Asia-Pacific
Economic Cooperation

2008/TFEP/WKSP3/021

Disaster Impact and Recovery Mapping Using Space Technologies

Submitted by: Pacific Disaster Center

Workshop on Large-Scale Disaster Recovery in APEC
Taipei, Chinese Taipei
22-23 September 2008

Workshop on Large-Scale Disaster Recovery in APEC

Chinese Taipei, September 2008

Disaster Impact and Recovery Mapping Using Space Technologies

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Fostering Disaster-Resilient Communities

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Presentation Outline

- Overview of Pacific Disaster Center
- Remote Sensing for Disaster Response and Recovery
  - Indian Ocean Tsunami
  - Typhoon Nargis
  - International Charter
- Szechwan Earthquake
- Remote Sensing Challenges
- Q&A

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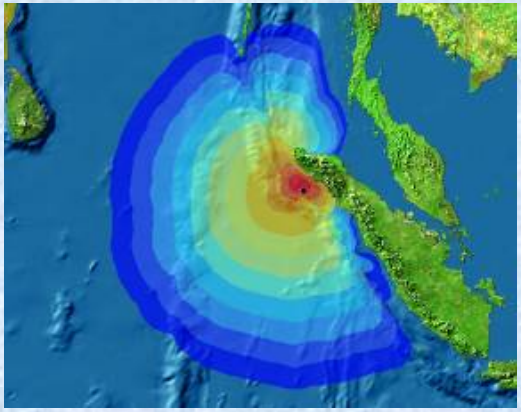
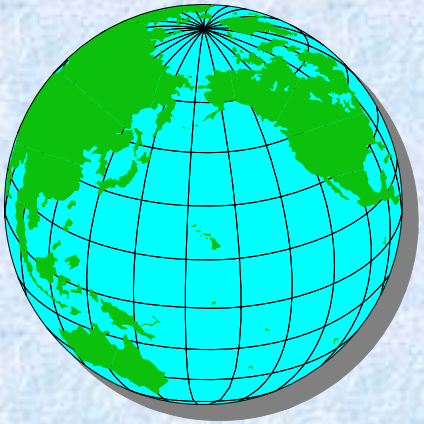
PDC Mission

Provide applied information research and analysis support for the development of more effective policies, institutions, programs and information products for the disaster management and humanitarian assistance communities of the Asia Pacific region and beyond.





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Building a Bridge

Science Community	Audience	Decision Makers
Peer Review		The Public
Low	Comfort with uncertainty	High
Complex	Vocabulary	Simple
Technical Groups	Associations	Very Public

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Indian Ocean Tsunami Recovery Monitoring

Space-based technologies used to monitor the recovery status and progress of communities impacted by the December 2004 Indian Ocean Tsunami.

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Banda Aceh, Indonesia : Pre-event June 23, 2004 QuickBird

Port Intact

Homes Intact

Aquaculture Intact

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Banda Aceh, Indonesia : Post-event Dec 28, 2004 QuickBird

Soil Stripped of Vegetation

Port Destroyed

Few Buildings Remaining

Aquaculture Destroyed

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Banda Aceh, Indonesia : Recovery
June 29, 2005 IKONOS

Vegetation Returning to Stripped Areas

Port and Aquaculture Remain Destroyed

Some New Construction

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Banda Aceh, Indonesia : Recovery
July 30, 2007 QuickBird

Vegetation Returning & New Construction Throughout Area

Port and Aquaculture Rebuilt

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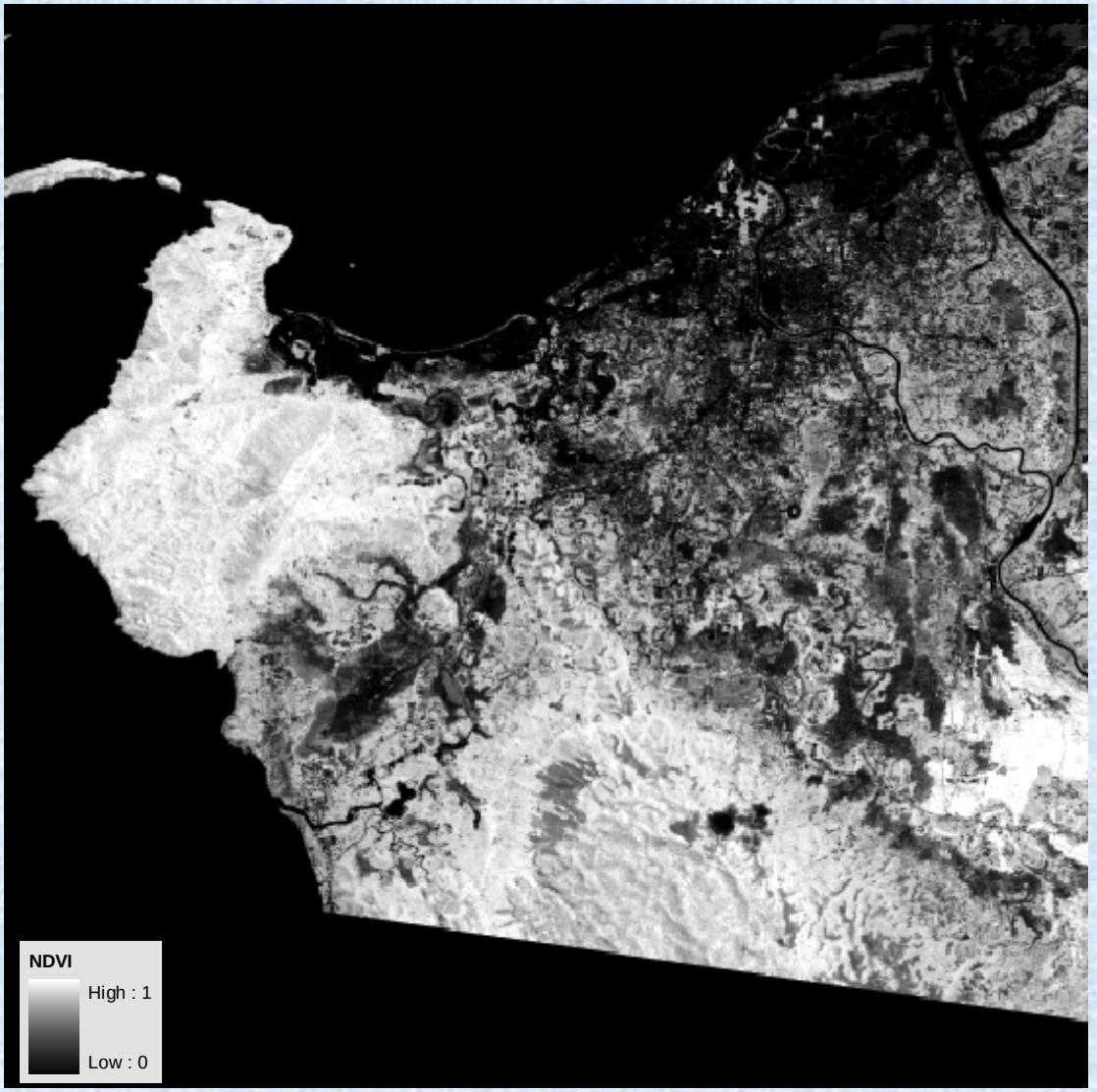
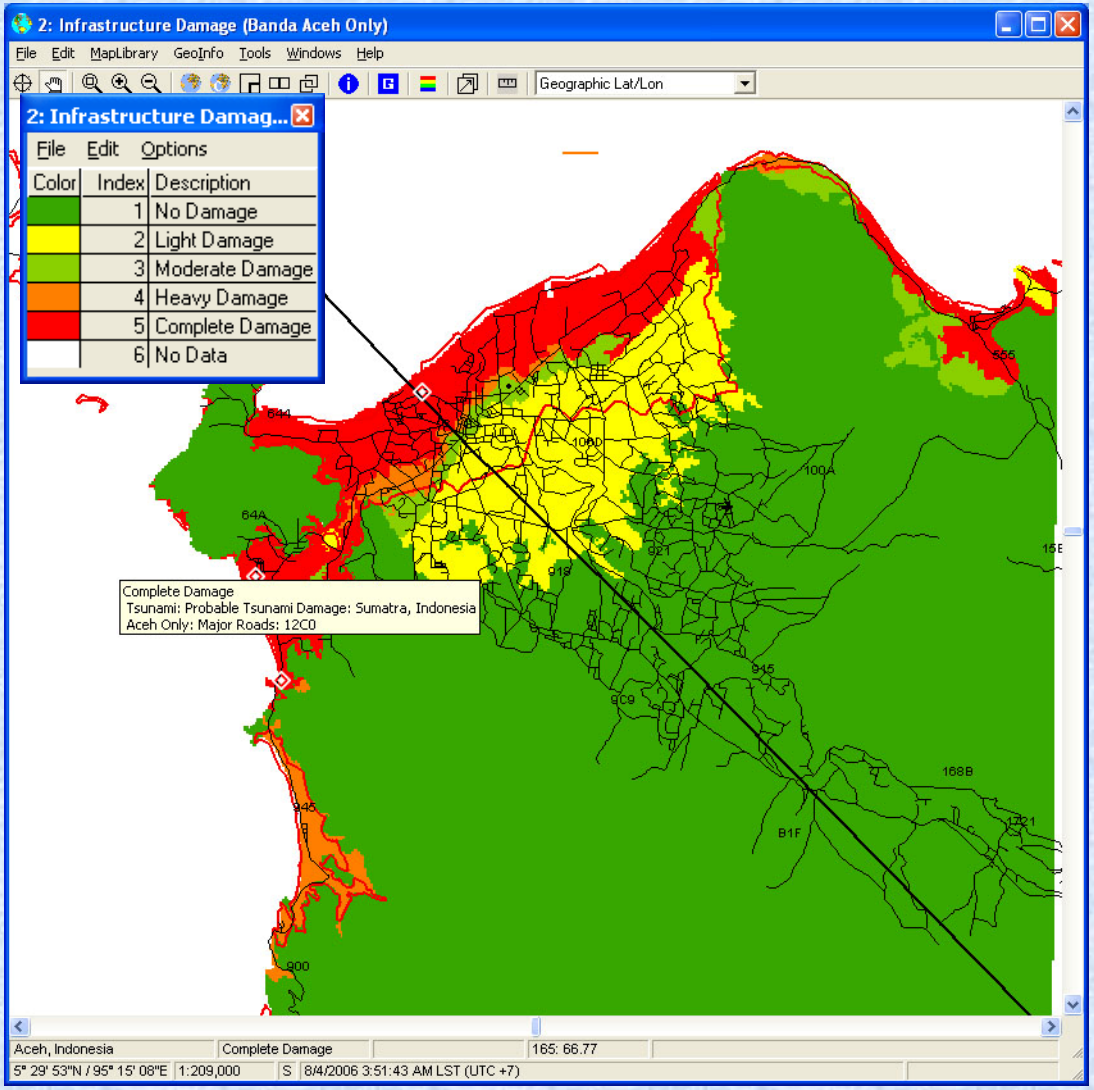
NDVI Time Series

6 Months After Tsunami



Infrastructure Damage Severity Index



Infrastructure Damage Severity Index (IDSI)

- Developed by PDC
- Documents relative damage in affected areas
- Prepared through manual interpretation of high-resolution (~1m) satellite imagery

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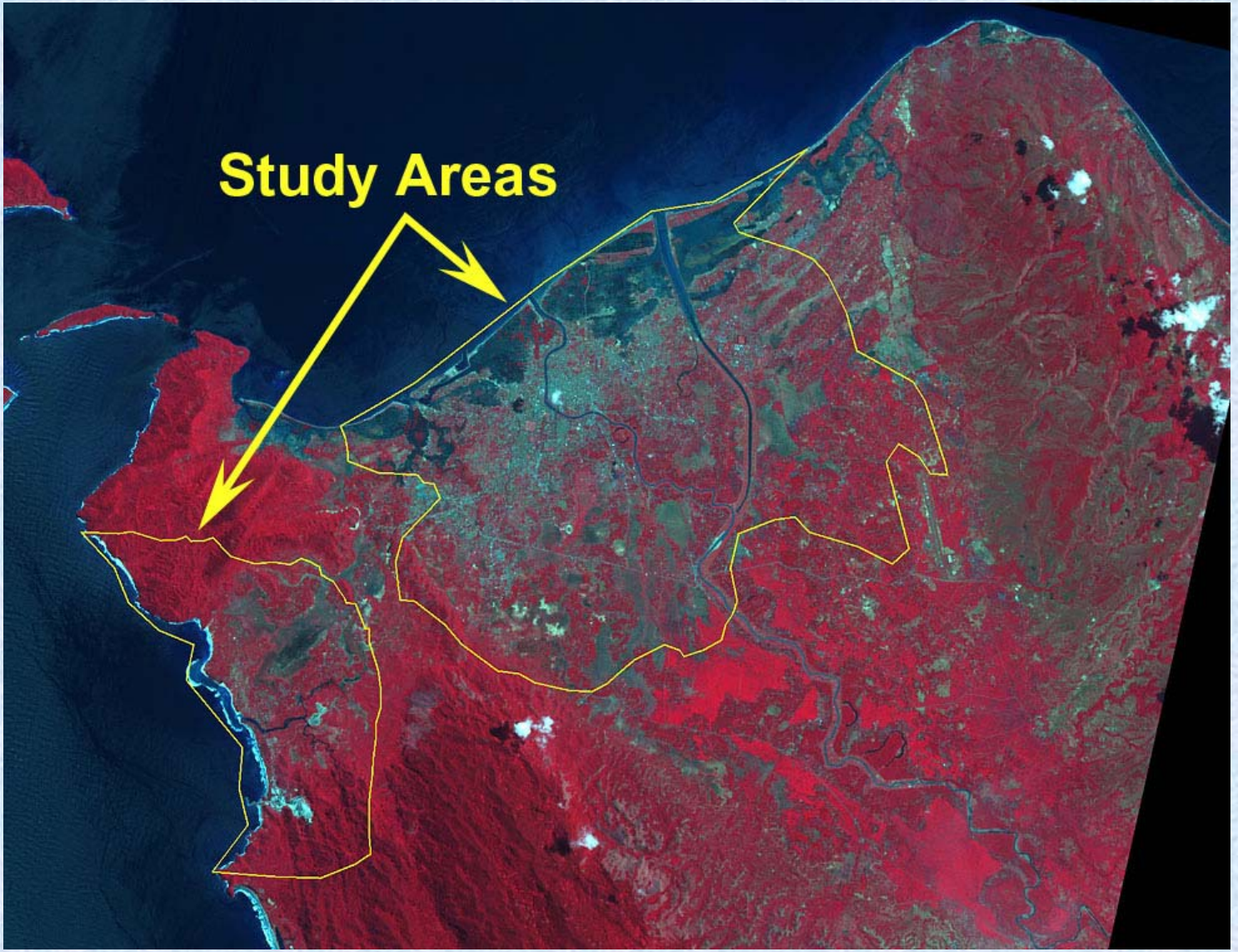
Quantification of Lost/Recovering Infrastructure



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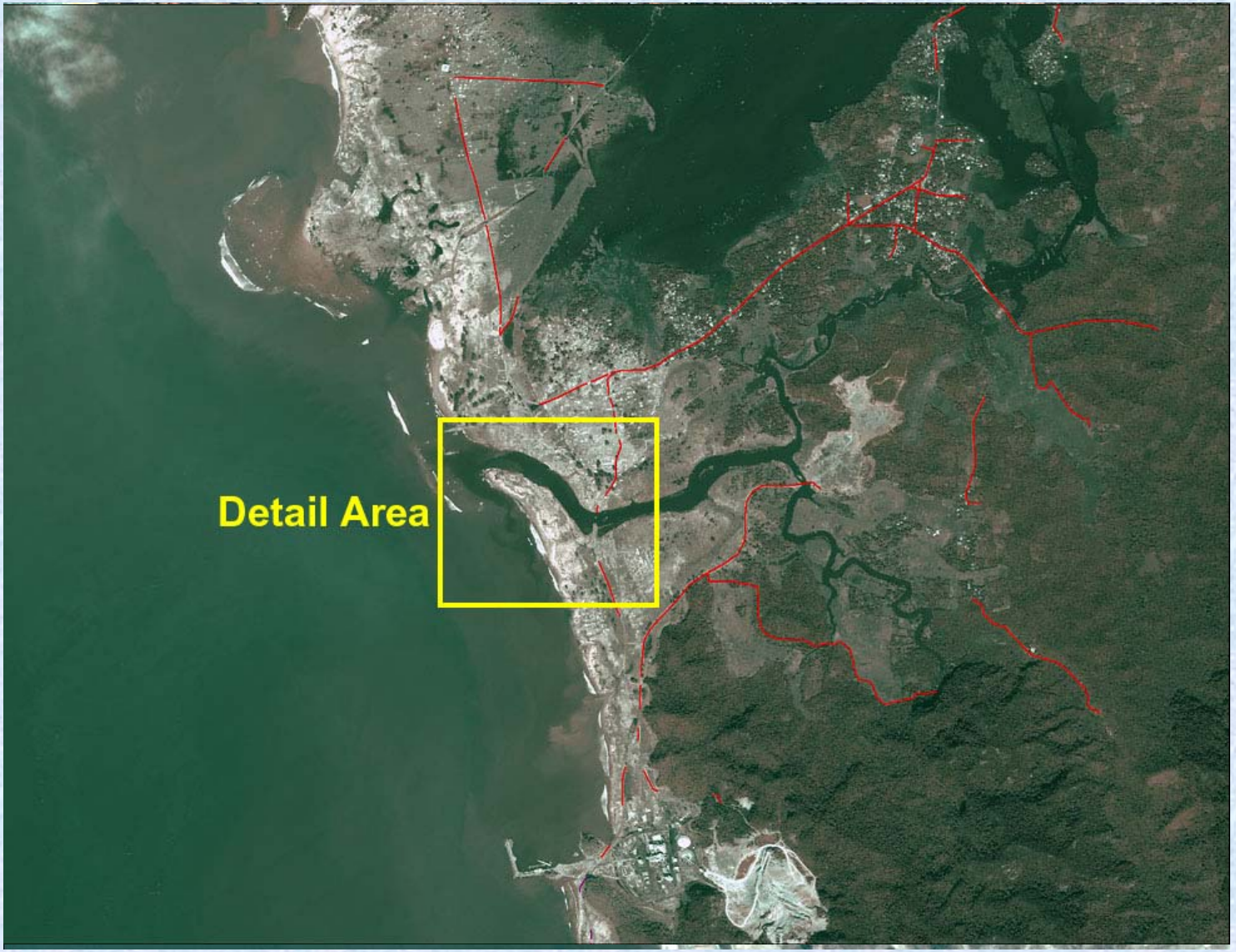
Quantification of Lost/Recovering Infrastructure



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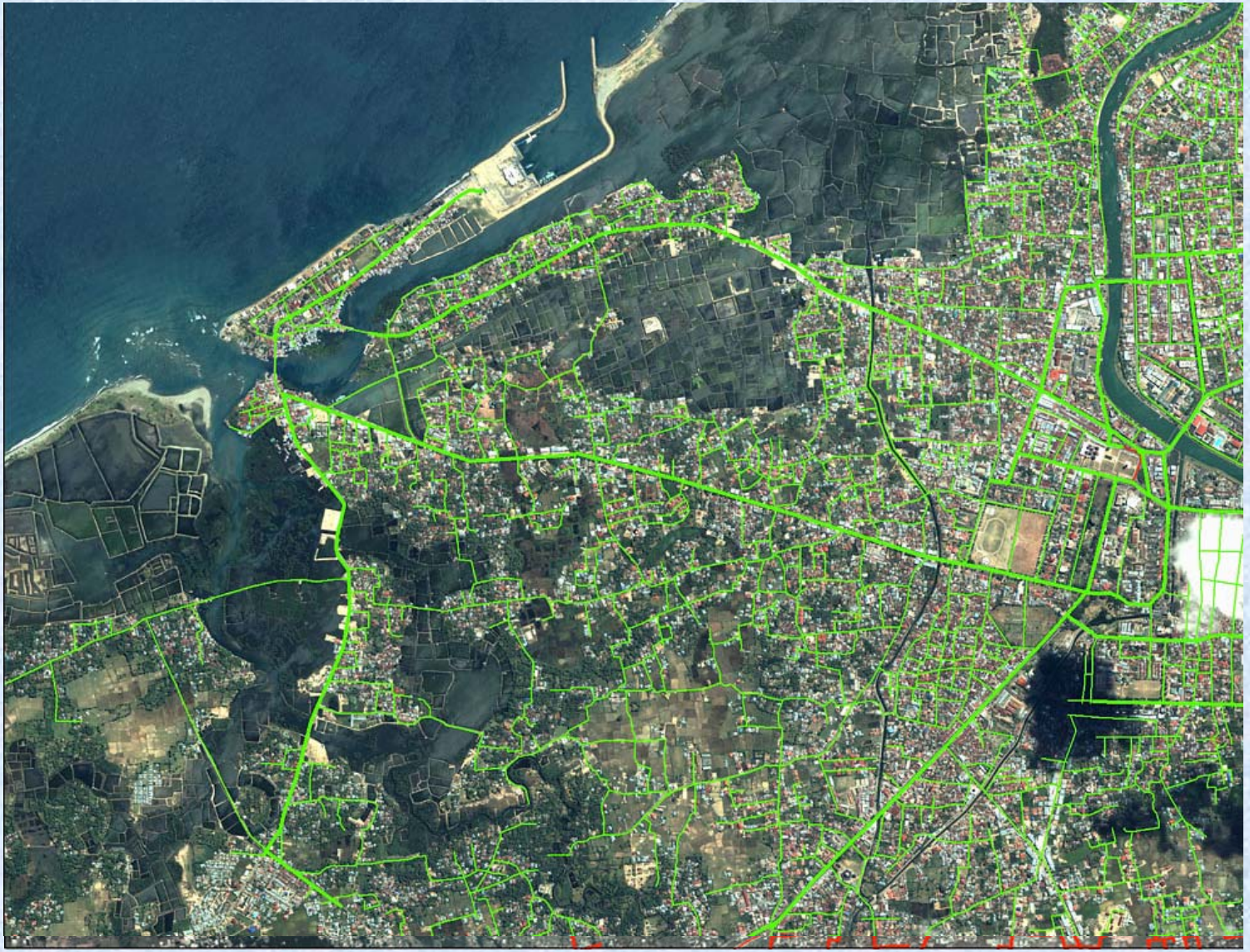
Quantification of Lost/Recovering Infrastructure



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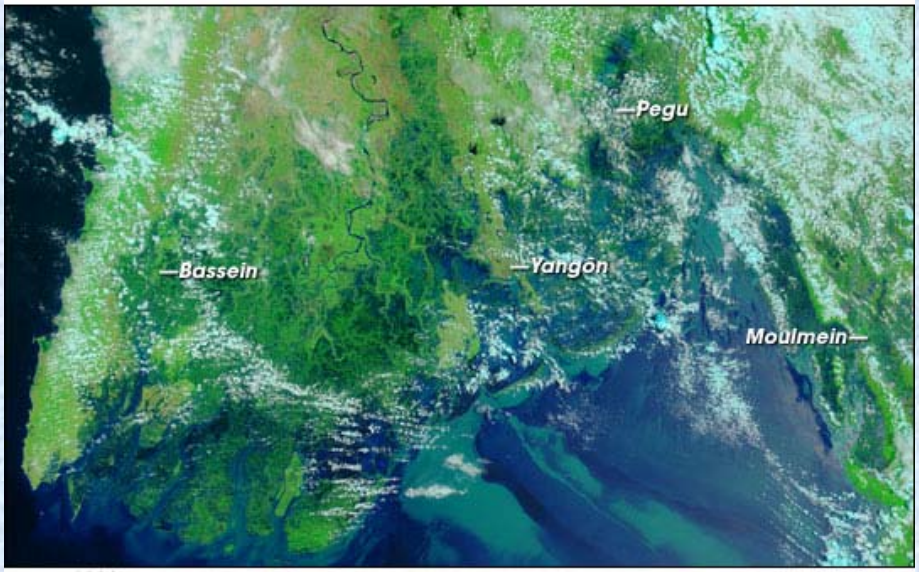
Inundation Detection - NASA

April 15, 2008

NASA's Terra satellite captured this image of the Burma coast on April 15, 2008, before Tropical Cyclone Nargis flooded the region.



May 5, 2008

NASA's Terra satellite captured this image of the Burma coast on May 5, 2008, showing the devastation of flooding caused by Tropical Cyclone Nargis.

Credit: NASA/MODIS Rapid Response Team

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International Charter

- European Space Agency (ESA)
- Centre national d'études spatiales (CNES)
- Canadian Space Agency (CSA)
- Indian Space Research Organisation (ISRO)
- National Oceanic and Atmospheric Administration (NOAA)
- Argentina's Comisión Nacional de Actividades Espaciales (CONAE)
- Japan Aerospace Exploration Agency (JAXA)
- United States Geological Survey (USGS)
- DMC International Imaging (DMC)

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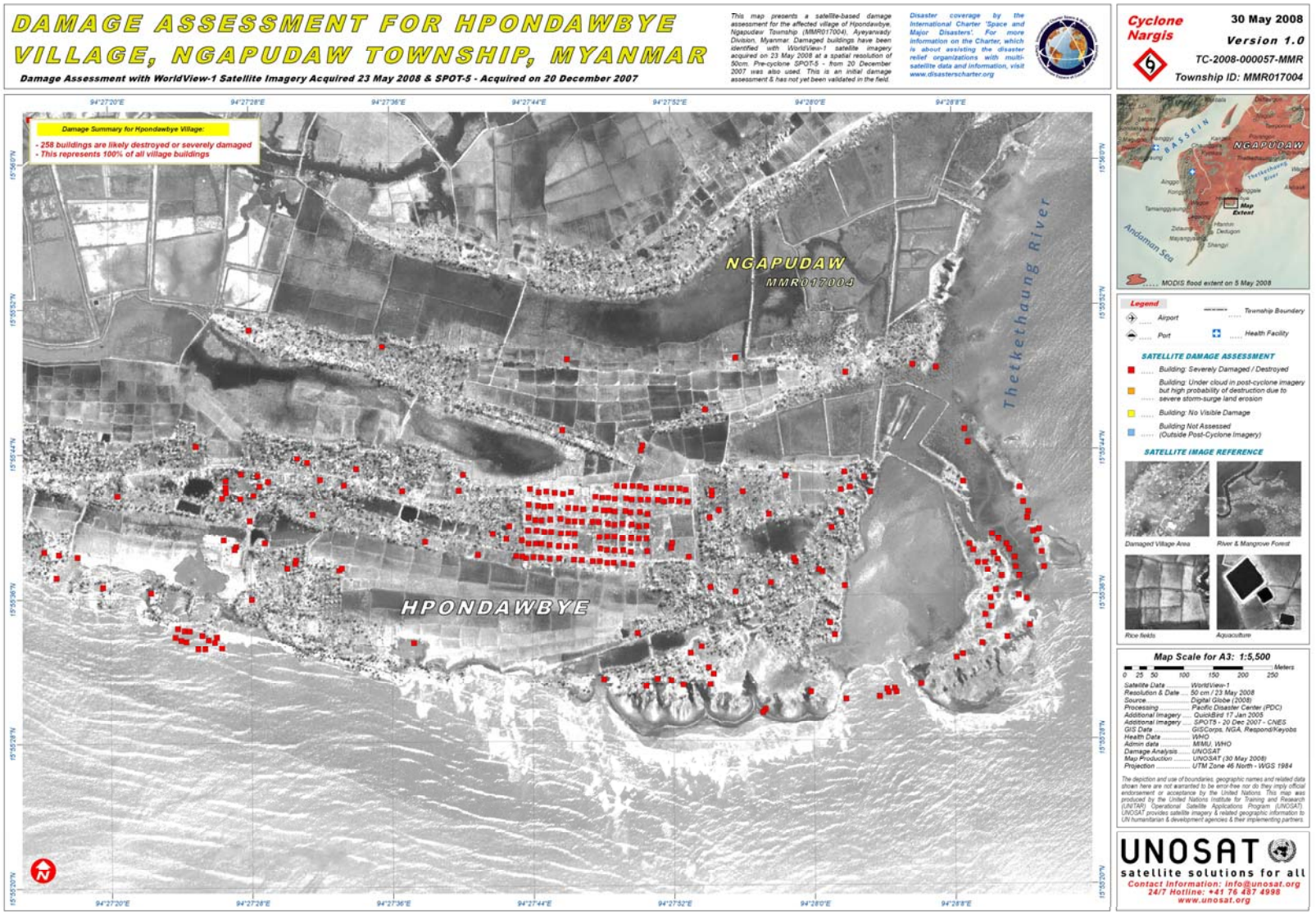
UNOSAT Myanmar Response



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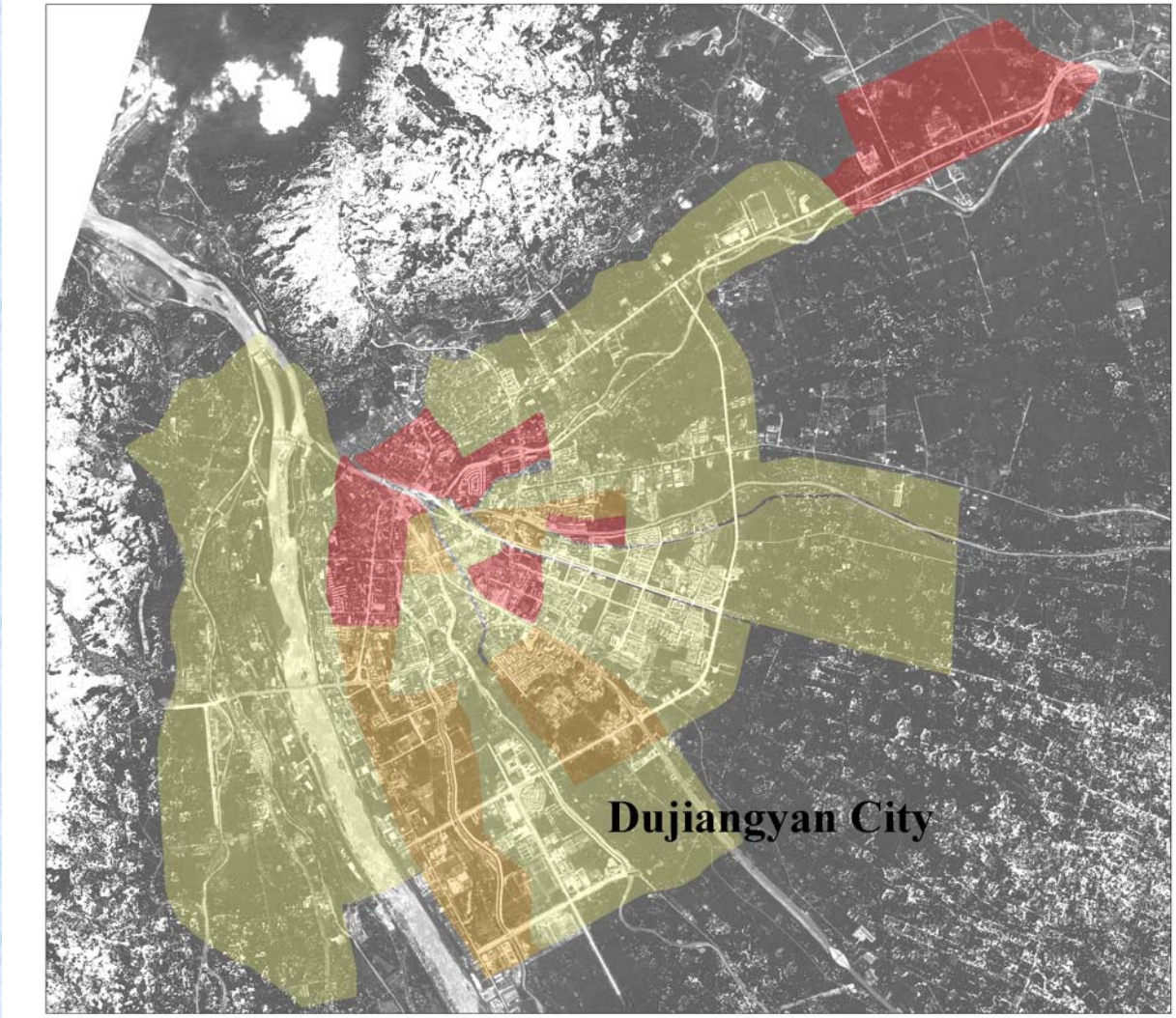
NDRC China Response



Charter 204号订单 - 产品编号 03
Charter Call 204 - Product No. 03

2008年5月12日，四川省发生7.8级强烈地震，震中位于汶川县，此次地震给四川、甘肃、陕西等地造成巨大的人员和财产损失。利用2008年5月15日遥感一号与2005年SPOT存档影像数据，对四川省都江堰市房屋倒损情况进行监测。都江堰中心城区存在部分严重倒房，城区东南部存在中度倒房，其他城区存在轻度倒房。

The 2008 Wenchuan earthquake at a magnitude 7.8 Ms, occurred at 14:28:01.42 CST (06:28:01.42 UTC) on 12 May 2008 in Sichuan province of China, which has caused lots of houses collapsed and roads destroyed. The collapsed houses assessment map was based on RS-1 (15 May 2008) and SPOT 5 image (15 August 2005).

严重倒房区（Extremely Destroyed）
中度倒房区（Moderately Destroyed）
轻度倒房区（Slightly Destroyed）

灾害类型: 地震　　时间: 2008年5月12日
Disaster Type: Earthquake　　Date: 12 May 2008

灾害影像 Disaster Image:
RS-1, 分辨率5m，获取时间2008年5月15日
RS-1, 5m, acquired on 15 May 2008
SPOT, 分辨率2.5m，获取时间2005年8月15日© SPOT IMAGE
SPOT, 2.5m, acquiredon 15 August 2005 © SPOT IMAGE

灾害分析 Earthquake Analysis:
NDRCC，2008年5月15日24时 UTC16:00 15 May 2008®NDRCC
制　图　Map Production:
NDRCC，2008年5月16日3时　UTC19:00 15 May 2008®NDRCC

投影 Projection: UTM
椭球体 Spheroid: WGS84
地球模型 Datum: WGS84

0 250 500 1,000 Meters

国家减灾委员会
National Commitee for Disaster Reduction, P.R.C.
国家减灾中心
National Disaster Reduction Center of China

联系方式 Contact Information:
remotesensing@ndrcc.gov.cn
电话 Hotline: (86-10) 6353 1082
http://www.jianzai.gov.cn/rs/
http://www.ndrcc.gov.cn

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Remote Sensing Challenges

- Type of Disaster
- Existing Imagery
- Post-Event Collections
- Weather Conditions

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Window of China

China to Launch 1st Natural Disaster Monitoring Satellite

BEIJING, Sept. 3 (Xinhua) -- China will launch the first of eight satellites to monitor environment and natural disasters from the country's north Taiyuan Satellite Launch Center this week, according to the China Aerospace Science and Technology Corporation (CASC).

The satellite "Environment 1", an optical satellite, will be sent into orbit by a Long March 2C carrier.

It will monitor most of the country and send back data daily, making up for the country's earth observation data shortage, said Wu Xiaoqing, vice minister of Environmental Protection, Wednesday's "China Business News" reports.

"Launch of the satellite will largely enhance our environment monitoring ability," said Wu, explaining that the present environment monitoring and researching method was not good enough to cope with the dynamic environment and the occurrence of natural disasters.

The satellite will work as a constellation with seven other satellites yet to be launched. Its observational footprint is 720 km.

It is expected to forecast and monitor natural disasters such as flooding, drought, typhoon, landslide and earthquake, said Wu.

www.chinaview.cn 2008-09-03 http://news.xinhuanet.com Editor: Yao

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Szechwan, 2005

Epicenter
30 Km

Chendu
55 Km

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Szechwan, 2008

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Conclusions

- Earth Observing Imagery has been used for more than 30 years to document disasters
- Spatial & temporal resolution have increased dramatically in the past 5 years
- Biggest gains (from DM perspective), however, have been in rapid collection and dissemination for VA-analysis and targeted re-distribution to end users