Applications of Satellite Data in Disaster Management

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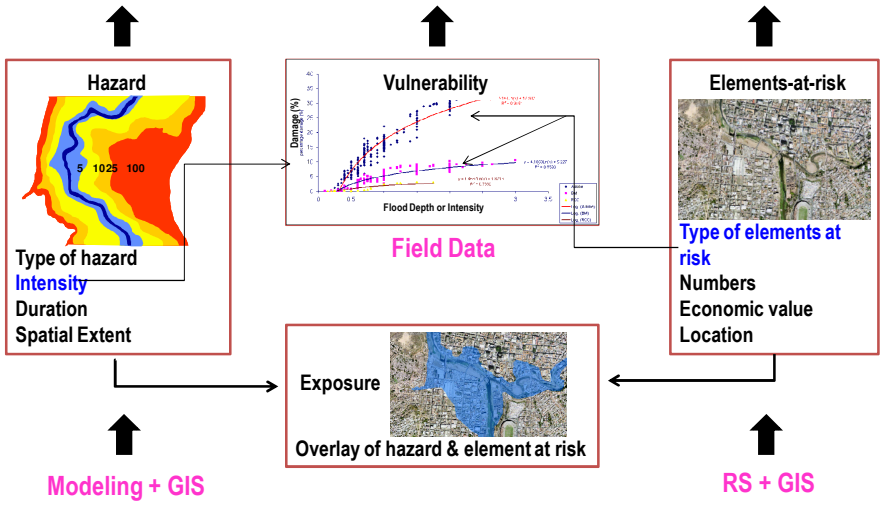
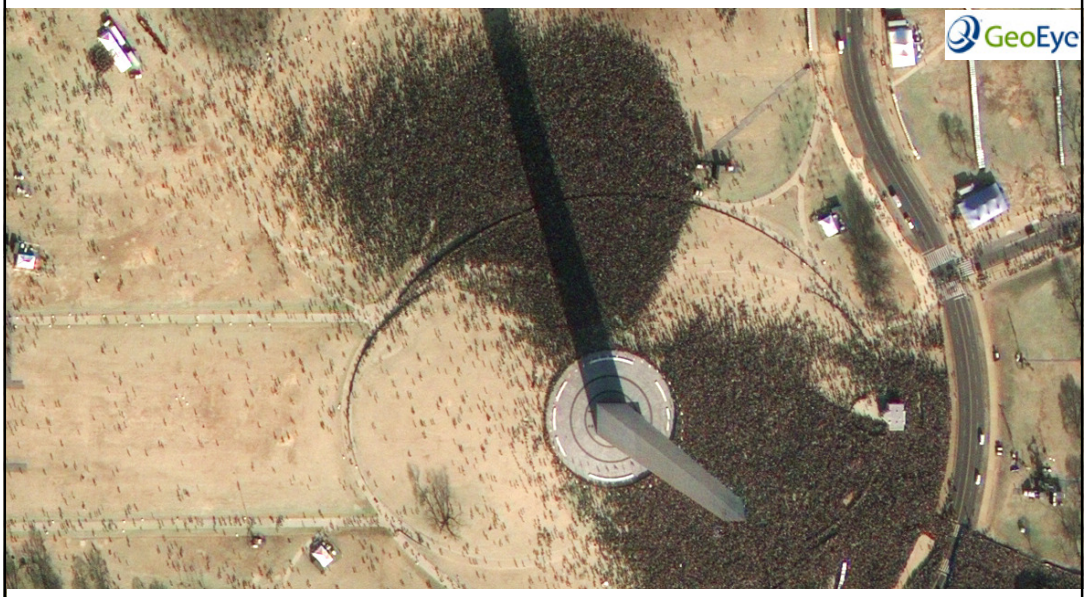
Disaster Risk and its Spatial Representation

Risk = Hazard (**Probability** of occurrence) **x Physical Vulnerability** (**Degree of losses** to elements at risk) **x Amount/Number** (Quantification of **exposed** elements)

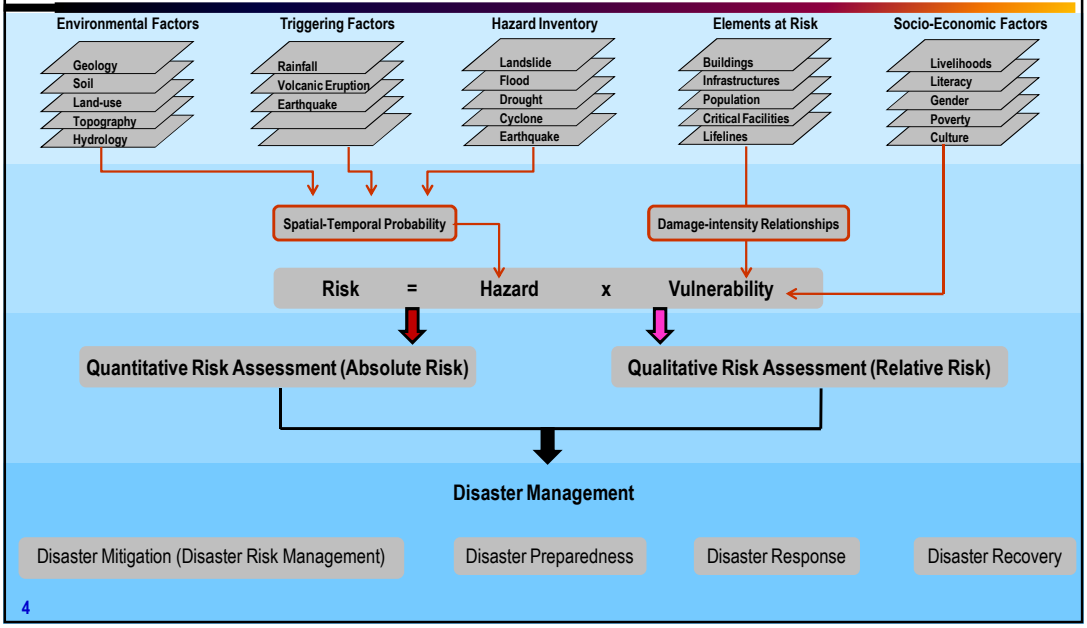


State-of-the-Art Technology



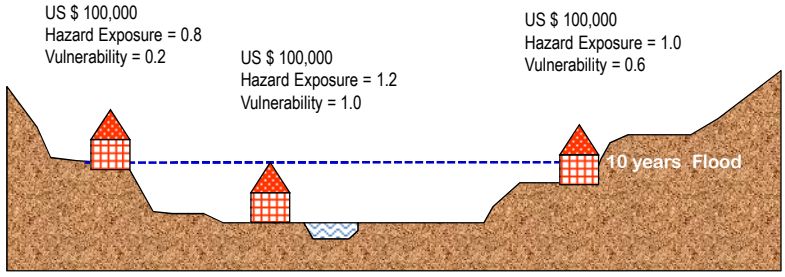
Satellite Data can Play an Important Role in Elements-at-Risk Mapping (Acquired on 20/01/2009)

Framework for Disaster Risk Assessment and Disaster Management



Quantitative (Absolute) Risk Assessment - Asset

Risk = Hazard x Physical Vulnerability x Amount (Asset)



Asset Risk

$Risk_{Lt}$ = (0.1 x 0.8) x 0.2 x 100,000 = 1,600 US$
$Risk_{Mid}$ = (0.1 x 1.2) x 1.0 x 100,000 = 12,000 US$
$Risk_{Rt}$ = (0.1 x 1.0) x 0.6 x 100,000 = 6,000 US$
$Risk_{Total}$ = 19,600 US$

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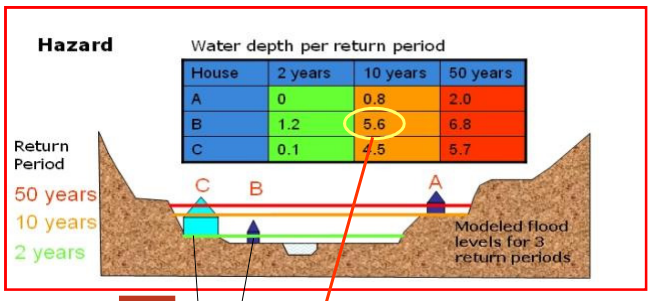
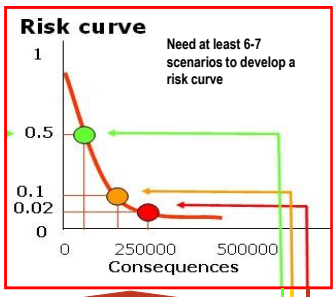
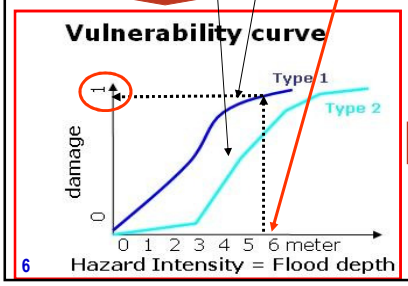
Quantitative Risk Assessment - Probabilistic







	RP	PT	A	V	V*A	ΣV*A
A	2	0.5	100000	0	0	20000
B	2	0.5	50000	0.2	10000	
C	2	0.5	200000	0.05	10000	
A	10	0.1	100000	0.1	10000	160000
B	10	0.1	50000	1	50000	
C	10	0.1	200000	0.5	100000	
A	50	0.02	100000	0.4	40000	250000
B	50	0.02	50000	1	50000	
C	50	0.02	200000	0.8	160000	

Courtesy: ITC

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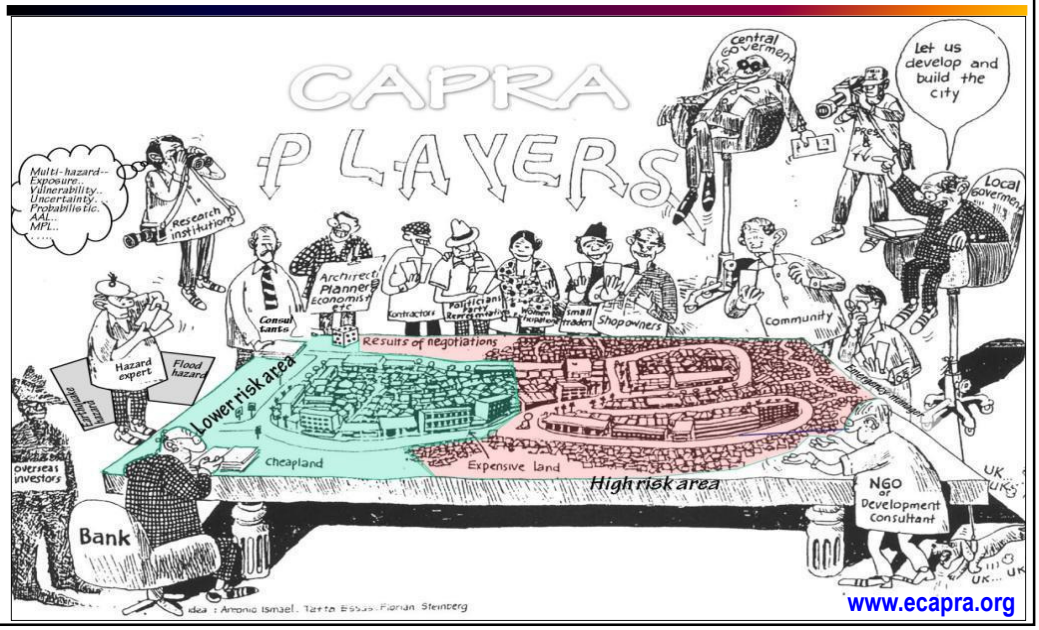
Probabilistic Risk Assessment Initiative – CAPRA (WB)



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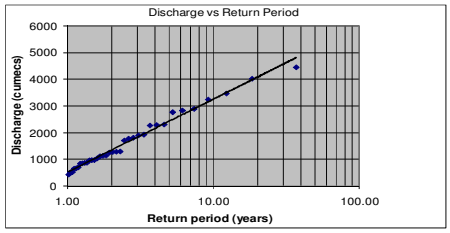
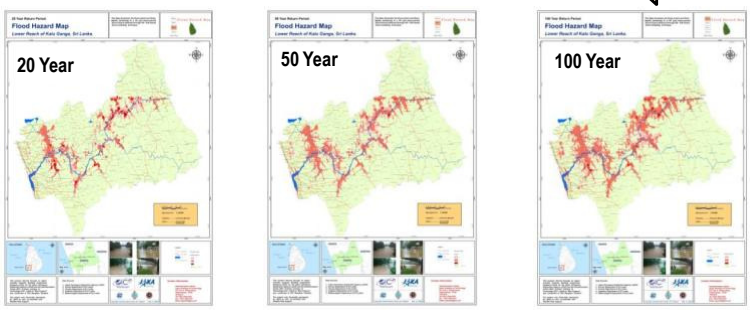
Hazard Assessment by Modeling (Sri Lanka)

Historical river discharge record was analyzed to find the frequency-magnitude relationship for flood



Modeling



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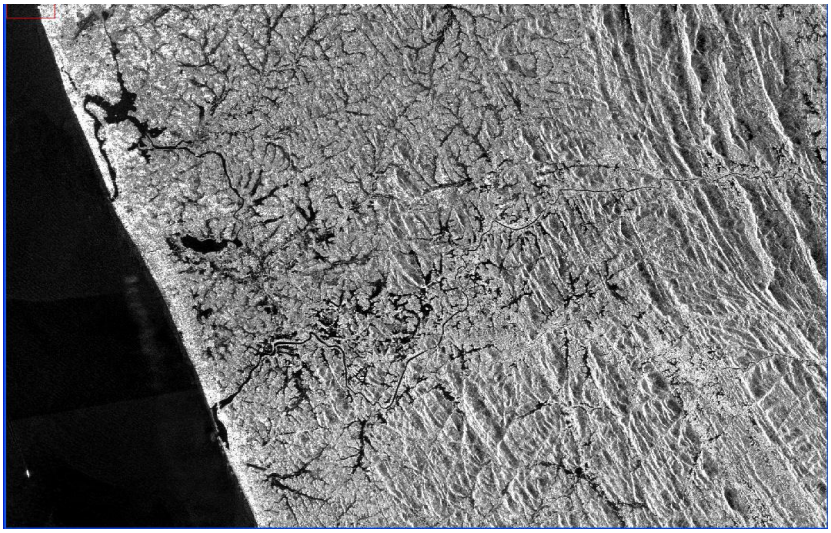
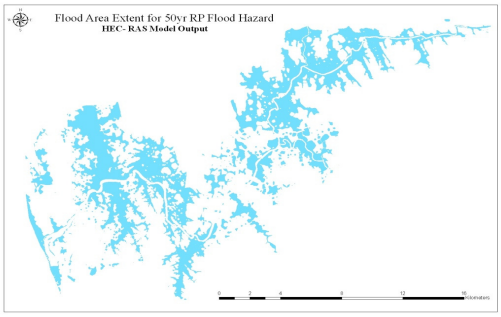
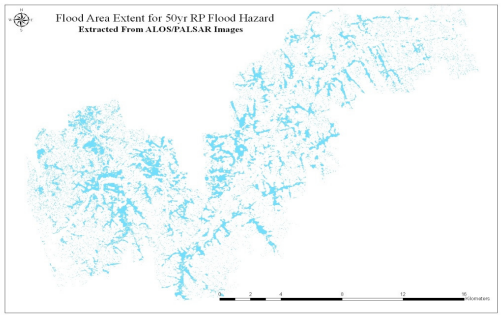
Flood hazard maps obtained from a flood model (Kalu-Ganga Basin, Sri Lanka)

ALOS PALSAR Data Acquired During Flood in 2008



Comparison for Model Result with Satellite Data Derived Flood Map





Field Data Collection for Vulnerability Assessment

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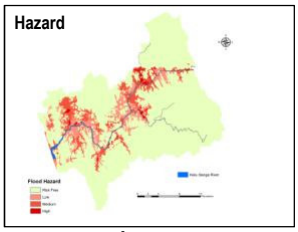
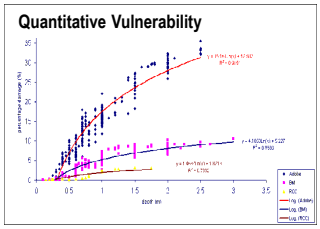
Quantitative Risk Map for Flood in Sri Lanka

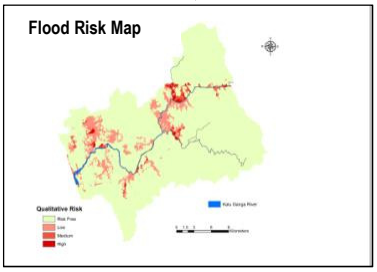


X



X

Amount of loss for various types of buildings



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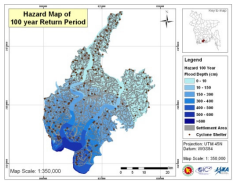
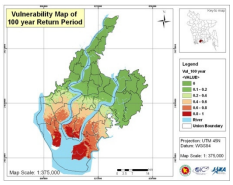
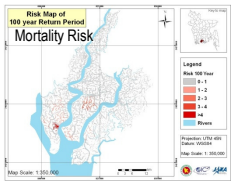
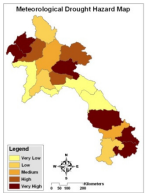
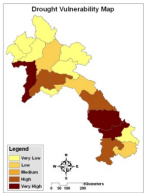
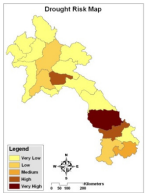
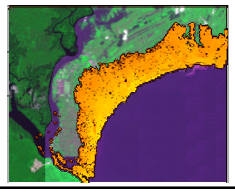
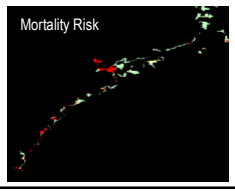
Accomplishments in Risk Assessment for other Hazards

	HAZARD	VULNERABILITY	RISK	
CYCLONE				BANGLADESH
DROUGHT				LAOS
TSUNAMI		If exposed, vulnerability in case of Tsunami = 1 (mostly)		INDONESIA

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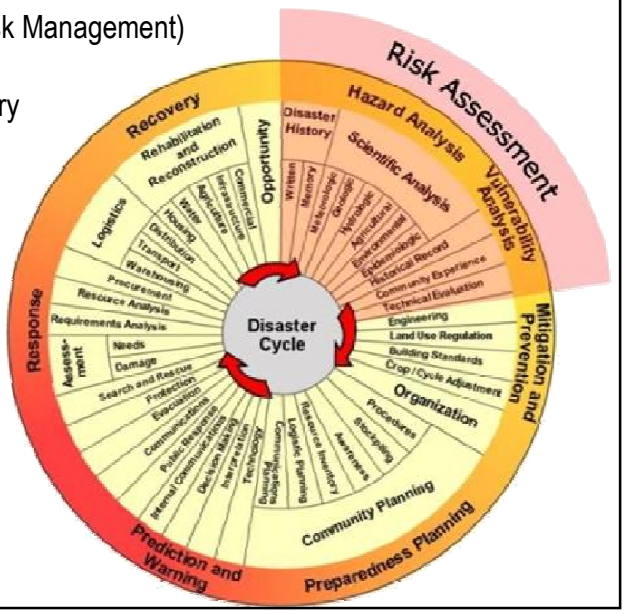
Applications of Disaster Risk Assessment in Disaster Management

1) Disaster Mitigation (Disaster Risk Management)
2) Disaster Preparedness
3) Disaster Response and Recovery



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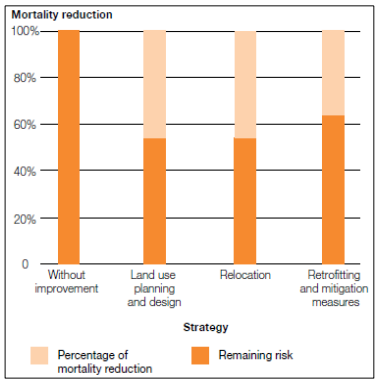
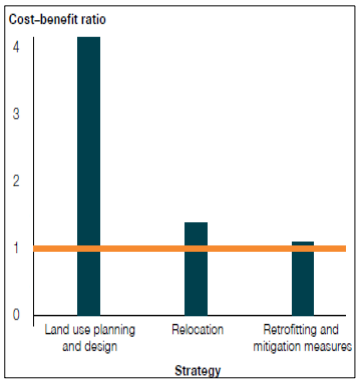
DRA in Disaster Mitigation (Disaster Risk Management)

- Prospective Risk Management (e.g., building codes, design, land-use regulations)
- Corrective Risk Management (e.g., retrofitting, relocation, restoration etc.)
- Compensatory Risk Management (e.g., insurance)



Mortality Reduction through DRM



Cost-Benefit Analysis

Source: GAR, 2011

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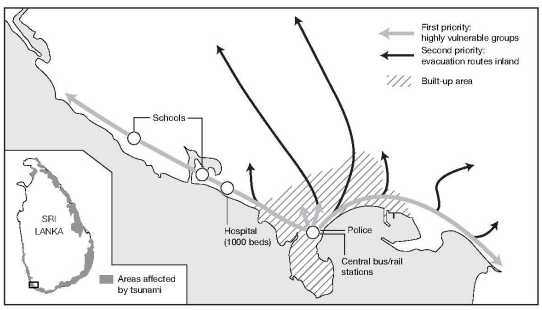
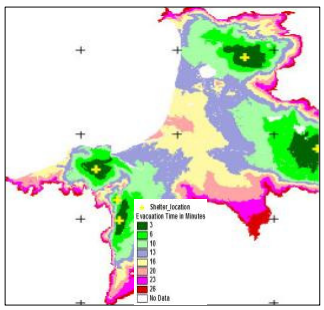
DRA in Disaster Preparedness

- Evacuation routes and locations of evacuation centers
- Location of emergency units (Fire station etc.)
- Location for stockpiling of equipments and supplies
- Awareness and public information
- Early warning



Tsunami Evacuation Map of Gall City (ISDR, 2006)



Tsunami Evacuation Time in Phuket

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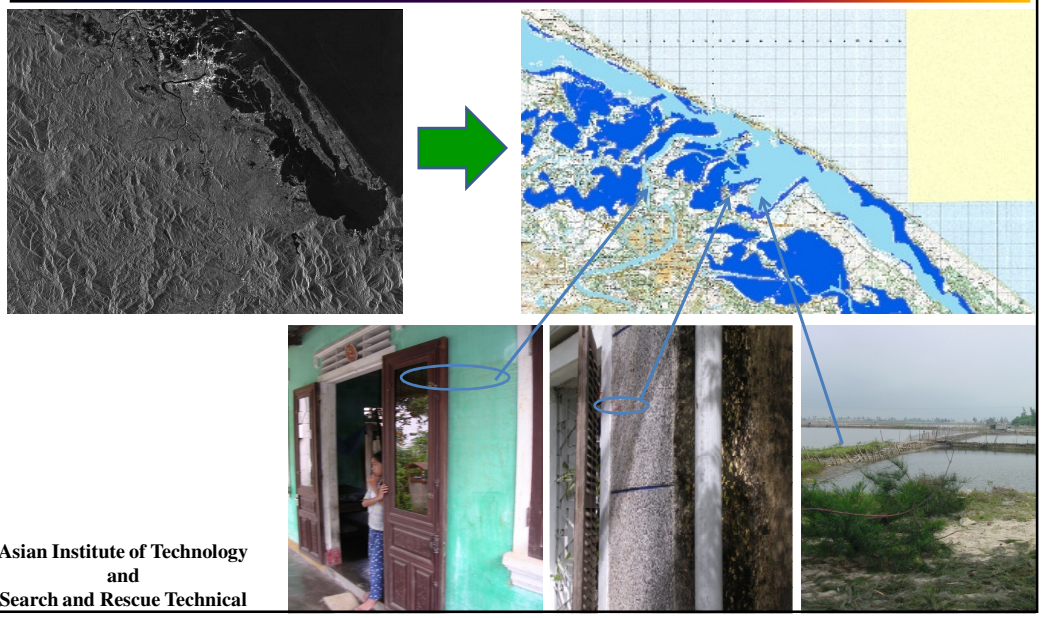
DRA in Disaster Response – Hue Province, Vietnam



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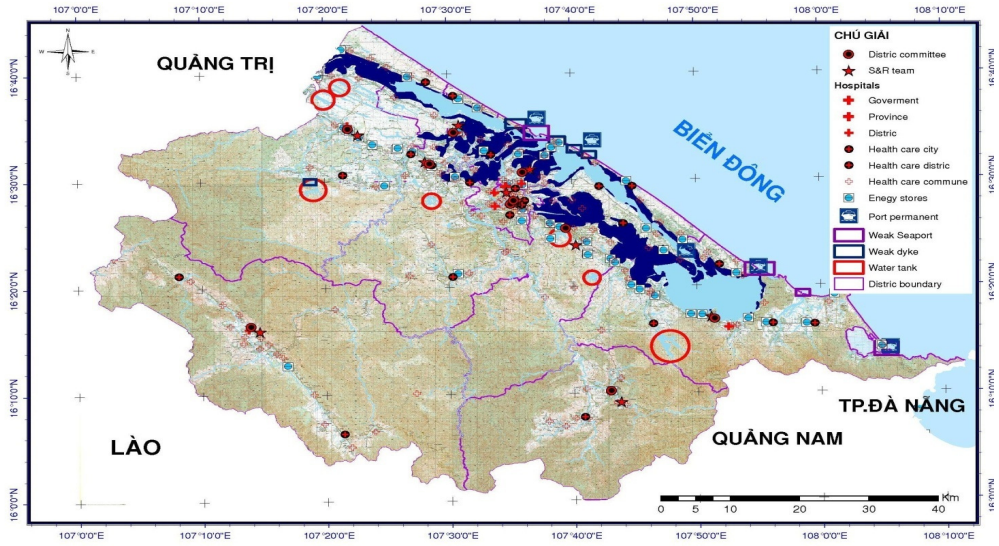
DRA in Disaster Response – Value Added Map Products



Conclusions

- ✓ Satellite Data are useful for hazard and risk assessment
- ✓ Risk maps are useful for effective disaster management
- ✓ Satellite data acquired during a disaster can be very useful for emergency response

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Thank you for your kind attention