

FLOOD MITIGATION STRATEGY FOR SUSTAINABILITY IN VIETNAM

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Vietnam is in South - East Asia

Trang Web Hội Đập lớn Việt Nam

Main land :

North parallels 80 - 230

East meridians 1020 - 1090

Territory : 331,000 km²

Population: 83 mil.

3/4 are mountainous

Subtropical humid monsoon climate

Mean annual rainfall 2,000 mm

(about 75% in only three months, more than 30% usually in only one peak month)

Total mean annual runoff: 880 bil. m³ (ranking 12th in the world, 70% is from outside the border)

Wet seasons → *rapid flood concentrations* → *heavy inundation in alluvial plains and deltas involving big cities.*

Dry seasons → *water shortages (the minimum monthly flow of most basins is just 1% of annual runoff)* → *serious drought* → *threatening living condition of millions people + impacts on environment, agriculture, aquaculture, etc...*

www.vncold.vn
Vietnam is one of the most natural disaster-prone countries :

typhoons, floods,
tropical storms, drought,
seawater intrusion, landslides,
forest fires, occasionally earthquakes.

Disasters triggered by **typhoons and floods** : most frequent and severe !!



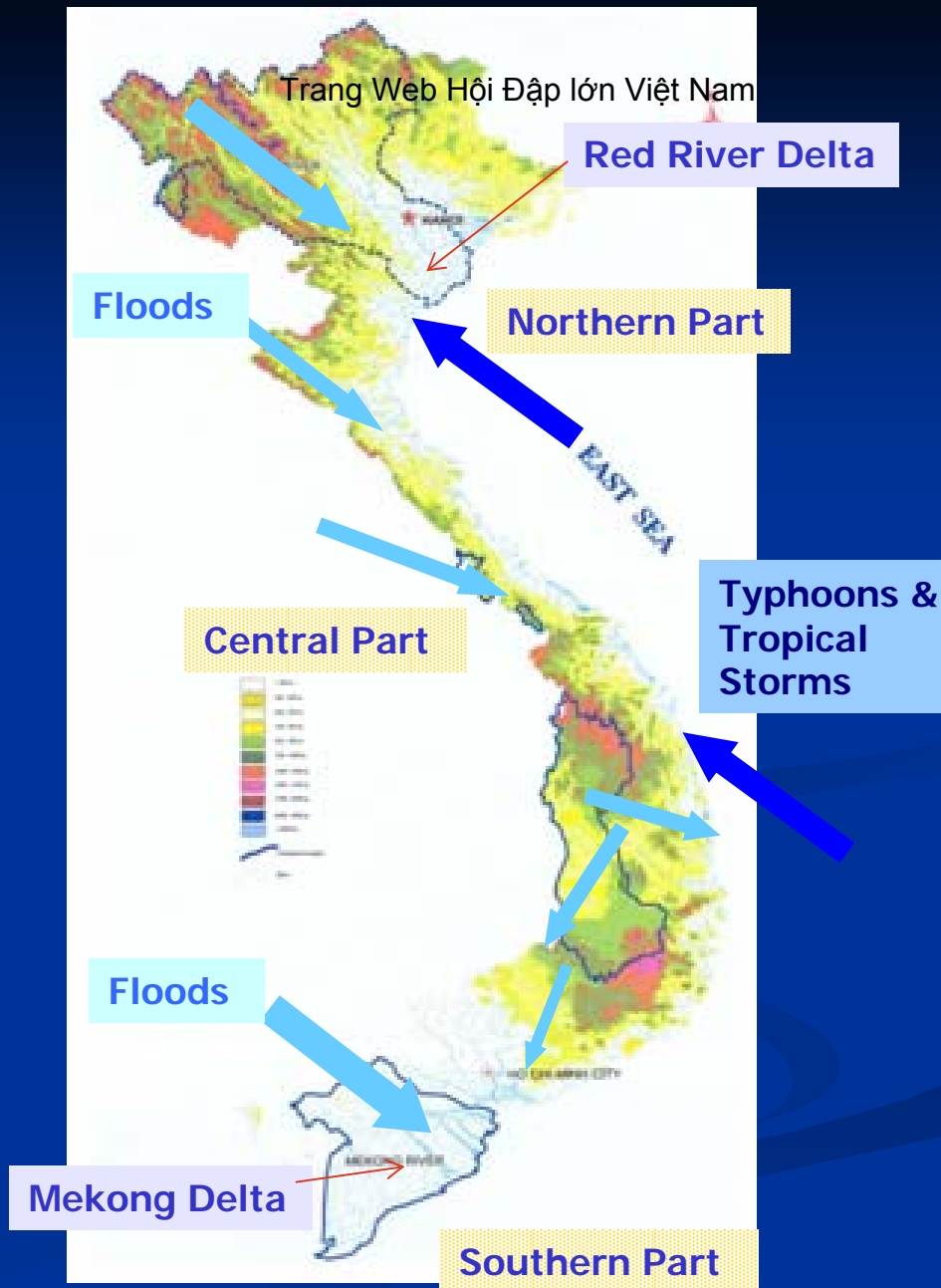
**Inundation,
infrastructure damage**

70% of population living
in lowland areas in the Red
River and Mekong deltas or
along the 3,200 km
coastline



**Flash flood,
landslides**

30% of
population
living in
mountainous
areas



Appropriate Mitigation Measures for Each Part of the Country

Typhoons & Tropical Storms

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North-Western Pacific Ocean typhoon zone

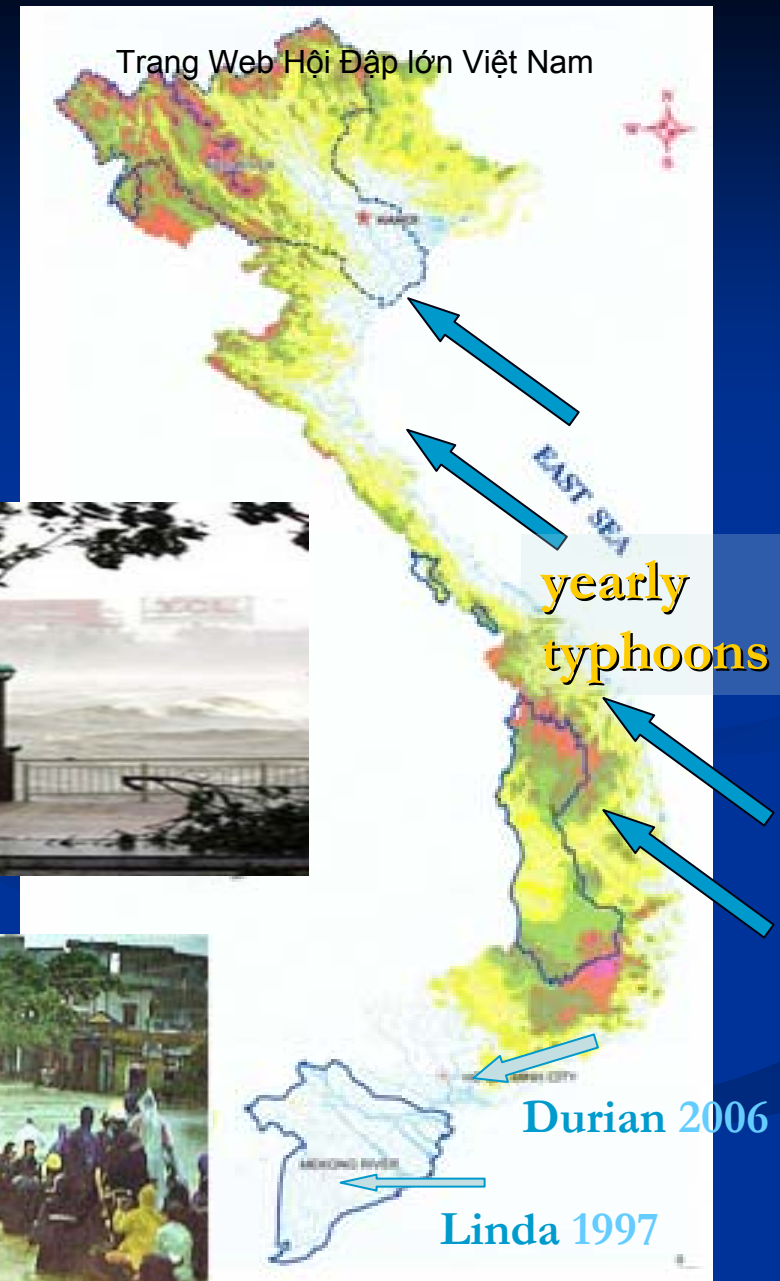
→ coastal areas in North & Central

number of typhoons / year :

← 1999 →

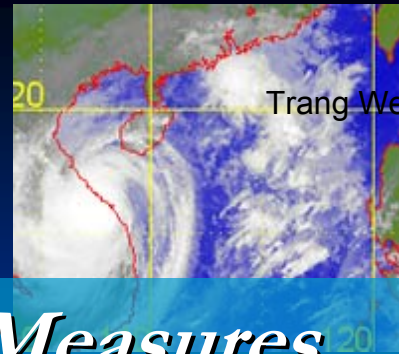
4÷7

8÷10



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Typhoons & Tropical Storms

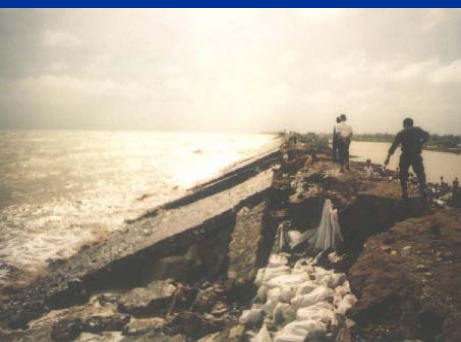


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Prevention & Mitigation Measures

- *Upgrading forecasting & warning systems*
- *Inhabitants rehabilitation in coastal areas where typhoon strikes towards.*
- *Sea areas protection by structural and non - structural measures.*
- *Strengthening infrastructures in coastal areas threatened by typhoons & reorganizing residential districts .*

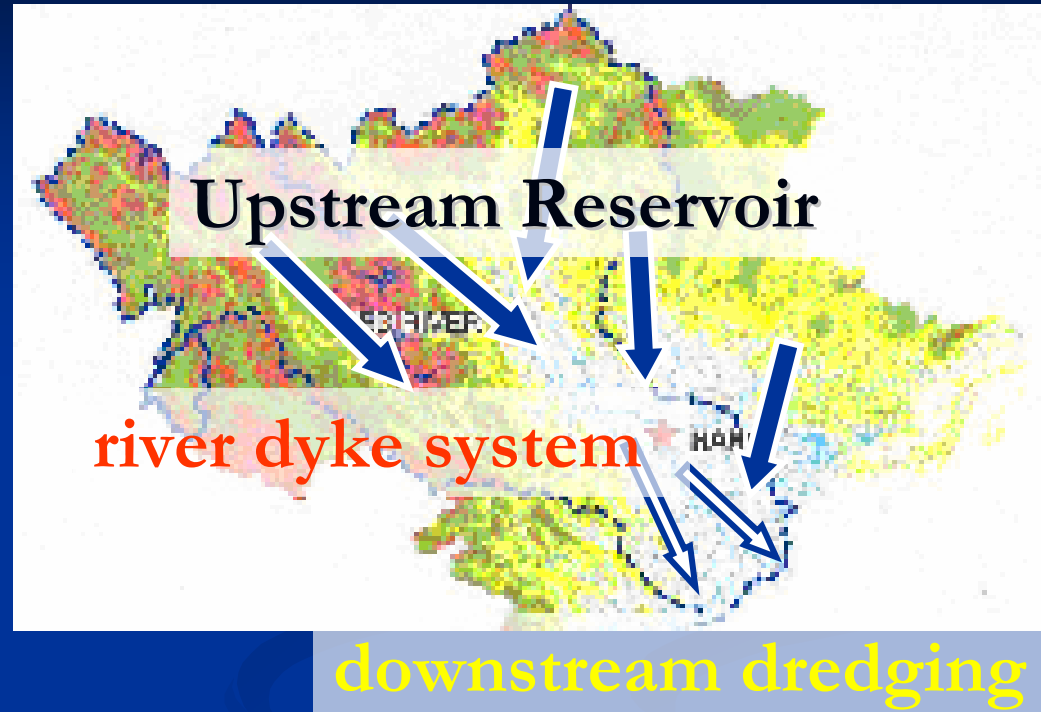


North Vietnam

Almost half *North Vietnam* belongs to the **Red River Basin** of 87,000 km² (the rest is outside the border)

The flood season is in July & August.

The Red River Delta is of 16,654 km² with a high density of population (about 25 mil. people) and big cities including Hanoi.



Flood

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North Vietnam

Son La
V12.5 bil.m³
P2400MW



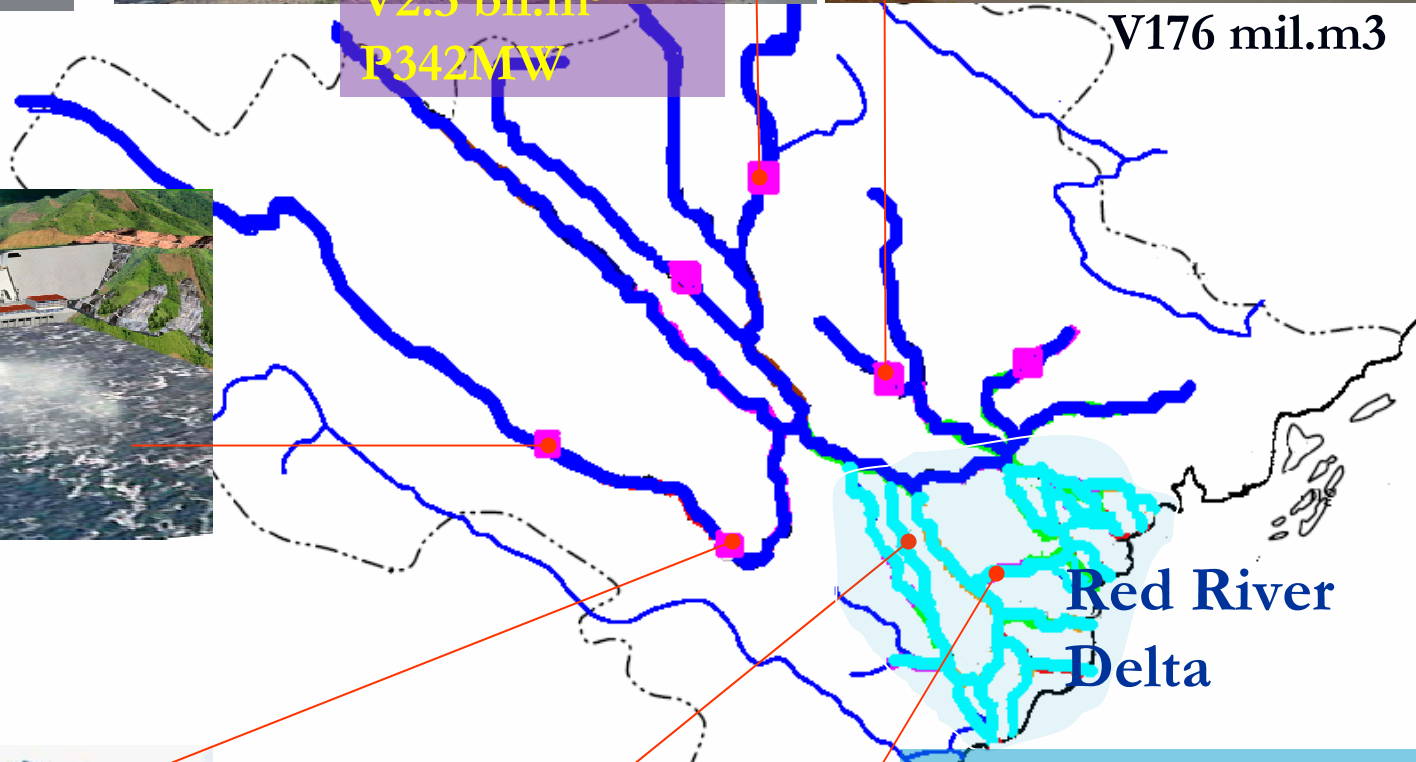
Hoa Binh
V9.5 bil.m³
P1920MW



Tuyen Quang
V2.3 bil.m³
P342MW



Nui Coc
V176 mil.m³



Red River
Delta

Downstream dredging



River dykes



Flood

www.vricold.vn

Central Vietnam

Floods usually come *suddenly right after heavy rains*, which often follow typhoons and tropical storms, because of the *big slope* of river bottom. Almost *no river dyke* can be built for safety in the region.

It can be mitigated by *reservoirs* only in connection with power generation.

flood season from August- *parallel 20°* →

flood season till November- *parallel 11°* →

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East Coastland

South – West
Highlands



Flood

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Ban Ve
V1.8 bil. m³
P320 MW

Cua Dat
V1.45 bil. m³
P97 MW

Song Muc
V174 mil. m³

Trang Web Hội Đáp lớn Việt Nam

Central
Vietnam

Phu Ninh
V344 mil. m³

Plei Krong
V1.08 bil. m³
P100 MW

Yaly
V1.03 bil. m³
P720 MW

Ba Ha
V240 mil. m³
P220 MW

Ayun Ha
V253 mil. m³

EaSup V170 mil. m³

A Vuong
V343 mil. m³
P420 MW

Dinh Binh
V226 mil. m³

Long Song
V37 mil. m³

Song Quao
V72 mil. m³

Song Muc
V174 mil. m³

*Reservoirs for
flood mitigation
with power
generation &
irrigation.*



Flood

www.mrcold.vn

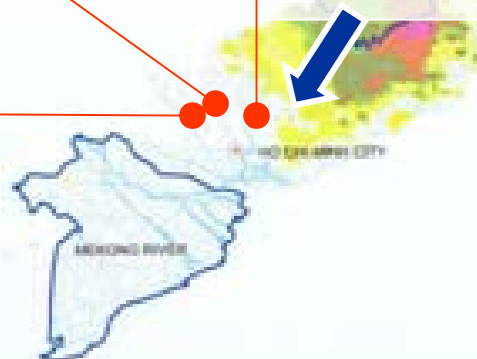
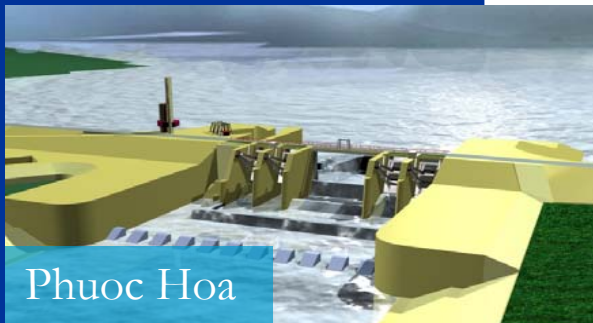
South Vietnam

Trang Web Hội Đập lớn Việt Nam

2 subregions : Eastern : *Dong Nai River Basin*

Flood mitigation: No dyke but multipurpose reservoirs (flood peak reduction, power generation, water supplies, irrigation,...) only.

Western : *Mekong River Basin* →



Flood

www.vhrcold.vn

Mekong River Basin 795,000km²

Trang Web Hội Đập lớn Việt Nam

yearly from August to November

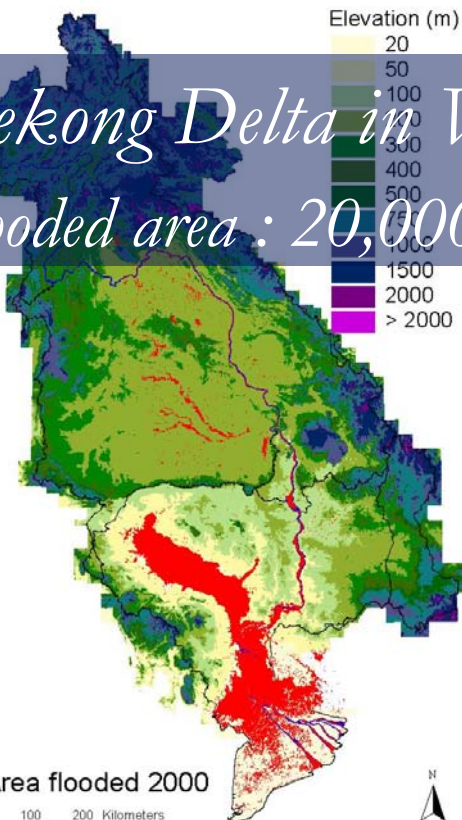
Special upstream rubber weirs for flood diversion



Mekong Delta in Vietnam 39,000km²

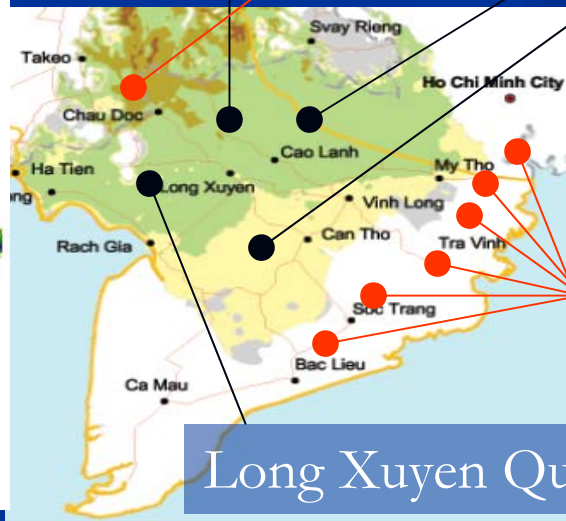
Flooded area : 20,000km² (deep inundation & shallow inundation)

Elevation (m)
20
50
100
200
300
400
500
1000
1500
2000
> 2000



Dong Thap Muoi Low Area

Special downstream sluices for intensive drainage & salinity control



Long Xuyen Quadrangle



Landslides & Flash floods

↑
Underground flow

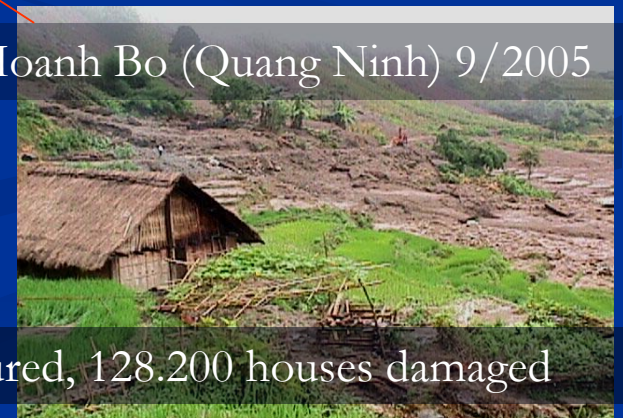
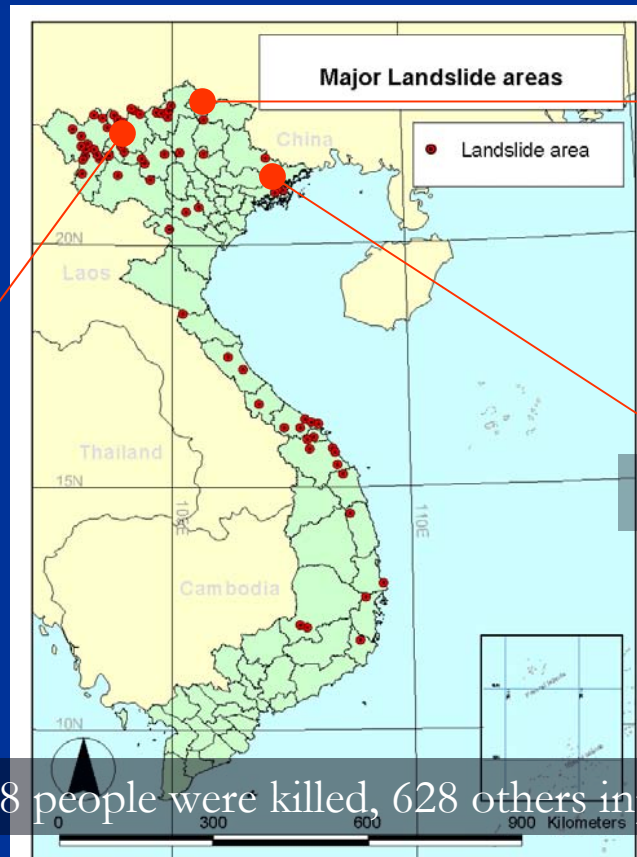
↑
Surface flow

↑
Heavy rain in mountainous areas

- *More heavy rains*
- *Wide deforestation*
- *Residence in dangerous zones*

*Almost no
alert
communication*

- *Early warning systems*
- *Reorganization of residential areas*
- *Aforestation*



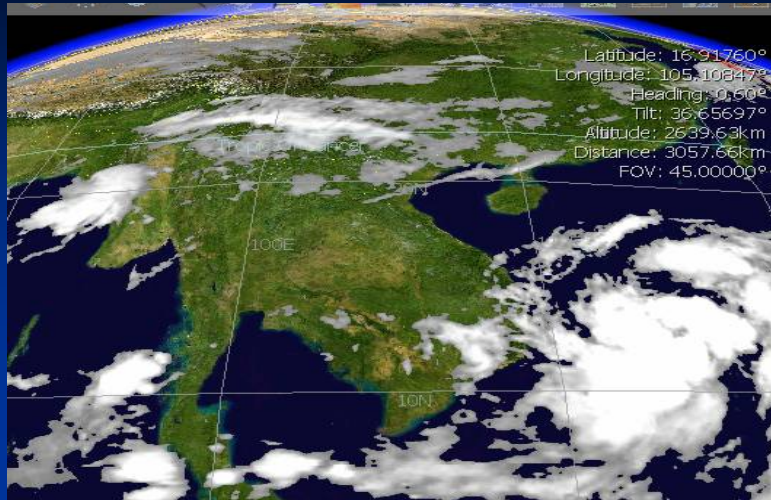
1990 ÷ 2005 : 27 flash floods, 988 people were killed, 628 others injured, 128.200 houses damaged

Flood Mitigation Management Institution.

- A **Steering Agency** at the Government level for:
 - * *Disaster Strategy*
 - * *Capacity Building*
 - * *Monitor & Control*
 - * *Law & Policy Making*
 - * *Proposals for Urgent Treatment*
 - * *Efforts Mobilization & Combination*
- Responsibility of local authorities with
“4 on - scene rules” (*commander, manpower, facilities, and logistics*)
- The awareness and tradition of mutual help of community

Conclusion.

- Natural disasters threaten seriously the sustainable socio-economic development
- Natural disasters are more damaging and more complex to handle, and apparently increasing in frequency over the long term.
- Losses of about 4000 lives by the Linda typhoon in 1997, 6000 lives & & US\$ 2.5 billion in Vietnam during 2000÷2004
- Regional & International Cooperation



Thank you for your attention!

