



Collaborative Geo-Information Service for Disaster Management

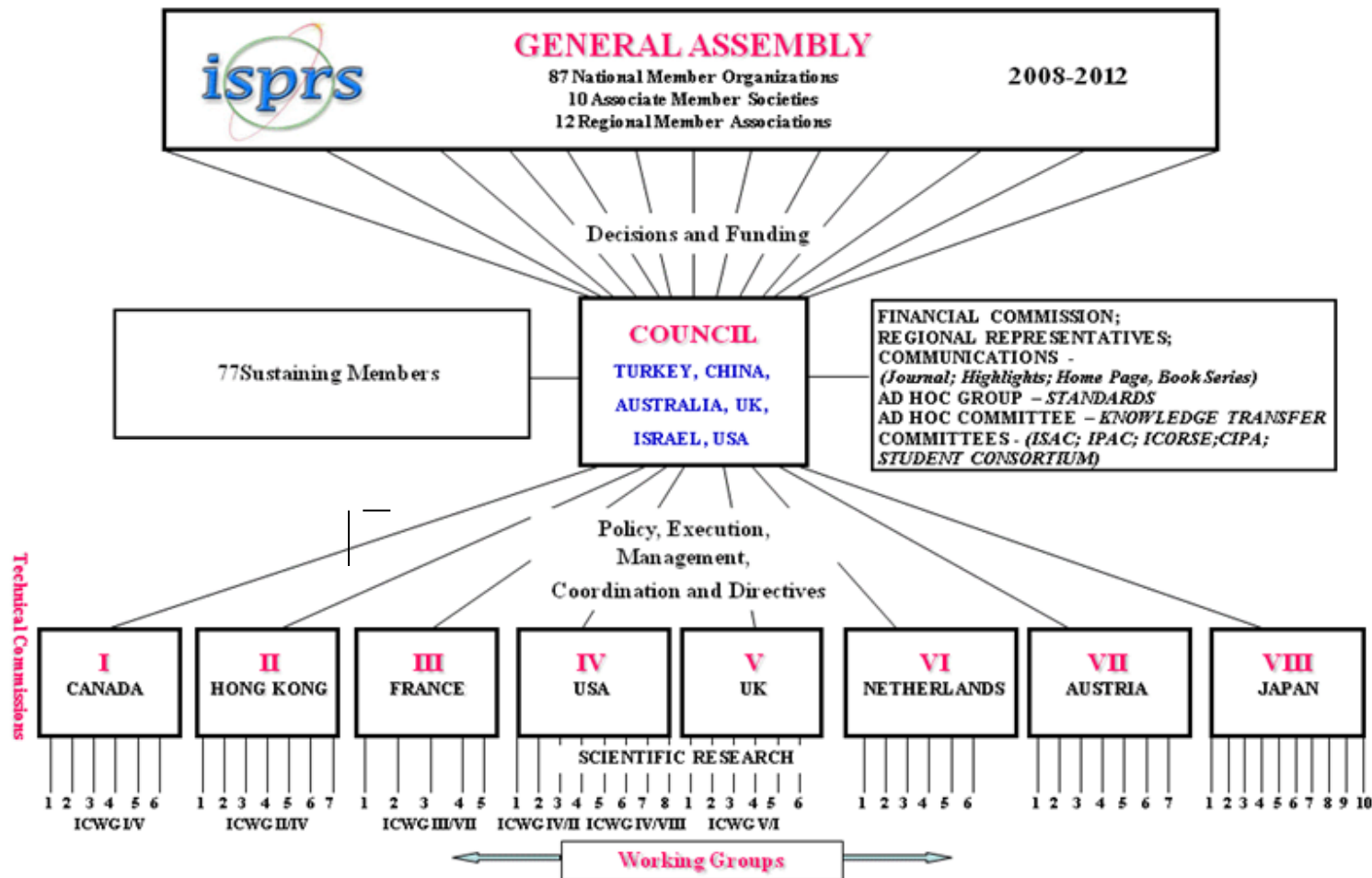
Chen Jun 1,2

**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

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

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?



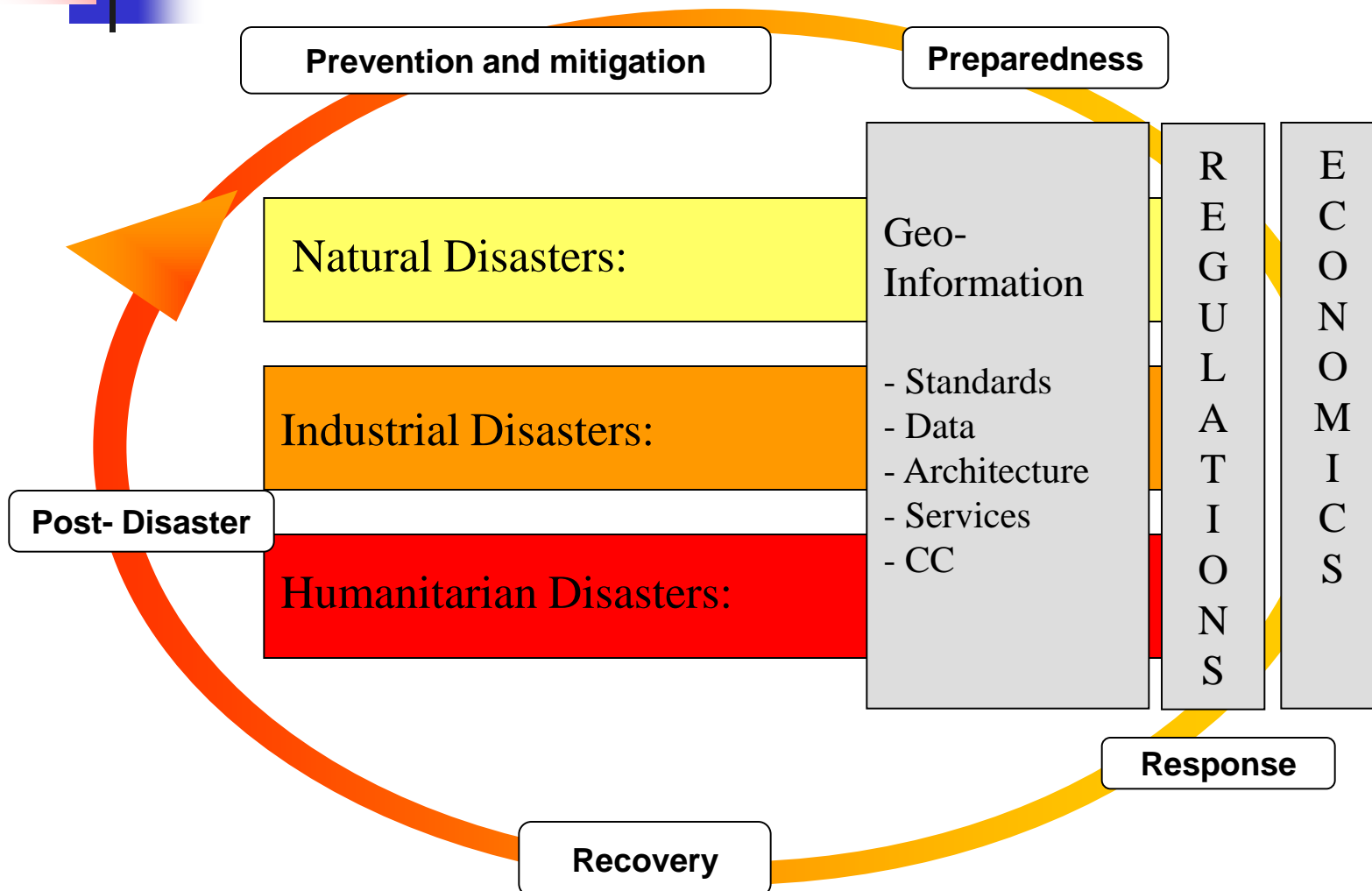
Joint Board of Geospatial Information Societies

United Nations Office for Outer Space Affairs

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



Role of Geo-information in Disaster management



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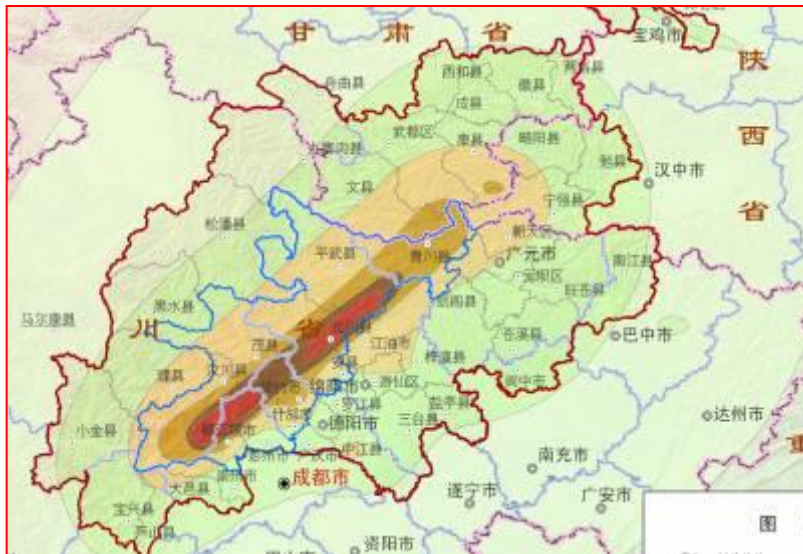
**2. Collaborative disaster
mapping**

3. Towards cross-boarder collaboration

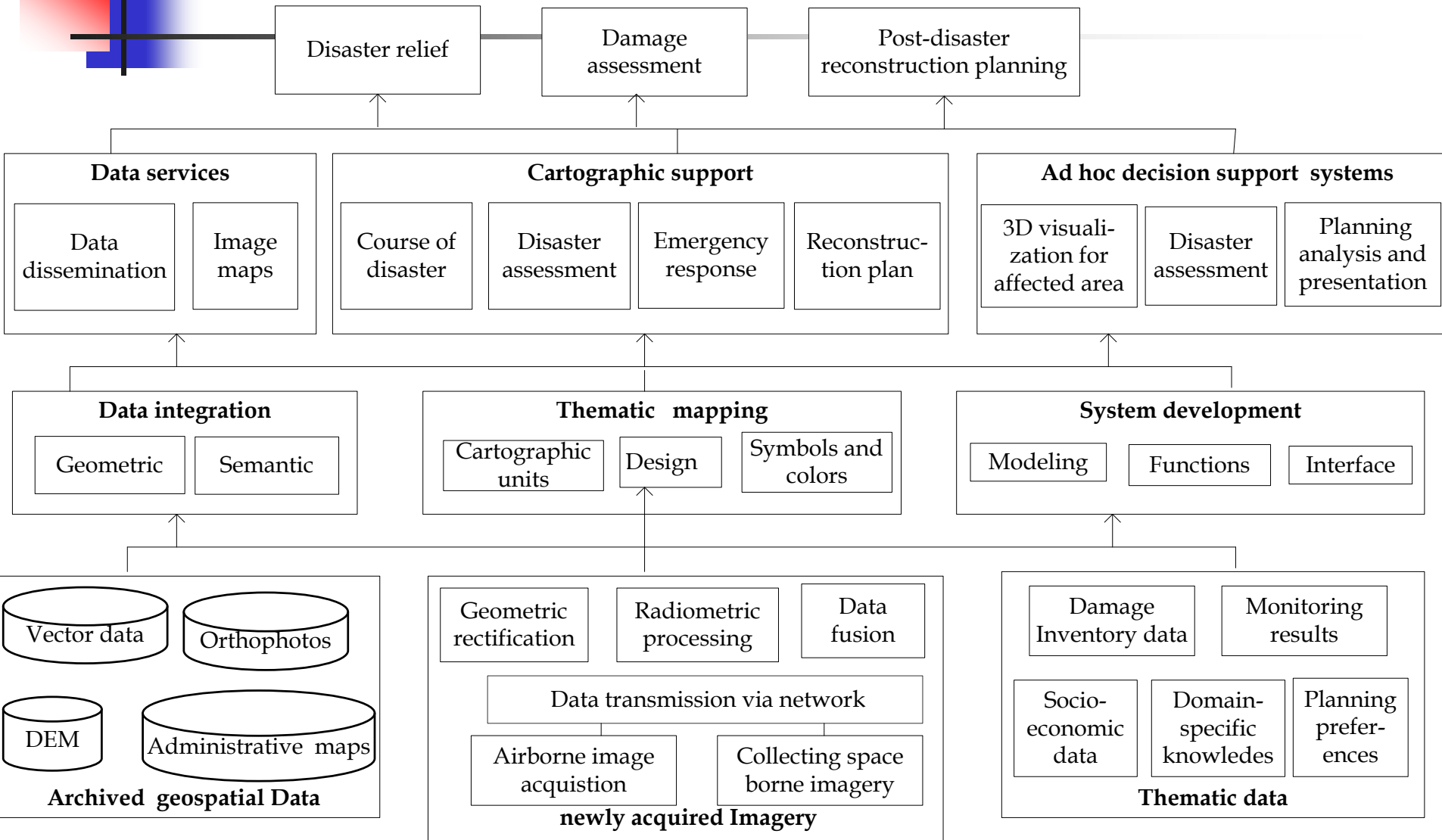
Wenchuan Case

(汶川地震巨灾)

•5.12汶川特大地震



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

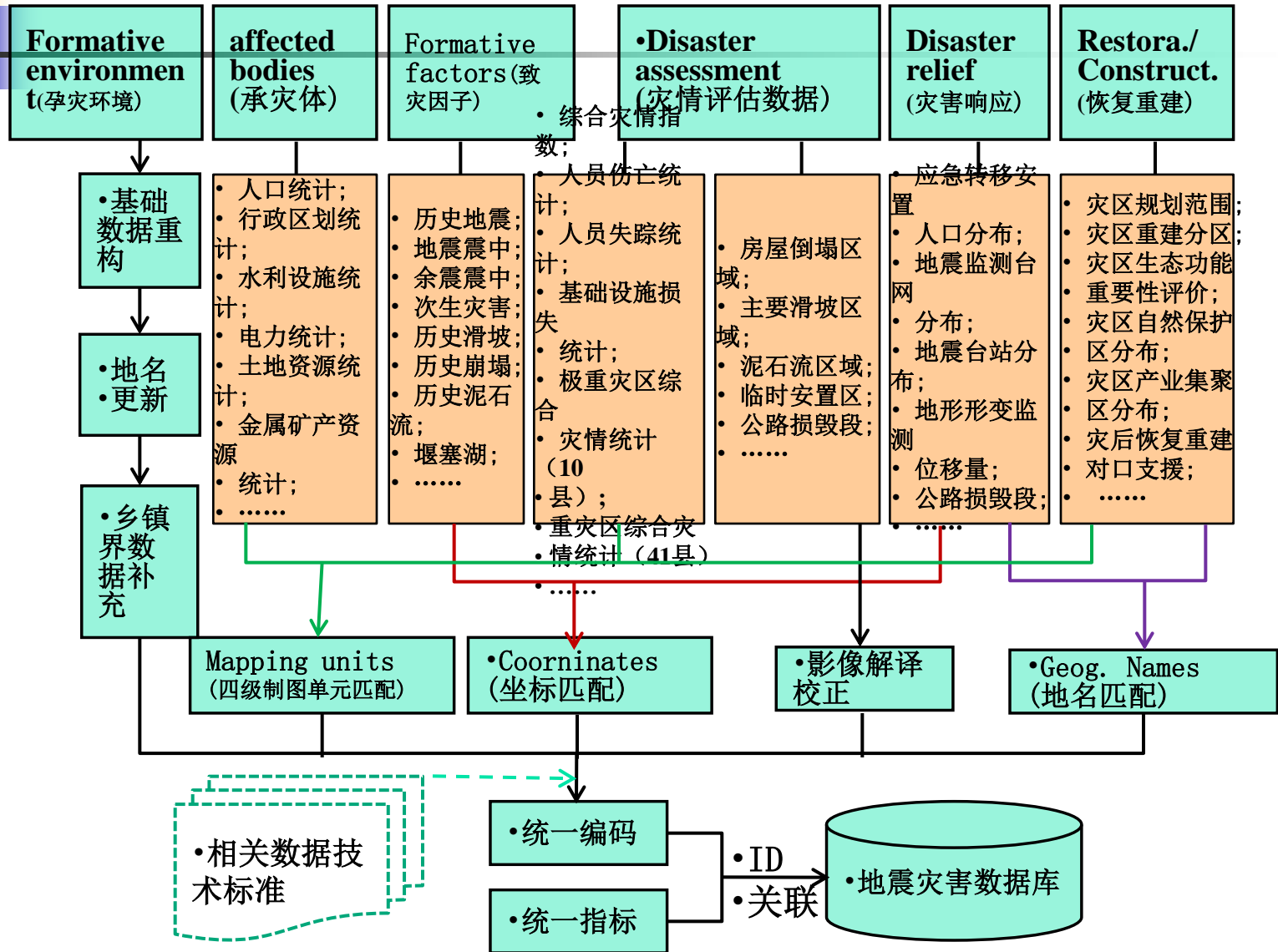
孕灾环境	承灾体	致灾因子	灾情评估	灾害响应	恢复重建
<ul style="list-style-type: none"> ●地质构造 ●地质地貌 ●气候水文 ●土壤生物 	<ul style="list-style-type: none"> ●人口 ●城镇 ●交通通讯 ●水利电力 ●资源 ●经济 	<ul style="list-style-type: none"> ●地震 ●地质灾害 • 与水灾 ●滑坡 ●崩塌 ●泥石流 ●堰塞湖 	<ul style="list-style-type: none"> ●综合灾情评估 ●人口损失 ●住房损失 ●农业损失 ●工业损失 ●服务业损失 ●基础设施损失 ●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) 	<ul style="list-style-type: none"> ●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 	<ul style="list-style-type: none"> ●重建规划 ●对口支援
<ul style="list-style-type: none"> ●中国板块构造 ●灾区地质 ●降水量分布 ••• 	<ul style="list-style-type: none"> ●灾区人口密度 ●灾城镇 ●灾区国内生产总值 ••• 	<ul style="list-style-type: none"> ●灾区历史地震 ●极重灾区次生灾害分布 ●极重灾区滑坡分布 ••• 	<ul style="list-style-type: none"> ●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 ••• 	<ul style="list-style-type: none"> ●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 ••• 	<ul style="list-style-type: none"> ●灾区规划范围 ●灾区重建分区 ●灾区产业集聚区 •••

Six major themes

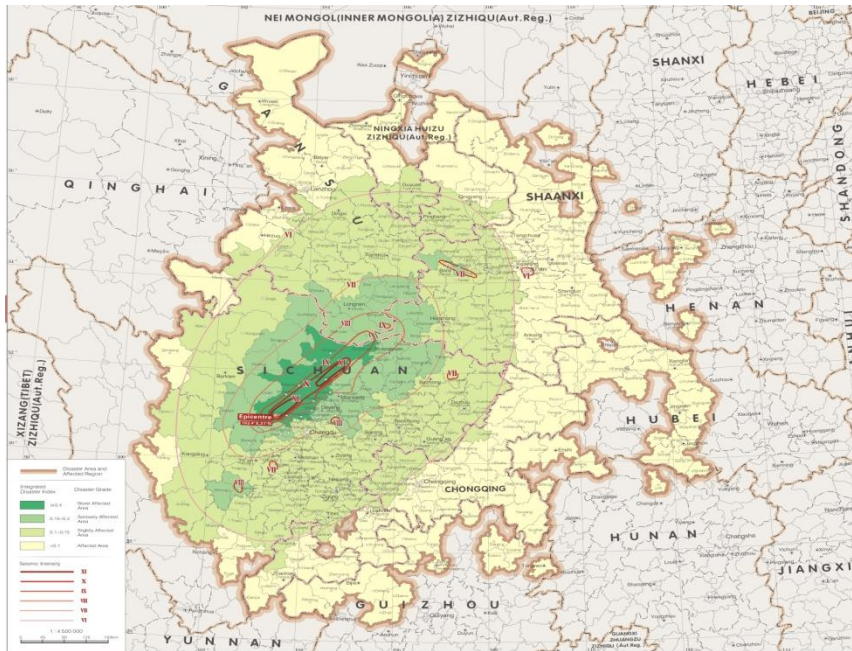
- 1、Hazard formative environment (孕灾环境)
- 2、Hazard affected bodies(承灾体)
- 3、Hazard formative factors (致灾因子);
- 4、Disaster assessment (灾情评估);
- 5、Disaster relief(灾害响应)
- 6、Restoration and construction (恢复重建)

Integration of multi-disciplinary data

(多源灾害信息的空间化整合)



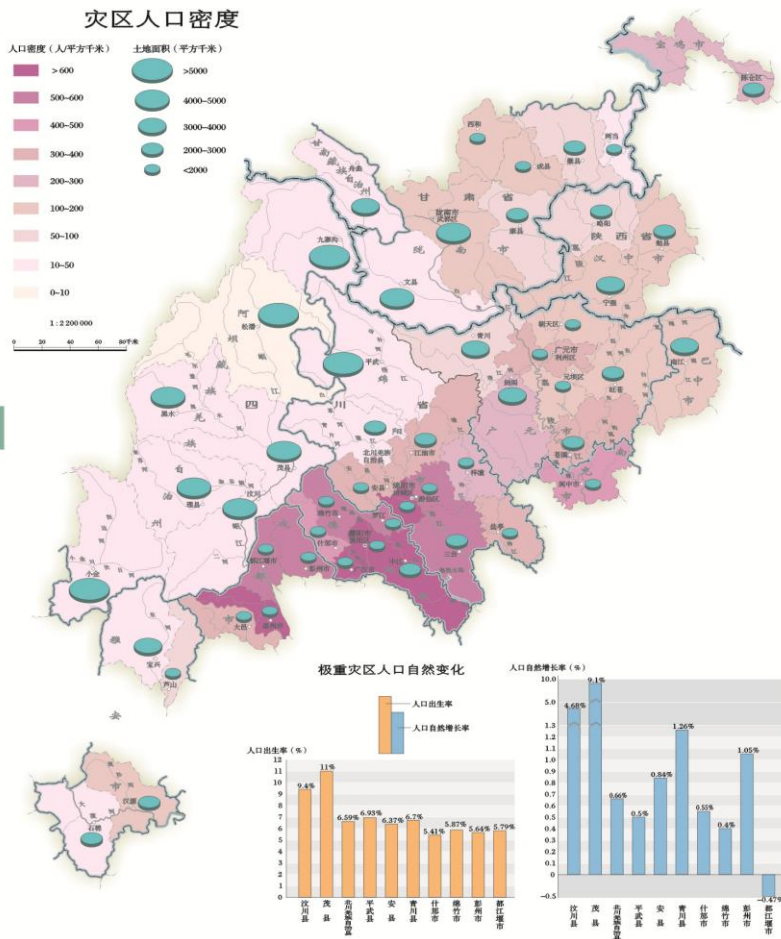
Four different levels of quake-affected areas



- 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)

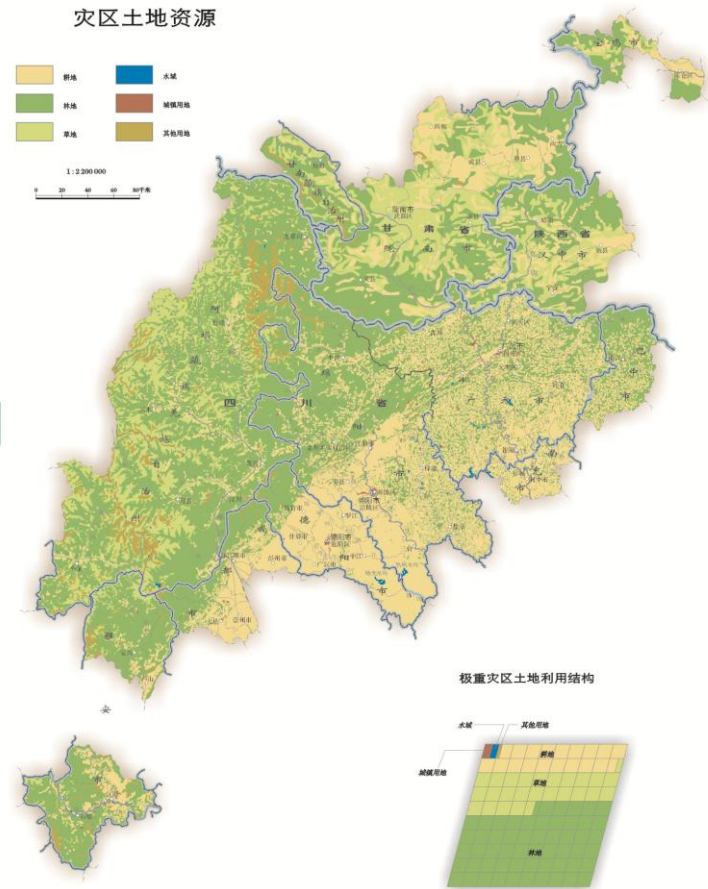
2.2 Bearing body(承灾体)

承灾体 · 人口分布 ·



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承灾体 · 资源 ·



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• 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。

数据来源:《四川汶川大地震震害调查与评估》、《汶川大地震震害调查与评估》、《汶川大地震震害调查与评估》、《汶川大地震震害调查与评估》、《汶川大地震震害调查与评估》、《汶川大地震震害调查与评估》

Bearing bodies (承载体)

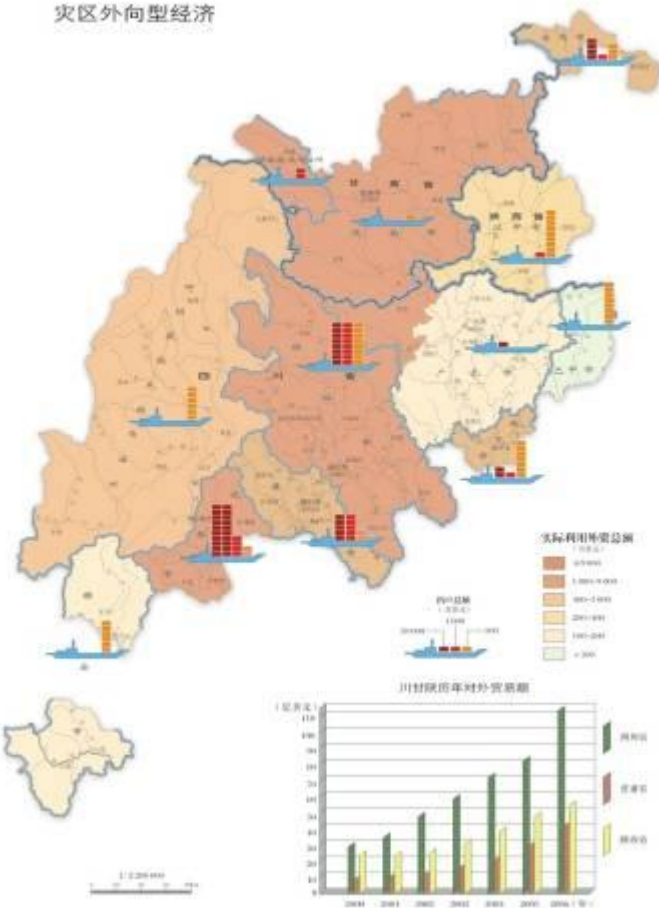
承灾体

经济

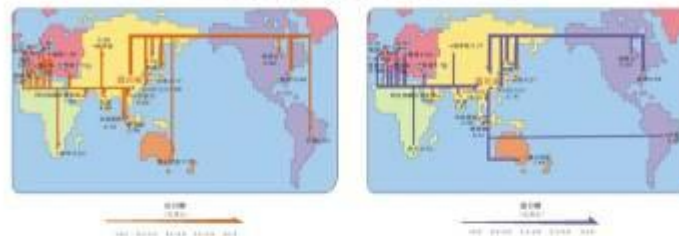
汶川地震灾害地理学



灾区外向型经济



四川省对外贸易主要国家和地区 (2006年)



甘肃省对外贸易主要国家和地区 (2006年)



陕西省对外贸易主要国家和地区 (2006年)



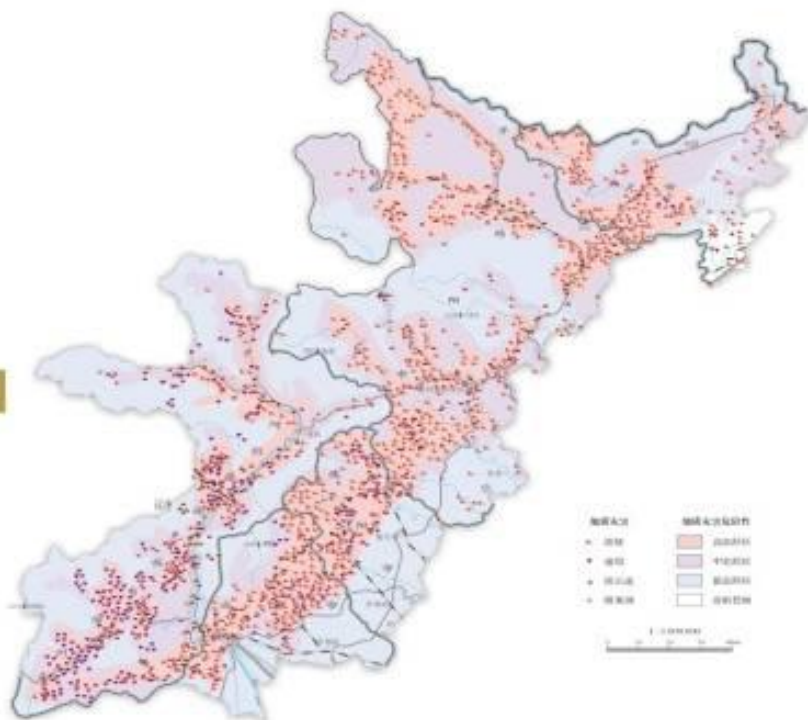
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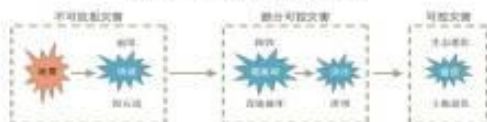
Hazard formative factors (致灾因子)



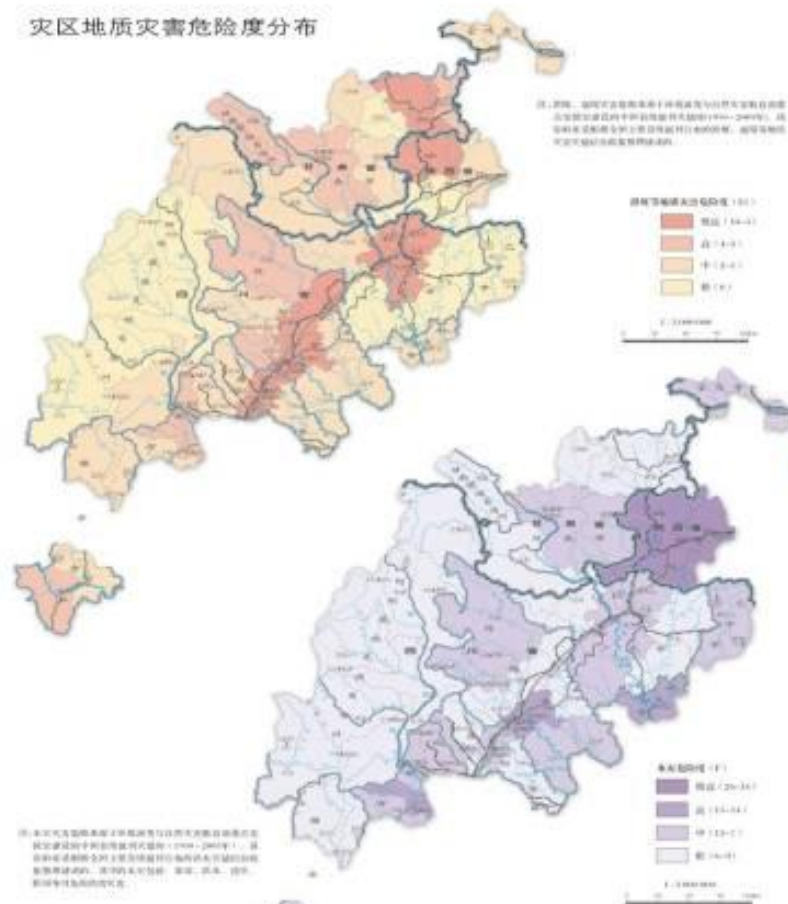
极重灾区次生灾害分布



地震引发的地质灾害与灾害链示意



灾区地质灾害危险度分布



灾区历史水灾危险度分布

2.4 Disaster assessment (灾情评估)

灾情评估

极重灾区—汶川县



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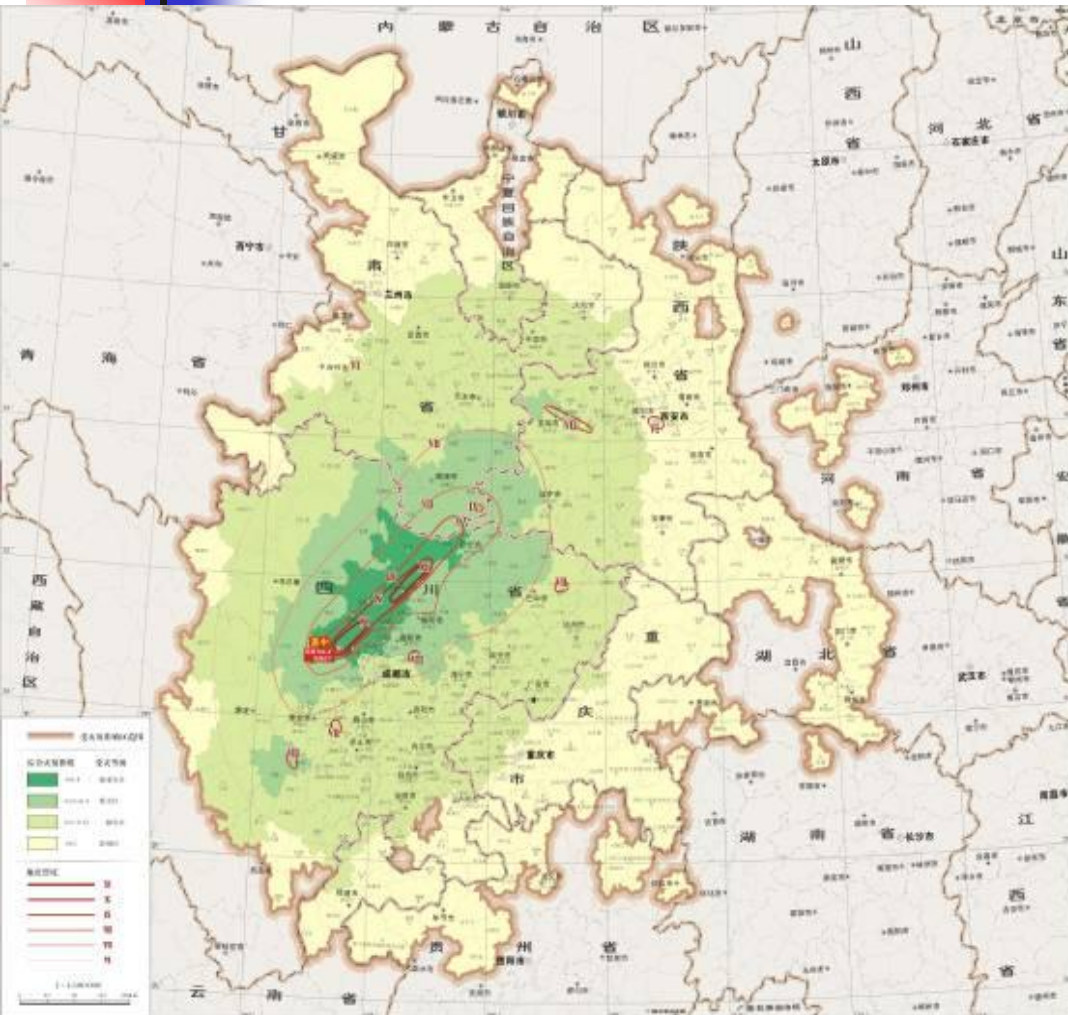
汶川地震灾害地图集
Wenchuan Earthquake Disaster Atlas



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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

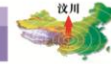
- 417 affected countries in Sichuan, Shanxi and Gansu Province, with total area of about 500,104 km².

Damage assessment

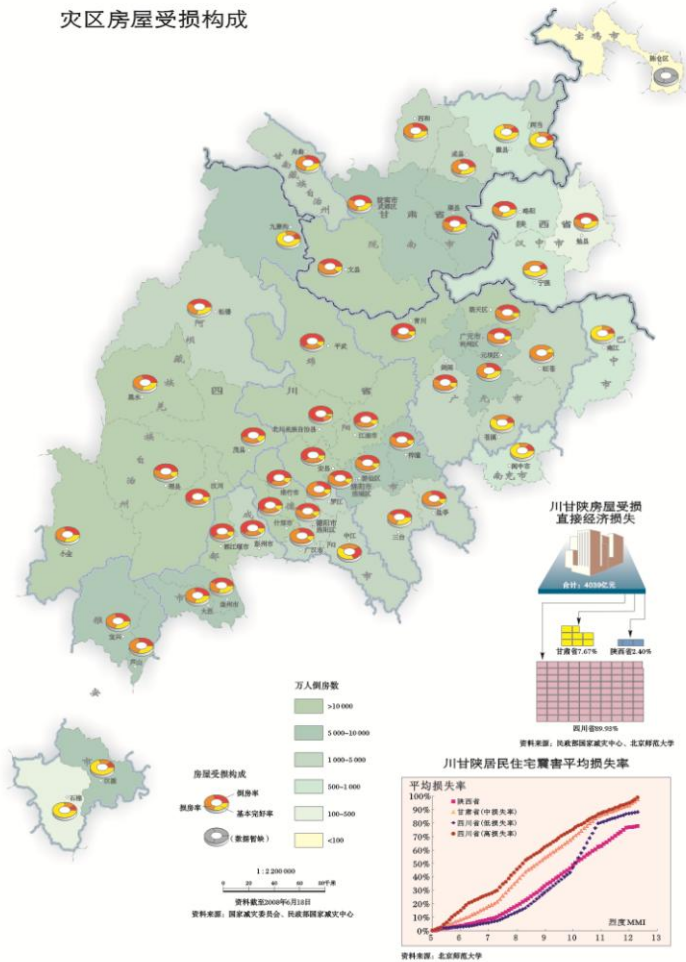
灾情评估 · 房屋受损 ·

(灾情评估)

汶川地震灾害地图集
WENCHUAN DIZHEN ZAHAI DITUJI

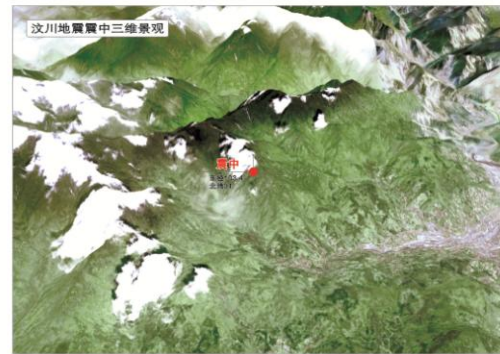
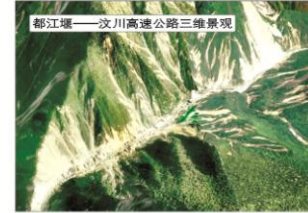


灾区房屋受损构成

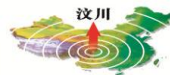


汶川县综合灾情表

农村房屋损失占四川省农村房屋损失比率的为2.2%	新建总耕地: 12 942.5公顷
城镇房屋损失占四川省城镇房屋损失比率的为1.9%	耕地损毁率: 2.1%
市政公用设施损失占四川省市政公用设施损失比率的为1.7%	耕地损毁面积: 375.6公顷
水利、电力设施损失占四川省水利、电力设施损失比率的为1.6%	灾民人口下降: 3,095人
广播电视设施损失占四川省广播电视设施损失比率的为2.6%	崩塌灾害点数: 135个
交通运输设施损失占四川省交通运输设施损失比率的为3.3%	滑坡灾害点数: 195个
教育系统损失占四川省教育系统损失比率的为0.0%	泥石流灾害点数: 83个
卫生系统损失占四川省卫生系统损失比率的为2.2%	堰塞湖: 3处
文化事业损失占四川省文化事业损失比率的为1.4%	地质灾情: 危岩体崩塌块体: 8处
科技系统损失占四川省科技系统损失比率的为2.3%	震害: 20千米
房屋系统损失占四川省房屋系统损失比率的为17.4%	震害: 20千米
国民经济损失占四川省国民经济损失比率的为4.7%	震害: 20千米
土地资源损失占四川省土地资源损失比率的为5.0%	震害: 480.0公里
自然保护区损失占四川省自然保护区损失比率的为27.3%	震害类型: 崩塌+泥石流



•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。



天池乡堰塞湖三维景观



小渝坪堰塞湖三维景观

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的为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的为6.5%
市政公用设施损失占四川省市政公用设施损失比率的为39.2%
水利、电力设施损失占四川省水利、电力设施损失比率的为2.9%
广播通讯设施损失占四川省广播通讯设施损失比率的为13.0%
政权设施损失占四川省政权设施损失比率的为5.7%
教育系统损失占四川省教育系统损失比率的为4.4%
卫生系统损失占四川省卫生系统损失比率的为4.6%
文化系统损失占四川省文化系统损失比率的为24.5%
科技系统损失占四川省科技系统损失比率的为4.2%
环保系统损失占四川省环保系统损失比率的为13.2%
居民财产损失占四川省居民财产损失比率的为15.5%
土地资源损失占四川省土地资源损失比率的为6.5%

耕地受损

耕地总面积：54 515.4公顷

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0.36万平方米

重要建筑：破坏铁路3段，3.31千米

地质灾害

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0.36万平方米

重要建筑：破坏铁路3段，3.31千米

小渝坪堰塞湖景观

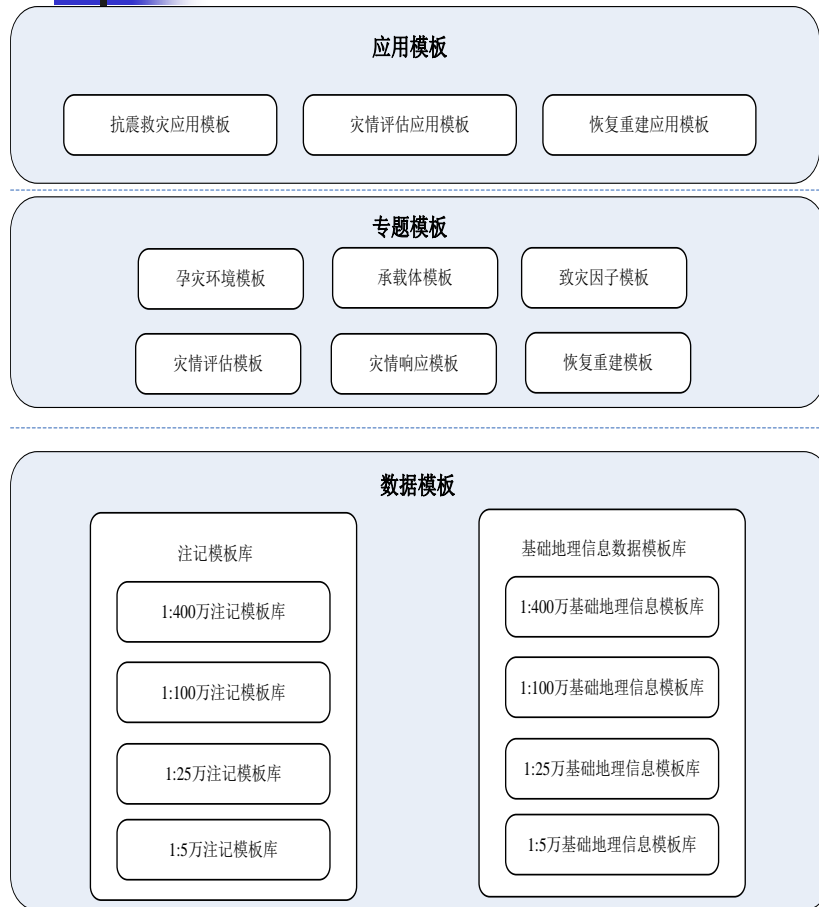


2.5 Restoration and construction (恢复重建规划)



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

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
<ul style="list-style-type: none"> • Map of China • Topography of China • Impacted areas and degrees 	<ul style="list-style-type: none"> • Geological structure • Land surface cover • Impacted areas and degrees • Climate & hydrology • Soil & biology 	<ul style="list-style-type: none"> • population • Administrative units • Transportation • Communication • Irrigation • Resource • Economy 	<ul style="list-style-type: none"> • Earthquake • Geological disaster & floods • Landslide • Collapse • Debris flow • Barrier lakes 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Emergency rescue • Emergency relief • National day of mourning • Transfer and placement • Scientific and technological support • Disaster monitoring • International rescue 	<ul style="list-style-type: none"> • Reconstruction planning • Counterpart assistance 	<ul style="list-style-type: none"> • 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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Activities and co-operation between relevant international organisations

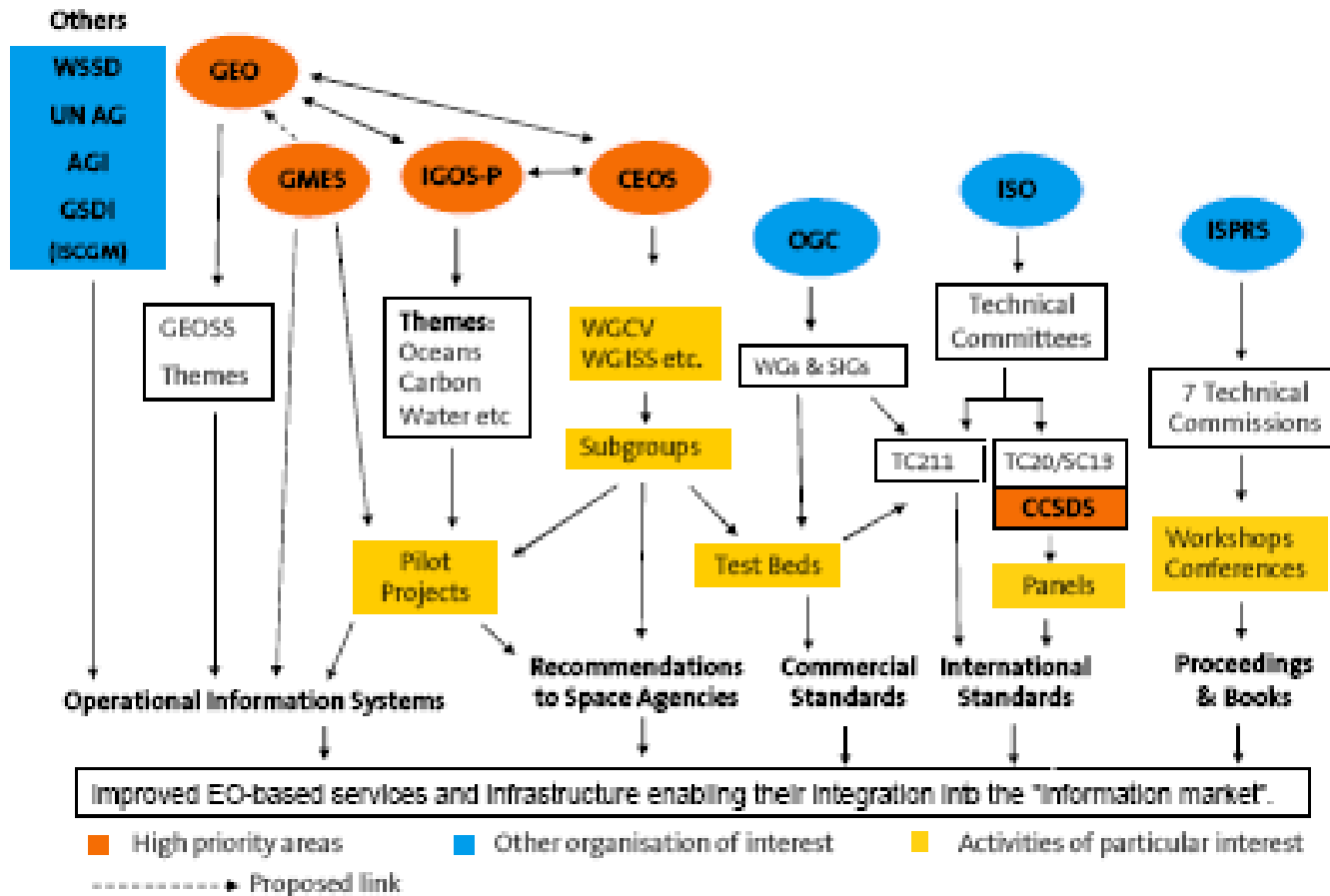
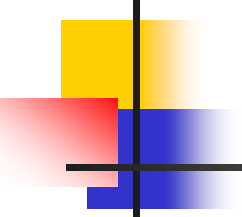


Figure A-2; Activities and co-operation between relevant International Organisations



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.

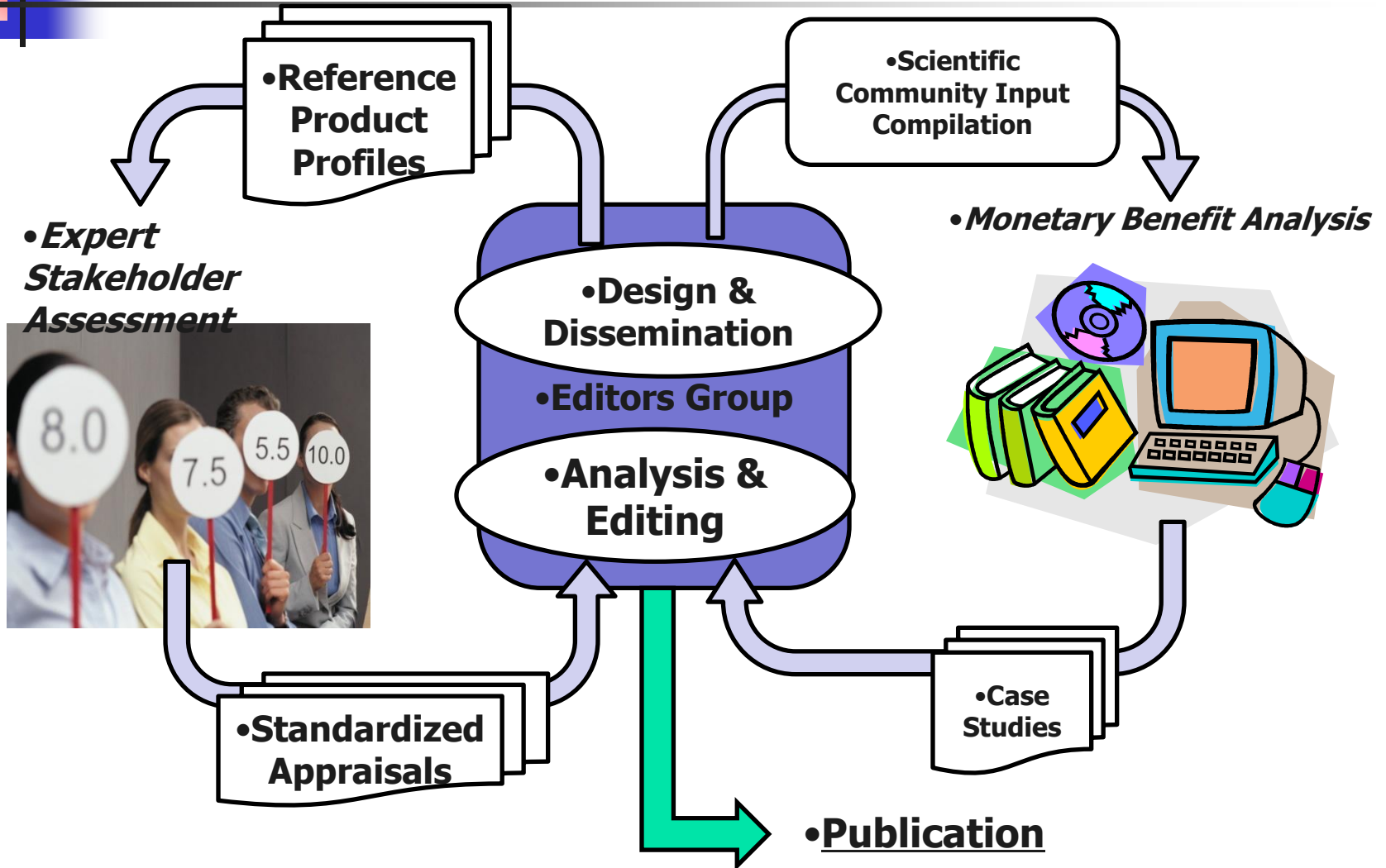
. Ismail-Zadeh, OECD Workshop, 2006;
ENHANS International Workshop on Extreme
Natural Hazards and Disaster



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



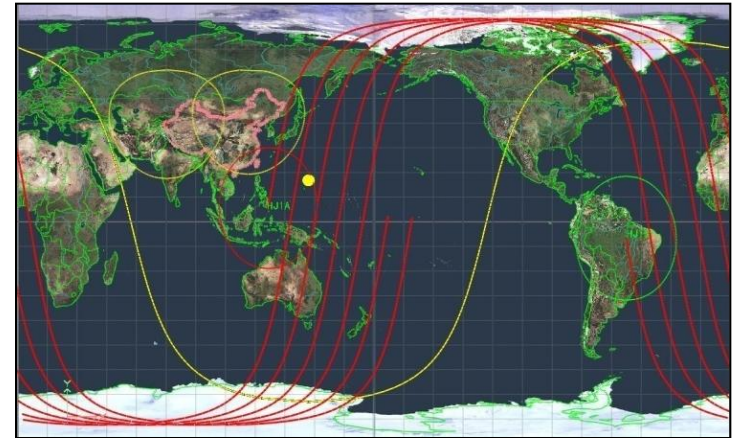
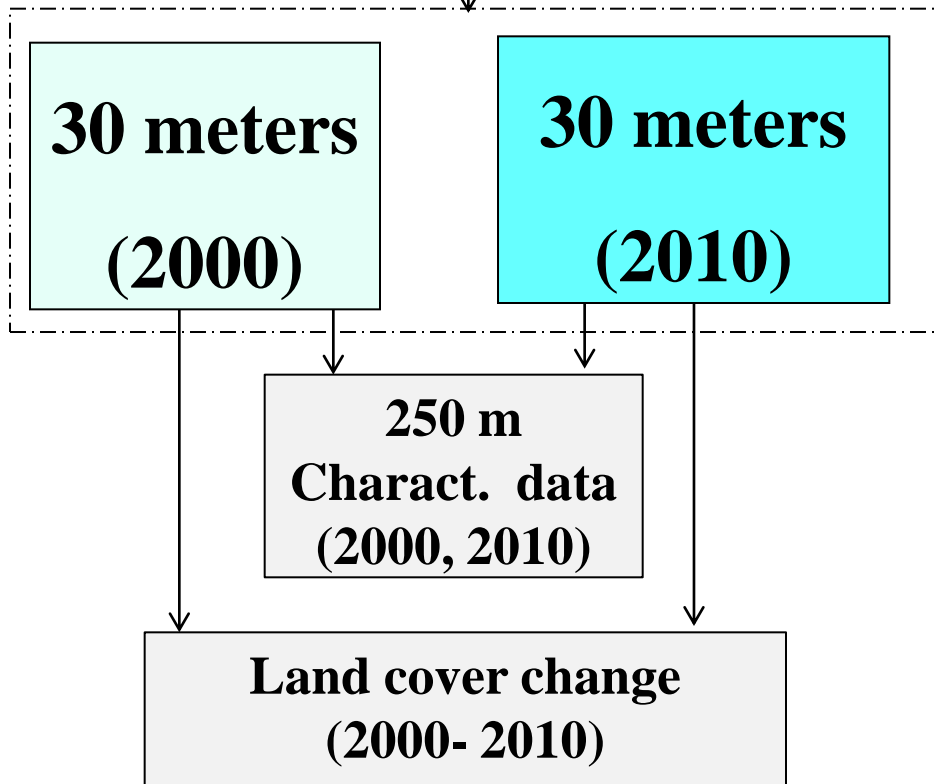


3.2 Institutional Structures for Applying EO to Hazard and Risk

- 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

a new classification scheme



- **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)

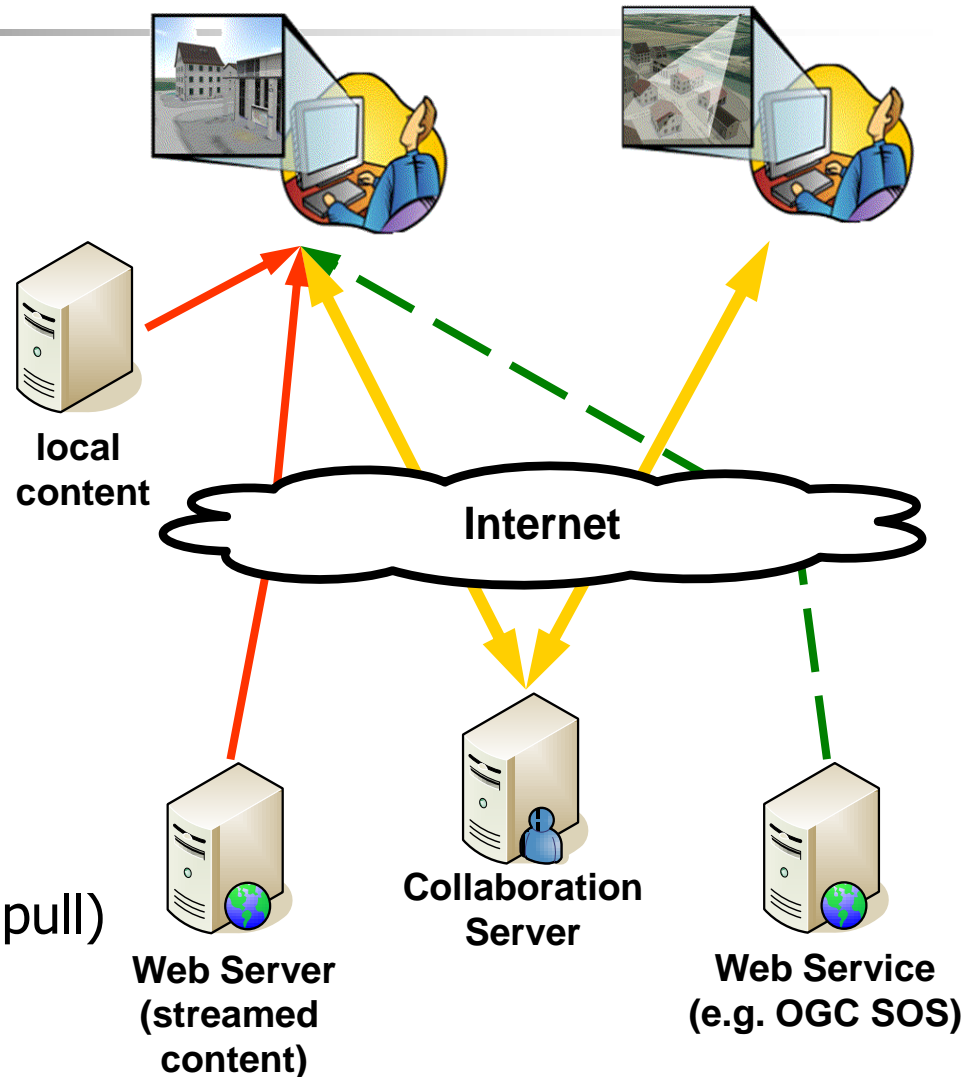
3.3 Content Delivery & Sharing

- 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 Service)

OASIS – Organisation for the Advancement of Structured Information Standards

- EM (Emergency Management)

- CAP (Common Alerting Protocol)
- EDXL-DE (Emergency Data Exchange Language - Distribution Element)



**Thanks you for your
attention!**