Rapid Assessment for Resilient Recovery
RARR methodology

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ESCAP

Regional Workshop on Rapid Assessment for Resilient Recovery
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Manual on Rapid Assessment for Resilient Recovery in South Asia Recovery Framework

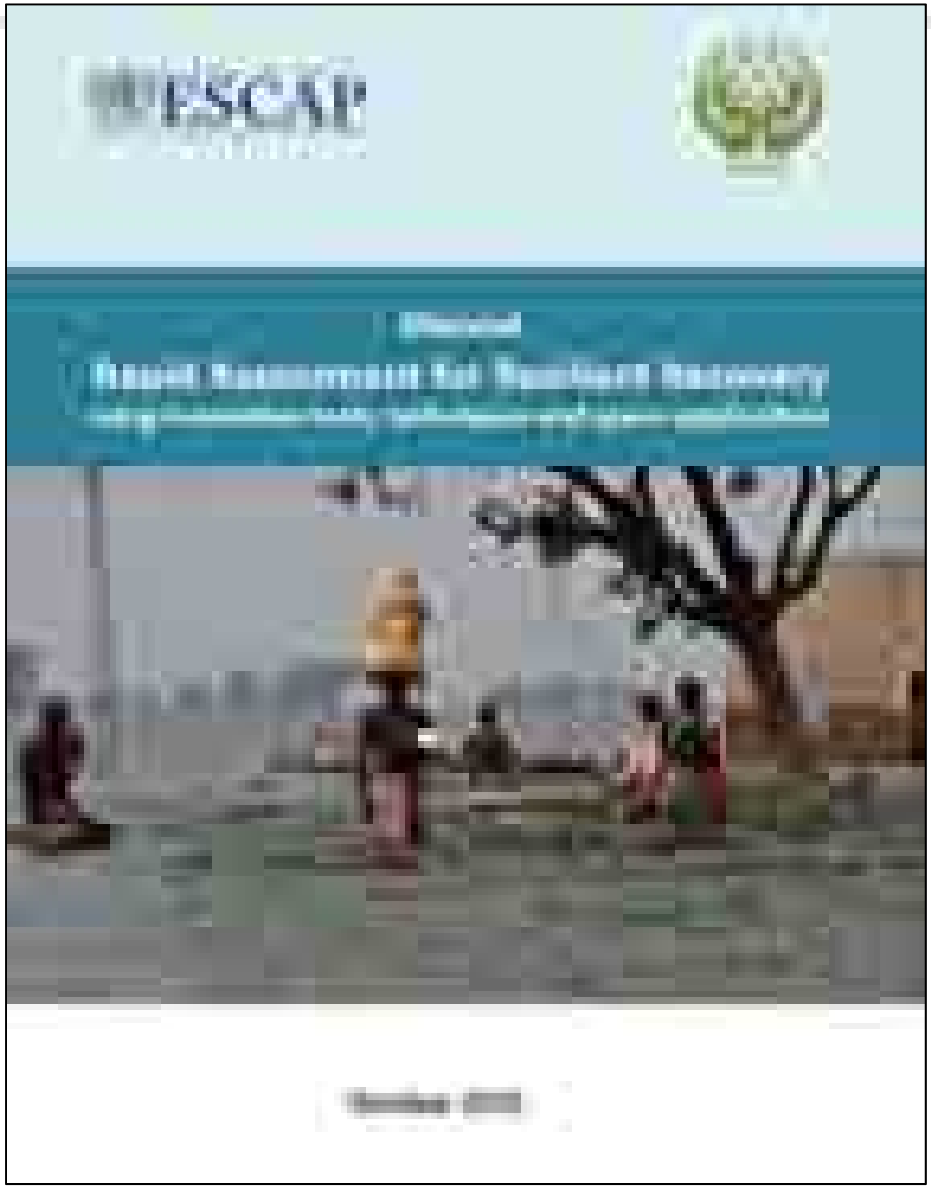
ESCAP and SAARC Collaboration

Content

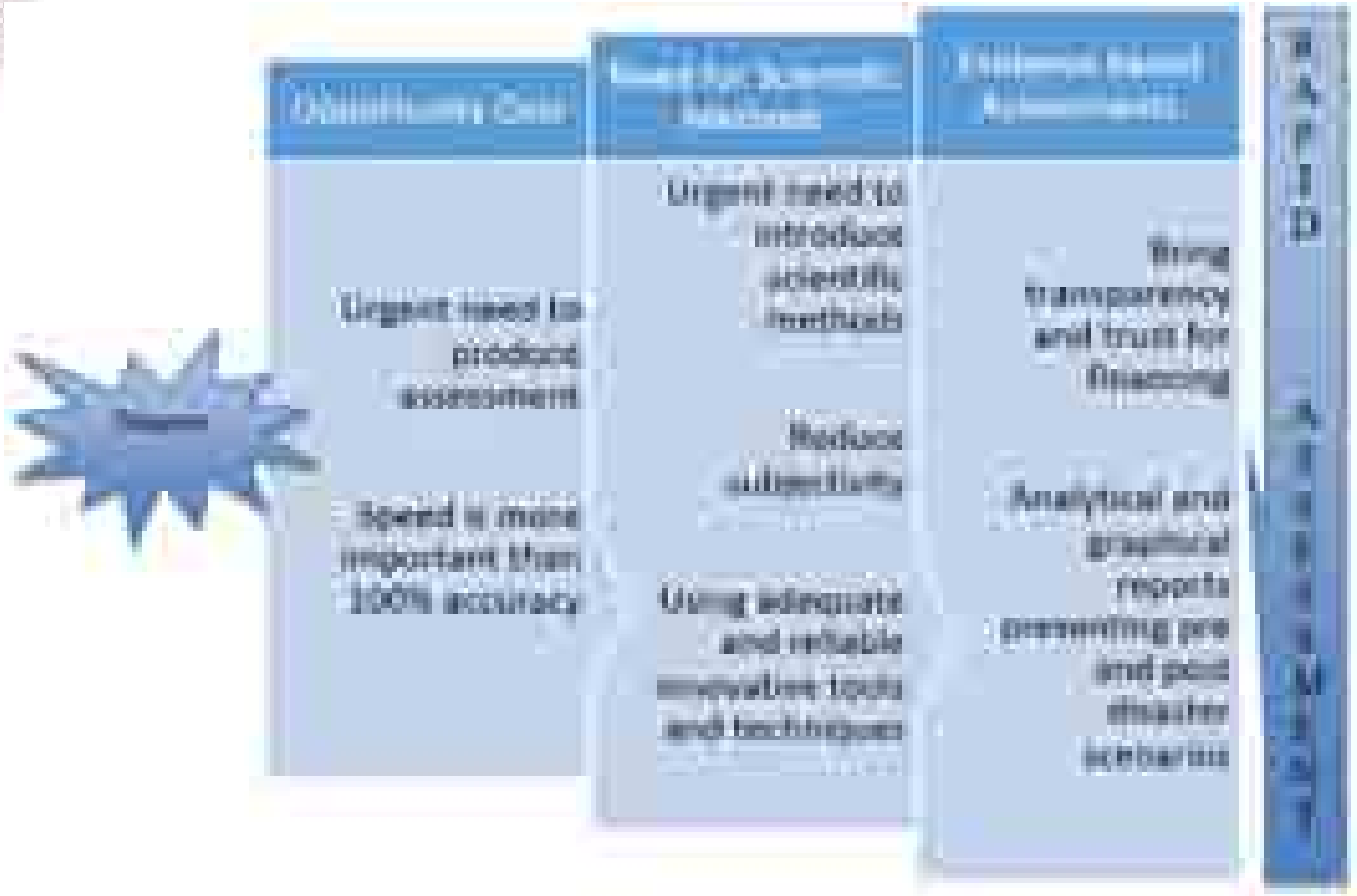
- Existing institutional arrangements and practices
- Use of innovative technologies for rapid assessment
- Methodology for rapid damage assessment
- Sector wise methodology for rapid damage and loss assessment (Agriculture, Housing, Infrastructure sector)

Annex

- Case studies of Rapid assessment using scientific tools
- Use of geospatial products



Need of technology for Rapid Assessment

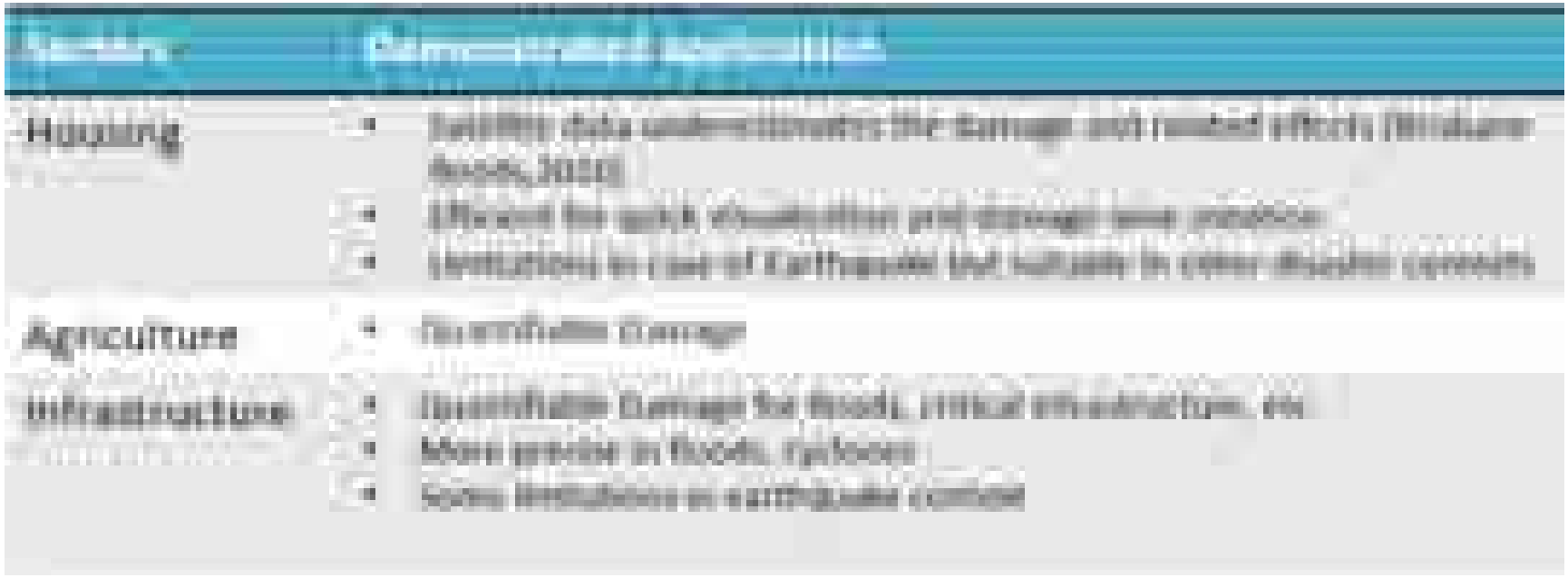


Rapid assessment of damage and loss of key affected sectors

	Preparedness / baseline	Key Informants	Key Informants	Sector-wise damage and loss assessment		
Goal		Flash Appeal	Emergency response	Recovery Framework		Recovery
PDNA core tools		Rapid Assessment				
			PDNA Damage and Loss Assessment			
	Pre-crises	72 hours	2 weeks	4 - 6 weeks	6 months	9 – 12 months

Rapid assessment also provides substantial Information-base to PDNA process

Key sectors for rapid assessment



PDNA (Multi-sector)→ RARR (Fewer sectors)
(Agriculture, Housing and Infrastructure)
80% of damage contribution
Roughly quantifiable damage possible

Chapter 4

Use of Innovative Technologies

Available innovative tools and services

- **Earth observation data** holds immense potential for providing immediate response to reconstruction needs in the field of disaster management.
- **Emerging technologies**
  - open source data (OSM)
  - tools
    - crowdsource mapping,
    - mobile technologies
    - and unmanned aerial vehicle (UAV)
- Provide better response and are becoming an integral part of disaster management.
- **Success stories of crowdsourcing :**
  - **MANU, during Uttarakhand Floods in India 2013,**
  - **Cyclone Pablo (2012) and Haiyan (2013) in Philippines,**
  - **and Earthquake in Nepal (2015).**

Limitations

a. Understand the limitations as well as the comparative advantage of space/GIS/other tools
b. Use strategically and in conjunction with other sources of data/information
c. Be mindful it's not standalone but just a source of information that is quite critical and evidence based in post-disaster situations

Comparative Advantage of Remote Sensing

- Provides synoptic overview of pre and post situation
- Fill in gaps in baseline pre- and post disaster data/information
- Substitute non-existing or outdated maps
- Provide tailored thematic information (damage)
- Support the field mission planning (where is the most affected area, what type of damage we an expect, etc.)
- Extrapolate field observations to statistically (more) reliable estimates of the total scale of the damage
- Unbiased information that is not distorted for political reasons or other forms of misinformation

Remote Sensing: Limitation and constraints

- Atmospheric conditions - cloud cover – floods/cyclone context and haze
- Less optimal spatial resolution, viewing configuration, non-optimal timing
- Availability and cost – in case of buying the data/products
- Incomplete or lack of access to near/real time data
- Processing errors (e.g. geocoding) or interpretation
- Lack of capacity to integrate geospatial data/products into PDNA
- Technological limitation and methodological gaps to quantify sector-specific damage

Three-pronged Strategy to integrate geospatial data

- Rush Mode
  - Real/Near Real Time Satellite Data for Rapid Mapping of Disaster Impacts – Large Swath, Frequent Observations, Timely
  - Opportunities: International Space Charter, Sentinel Asia, RESAP Network, Commercial and Bilateral Cooperation

- **Progress Monitoring**
  - Multi-date data acquisition to support preparedness, monitor response, early recovery

- **Independent Validation**
  - For monitoring and evaluation of recovery and reconstruction process
  - Opportunities: Access to data – with own capacity, Commercial and Cooperation related opportunities

Emerging Opportunities

- Tremendous Increase of Imagery Data
  - Large number of Earth Observations (EO) Satellites in Orbits/being launched (Sentinels, Landsat, DM Constellations)
  - GEO EO data policy to have 20 m multi-spectral data in public domain, EO products/services as public good..
  - EO data/products are getting cheaper and more accessible
- International and regional cooperation becoming more effective and user friendly (Charter, Sentinel Asia, RESAP, GIO-EMS, GEOSS..)
- Private sectors – Google, Bing, SMEs
- Community – Open Street Map, Open Source Software, Free data access

Prospects of crowdsourcing

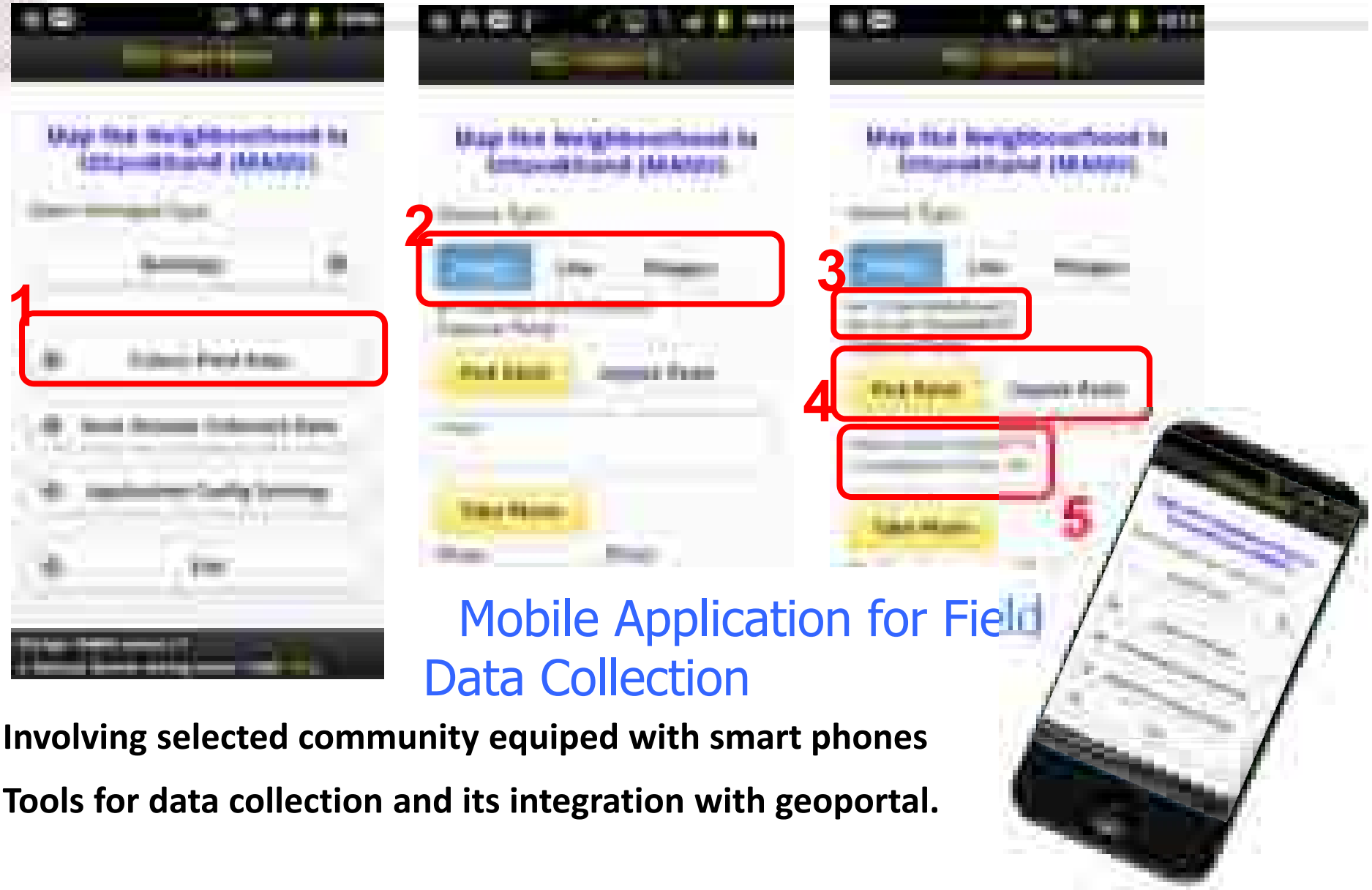
Uttarakhand Flash Floods 2013

Source: CSSTEAP

Case Study: Uttarakhand Flash Floods 2013
Structure of Field Data Collection Proforma through Mobile App

- Damage to buildings and infrastructure
  - 1a. Damage to Buildings
  - 1b. Damage to Infrastructure
    - 1b1. Roads
    - 1b2. Bridges and Culverts
    - 1b3. Other Infrastructure
- Landslides
- River Bank Erosion
- Damage to Land-cover and Natural Resources
- Points of Interest

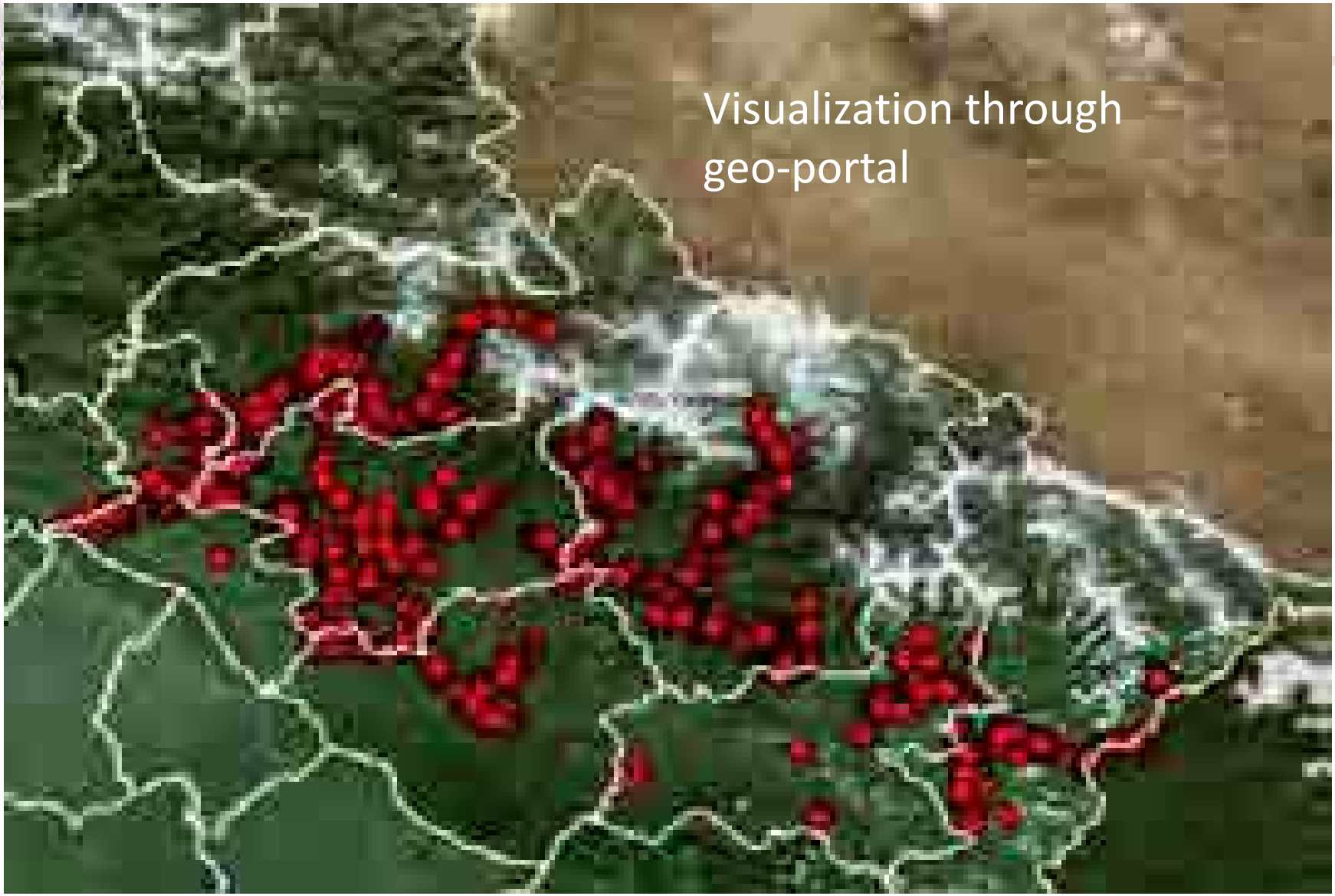
Controlled Crowdsourcing :
Collection of primary data from the affected areas



Mobile Application for Field Data Collection

- **Involving selected community equiped with smart phones**
- **Tools for data collection and its integration with geoportal.**

Primary field data-collection points in affected areas



Total points – 19,559

Source: CSSTEAP

Reported Landslide Locations

Source: CSSTEAP

Importance of capacity building in quick and reliable data collection using crowdsourcing approach

Disaster Assessment

- Rapid Assessment – 661 $Million
- Housing –25 $Million
- Road & building –452 $Million
- Other infrastructure –131 $Million

Crowdsourcing: Typhoon Pablo Social Media Mapping, OCHA , 2012

Crowdsourcing fulfills the requirement of rapid and large volume of data collection through a geospatial platform for data repository and analysis including quality check with an artificial intelligence (AI) based algorithm for tagging disaster risk from random crowd sourced data.

Chapter 5

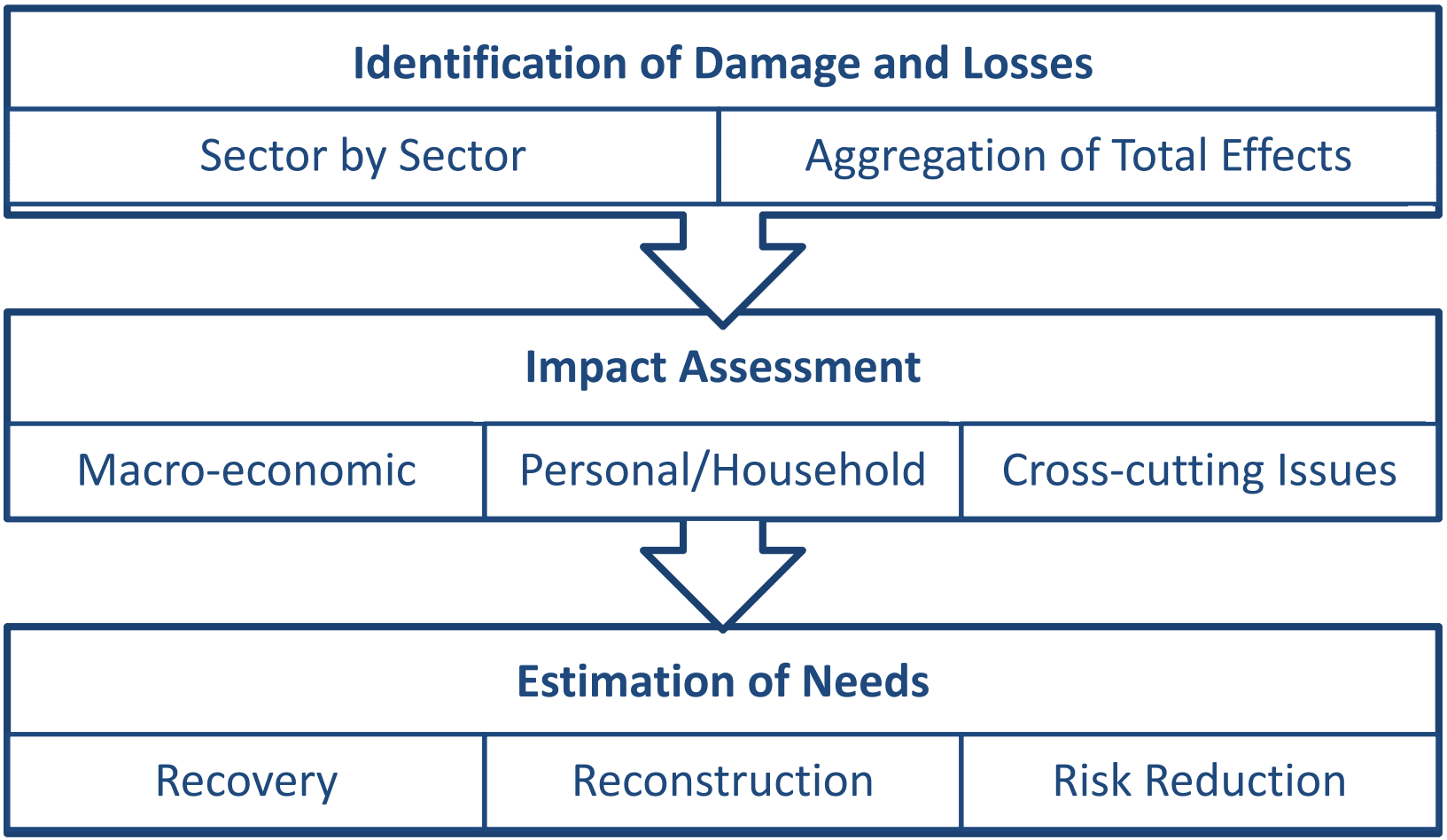
Step by Step Methodology for Rapid Damage Assessment

Methodology for Rapid Disaster Damage and Loss Assessment

Collateral data/info

Satellite data/products

The Assessment Process



Chapter 6

Agriculture Sector – limitation in terms of getting cloud free scene but advantage timeliness, accuracy and evidence based assessment

Estimating Damage and Losses (Agriculture Sector)

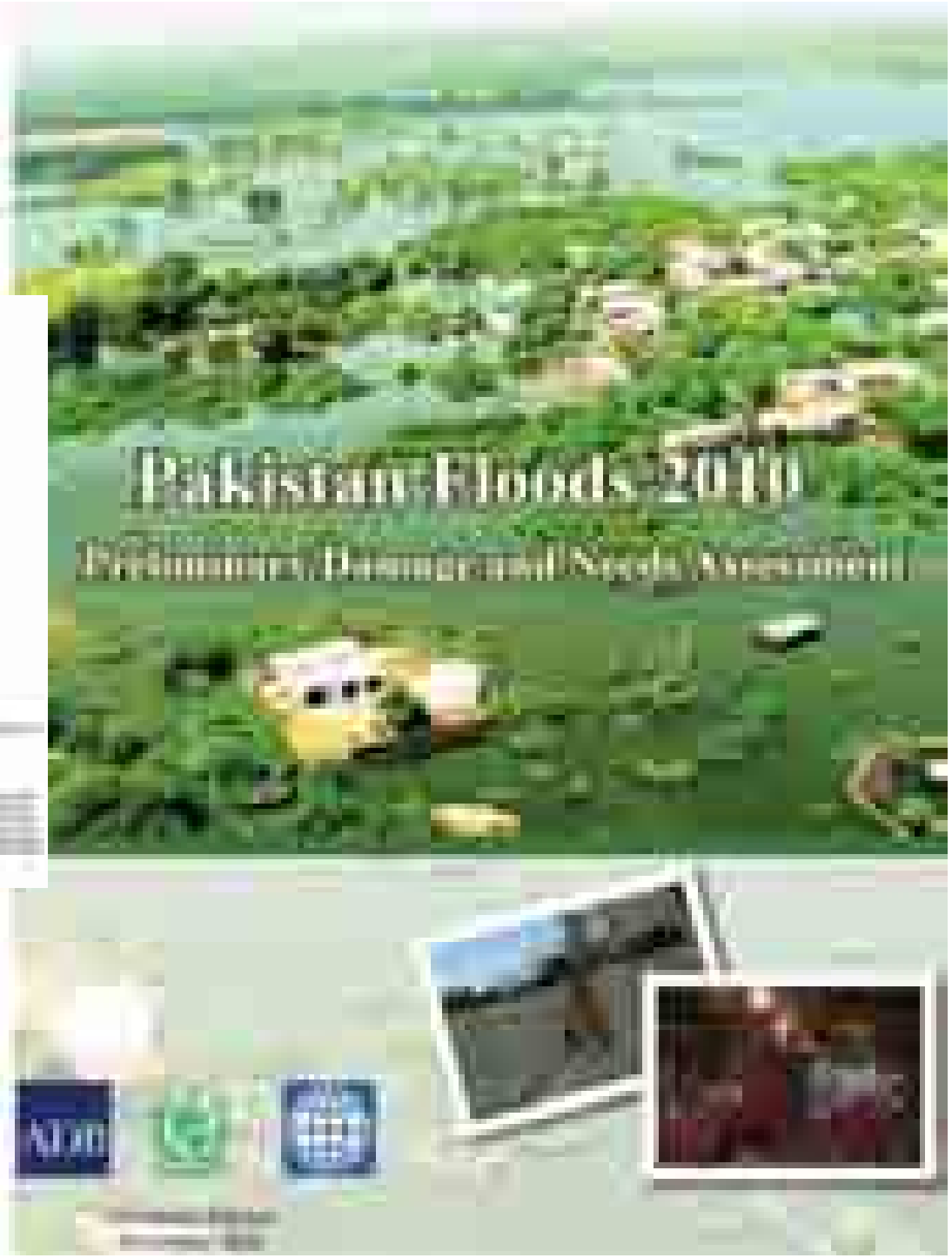
1. Baseline data
2. Estimate Damage and Losses
    1. Damages
    2. Losses
    3. Losses beyond the disaster year
    4. Total Damage and losses in a district
3. Total Damage and losses in the province
4. Validate the information on damages and losses
5. Analyze the impacts of the damages and losses to the affected population
6. Estimate recovery and reconstruction needs
7. Draft the implementation plan of the identified programs and projects
8. Draft the post-disaster damages, losses and needs (DaLNA) report of the sector

Agriculture Sector: Minimum requirement of baseline information

Damage to agricultural assets					
Name of City or District:					
Assets	Number of Totally Destroyed	Average Replacement Cost per Unit (Curr)	Number of Partially Damaged	Average Repair Cost per Unit (Curr)	Total Value of Damages (Curr)
	A	B	C	D	E
Physical Assets					
a. Agriculture land					
b. Storage buildings					
c. Others					
Stocks and raw materials					
a. Rice					
TOTAL	N/A				

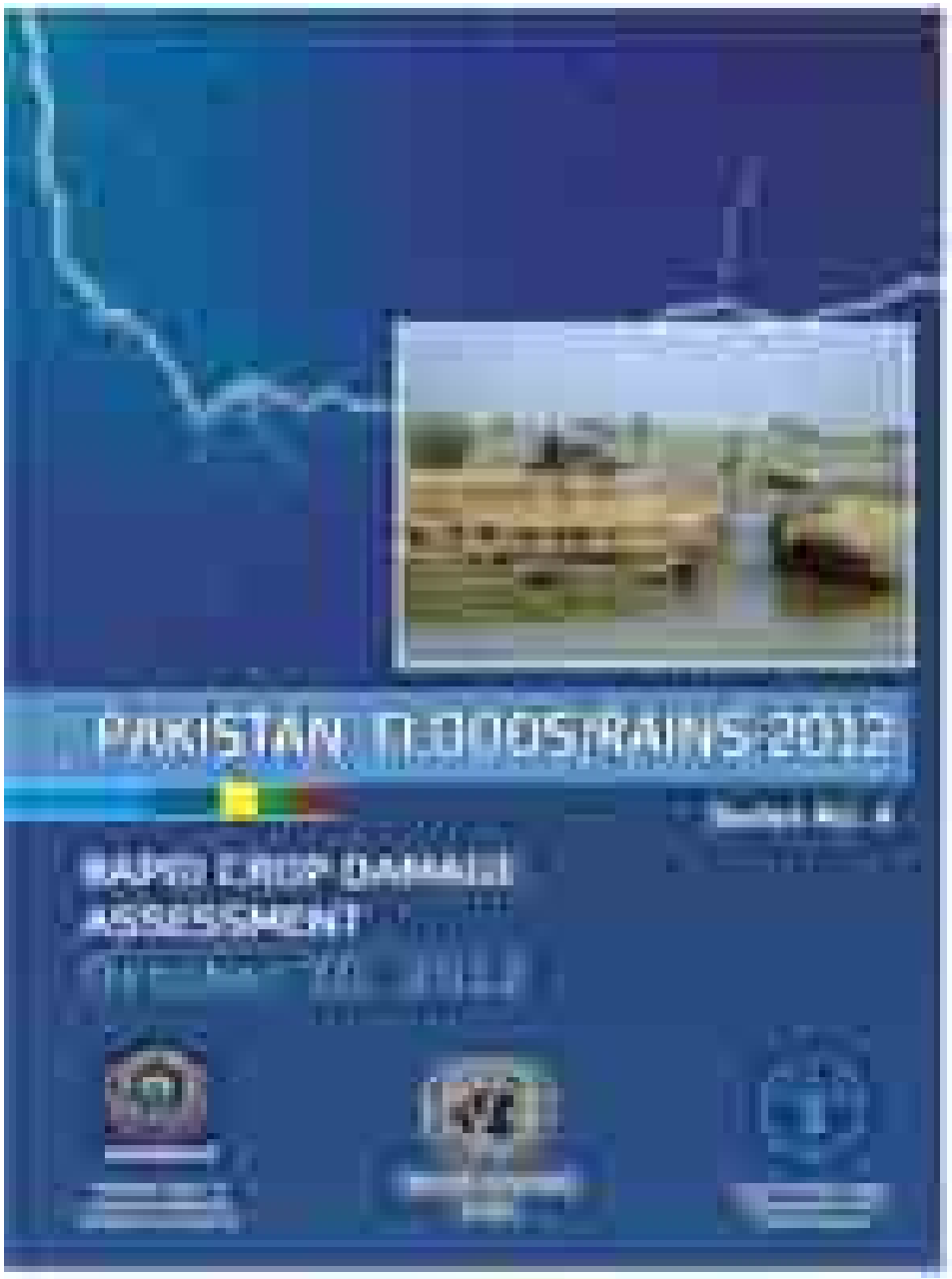
Damage to Irrigation					
Name of City or District:					
Name of the Irrigation Facility	Partially damaged	Totally destroyed	Repair Cost	Replacement Cost	Value of Damages
	Meters	Meters	(Curr)	(Curr)	(Curr)
	A	B	C	D	E
1					
2					
3					
TOTAL					

Summary of damages and losses in agriculture in the District (in Currency)							Planting to Harvest Season (Months)
Name of District:							
Sub-sector	Disaster Year		Year 1	Year 2	Total		
	Damages	Losses	Losses	Losses	Damages	Losses	
a. Crops							
b. Permanent Crops							
c. Fisheries							
d. Livestock							
e. Forestry							
f. Irrigation							
g. Others							
TOTAL							



Impacted largely to agriculture sectors

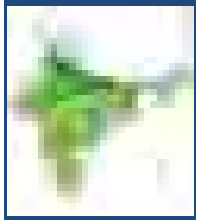
Agriculture Sector



Rapid Assessment

AGRICULTURAL DROUGHT ASSESSMENT REPORT

August , 2014
Assessment for 14 States, with 5 states at sub-district level

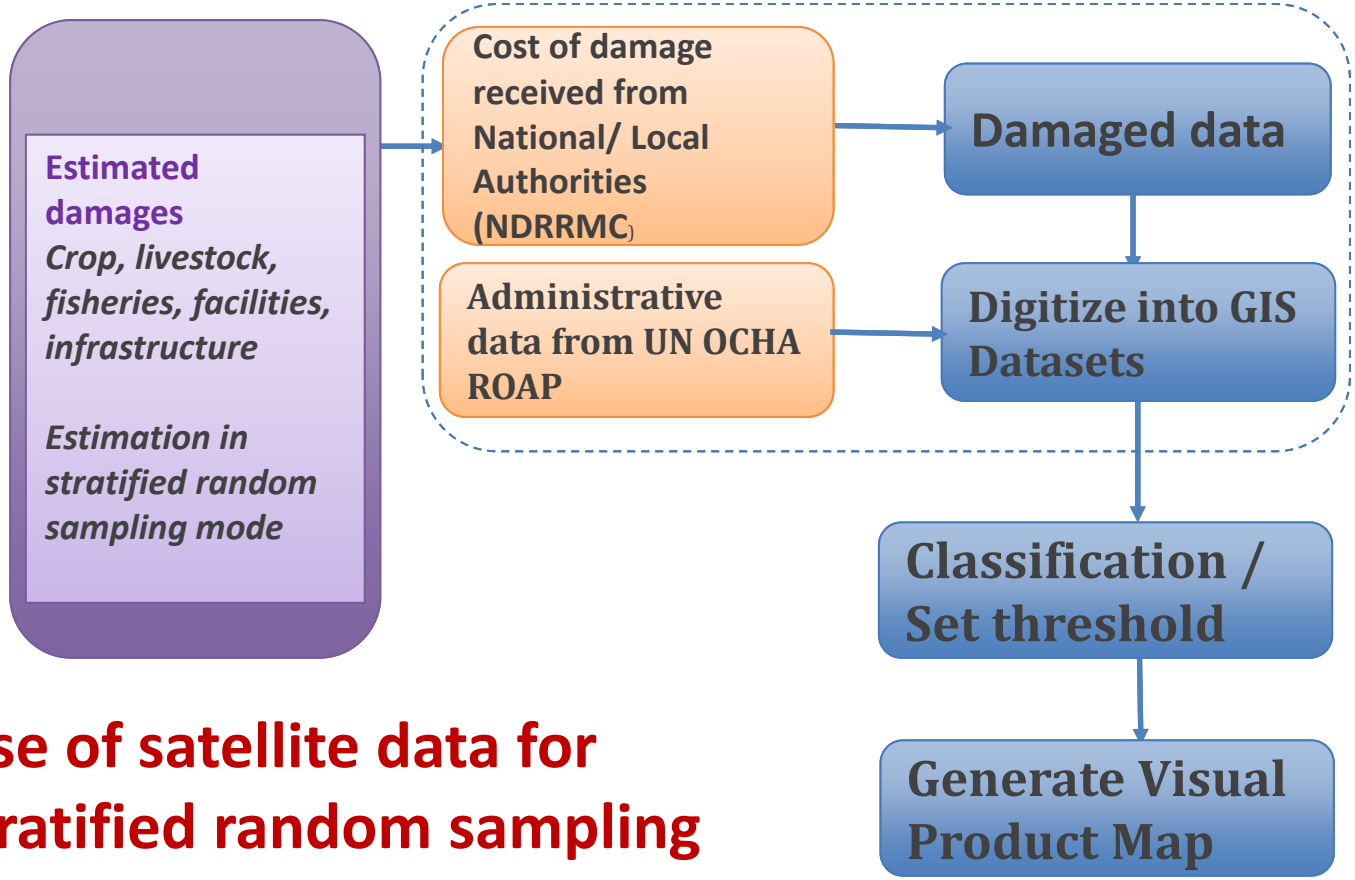


Mahalanobis National Crop Forecast Centre
Department of Agriculture & Cooperation, New Delhi -110 012

National Remote Sensing Centre, ISRO
Department of Space, Hyderabad – 500 625

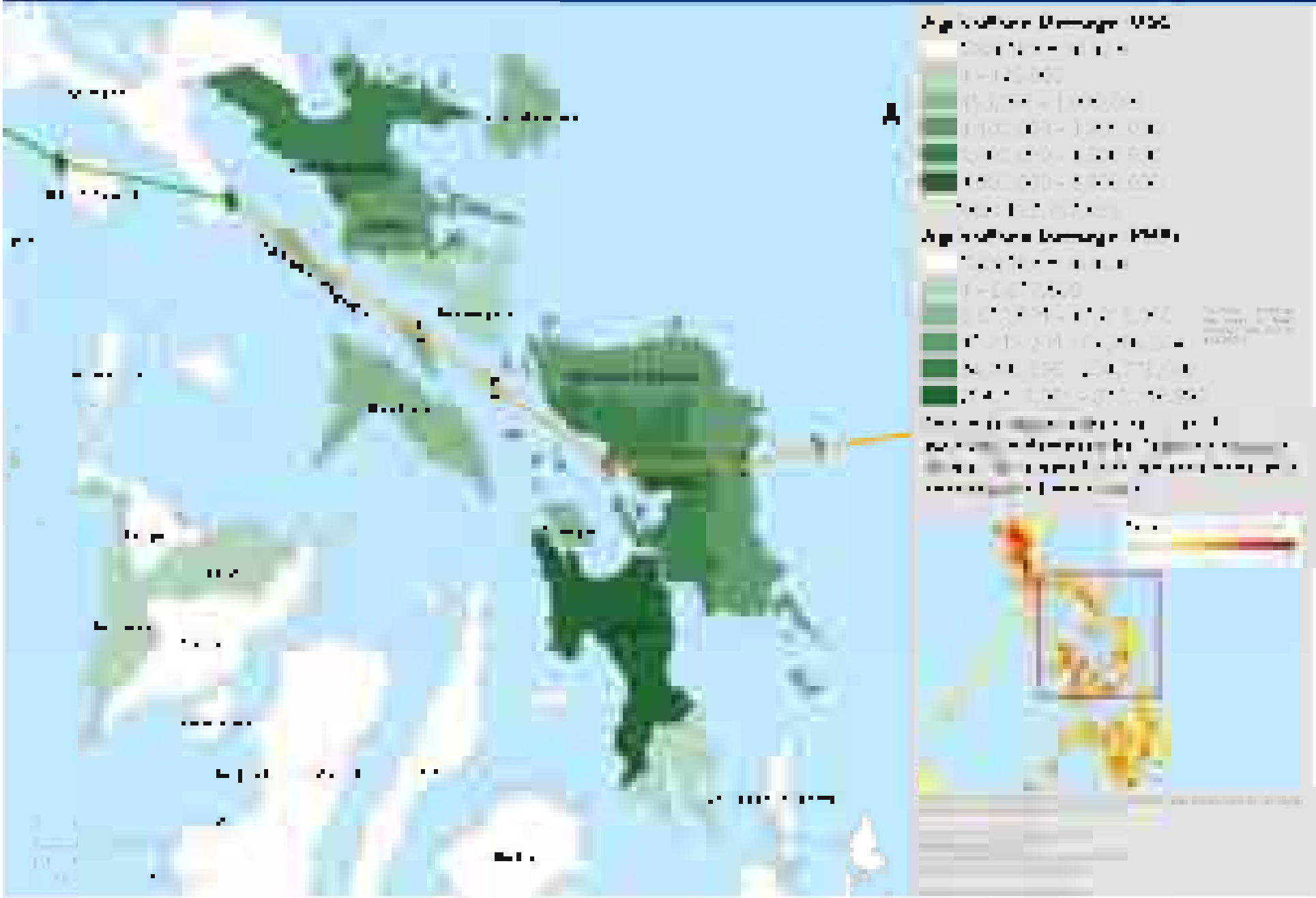
Agriculture: Methodology for Damage Assessment

Example from Typhoon Hagupit (Ruby) Dec 2014 – Philippines



Use of satellite data for stratified random sampling design, field mission to support damage assessment and validation.

Estimated Economic Impact – Typhoon Hagupit (Ruby)

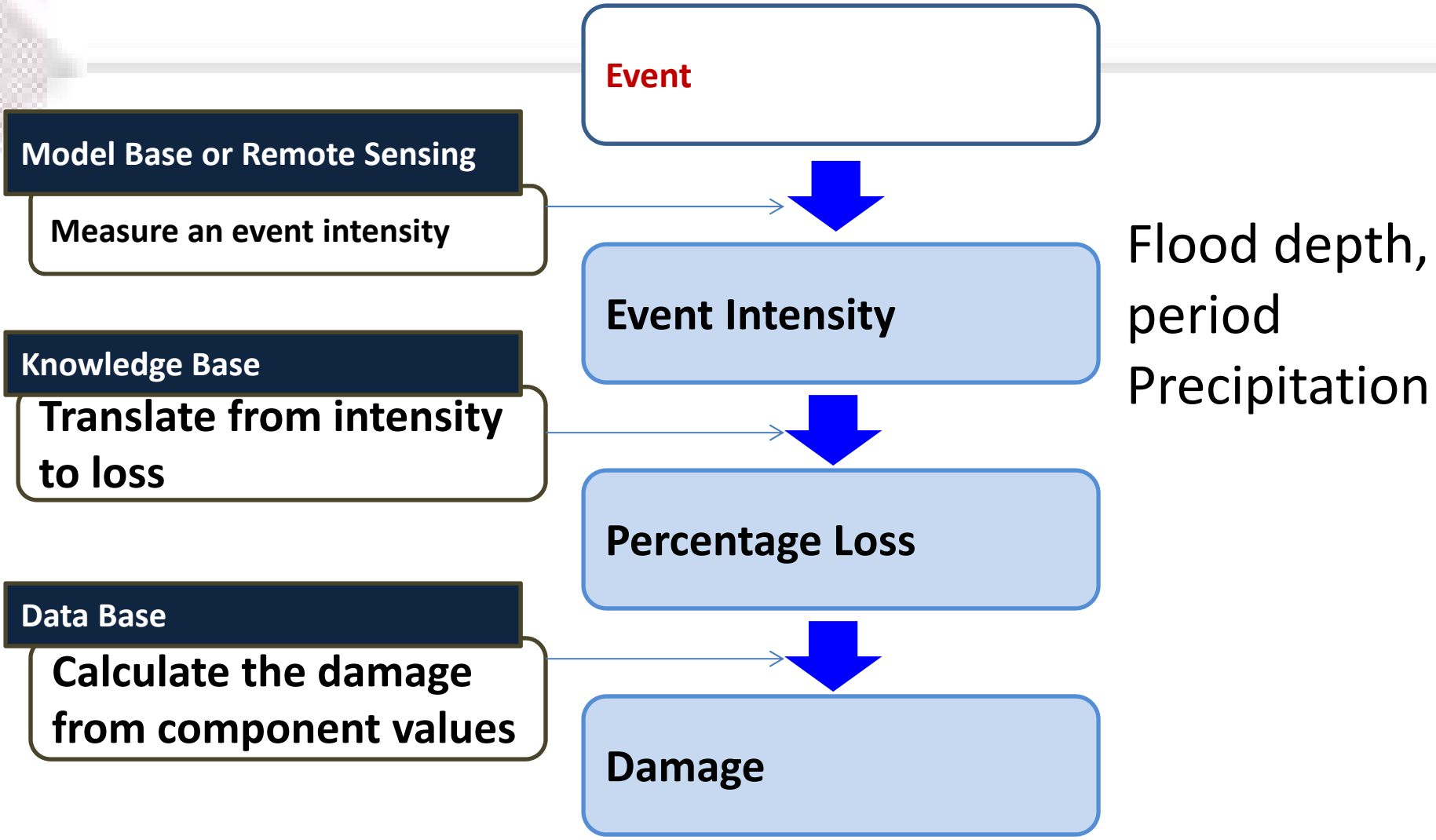


FAO: Rapid Agricultural Disaster Assessment Routine (RADAR)

- RADAR was used to evaluate integrated impact (the loss) for the Honduran agricultural production system during 1998 Hurricane Mitch. The total impact estimated was about $US750 million with an 8 percent error margin (FAO, 2008).

- RADAR has further been used for flood damage assessment in Bangladesh caused by cyclone SIDR and the RADAR estimation of paddy damage was found to be 20 percent more than the damage and loss assessment done by the government of Bangladesh (Amarnath, Inada, & Alahacoon, 2012).

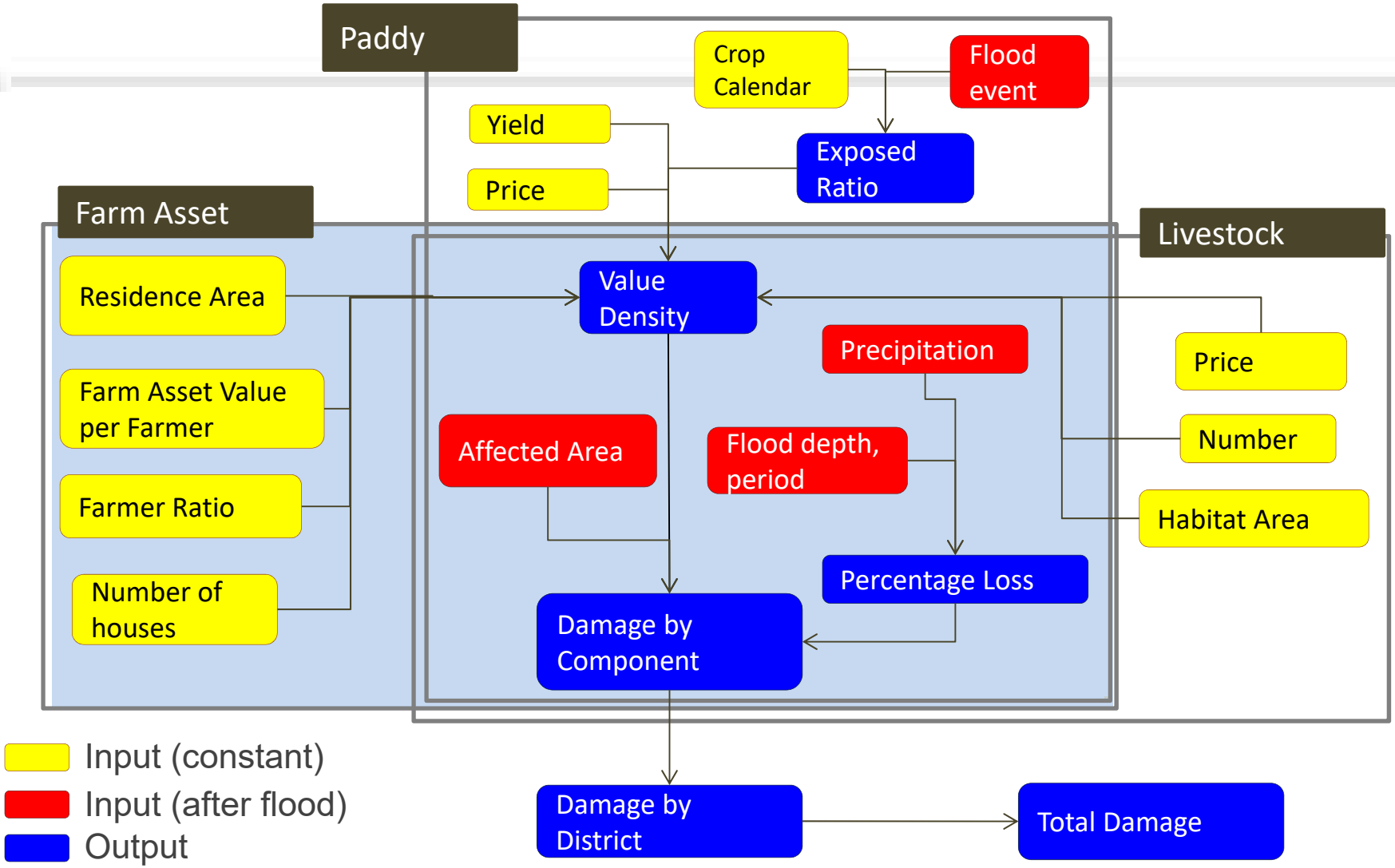
Basic concept of RADAR



Case Study: Cyclone Sydr 2007

Source: FAO/IWMI

Damage Calculation Process



Source: IWMI/FAO

Cyclone Sydr 2007: Affected Area

Land Use Map

Flood Map (Nov 2007

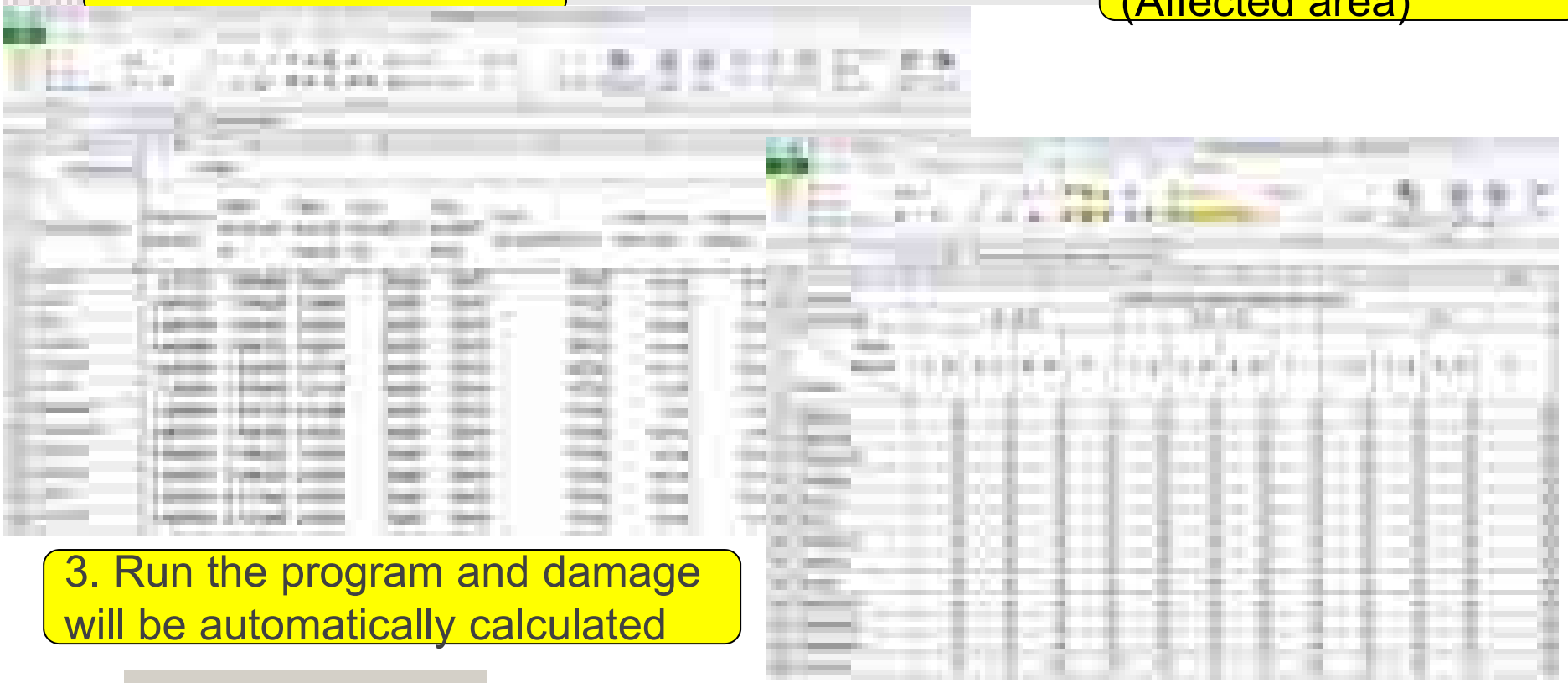
Affected area by land use will be obtained

Source: FAO/IWMI

Damage Assessment: Data Synthesis

1. Input before Flood

2. Input after Flood (Affected area)



3. Run the program and damage will be automatically calculated

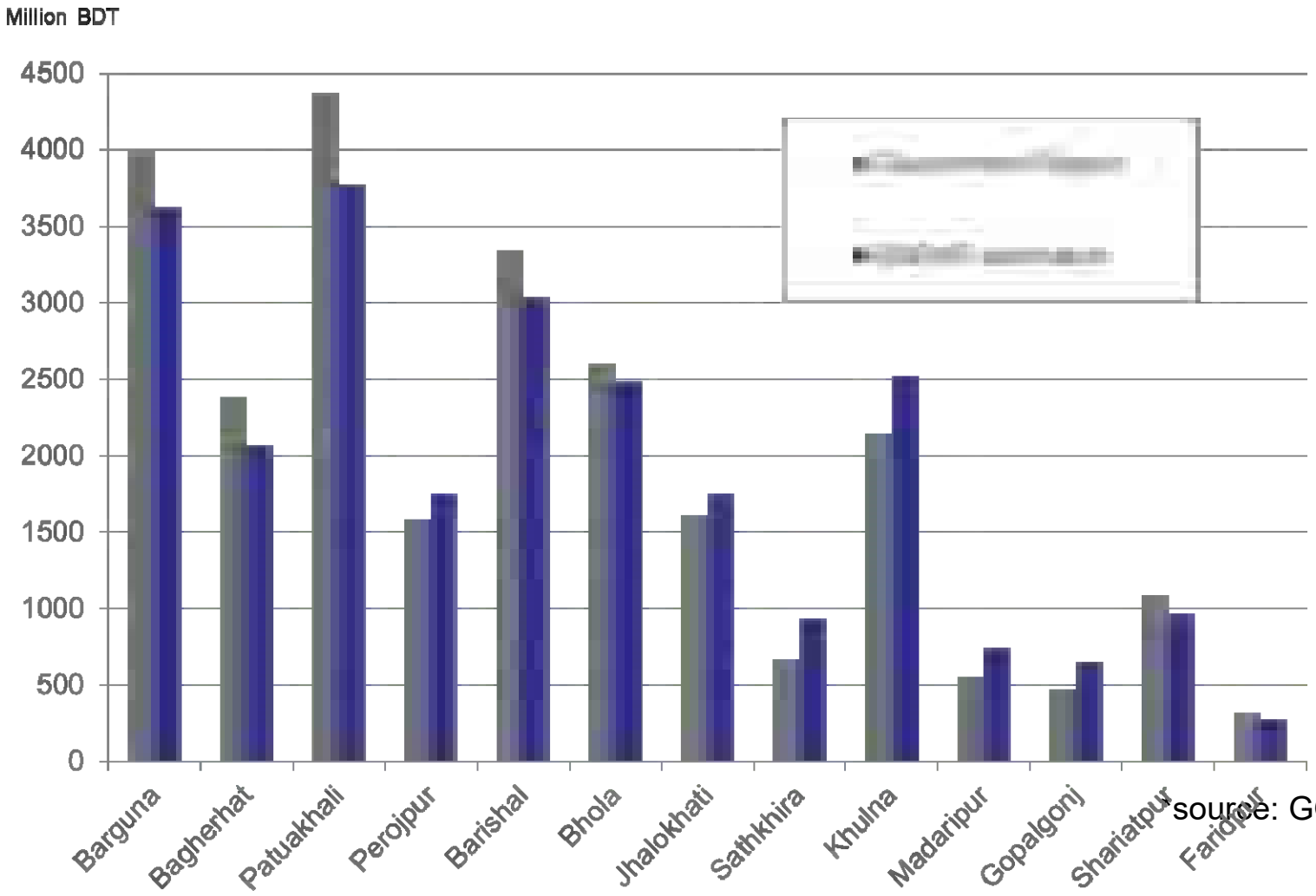
Just input affected area from GIS, then
You can immediately estimate the damage

Case Study: Cyclone Sydr 2007

Source: FAO/IWMI

Case Study (Cyclone SIDR 2007)

Comparison RADAR and Government report



source: GOB 2008

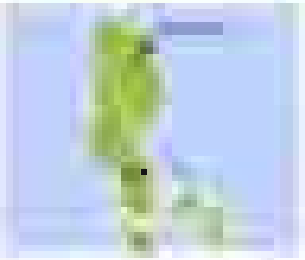
Chapter 7

Housing Sector – limitation in terms of accuracy but advantage of enabling sampling accuracy and evidence based assessment

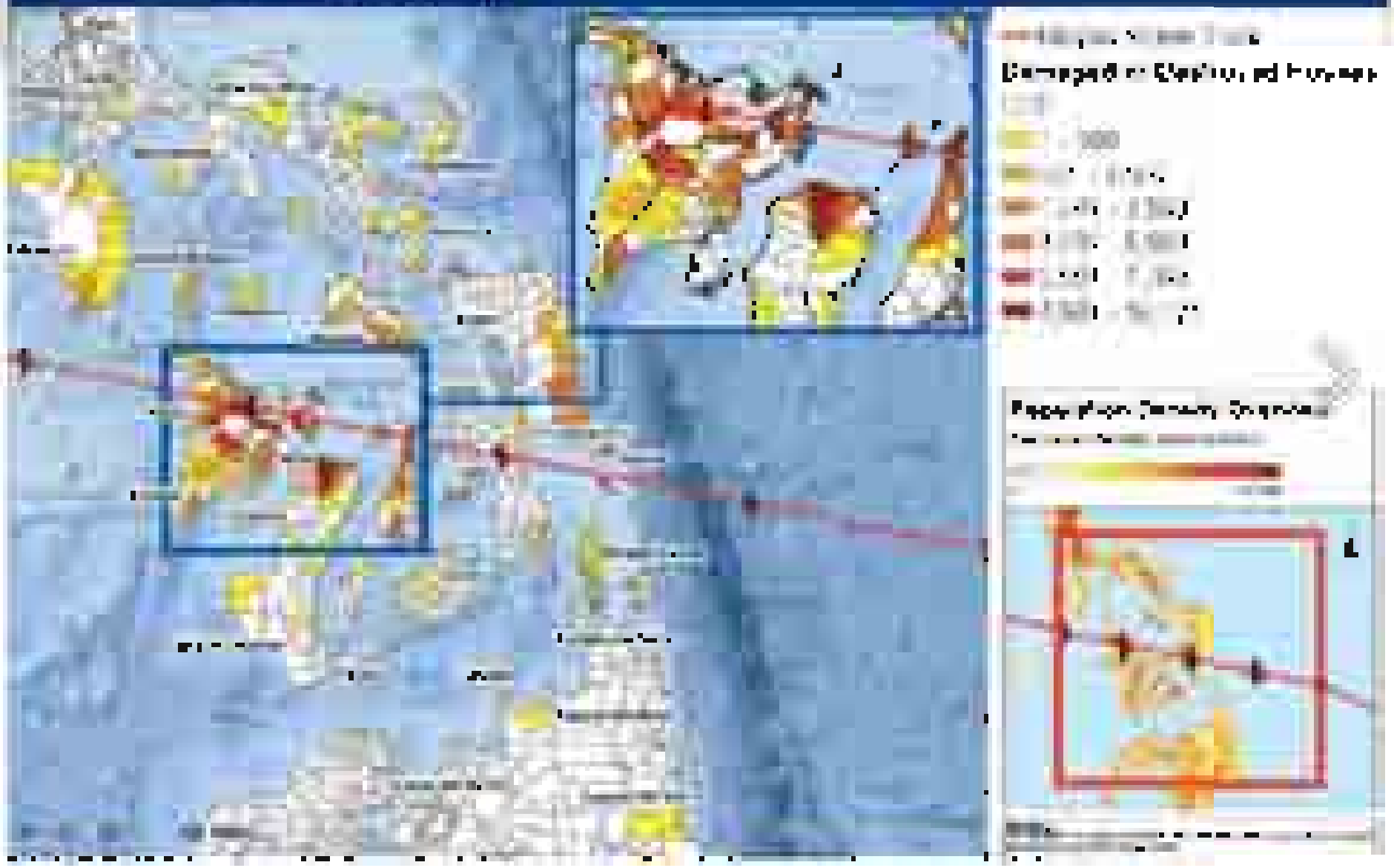
JRC

GRADING map – EQ example 1

..But it serves the purpose of grid wise stratification for damage quantification

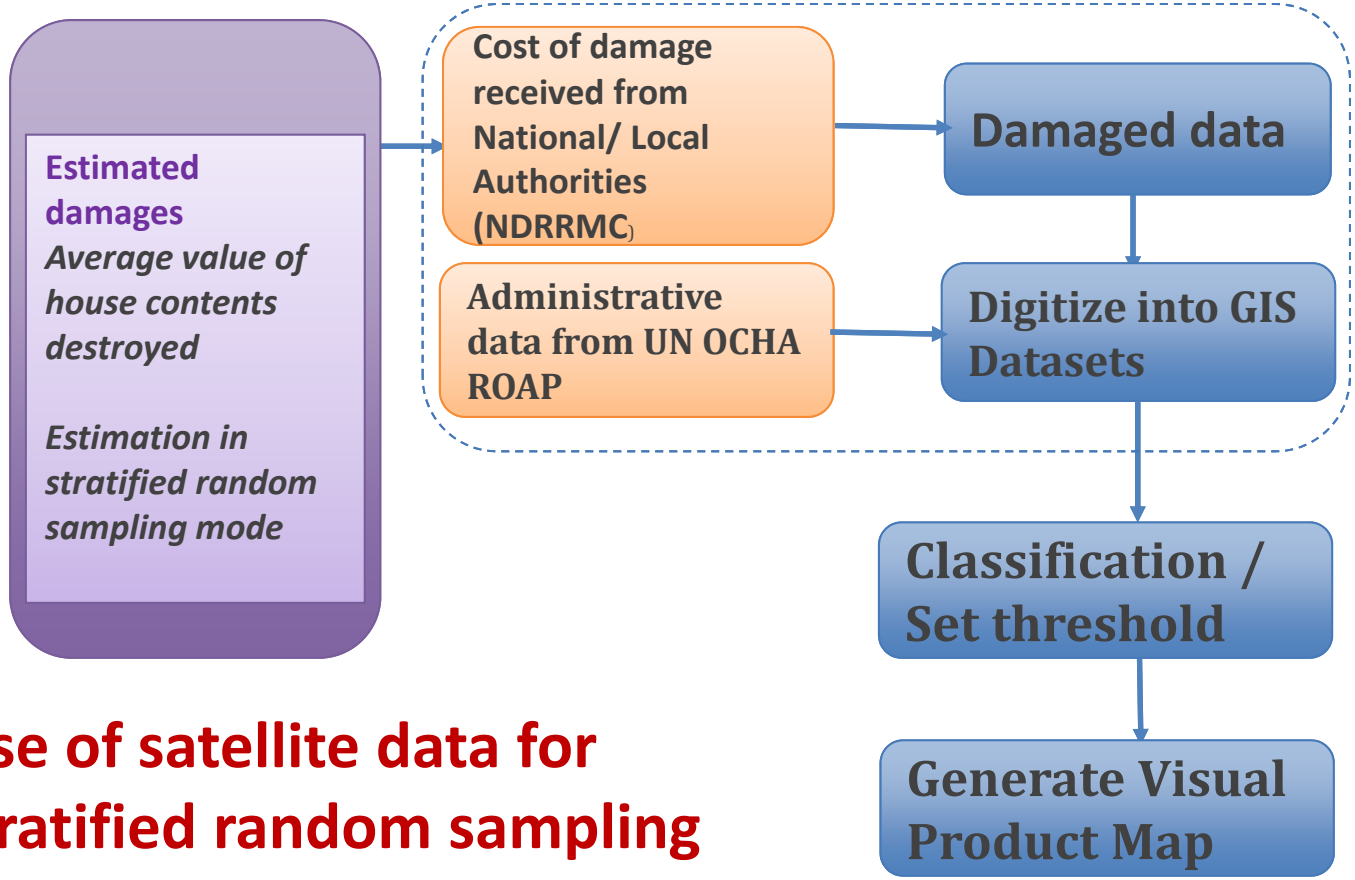


Number of Damaged Houses - Typhoon Haiyan (Yolanda)

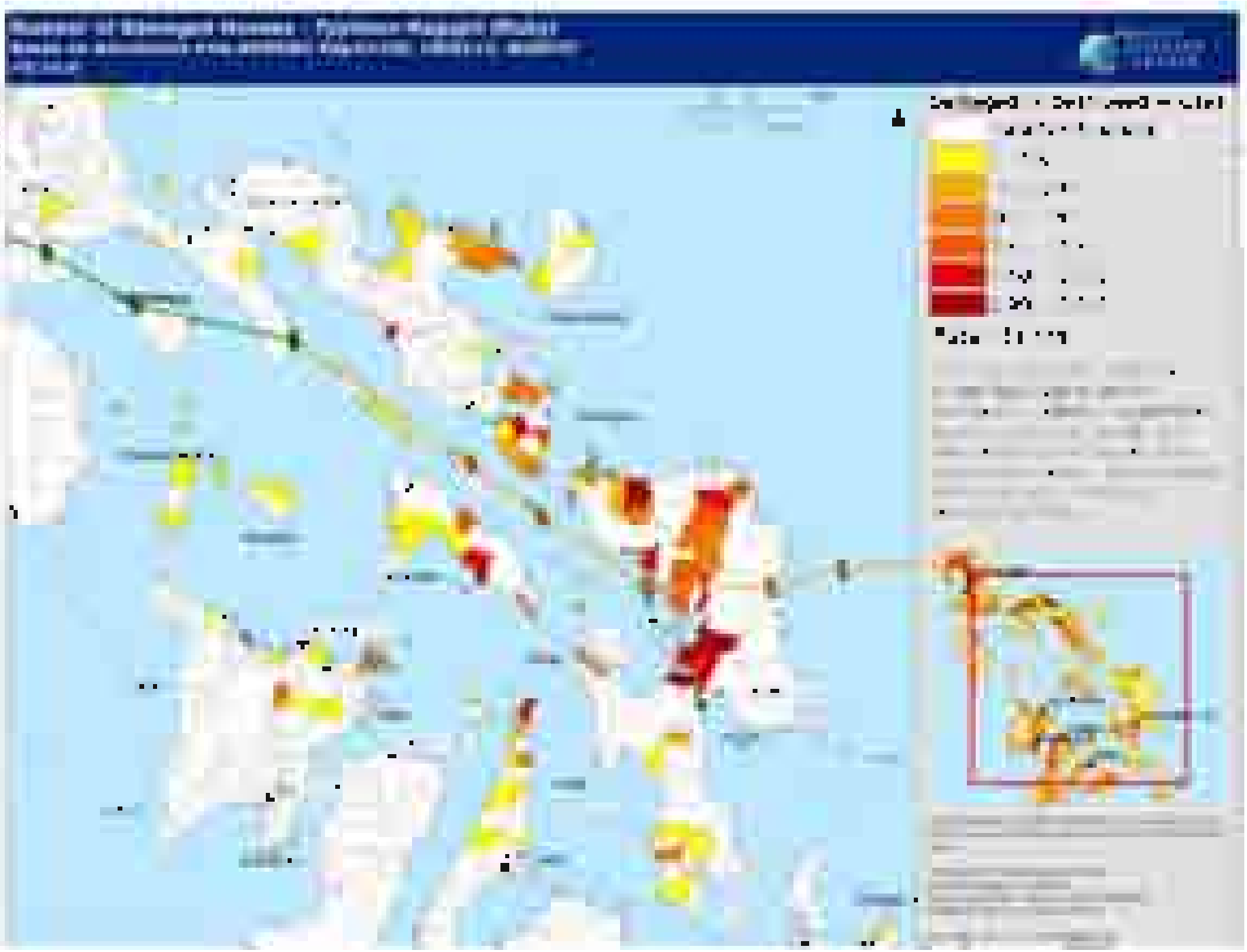


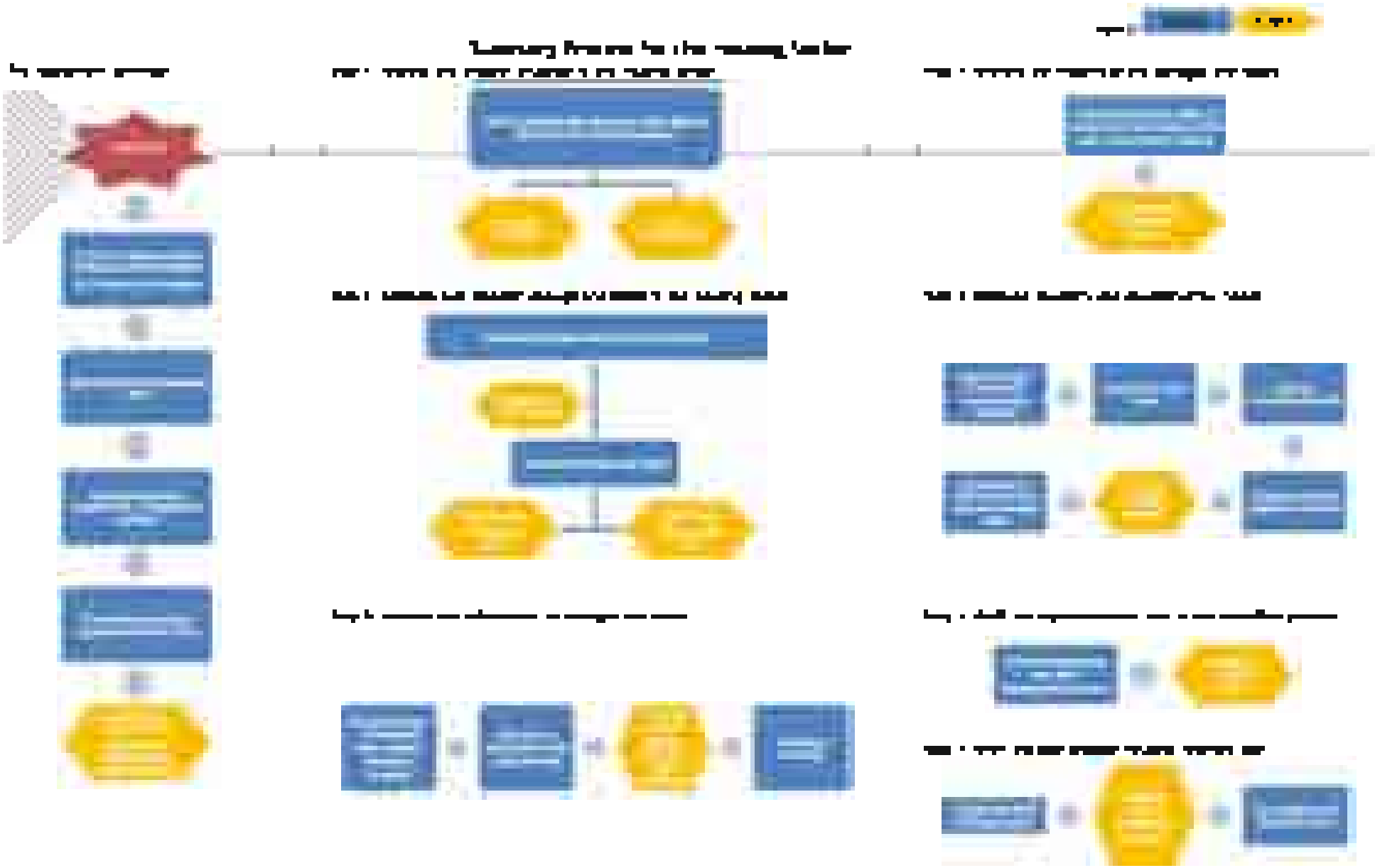
Housing sector: Methodology for Damage Assessment

Example from Typhoon Hagupit (Ruby) Dec 2014 – Philippines



Use of satellite data for stratified random sampling design, field mission to support damage assessment and validation.

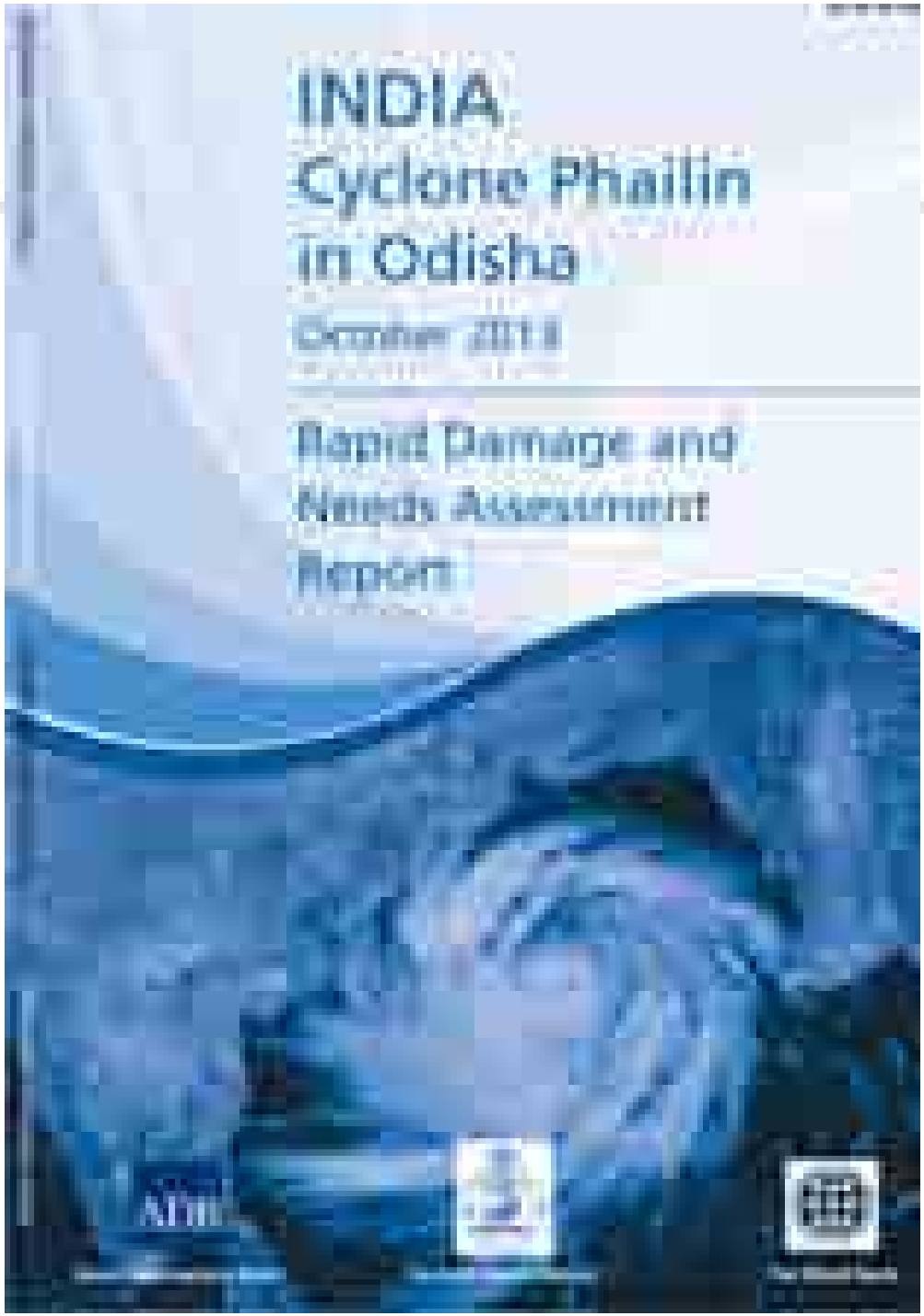




Chapter 8

Infrastructure Sector – Roads, critical infrastructure – Damage quantifiable – more precisely in floods, cyclones & some limitations in earthquake context

Roads, critical infrastructure – Damage quantifiable – more precisely in floods, cyclones



Methodology for developing visual product map for estimating cost of infrastructure damage during Typhoon Yolanda, 2013 in Philippines

Rapid flood mapping in the Hue province, Vietnam

- Flood model used to delineate the extent and depth of flood
- Threshold method also used to classify flood and non-flood areas from the satellite images and it was quite close to model-simulated results.
- Deriving flood extent from satellite image was much faster and easier to implement than carrying out modeling.

Source: GIC, AIT

Infrastructure sector: Methodology for Damage Assessment

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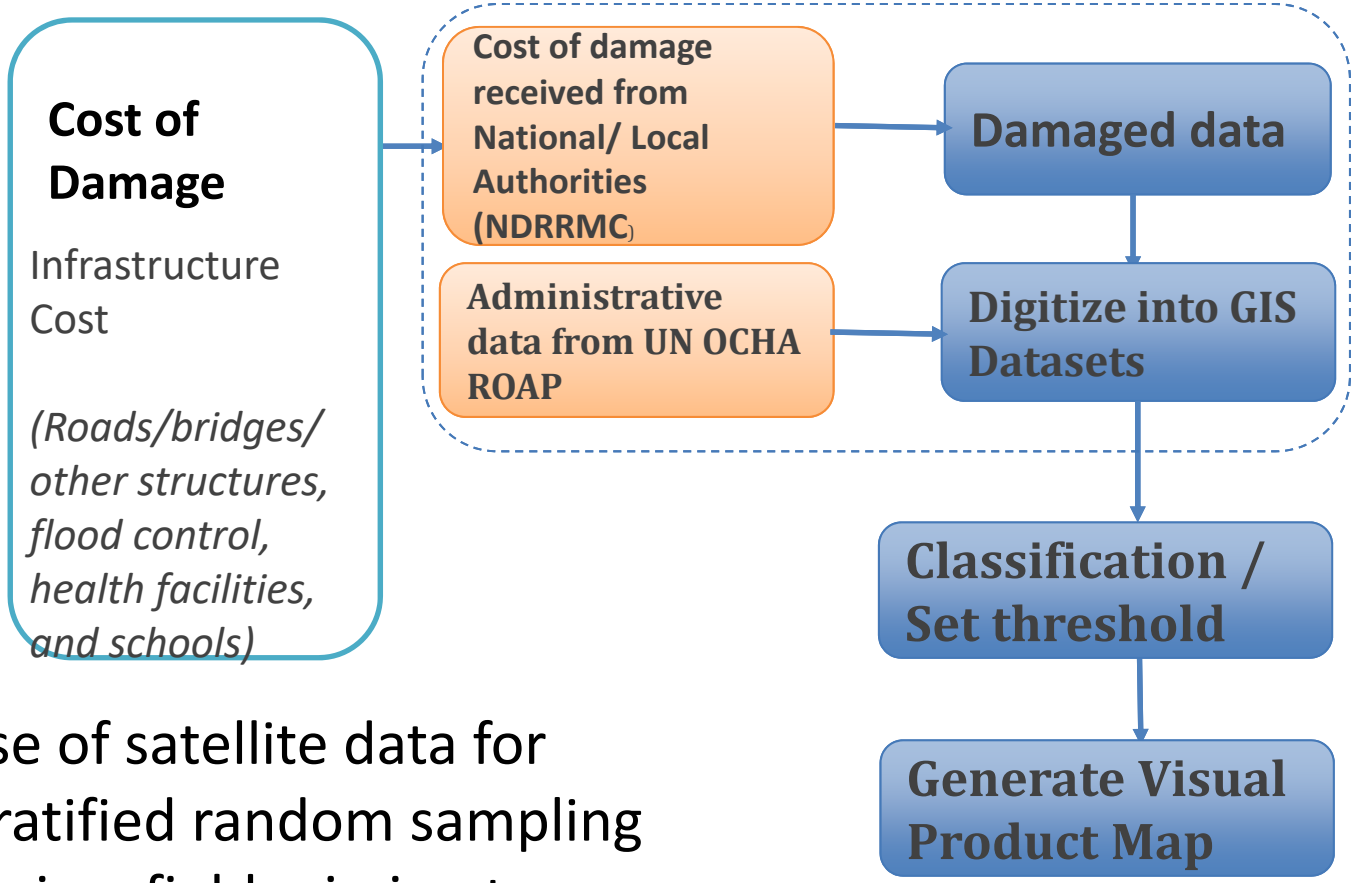

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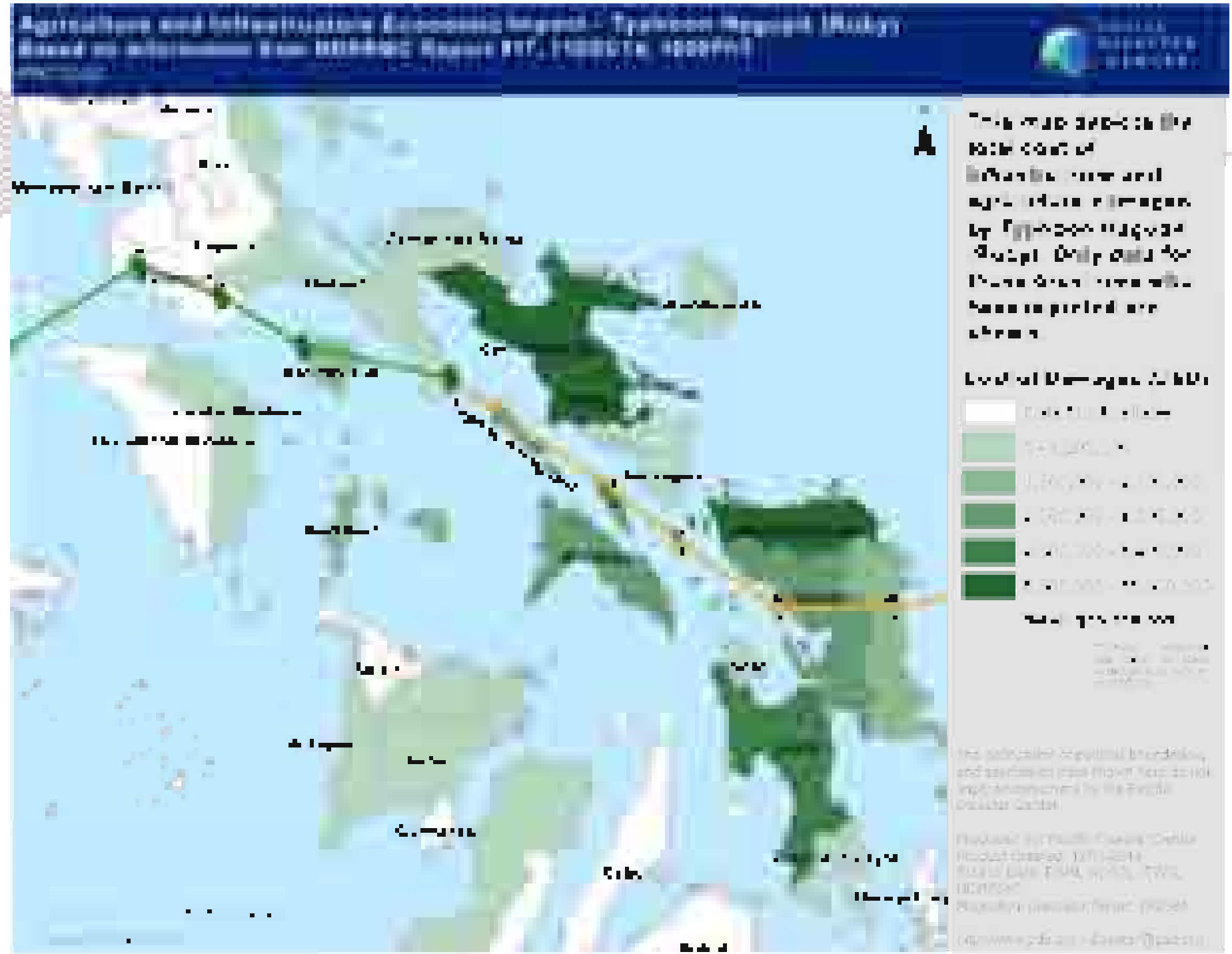

Myanmar Floods 2015
Use of satellite and geospatial data

Satellite Data (1): Pleiades
Imagery Dates: 16 September 2015
Resolution: 50 cm
Satellite Data (2): Worldview-2
Imagery Date: 31 January 2013

Source: USGS/HDDS
Road Data : Google Map Maker / OSM / ESRI
Other Data: USGS, UNCS, NASA, NGA
Analysis : UNITAR / UNOSAT
Production: UNITAR / UNOSAT
Analysis conducted with ArcGIS v10.3

Legend: Activity

Summary Process for the Infrastructure Sector

Pre-Assessment activities

DISASTER

The Govt . decides a Rapid Damage Needs Assessment (0-72 hours of the Disaster)

Agreement on the Assessment Team

Government assigns responsibility to Department/ Agencies

Coordination discusison among the Assessent Team

agreement is reached on the conduct of the Rapid Damage Needs Assessment

Step 1: Analyze pre-disaster situation in the Infrastructure sector

Collect baseline data for each of the affected districts before field assessment

- Buildings and structures
- equipment, machinery and supplies

Step 2: Estimate post-disaster damage and losses in the Infrastructure sector

Estimate the damages and losses to Infrastrucrure sub sectors

Water, sanitation and hygiene

Community Infrastructure

Energy & Electricity

Transport & Telecommunication

- Damaeg and Loss estimate
- Summarize damages and losses
- District wise Damaeg
- State/ Province Damaeg and Loss

Step 3: Validate the information on damages and losses

Assessment team conduct validation meeting → Sub-sector teams share their collected data → infrastricture sector damage and loss data confirmed → Validation meeting

Step 4: Analyze the impacts of the damages and losses

Analyze the imapct of infrastruer sector to people → Brief assessment of potential impacts

Step 5: Estimate recovery and reconstruction needs

Identify overall recovery and reconstruction strategies → Estimate recovery needs → Estimate reconstruction needs → Prioritize identified projects for recovery → Table of Priority Initiatives → Summarize the estimated recovery and reconstruction needs

Step 6: Draft the implementation plan of the identified projects

Prioritize initiatives and draft implementation plans → Sumamry Table of Needs

Step 7: Draft the post-disaster housing recovery plan

Prepare the draft Housing report → Infrastrcure Rapid Assessment report → The report to the State/Province

Thank you

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