contents

GI in Disaster Risk Management

- JBGIS/UNOOSA
- Booklet Launch, 2nd of July 2010, Vienna

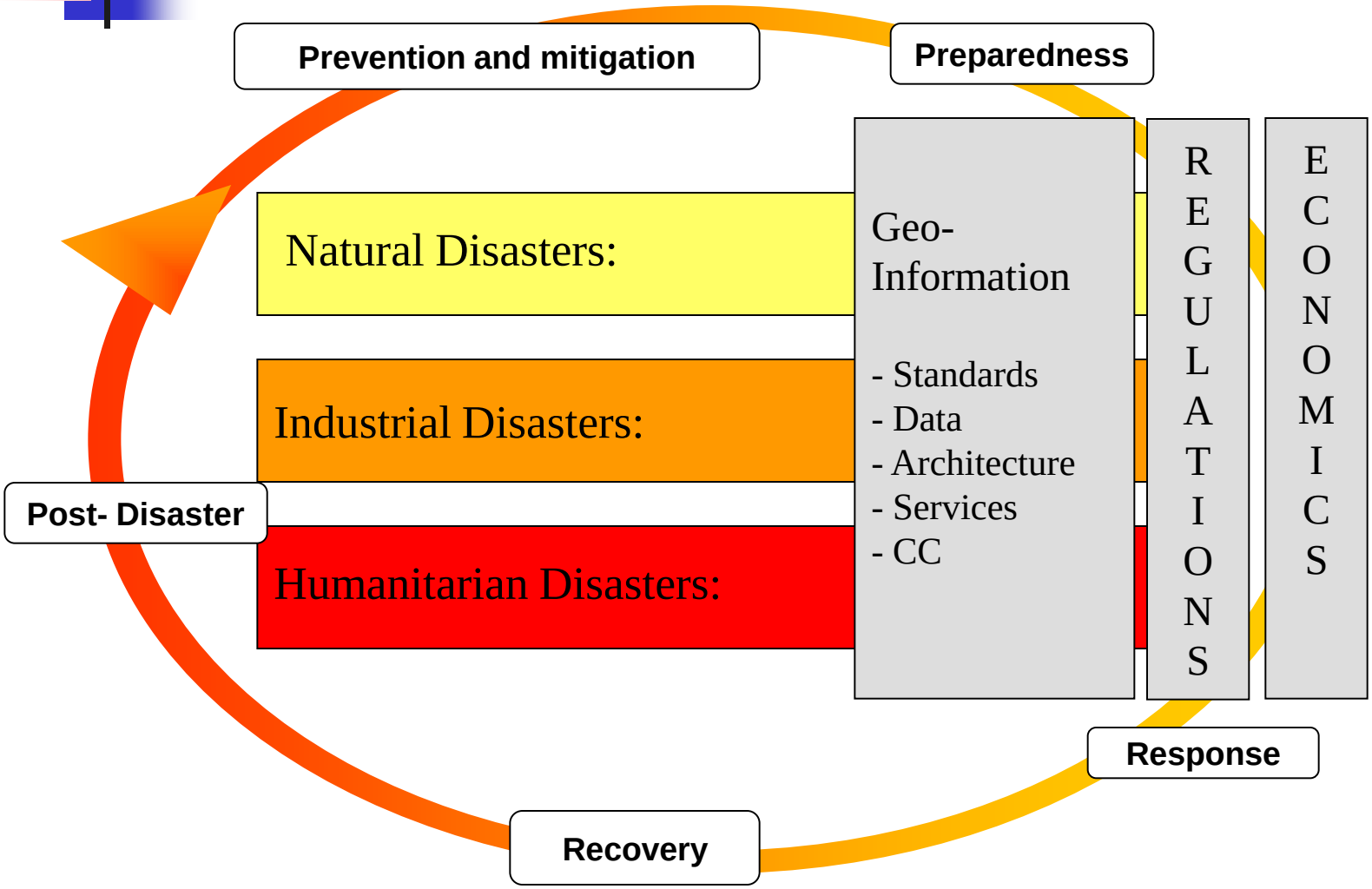
•**Editors: Orhan Altan, Robert Backhaus, Piero Boccardo and Sisi Zlatanova**

Provided knowledge on what can be done?



www.isprs.org

Role of Geo-information in Disaster management



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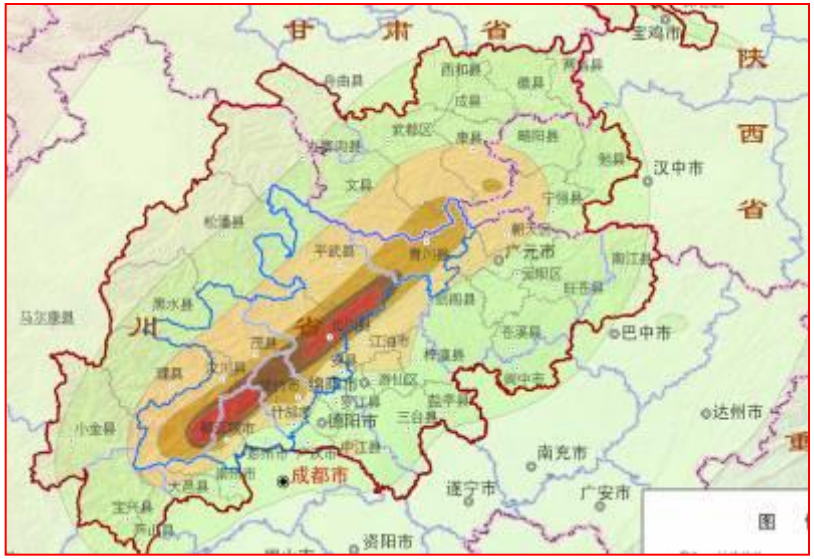
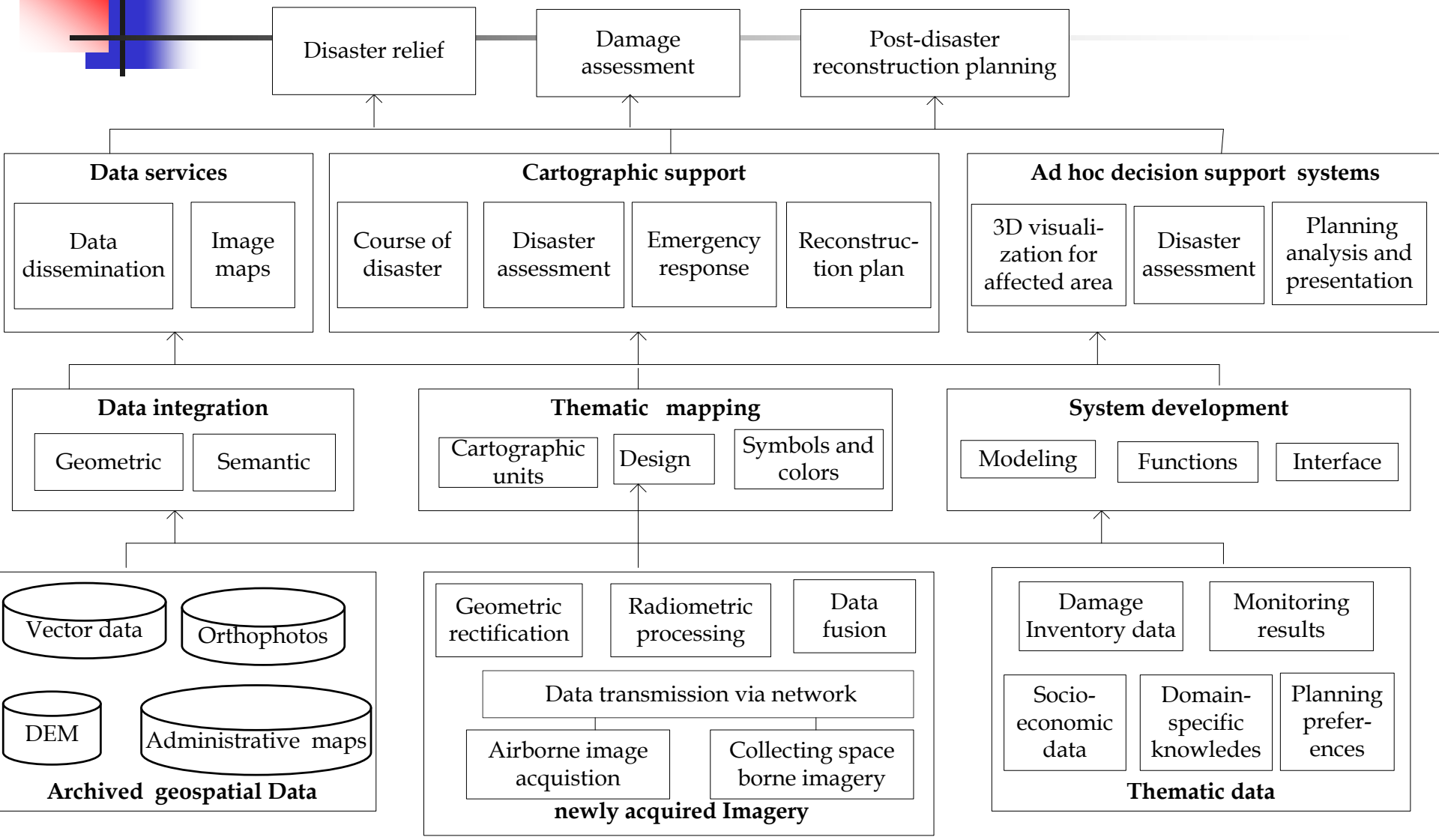
1. GI for disaster management
2. **Collaborative disaster mapping**
3. Towards cross-boarder collaboration

Wenchuan Case
（汶川地震巨灾）



Collaborative GI Emergency Service



Key factors for EQ Disaster Mapping

（地震灾害的主题分类）

•汶川地震灾害专题图主题

•孕灾环境	•承灾体	•致灾因子	•灾情评估	•灾害响应	•恢复重建
●地质构造 ●地质地貌 ●气候水文 ●土壤生物	●人口 ●城镇 ●交通通讯 ●水利电力 ●资源 ●经济	●地震 ●地质灾害与水灾 ●滑坡 ●崩塌 ●泥石流 ●堰塞湖	●综合灾情评估 ●人口损失 ●住房损失 ●农业损失 ●工业损失 ●服务业损失 ●基础设施损失 ●社会事业损失 ●居民财产损失 ●土地资源损失 ●自然生态损失 ●文物损失 ●极重灾区-汶川县……(共计10个县) ●重灾区-理县……(共计41个县)	●应急救援 ●应急救助 ●全国哀悼日 ●应急转移安置 ●科技支撑 ●灾害监测 ●国际救援	●重建规划 ●对口支援
●中国板块构造 ●灾区地质 ●降水量分布 。。。	●灾区人口密度 ●灾区城镇 ●灾区国内生产总值 。。。	●灾区历史地震 ●极重灾区次生灾害分布 ●极重灾区滑坡分布 。。。	●灾区综合灾情 ●灾区人员死亡和失踪程度 ●灾区住房受损 ●灾区教育系统损失 ●汶川县综合灾情 。。。	●汶川地震灾区应急转移安置人口分布 ●汶川地震震中及周边地区地形形变监测水平位移图 。。。	●灾区规划范围 ●灾区重建分区 ●灾区产业集聚区 。。。

Six major themes

1、Hazard formative environment (孕灾环境)

2、Hazard affected bodies(承灾体)

3、Hazard formative factors (致灾因子);

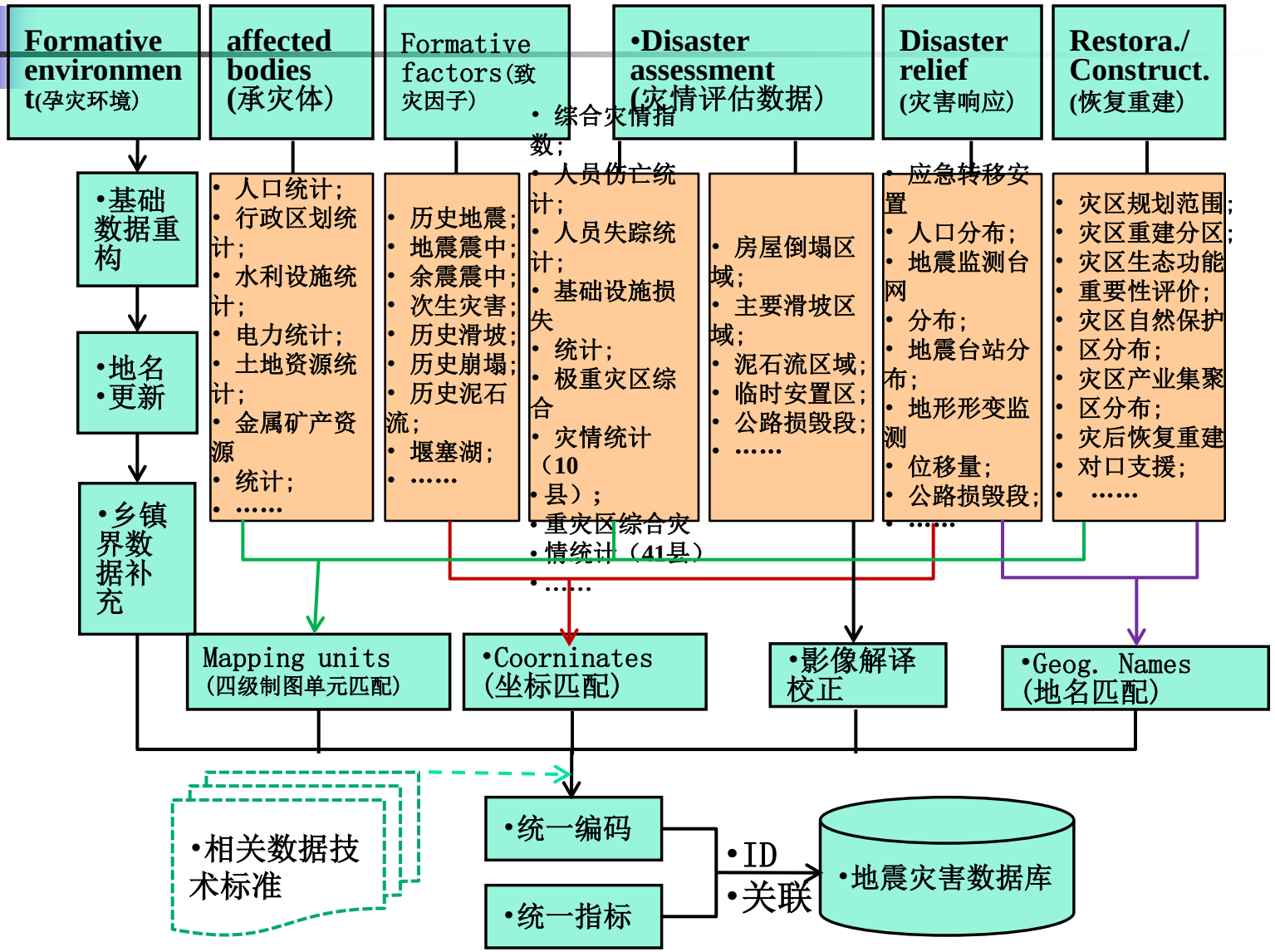
4、Disaster assessment (灾情评估);

5、Disaster relief(灾害响应)

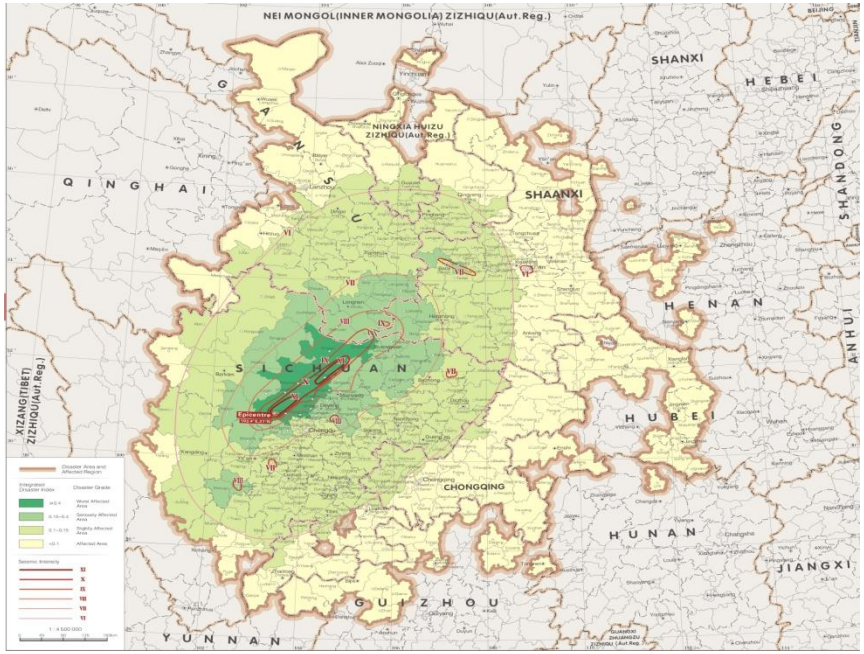
6、Restoration and5、construction (恢复重建)

Integration of multi-disciplinary data

（多源灾害信息的空间化整合）



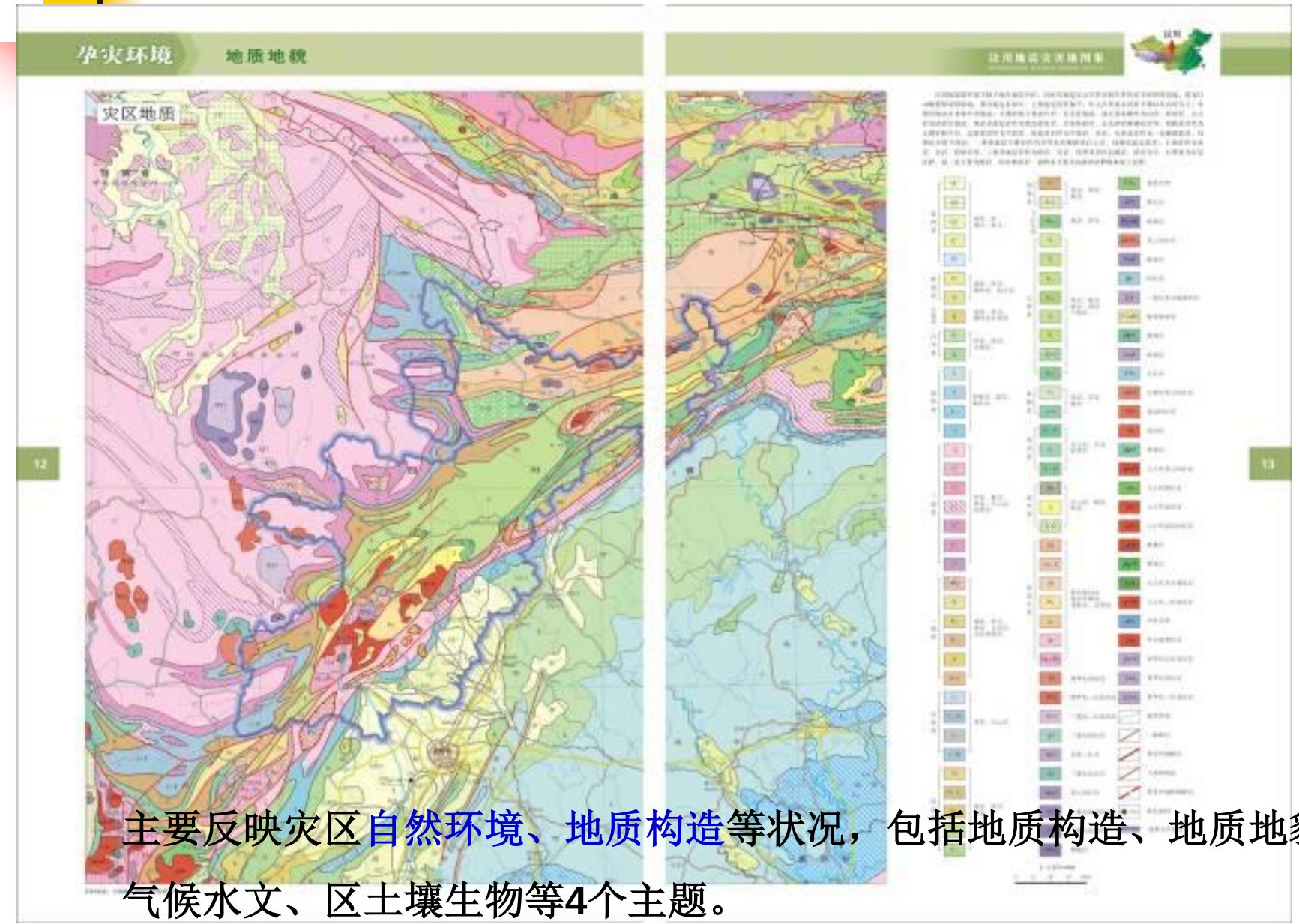
Four different levels of quake-affected areas



- Dark green: the worst affected area (10 counties)
- Green: the most seriously affected area (41 counties)
- Pea green: slightly seriously affected area (186 counties)
- Yellow: affected area (419 counties)

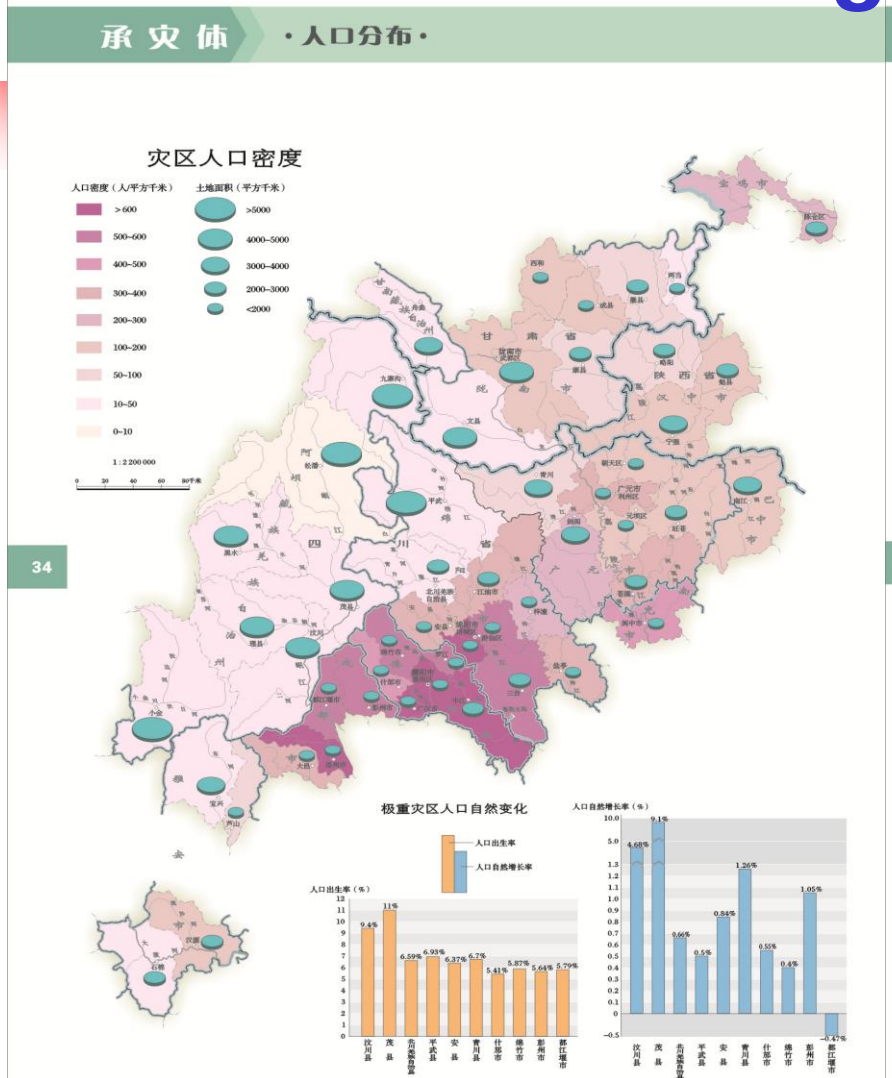
2.1 Hazard formative environment

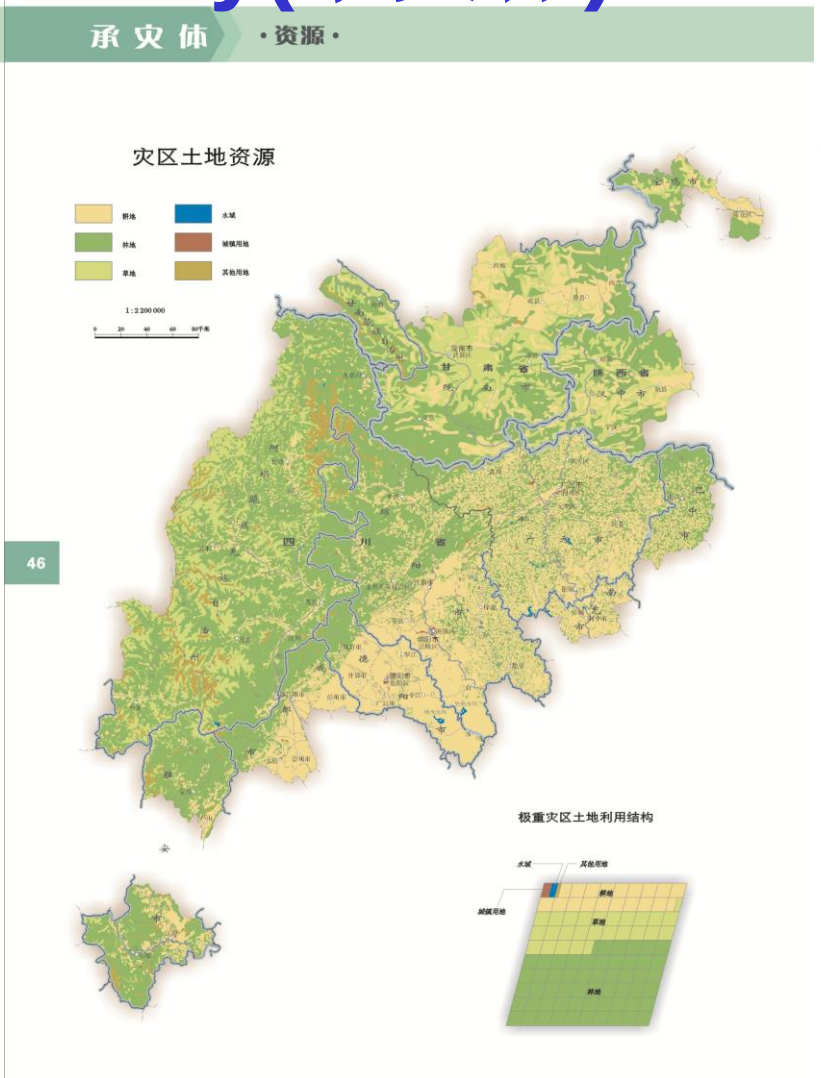
(孕灾环境)



主要反映灾区自然环境、地质构造等状况，包括地质构造、地质地貌、气候水文、区土壤生物等4个主题。

2. 2 Bearing body(承灾体)

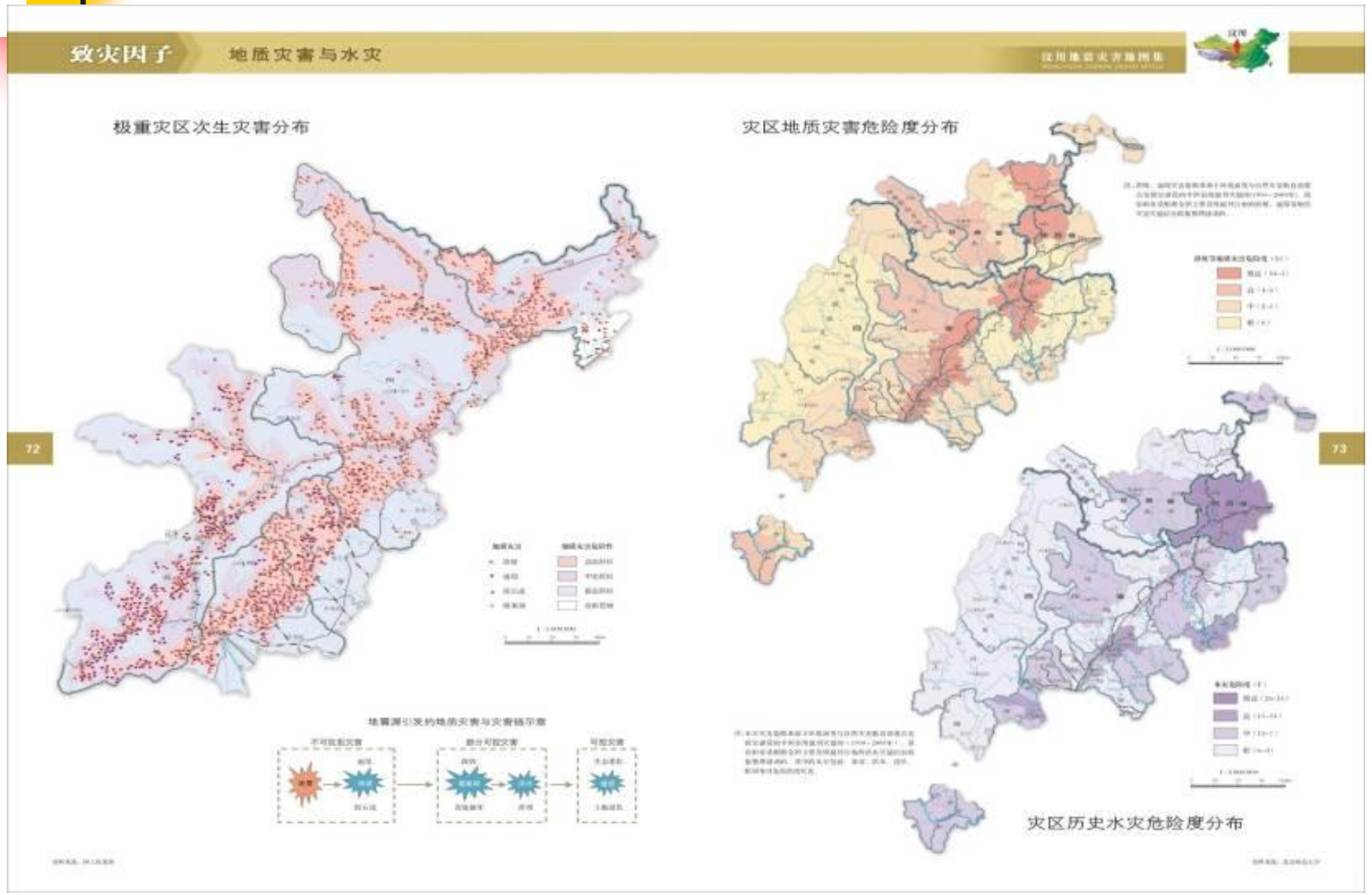




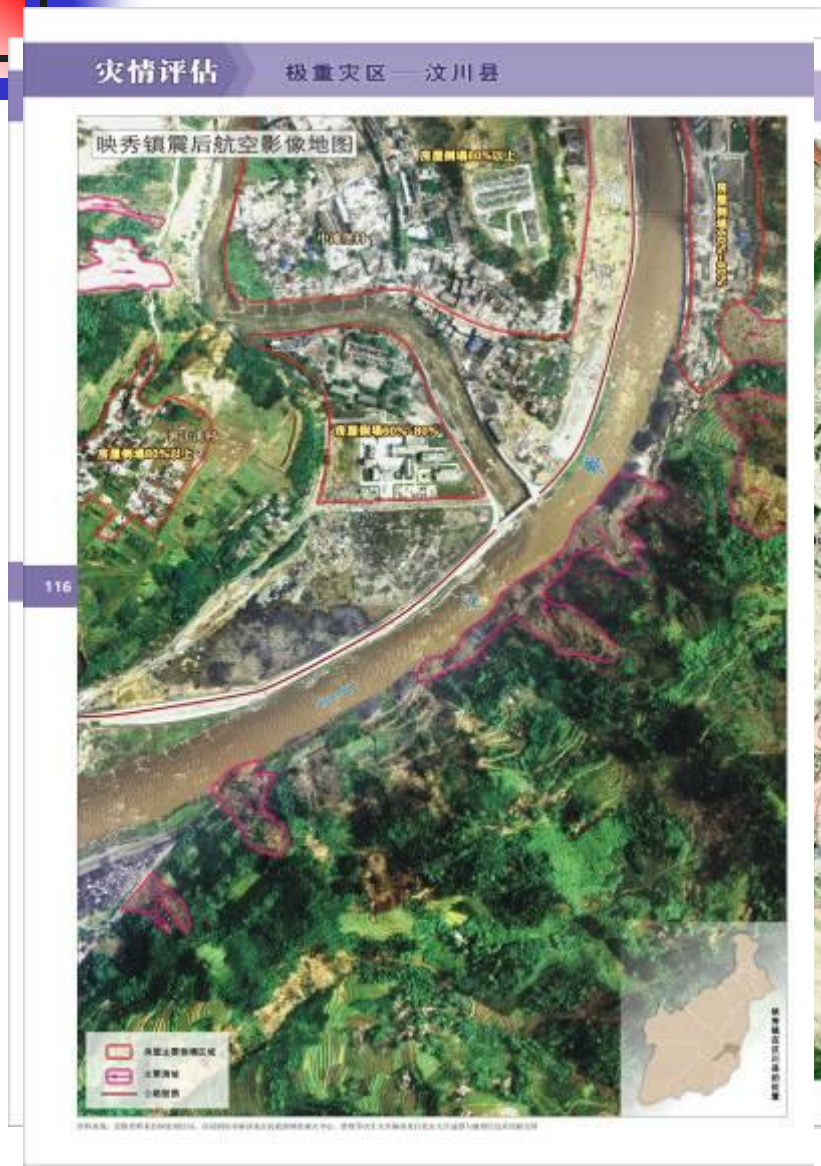
- 主要反映灾区社会人文经济等状况,包括人口分布、城镇分布、交通通讯\水利设施、资源、经济等6个主题 。

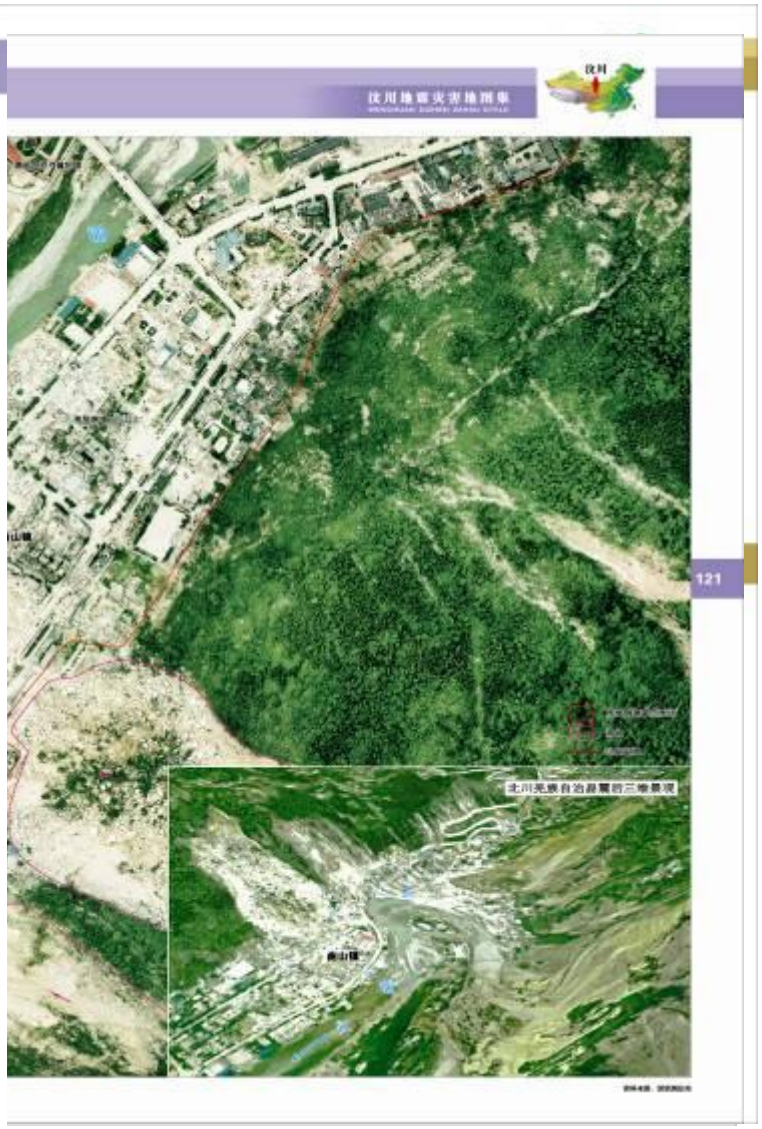
Bearing bodies
(承载体)

Hazard formative factors
(致灾因子)

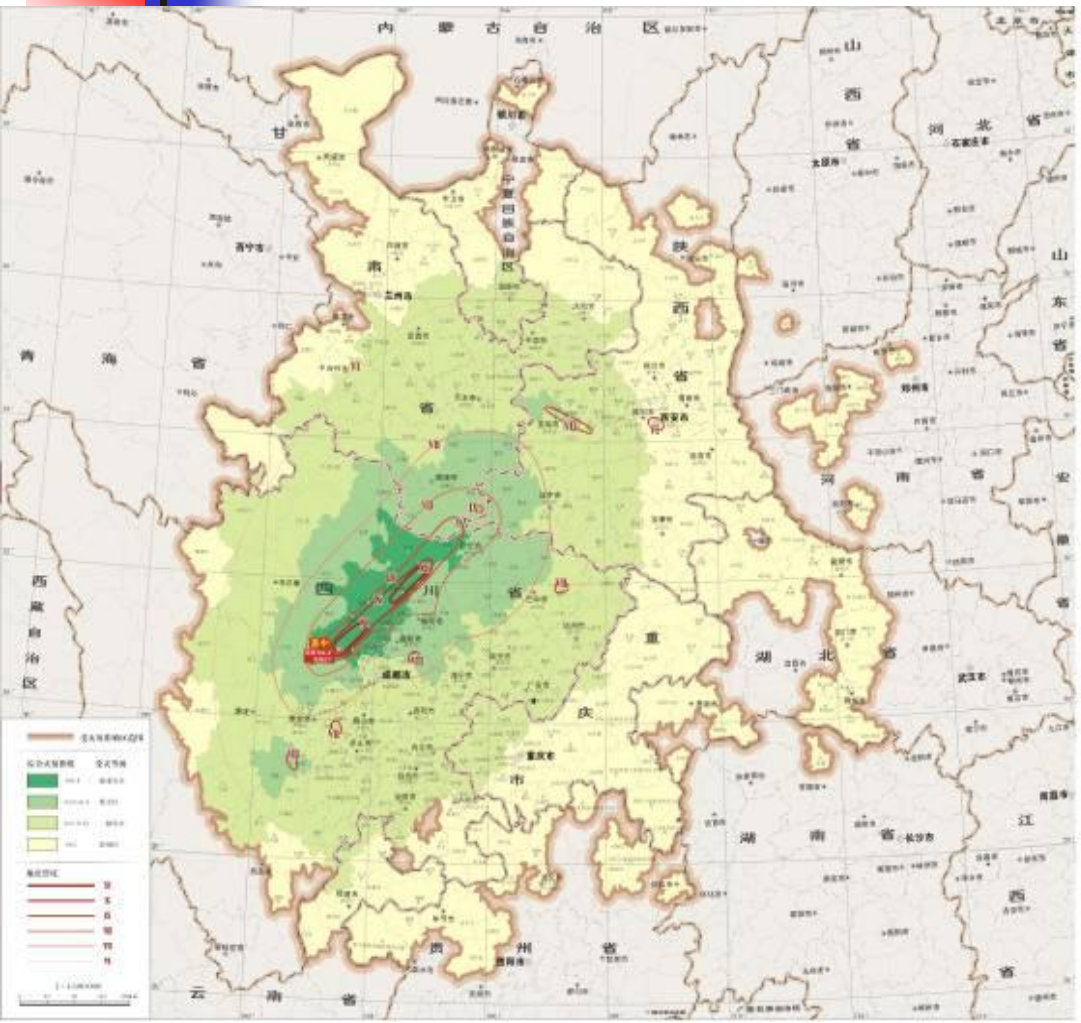


2.4 Disaster assessment
(灾情评估)





Affected area and degrees
(灾害范围类型评估)

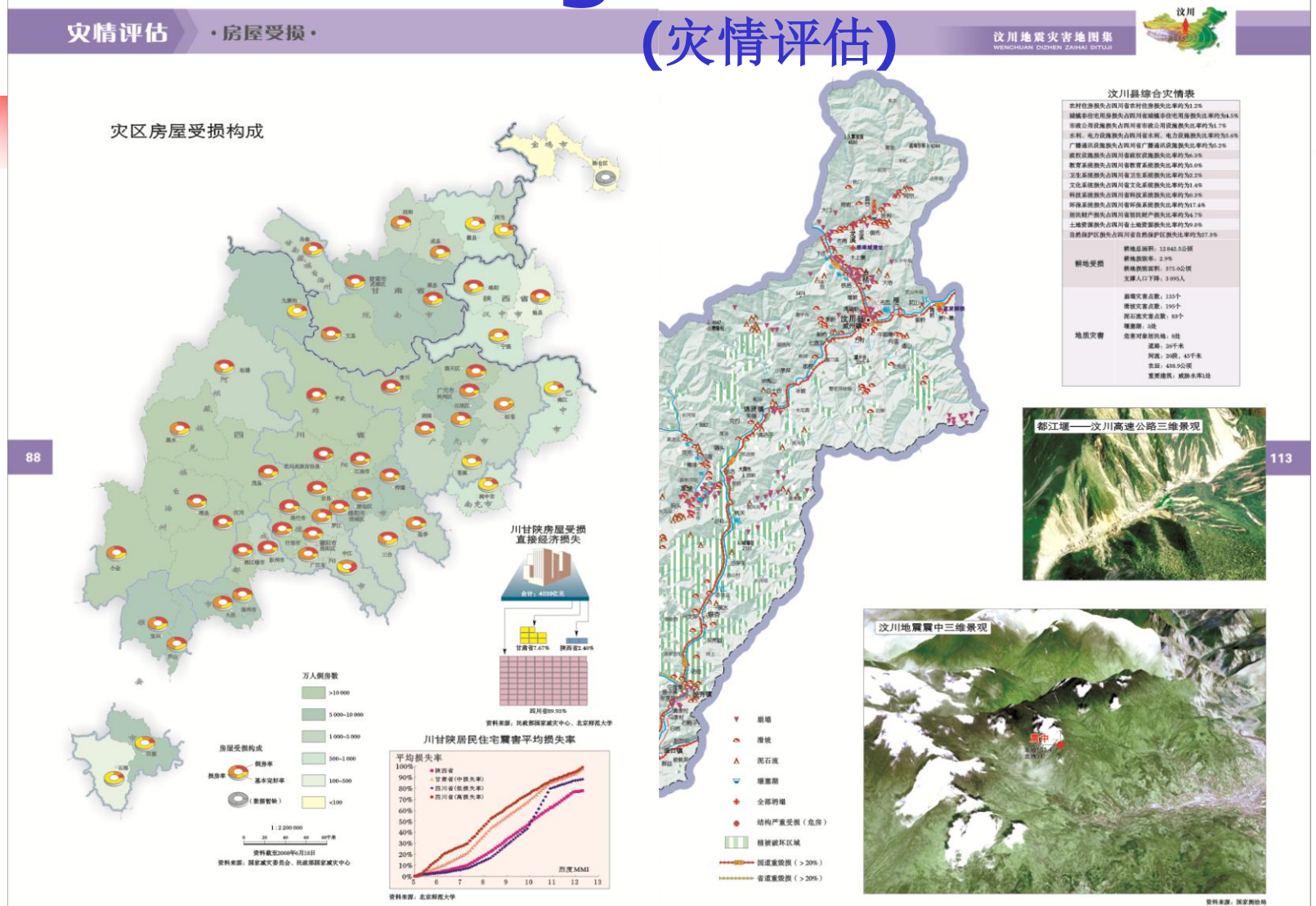


•10 most serious disaster countries, about 26,104 km2

• 41 serious disaster countries, about 130,104 km2

•417 affected countries in Sichuan, Shanxi and Gansu Province, with total area of about 500,104 km2.

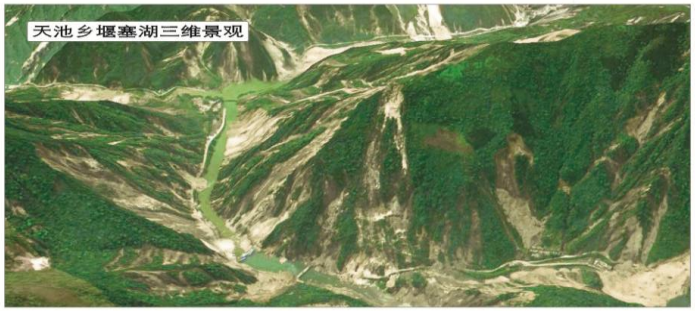
Damage assessment
(灾情评估)

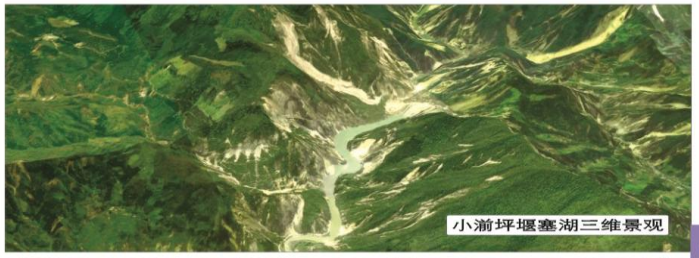


•反映受灾情况、总体评估等，包括综合灾情评估、人员损失、房屋受损、工业损失、农业损失、基础设施损失、自然生态损失、文物损失、极重灾区分县灾情、重灾区分县灾情等**10**个主题。

绵竹市综合灾情表

农村住房损失占四川省农村住房损失比率约为6.9%	
城镇非住宅用房损失占四川省城镇非住宅用房损失比率约为6.5%	
市政公用设施损失占四川省市政公用设施损失比率约为39.2%	
水利、电力设施损失占四川省水利、电力设施损失比率约为2.9%	
广播通讯设施损失占四川省广播通讯设施损失比率约为13.0%	
政权设施损失占四川省政权设施损失比率约为5.7%	
教育系统损失占四川省教育系统损失比率约为4.4%	
卫生系统损失占四川省卫生系统损失比率约为4.6%	
文化系统损失占四川省文化系统损失比率约为24.5%	
科技系统损失占四川省科技系统损失比率约为4.2%	
环保系统损失占四川省环保系统损失比率约为13.2%	
居民财产损失占四川省居民财产损失比率约为15.5%	
土地资源损失占四川省土地资源损失比率约为6.5%	
耕地受损	耕地总面积：54 515.4公顷
地质灾害	崩塌灾害点数：399个 滑坡灾害点数：28个 泥石流灾害点数：8个 堰塞湖：4处 重大隐患灾害点数：106个 危害对象居民地：毁坏9处，威胁5处 道路：10段，9.28千米 河流：威胁19段，19.09千米 农田：毁坏0.36平方千米 重要建筑：破坏铁路3段，3.31千米



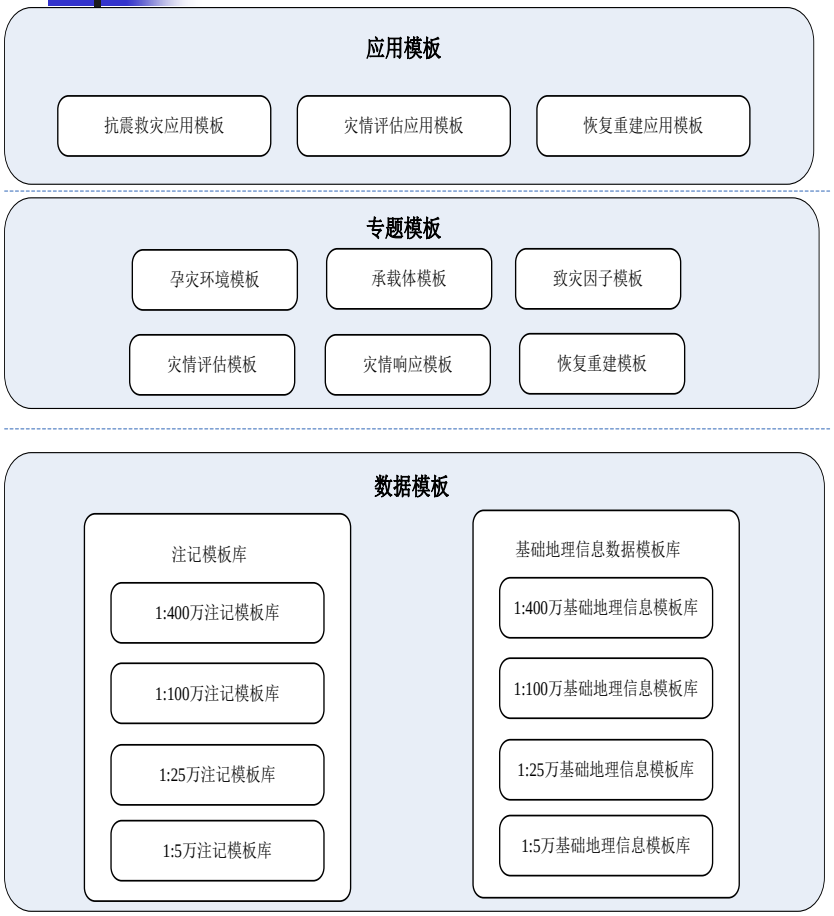


资料来源：国土资源部中国地质调查局中国国土资源航空物探遥感中心 国家测绘局

2.5 Restoration and construction
(恢复重建规划)

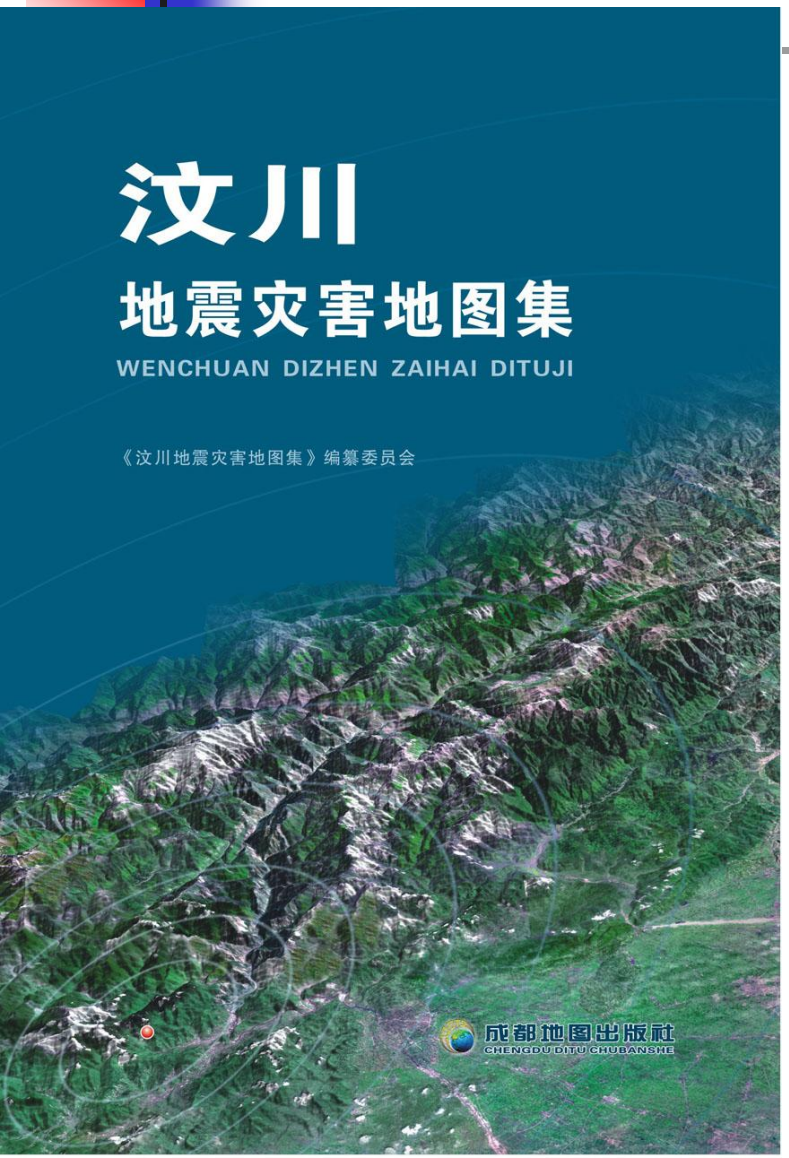
Self-adaptive automatic mapping

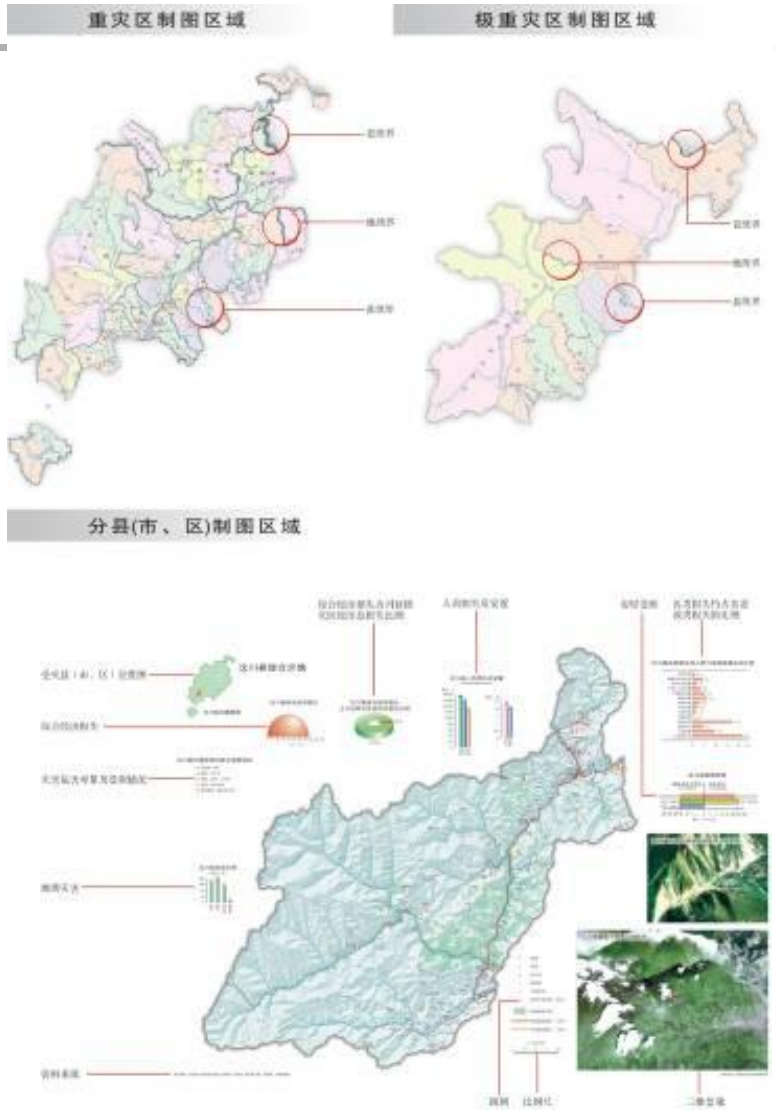
（自适应动态制图）



- **Self-adaptive automatic mapping includes three issues:**
- **1) Classification and hierarchy of map templates**
- **2) Dynamic combination of map templates**
- **3) Specification of the map extent and scale**
- **Besides having the characteristics of traditional static map template, the self-adaptive map template has more compatible and extensible capabilities.**

Wenchuan EQ Disaster Atlas



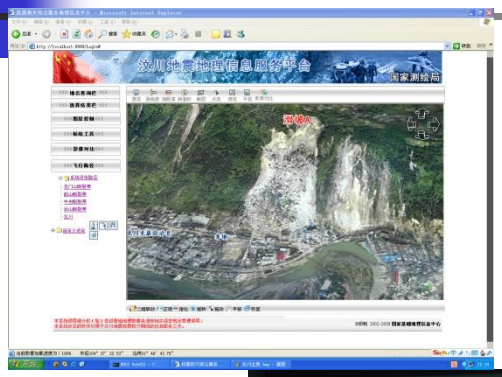


Wenchuan EQ Disaster Atlas

Disaster Atlas of Wenchuan Earthquake
(8 graphic groups and 43 topics)

Background	Hazard-formative Environments	Hazard-affected Bodies	Hazard-formative Factors	Disaster Assessment	Disaster Relief	Restoration and Reconstruction	Appendix
• Map of China • Topography of China • Impacted areas and degrees	• Geological structure • Land surface cover • Impacted areas and degrees • Climate & hydrology • Soil & biology	• population • Administrative units • Transportation • Communication • Irrigation • Resource • Economy	• Earthquake • Geological disaster & floods • Landslide • Collapse • Debris flow • Barrier lakes	• Comprehensive disaster loss assessment • Casualty • Building damage • Industry loss • Agriculture loss • Service loss • Infrastructure loss • Social undertakings loss • Residents property loss • Land resource loss • Ecology loss • Cultural heritage loss • Disaster loss in extremely hardt-hit area • Disaster loss in hardt-hit area	• Emergency rescue • Emergency relief • National day of mourning • Transfer and placement • Scientific and technological support • Disaster monitoring • International rescue	• Reconstruction planning • Counterpart assistance	• Regulations on Post-Wenchuan Earthquake Rehabilitation & Reconstruction • A few notes on atlas compilation
3 topics	4 topics	6 topics	6 topics	14 topics	7 topics	2 topics	2 topics

Three Ad-hoc GISs



- 3D GISs for EQ area

（国家汶川地震专家委员会，国家减灾委/科技部专家组，各对口支援省（市）人民政府）

- Disaster Assessment GIS

(国家减灾委/科技部专家组）

- Re-constructions GIS

(国家汶川地震重建规划组）

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3. **Towards cross-boarder collaboration**

Activities and co-operation between relevant international organisations

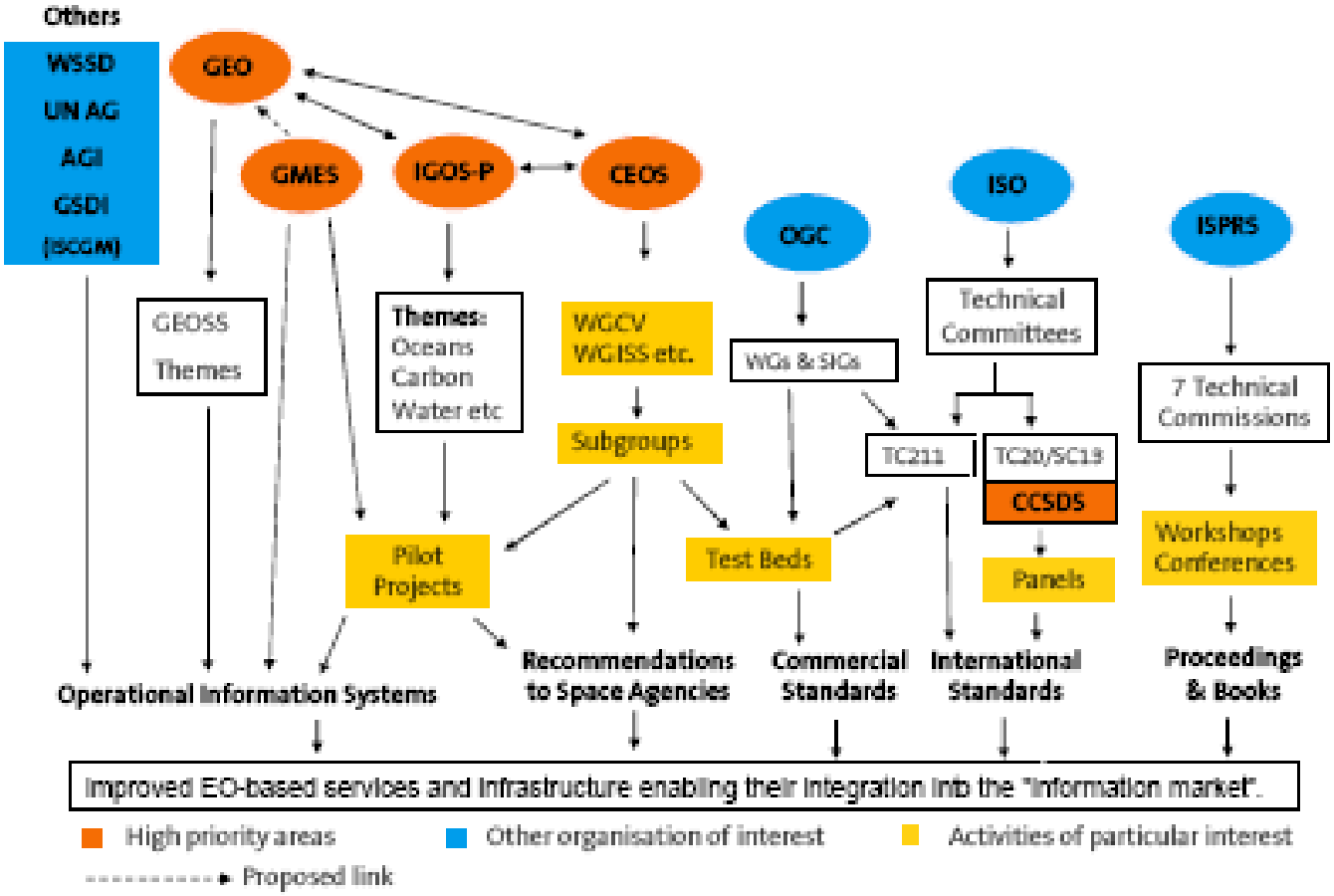


Figure A-2; Activities and co-operation between relevant International Organisations

3.1 What is it worth? - VALID project

VALID

- The Value of GI for Disaster Management

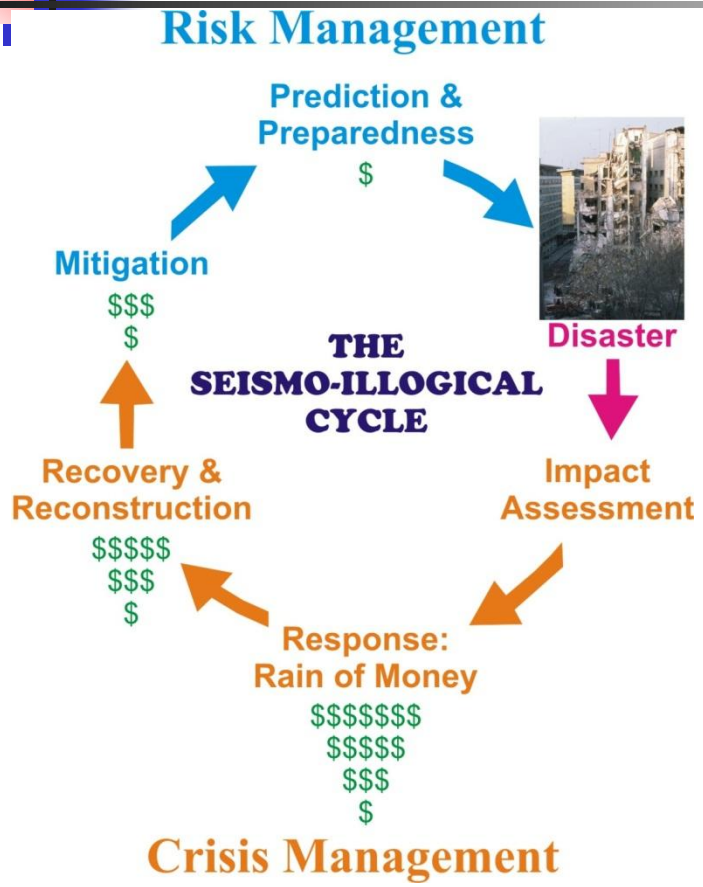
Goals

•Benefit evaluation

•Awareness in the political and programmatic environment

•Highlighting priorities in research and development.

Crucial Economic Inconsistencies



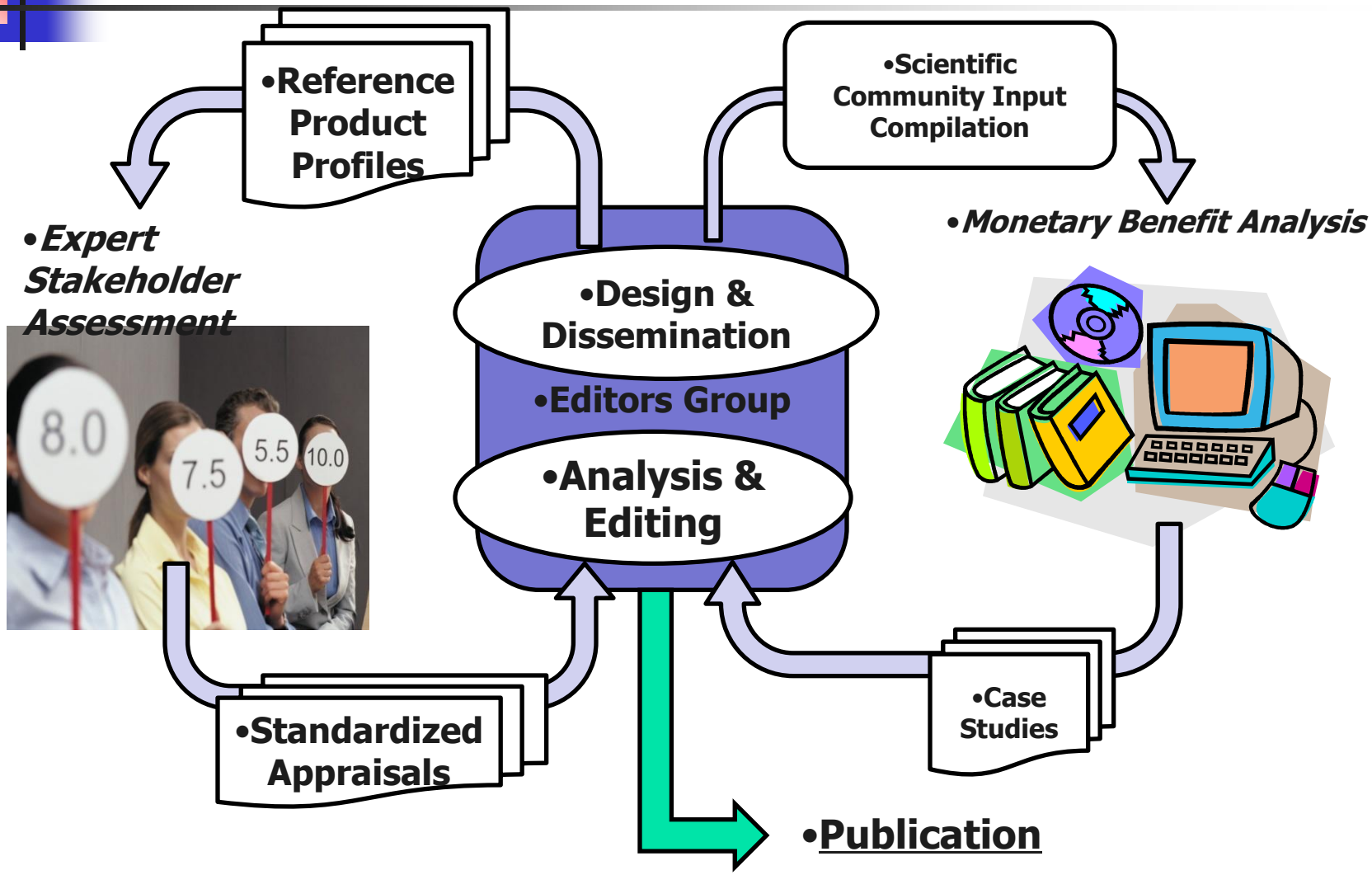
If about 5 to 10% of the funds, necessary for recovery and rehabilitation after a disaster, would be spent to mitigate an anticipated earthquake, it could in effect save lives, constructions, and other resources.

. Ismail-Zadeh, OECD Workshop, 2006; ENHANS International Workshop on Extreme Natural Hazards and Disaster

Status

- Project description available
- Endorsement by UNOOSA (meeting in Vienna during the COPUOS Meeting February 2011)
- Project site on www.un-spider.org/publications/VALID
- Presentation to 20 Gi4DM-11 participants (VALID Round Table, including UN-OCHA, ESRI, OGC, NAPSG Foundation, TU Vienna/ICA)
- Geodata products long-list (51 items) published on project site for prioritization by the global community
- Prioritization call closed, results under evaluation

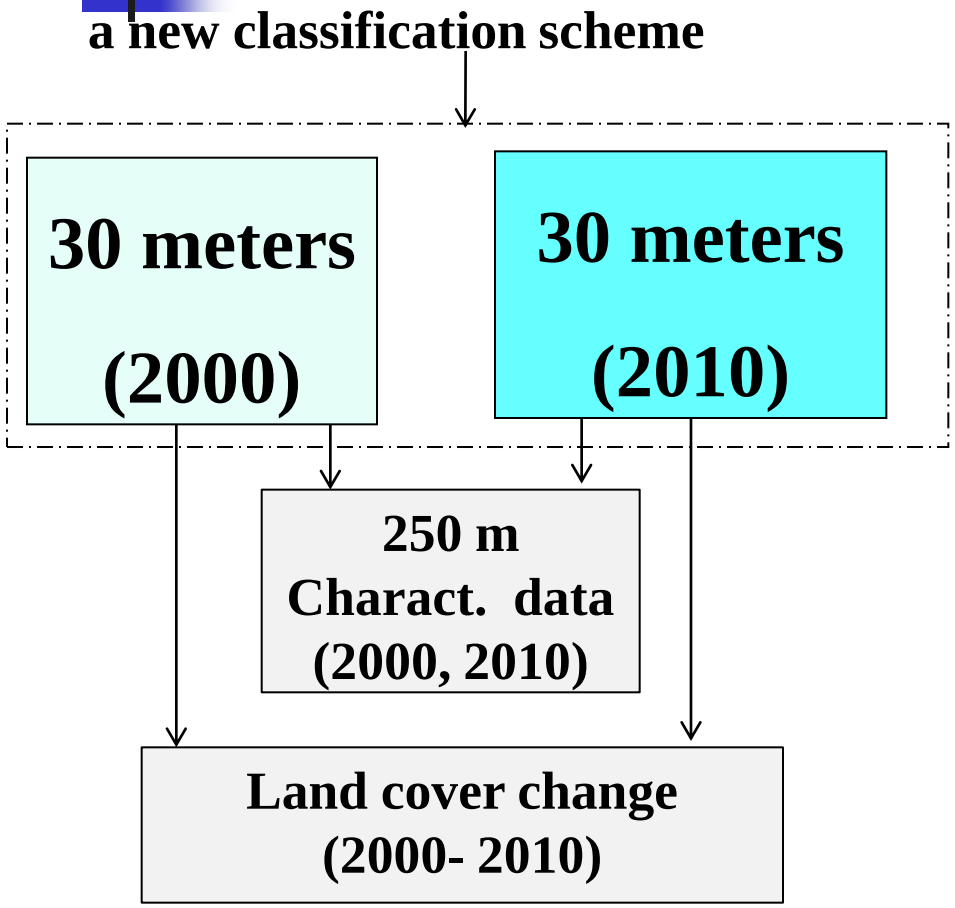
Logic Flow Chart: General Approach

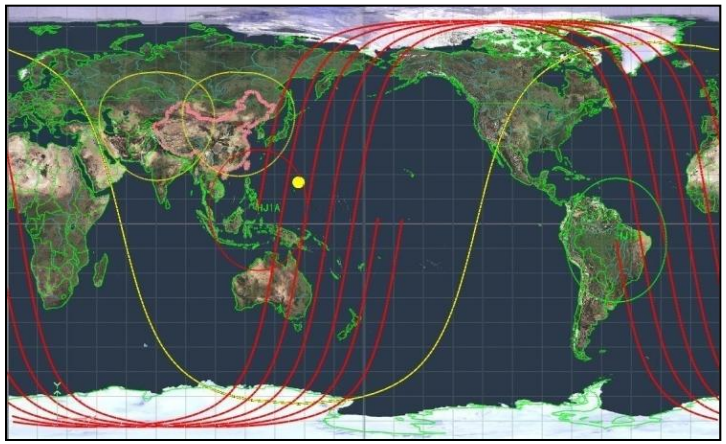


3.2 Institutional Structures for Applying EO to Hazard and Risk

- Structures exist at many levels
  - Inter Government – GEO
  - Inter Agency – CEOS
  - National and Regional
- Need for coordination to create regional and global networks is essential
- There is progress
  - GEONetcast
  - Tsunami warning systems
- Technology is available
  - IfSAR for Earthquake analysis
  - EO for tsunami warning?

Higher resolution GLC products

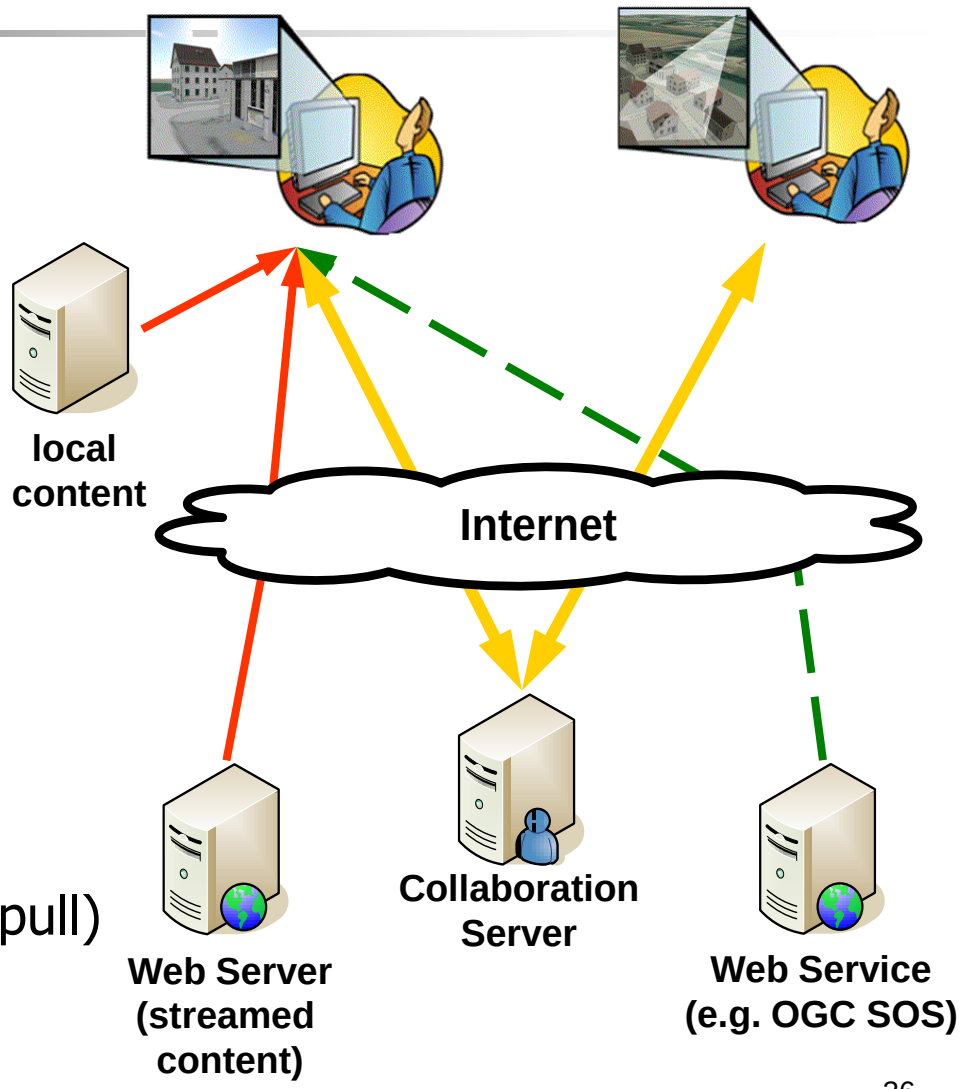




- **Produce higher resolution(spatial and temporal) new GLC products (**研制全球二期高分辨率地表覆盖数据产品**)**

3.3 Content Delivery & Sharing

- Content Channels
  - Static /fixed content
  - Streamed content
  - Content services
  - Synchronised content
- Content Delivery Types
  - Pull
  - Push
  - Object synchronisation (push/pull)



3.4 Integrated open standards

- OGC – Open Geospatial Consortium
  - SWE (Sensor Web Enablement) Standards
    - SAS (Sensor Alert Service)
    - SOS (Sensor Observation Service)
    - WNS (Web Notification Service)
  - OWS (OGC Web Service) Standards
    - WMS (Web Mapping Service)
    - WPS (Web Processing Service)
    - WFS (Web Feature ServiceOASIS – Organisation for the Advancement of Structured Information Standards
  - EM (Emergency Management)
    - CAP (Common Alerting Protocol)
    - EDXL-DE (Emergency Data Exchange Language - Distribution Element)

[OGC, Antalya), May, 2011]


Thanks you for your attention!