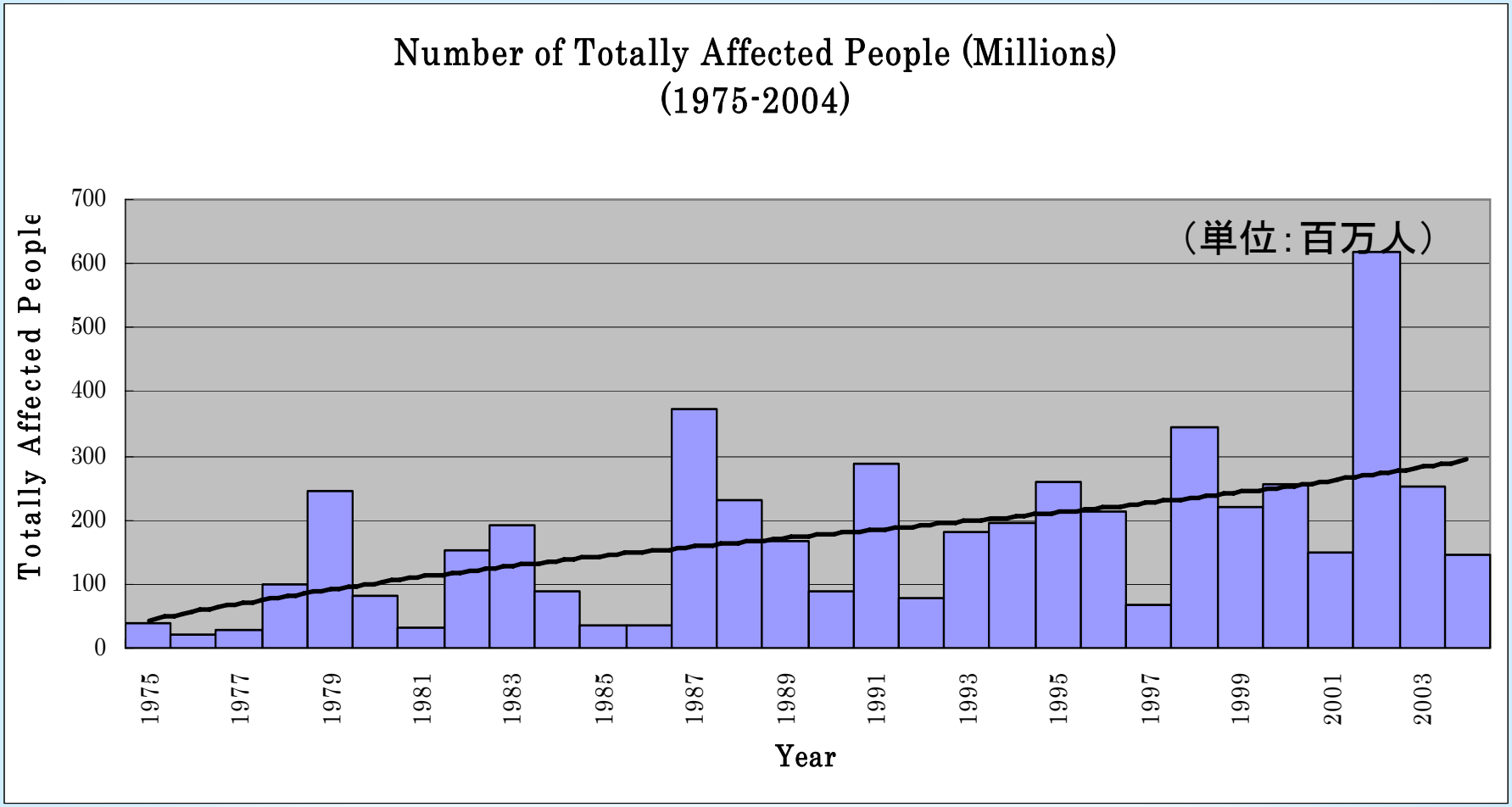
ALOSを利用したアジア防災協力

ALOS Rapid Response System (ARRS) For Effective Decision Making on HQs

Masaru ARAKIDA
Asian Disaster Reduction Center
(ADRC)

世界の自然災害による被災者数の推移
（1975～2004年）



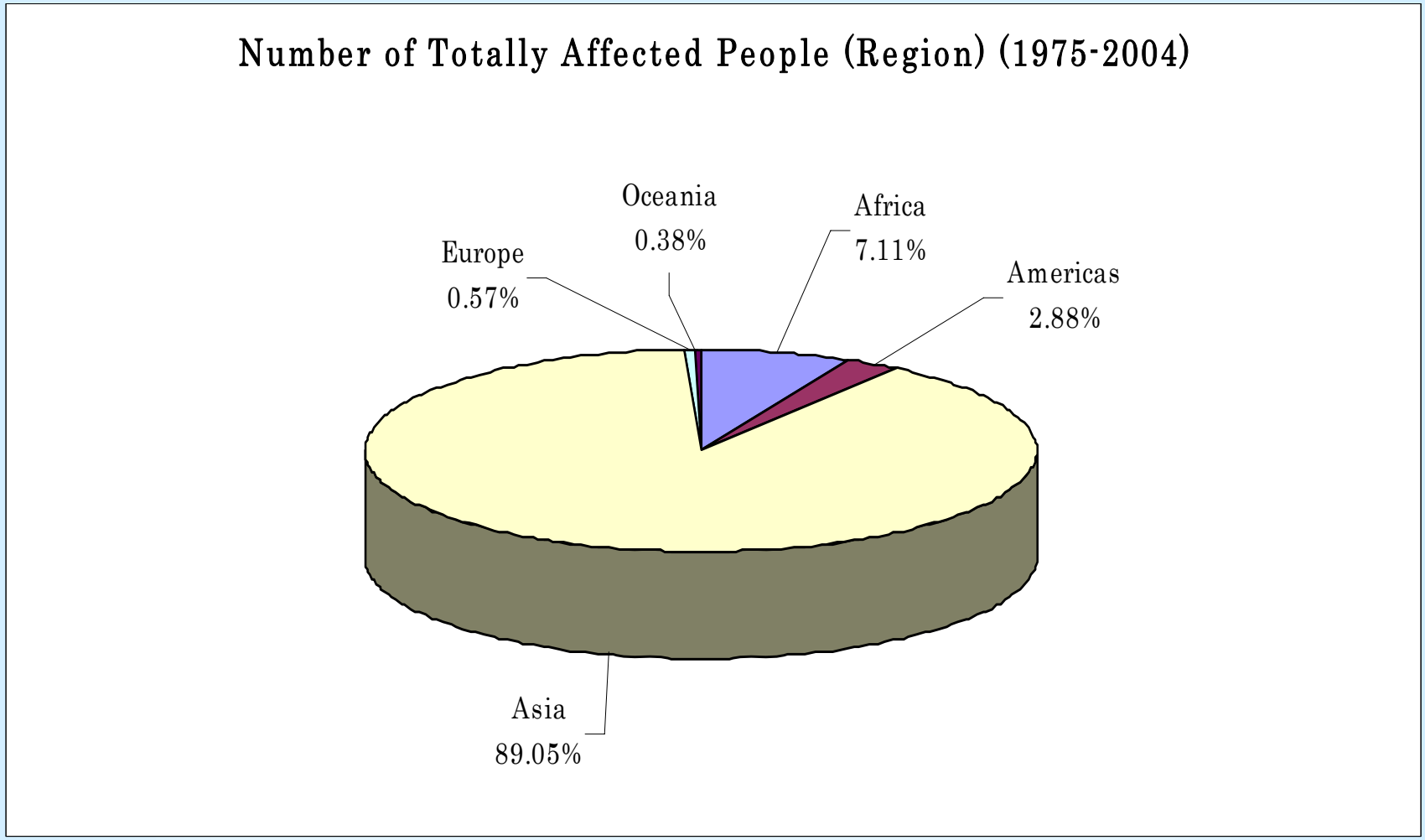
（注）1．ルーベンカトリック大学（CRED）資料をもとにアジア防災センター作成
2．被災者には、死者・行方不明者、負傷者、家屋を失ったなど影響を受けた者を含む

1．被災者数は、継続的に増加、特に90年代後半増加

2．毎年4万人の死者数、260万人の被災者数（94-2003年の10年間平均）

3．更に被災者数増加の傾向（ハリケーン被害、パキスタン北部地震等）

自然災害による被災者の地域別割合
（1975～2004年）



（注）1．ルーベンカトリック大学（CRED）資料をもとにアジア防災センター作成
2．被災者には、死者・行方不明者、負傷者、家屋を失ったなど影響を受けた者を含む

・被災者の90%はアジア地域の人々である。⇒何故アジアなのか？

①地理的条件（火山帯、地震帯等） ②都市への人口の集中 ③貧困地帯

近年アジアで発生した主な自然災害

発生年	国名	災害の種類	死者・行方不明者	被災者
1998	アフガニスタン	地震	4,700	116,935
	中国	洪水	3,656	238,973,000
	パプアニューギニア	津波	2,182	12,049
1999	トルコ	地震	17,127	1,358,953
	中国（台湾）	地震	2,264	110,928
	インド	サイクロン	9,843	12,628,312
2000	インド	洪水	1,290	12,800,000
2001	インド	地震	20,005	16,066,812
2002	アフガニスタン	地震	1,000	35,200
2003	イラン	地震	26,796	332,396
	韓国	台風	130	80,130
	中国	洪水	430	150,146,430
2004	インド	洪水	1,195	12,000,000
	バングラデシュ	洪水	628	33,561,939
	インド洋沿岸諸国（12カ国）	地震・津波	226,408	2,428,413
2005＊	パキスタン	地震	73,318	2,733,000

（注）ルーベンカトリック大学（CRED）資料をもとにアジア防災センター作成

＊　05．11．11付UNOCHA最新災害情報に基づく

自然災害による経済損失（対GDP比）
（1960～2004年。アジアの上位7位まで）

国　名	発生年	種　別	被害額（億＄）	GDP（億＄）	災害被害/GDP比
アルメニア	1988	地震	205.00	22.57	908%
モンゴル	1996	森林火災	17.13	8.93	192%
モンゴル	2000	寒波	8.75	9.07	96%
モルディブ	2004	津波	4.70	7.53	62%
ラオス	1992	台風	3.02	11.28	27%
ネパール	1987	洪水	7.28	28.51	26%
グルジア	1990	地震	17.00	77.38	22%

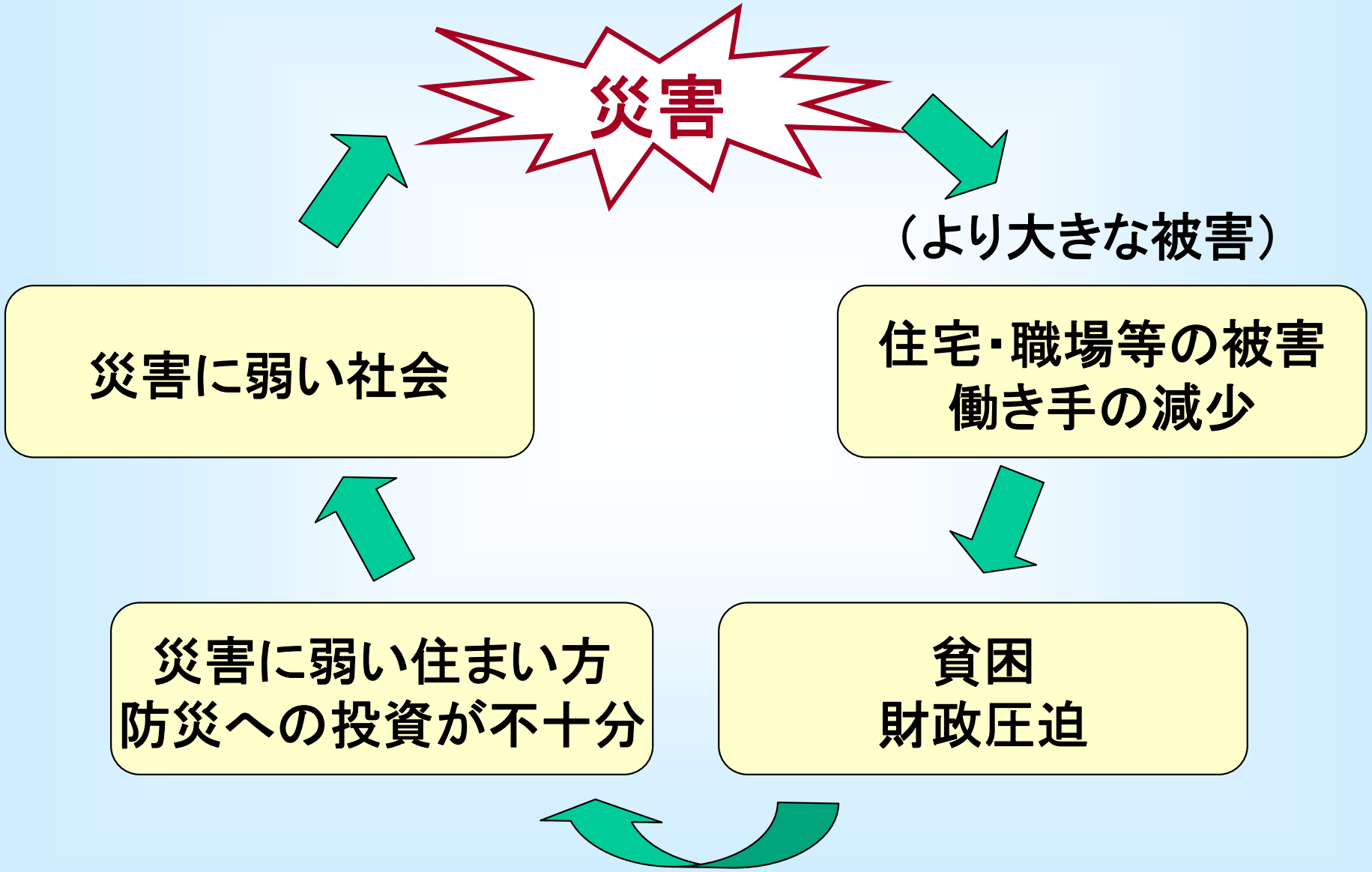
（注）1．ルーベンカトリック大学（CRED）資料、世界銀行資料をもとにアジア防災センター作成
2．GDPは、災害発生前年のもの。ただし、アルメニアについては旧ソ連から独立後の1990年。
3．インド用津波については、2番目がスリランカで、災害被害/GDP：7.5%（被害額：15億＄、GDP：200.55億＄）

□　一度の自然災害が一国のGDPを上回る経済被害をもたらすこともある

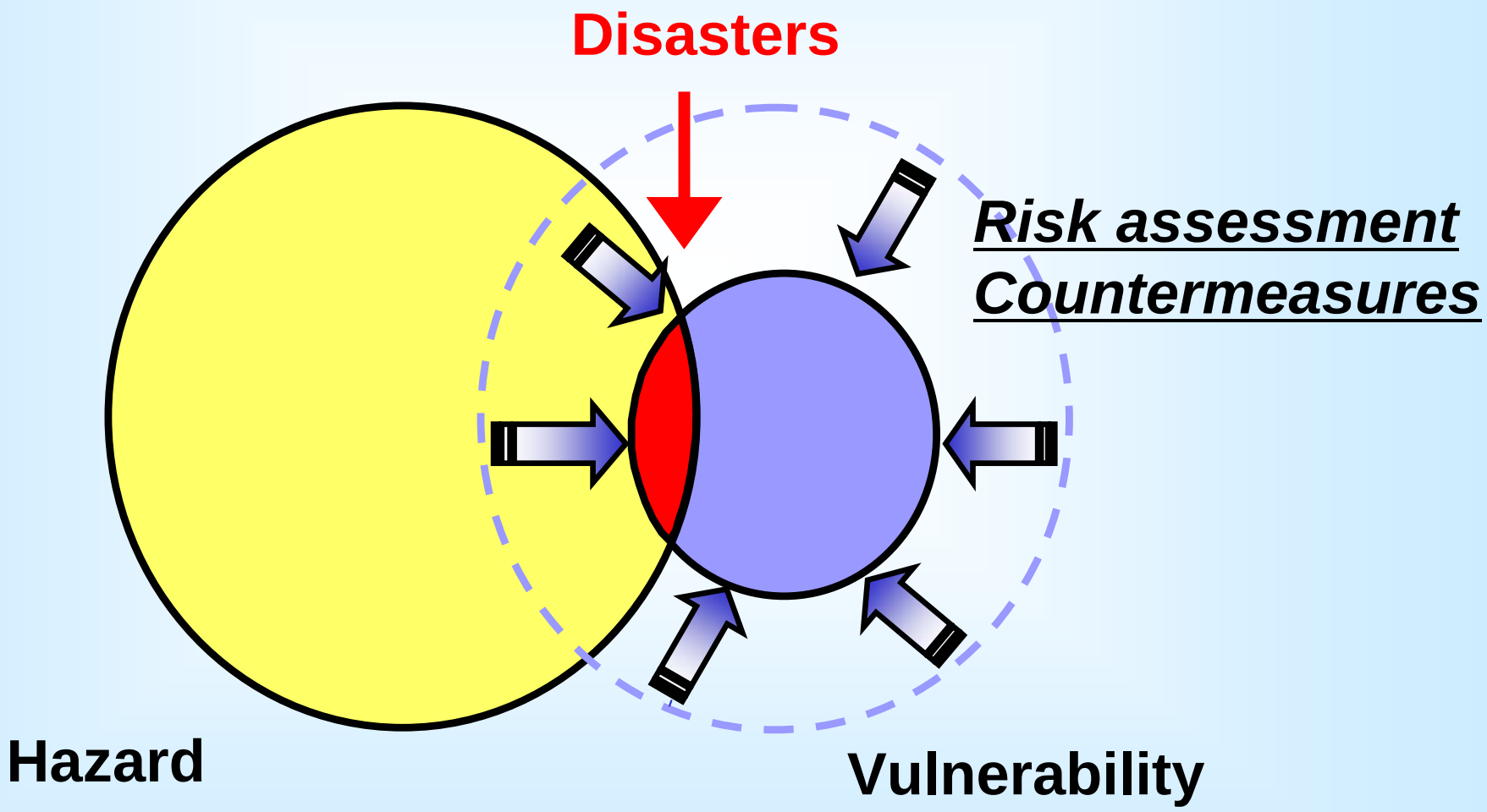
□　自然災害は社会の安定、国家の安全保障への大きな障害となっている

防災はアジアの持続可能な開発に不可欠である

途上国での災害の悪循環

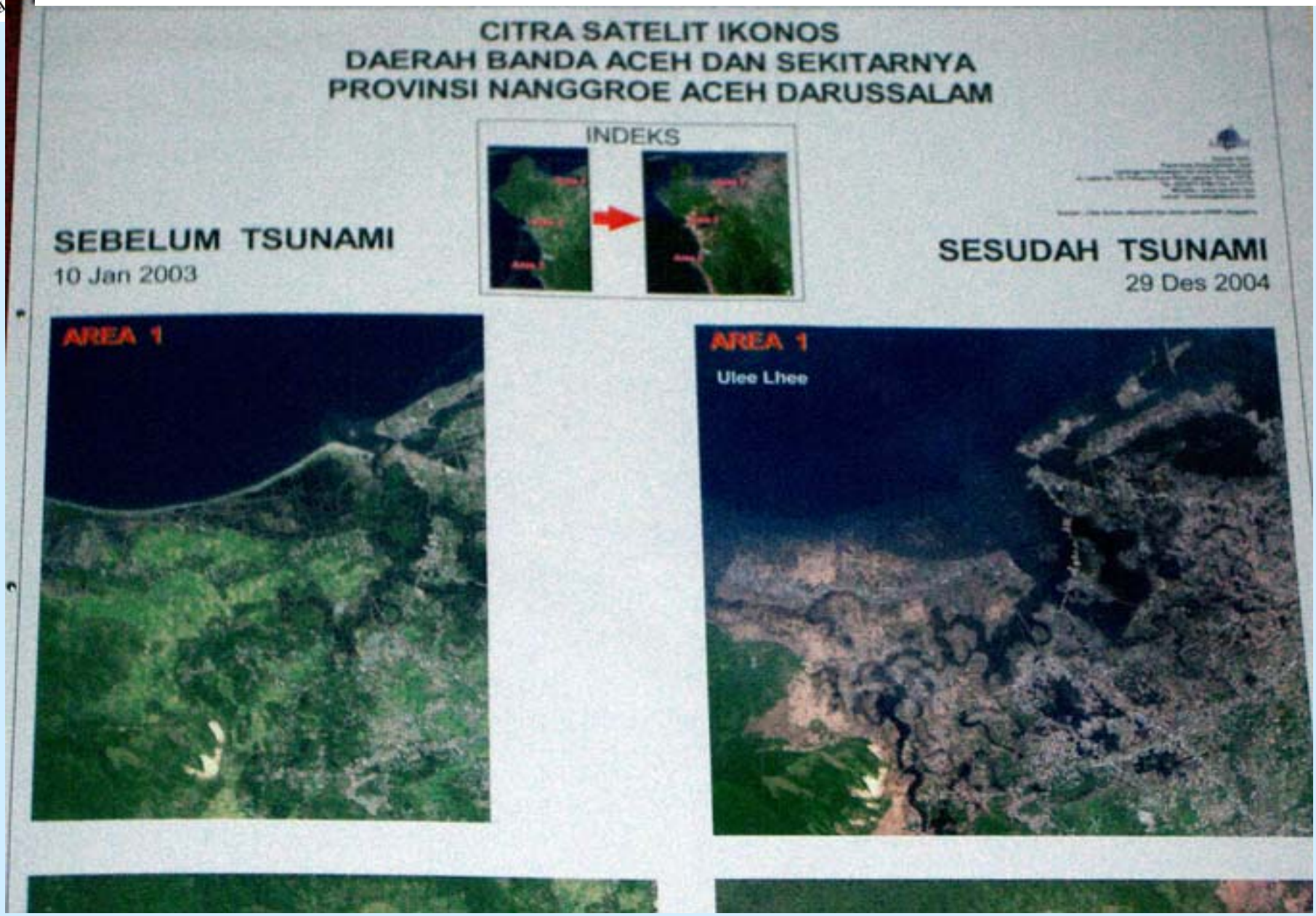


災害は軽減することが可能



総合的な防災対策と衛星利用

Banda Aceh on Jan. 2005



IKONOS Image in operation center

Yogyakarta 1st June 2006

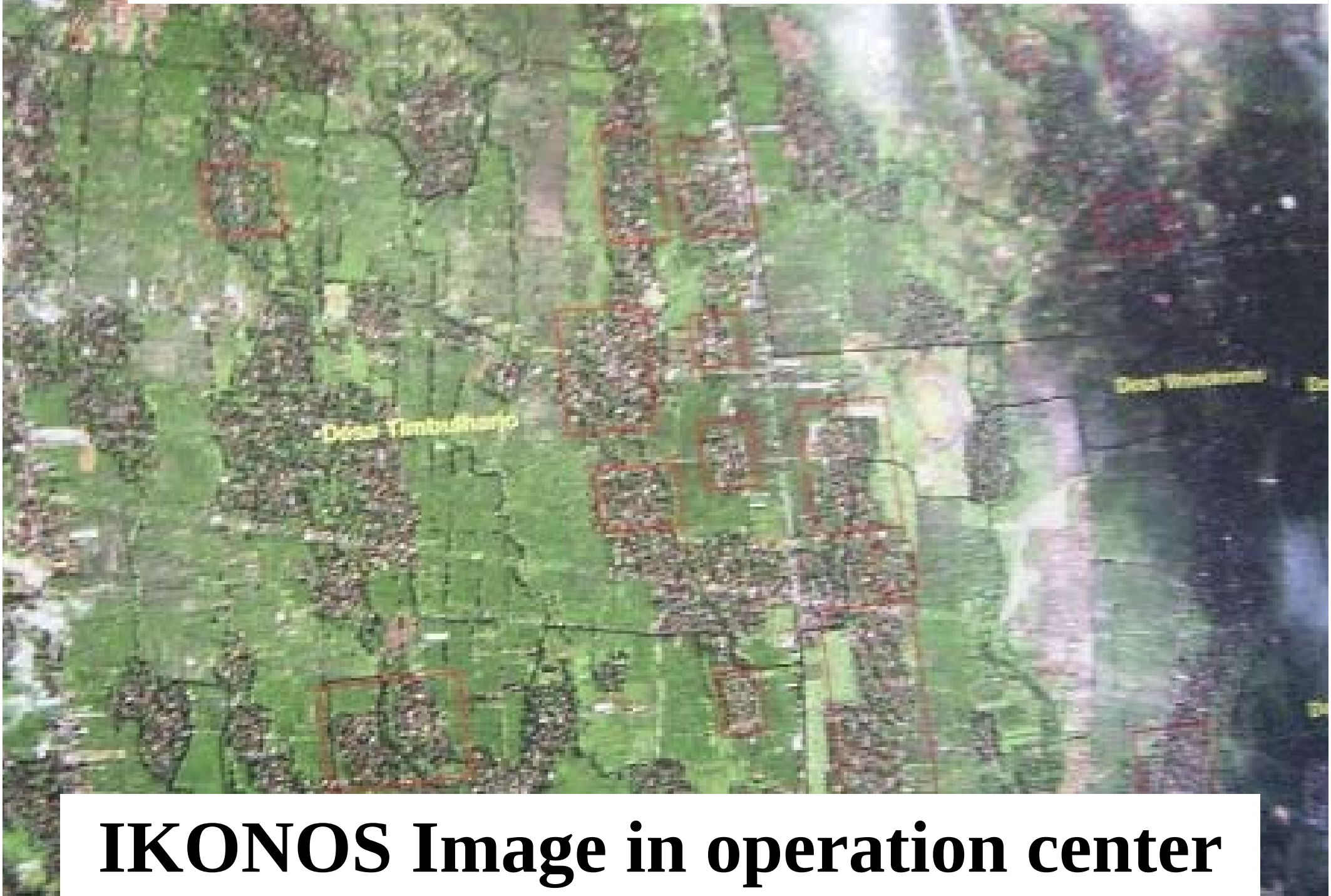
IKONOS image in Media Center

災害対策本部が必要とする情報とは？

- 災害対策本部には衛星写真が飾られていた
- 写真だけでは使われていない、使えない.
- 災対本部では情報を加工する時間も人材もない。
- 被災範囲、被災者数の推計、通行可能道路等の付加情報がなければ、
  いかに早く衛星画像が送られても利用されない。

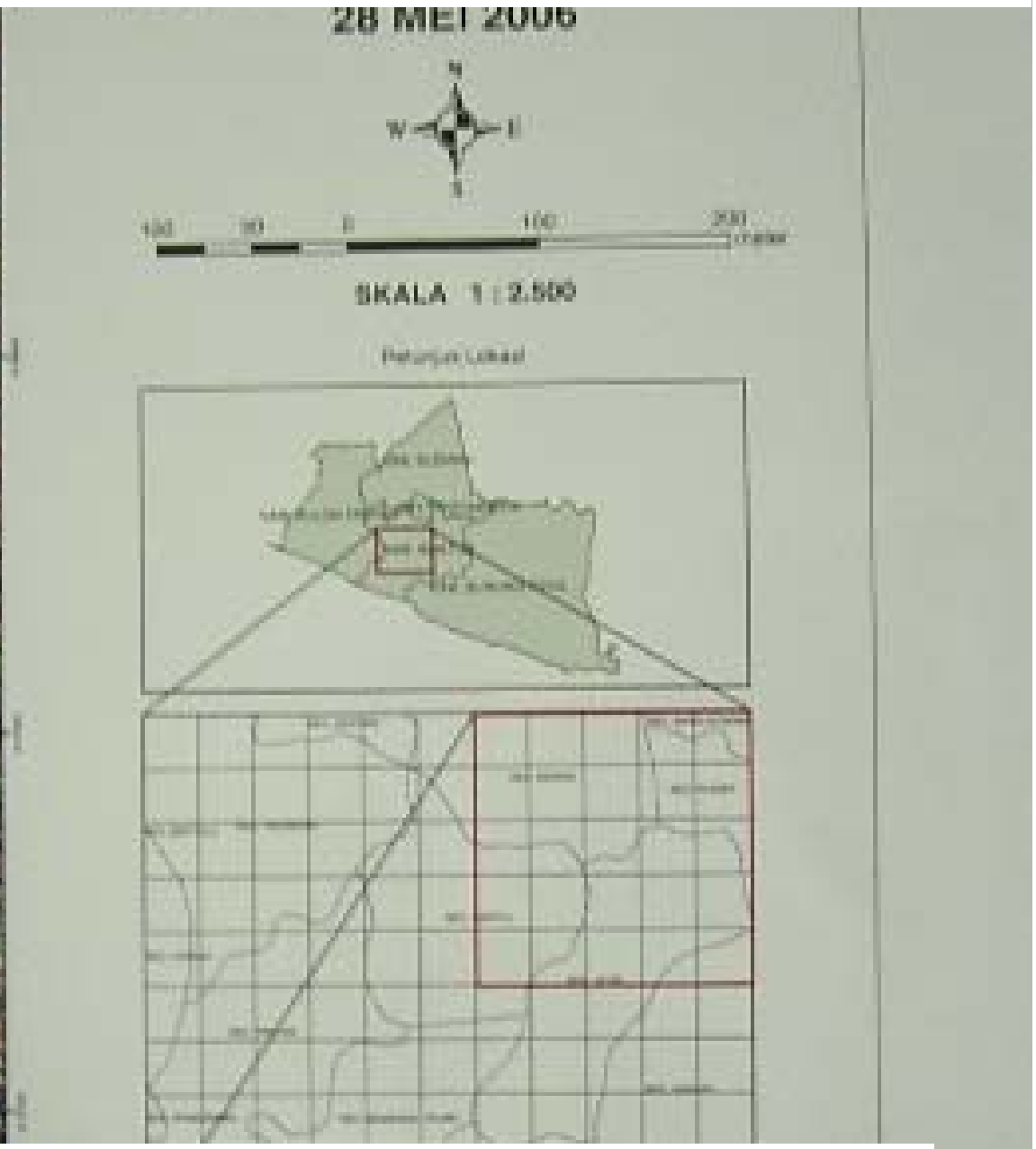
災対本部には衛星画像を加工する知識も技術も処理する時間も不足している。画像に解析結果や分析情報が付加されたものが緊急対策には必要である

Yogyakarta 1st June 2006



IKONOS Image in operation center

Yogyakarta 1st June 2006

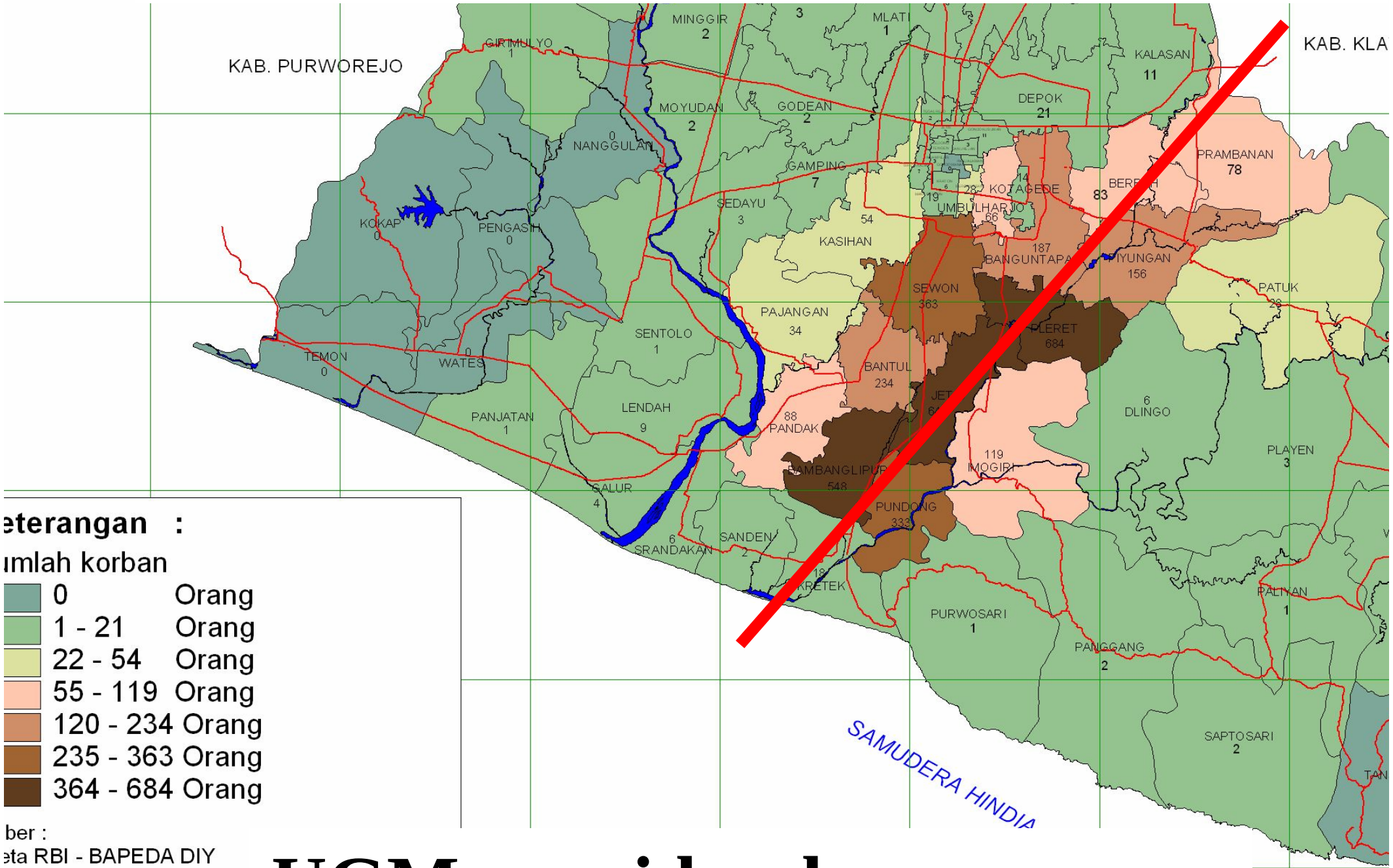


IKONOS Image in operation center

Yogyakarta 1st June 2006

“OPAK” Active fault has moved

Yogyakarta 1st June 2006



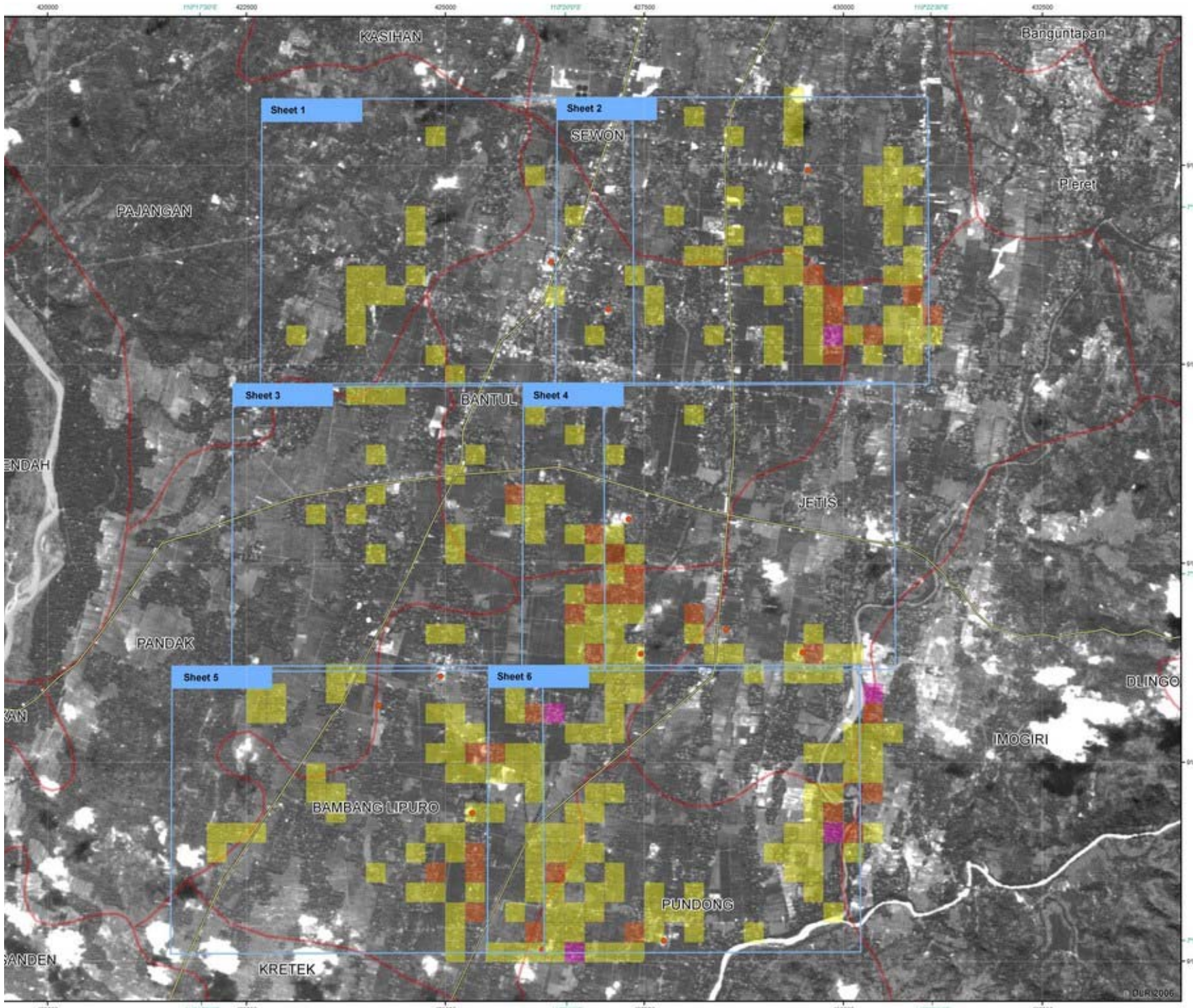
UGM provides damage maps

Yogyakarta 1st June. 2006

HQs gather amount of damages

ESIA / JAVA - Bantul Region - Earthquake May 27, 2006 - Damage Assessment - Overview

1:25.000



Center for Satellite Based Crisis Information
– Emergency Mapping & Disaster Monitoring –

German Remote Sensing Data Center
German Aerospace Center

Legend

no damage visible | moderately affected area | heavily affected area

severly affected area | possible shelter locations | major roads

Interpretation

On May 27, 2006 at 5:53 AM local time an earthquake of magnitude 6.2 has struck the very densely populated region of Yogyakarta on the island of Java, Indonesia. The map is based on a SPOT 5 post-disaster image from May 30, 2006 and displays the extent of six damage assessment maps in the region of Bantul, about 15 km south of Yogyakarta (available at www.zki.caf.dlr.de).
Damage assessment was carried out through visual interpretation of high-resolution QUICKBIRD images, using 250 x 250 m gridcells. Four damage classes were defined: no damage visible, moderately affected area (<33%), heavily affected (33-66%) and severly affected area (>66%).
Depending on the type of building structure, the quality of damage assessment based on satellite imagery may vary and can differ from field observations.

Scale

Scale: 1:25.000 for DinA1 printing

Reference coordinate system: *Geographic coord. info:*

Projection:	UTM Zone 49 S	*Geographic (DMS)*
Spheroid:	WGS 84	*WGS 84*
Datum:	WGS 84	*WGS 84*

Data Sources

SPOT 5 © CNES 2006
Administrative borders provided by the Indonesian RSGIS Forum

Processing/Analysis

Image processing and map creation by DLR:
- Image enhancement for SPOT
- Identification of damaged areas from QUICKBIRD

Map created June 2, 2006 by ZKI@DLR.DE

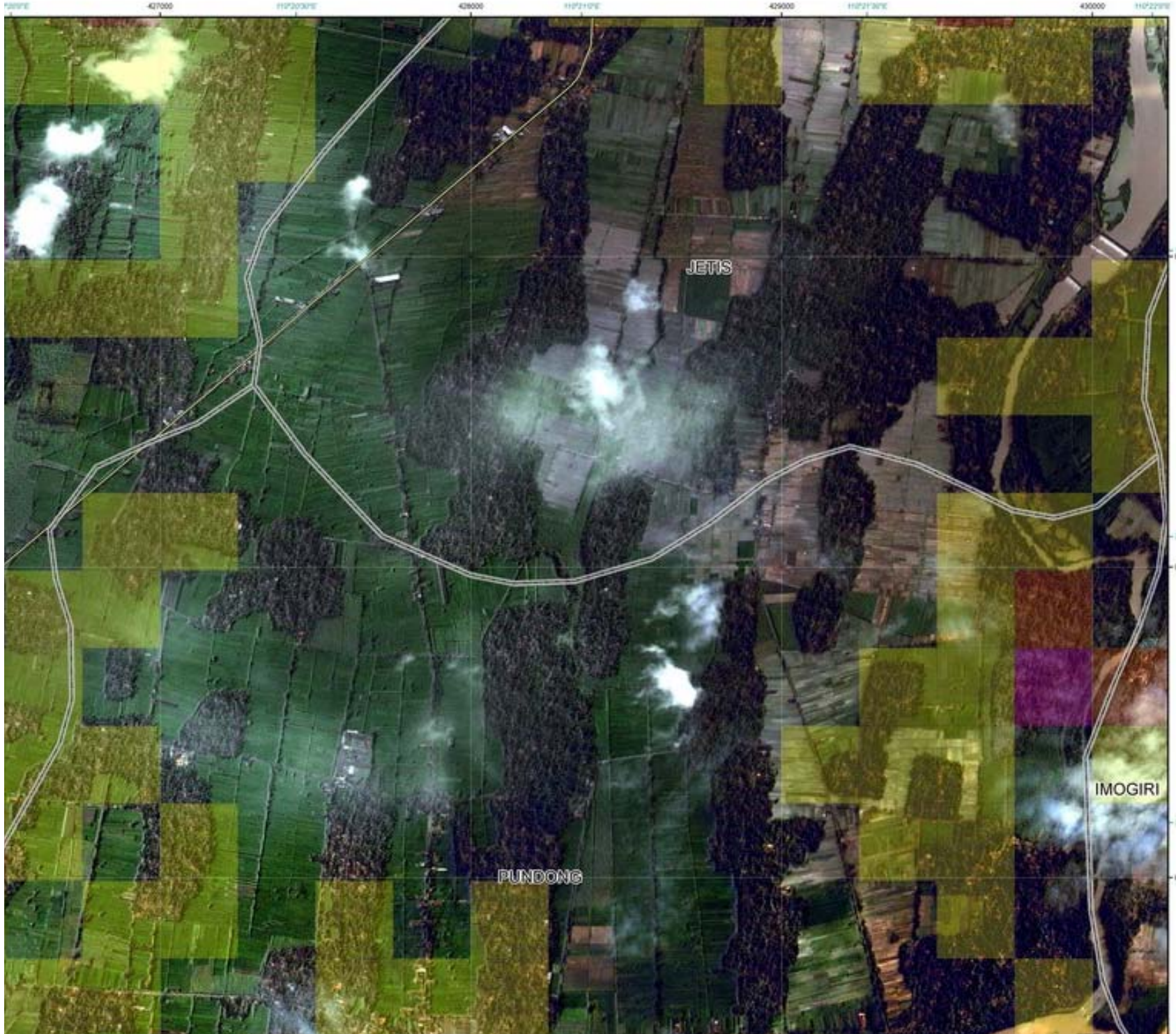
Map disseminated by:

RESPOND

For more information visit: http://www.respond-int.org
feedback@respond-int.org

antul Region - Earthquake May 27, 2006 - Damage Assessment - Sheet 6

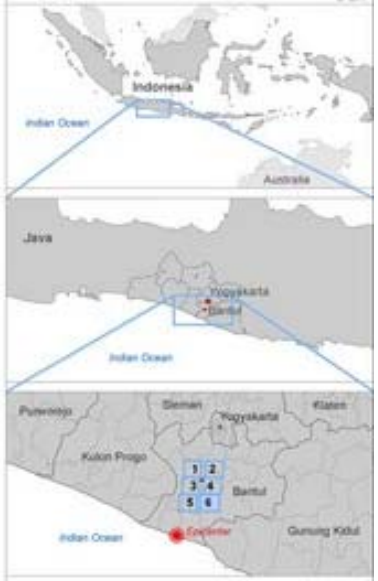
1:7.500



Center for Satellite Based Crisis Information
-- Emergency Mapping & Disaster Monitoring --

German Remote Sensing Data Center
German Aerospace Center

DLR



Legend

no damage visible

moderately affected area

heavily affected area

severly affected area

possible shelter locations

major roads

Interpretation

On May 27, 2006 at 5:53 AM local time an earthquake of magnitude 6.2 has struck the very densely populated region of Yogyakarta on the island of Java, Indonesia. The map displays a QUICKBIRD image from May 28, 2006 (ground resolution: 0.6 m) from the region of Bantul, about 15 km south of Yogyakarta.

Damage assessement was carried out through visual interpretation of the image using 250 x 250 m gridcells. Four damage classes were defined: no damage of infrastructure and buildings visible, moderately damaged (<33%), severly damaged (33-66%) and completely destroyed (>66%).

Depending on the type of building structure, the quality of damage assessment based on satellite imagery may vary and can differ from field observations.

Scale

Scale: 1:7.500 for DinA1 printing

N

Reference coordinate system: *Geographic coord. info*

Projection: UTM Zone 49 S — *Geographic (DMS)*
Spheroid: WGS 84 — *WGS 84*
Datum: WGS 84 — *WGS 84*

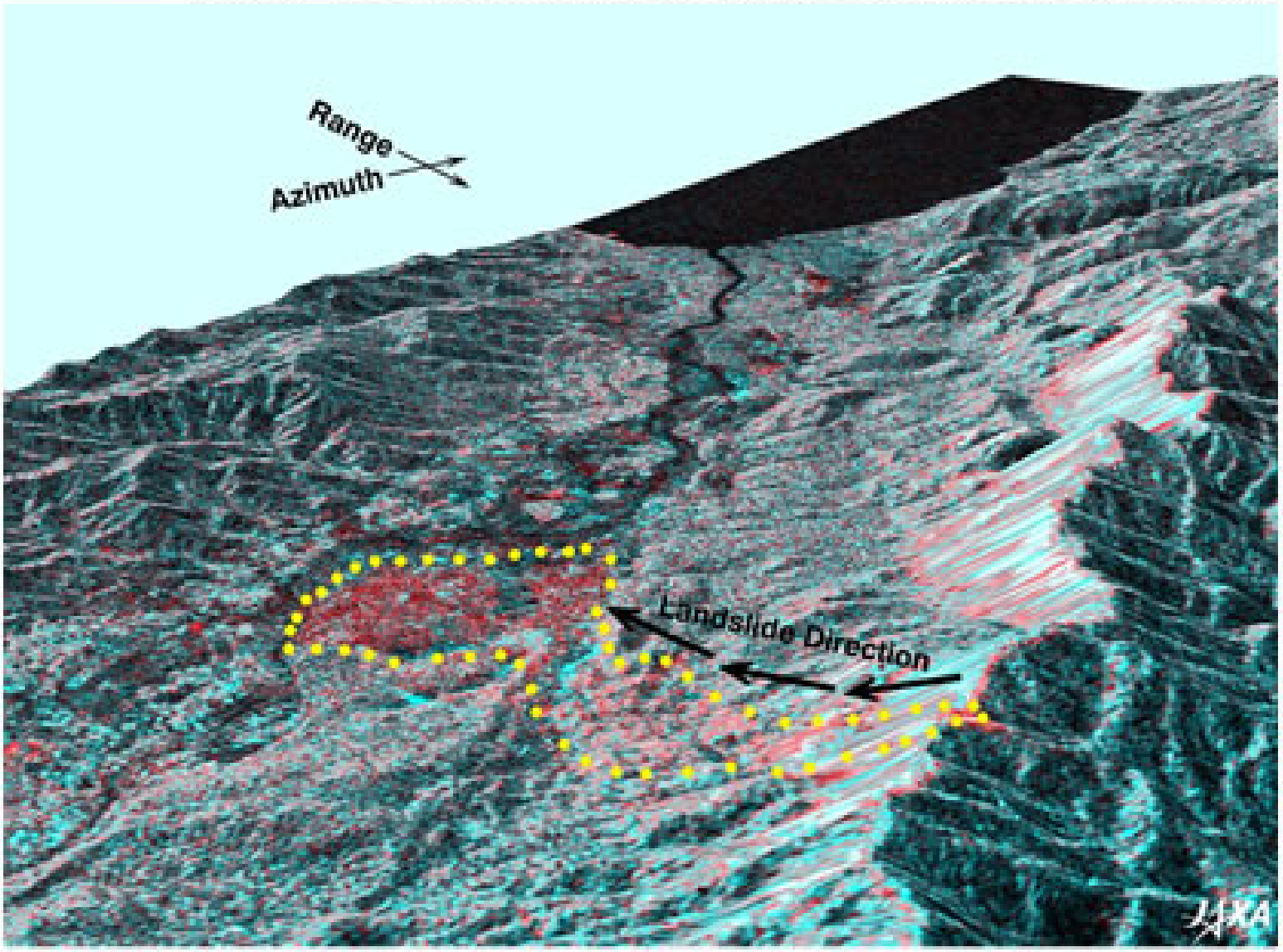
Data Sources

QUICKBIRD © DigitalGlobe 2006 - Distributed by Eurimage
Administrative borders provided by the Indonesian RSGIS Forum

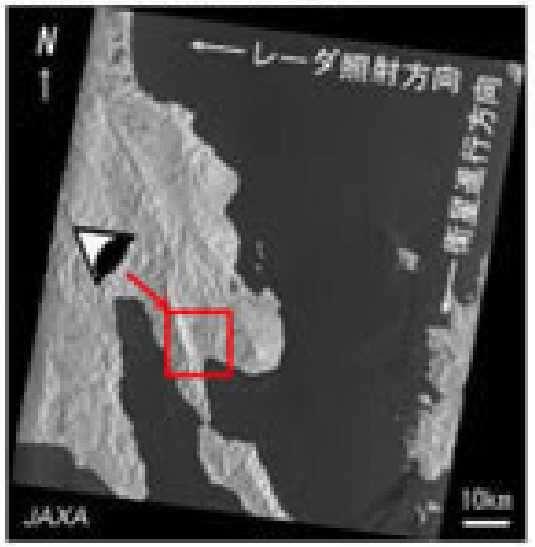
Processing/Analysis

Image processing and map creation by DLR:
- Image enhancement for QUICKBIRD

North-west view of landslide area in Leyte Island, Philippines



Bird's eye view of the landslid stricken area



ALOS/PASLAR observation:
Feb. 24, 2006 (JST)

JERS-1/SAR observation:
Feb. 2, 1996 (JST)

Longitude and latitude around the landslide stricken area

Around 10° 20' N, 125° 5' E

Color composite image with observation data by the PALSAR and JERS-1/SAR (R: PALSAR, G and B: SAR)
The area circled by yellow dots is estimated as a disaster stricken area based on the color composite image.

ALOS Rapid Response System

From 2006 Autumn

- **Accept observation request (in parallel with Disaster Charter)**
- **Quick data dissemination via ADRC**

Asia Disaster Management Agencies
25 ADRC member countries

Request

ADRC
(Asian Disaster Reduction Center)

Information Desk

JAXA

Satellite observation planning

Disaster Observation by ALOS

Disaster !

ADRC Disaster Information

GIS service with Satellite Image（Public）

Internet Access

DATA service for Centralized Information

Remote-Sensing Data by JAXA satellite

Satellite Data (with low spatial resolution)

(for registries users）

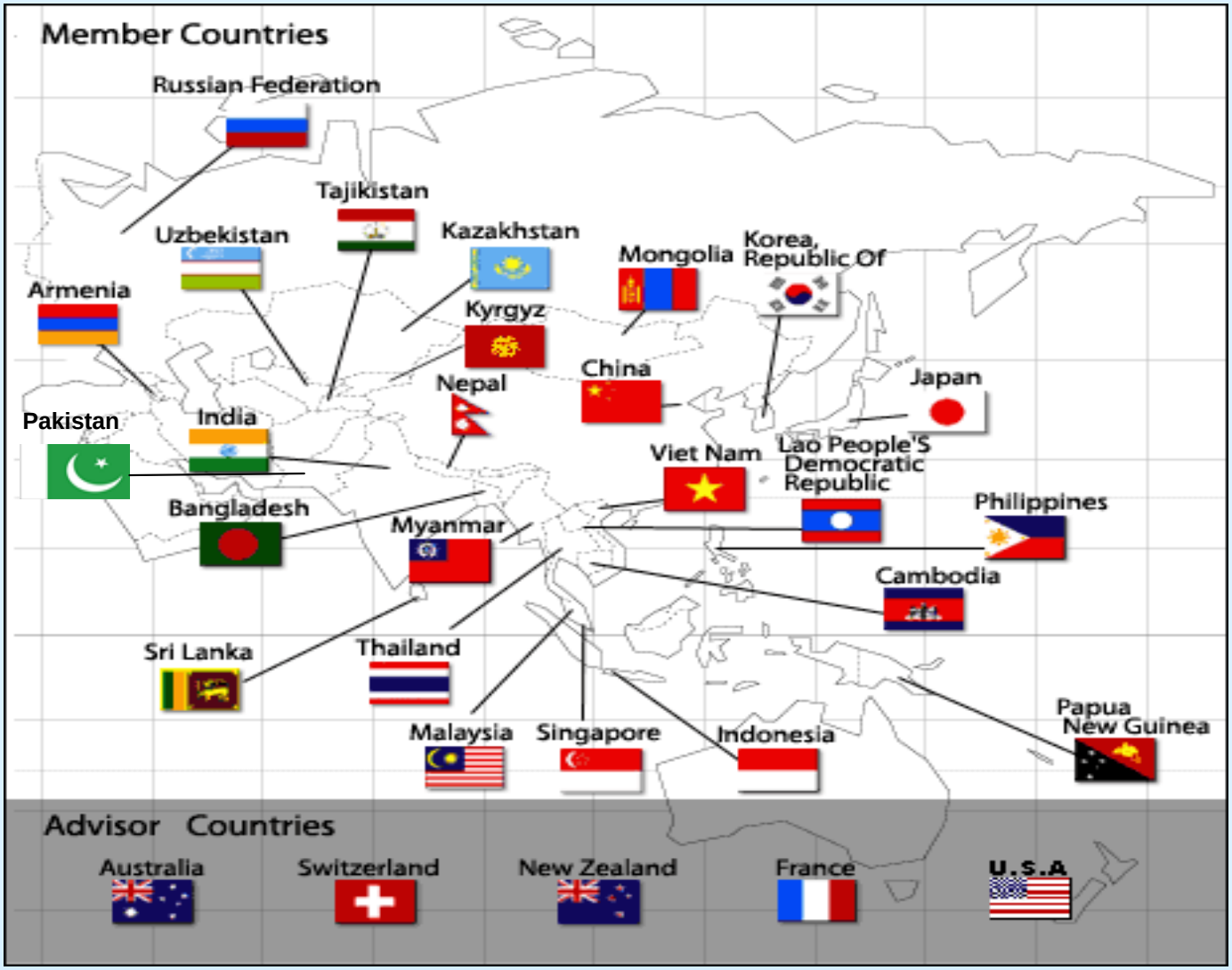
Use Common platform provided from “Digital Asia” project（leaded by Keio Univ.）

（Future）

Asia Space Agency Satellite Data Node

アジア防災センターのメンバー国等

メンバー国25カ国、アドバイザー国5カ国、オブザーバー1機関



※　また、UN／ISDR、UN／OCHA、UNESCO、UNU、WMO、UN／ESCAP、WHO等の国連機関・国際機関等と連携して各種事業を実施

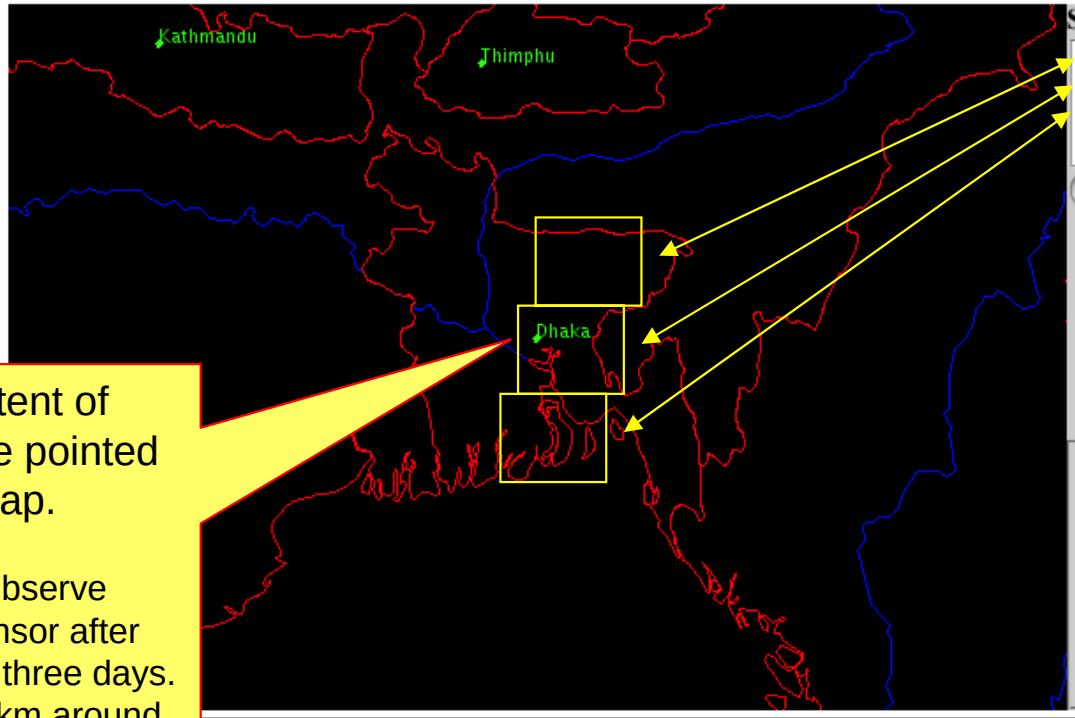
Request page for New Observation

JAXA Satellite Information for Disaster Management – Request New Observation

JAXA Satellite Information for Disaster Management - Request New Observation

GLIDE Number:	DO NOT USE THIS FORM, unless you can identify disaster or GLIDE number. If you can, goto top page and click "GLIDE Number", then click "Request More Observation".
Event (type of disaster):	(Select)
Observation Span:	1 week(s) from the beginning of observation. * These values depend on the selected event above.
Region/Country (location of occurrence):	(Select) / (Select)
Organization:	Bangladesh * This value depends on your logged-in account.
Additional Information on the disaster:	
Additional Instructions (shipping instructions):	

Observation Locations



Selected locations on the map:

first extent
second extent
third extent

Delete selected extent

[+]
[-]
[Address]

Legend

Layer1
Layer2
Layer3
Layer4
Layer5
Layer6
Layer7

Reset Submit Request

How to request observation

Download request form: [MS-Word] [PDF]

E-Mail to JAXA / E-Mail to ADRC

Selected extent of observation are pointed on this map.

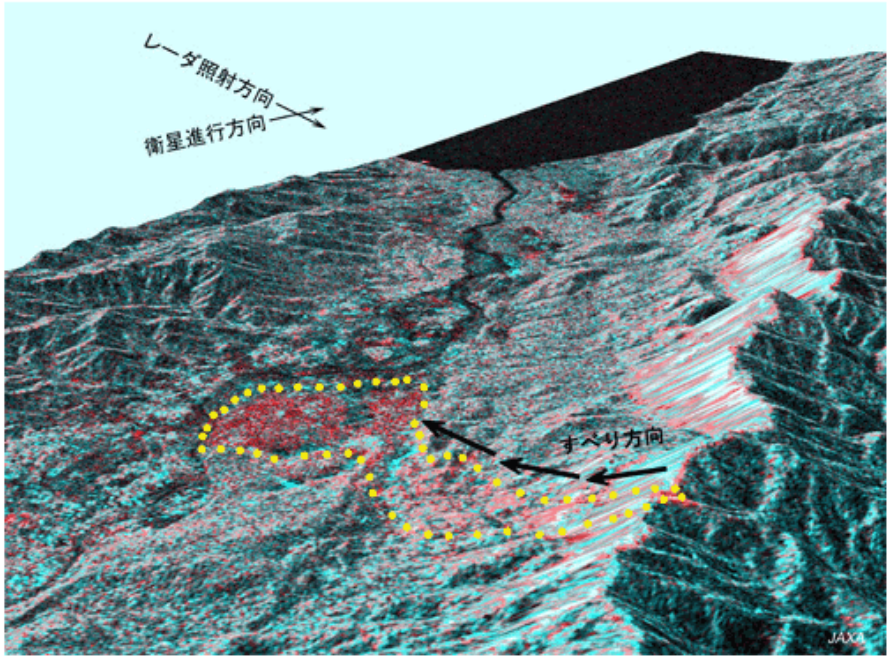
* In ALOS, it can observe with the optical sensor after observation within three days.
* The extent is 70 km around.

Not only Raw Images but also Analyzed information

JAXA Satellite Information for Disaster Management – Satellite Image Details

Observation Date:	ALOS/PALSAR: 2006/02/24, JERS-1/SAR 1996/02/02
Sensor:	ALOS/PALSAR and JERS-1/SAR (R: PALSAR, G and B: SAR)
Product:	Analyzed image
Comments:	North-west view of landslide area in Leyte Island, Philippines Bird's eye view of the landslid stricken area: Color composite image with observation data by the PALSAR and JERS-1/SAR (R: PALSAR, G and B: SAR) The area circled by yellow dots is estimated as a disaster stricken area based on the color composite image. Layte Island Observed from the North-west Side: As the two radars used for the analyses, the PALSAR of the Daichi and the SAR of the Fuyo-1, share almost the same characteristics (such as radio frequencies), as well as the incident angles being almost the same, we can study the difference before and after the crisis by overlapping the images in a relatively simple way. For underscoring the difference, the image taken by the Fuyo-1 is colored with blue and green, and the one taken by the Daichi with red to make a color composite image. By doing so, we can confirm the geographic change in mountainous area and difference of brightness in the flatland. The brighter the area has become, the redder they are in the image. The image is a bird's-eye view of those changes explained above observed from the north east. The height information was acquired from the global altitude data with a 90-meter resolution that was compiled by the cooperative analysis of each country based on data observed by the Space Shuttle Endeavour mission which Astronaut Mori of JAXA participated in. In image, you can see the smooth area on the slope on the east side of the rigid line on the right-hand side of the image, but it was created due to the relative position between the inclination angle of the radar wave and the slope, thus it does not indicate the landslide.

Satellite Image



High Resolution Image for ADRC member Countries

JAXA Satellite Information for Disaster Management – Satellite Image Details

JAXA Satellite Information for Disaster Management - Satellite Image Details

Observation Date:	2006/03/05 12:34
Sensor:	PRISM
Product:	Level-1B
Comments:	This is comments about this satellite image.

Satellite Image

Click to get more high resolution satellite image.

* This image is about 1 or 2 MB GeoTiff (it means several hundred meters as surface imagery).

[Download this image from FTP site]

Related photos from Site

JAXA Satellite Information for Disaster Management – Photo Details

JAXA Satellite Information for Disaster Management - Photo Details

Posted Date:	2006/03/05 12:34
Poster:	ADRC
Title:	Title
Comments:	This is comments about this photograph.

Photo

[Edit this Photo] [Add New Photo]

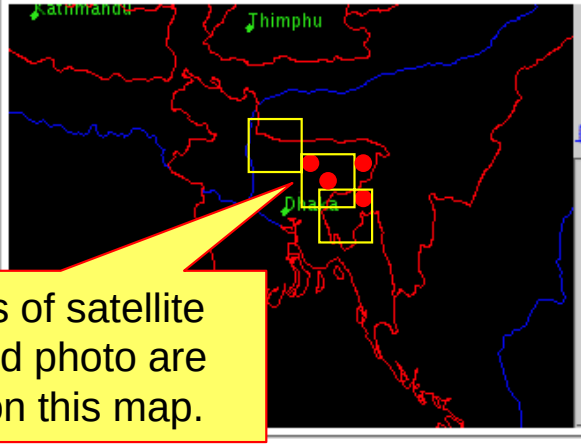
Related information to the specific disaster.

JAXA Satellite Information for Disaster Management – Disaster Details

JAXA Satellite Information for Disaster Management - Disaster Details

GLIDE Number:	TO-2006-000032-BGD	At least five people were killed and over 200 injured when a tropical storm swept over several villages near the Sundarbans mangrove forests in Bangladesh's south, police said on Sunday. [Goto ADRC]
Event:	Tropical Storm	
Duration:	2006/03/05	
Country or District:	Bangladesh	

Related Locations of Satellite Images and Photos



[+] [-] [Address]

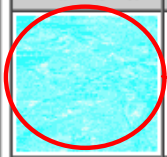
Legend
- Layer1
- Layer2
- Layer3
- Layer4
- Layer5
- Layer6
- Layer7

Related Recent Photos

Thumbnail	Date/Poster/Title	Comments
	2006/03/05 12:34 by ADRC Title	This is comments about this photo
	2006/03/05 by ADRC Title	is comments about this photograph.
	2006/03/05 by ADRC Title	This is comments about this photograph.

[View all images] [Add new image]

Related Satellite Images

Thumbnail	Observation Date	Sensor	Product	Comments
	2006/03/05 12:34	AVNIR	Level-1B	This is comments about this satellite image.
	2006/03/05 12:34	PRISM	Level-1B	This is comments about this satellite image

Related Observation Requests

Request ID	Requested Date	Observation Span	Event	Country	Organization	Sta
123456	2006/03/05 12:34	2006/03/05 - 2006/03/11	Tropical Storm	Bangladesh	ADRC	Wating for Au zation
123456	2006/03/05 12:34	2006/03/05 - 2006/03/11	Earthquake	Mozambique	ADRC	Rejected or Ca ed
123456	2006/03/05 12:34	2006/03/05 - 2006/03/11	Floods and landslide	Indonesia	ADRC	Wating for Obs vation
123456	2006/03/05 12:34	2006/03/05 - 2006/03/11	Mudslide	Philippines	ADRC	Processing

[Request More Observation]

Go to ADRC latest disaster information page

From the Site

Locations of satellite image and photo are pointed on this map.

Satellite Images

Request more observation

ADRC 受付

- Web-GISと e-mailは24時間受付
  (e-mailの場合位置確認が必要)
- 電話及びFAXは日中のみ（12h）受付
  (位置確認が必要)
- UNDACトレーニングへの協力
- 活動報告

メンバー国へのARRS普及啓発

- インドネシア、タイ、スリランカの津波防災教育の一環で研修
- アルメニア、シンガポール、フィリピンのメンバー国協力プロジェクトの一環で実施
- メンバー国会合でのデモンストレーション実施

ARRS当面のスケジュール

- 7月: システム稼動テスト
- 8月: 利用マニュアルの作成（web、紙）
- 9月: UNDAC研修
- 10月以降: 各国で研修等実施

ご静聴、ありがとうございました。