



Prevention and mitigation of geological hazards in Vietnam

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1. Brief introduction on geological hazards in Vietnam



Vietnam is in the natural hazard region of the Asia-Pacific. It has experienced several geological hazards, including flood, drought, erosion, landslide, fire, polluted environment from mining, which effects on 60% of population of Vietnam (MARD, 2009).

1.1. Typhoon

- Vietnam normally suffers from 5-6 typhoons per year (scale from 9 to 13 degree).
- It causes averagely 120 of dead, 100 missing victims and damages about 50.219 of housing, infrastructure and construction), 200.000 ha of farming and \$20.000.000 per year (Ministry of Agricultural and Rural Development-MARD, 2012)



The Linda typhoon (150km/h) in Ca Mau and Kien Giang Province (1997): 4500 of dead, damaging 200000 housing and 325000 ha of farming

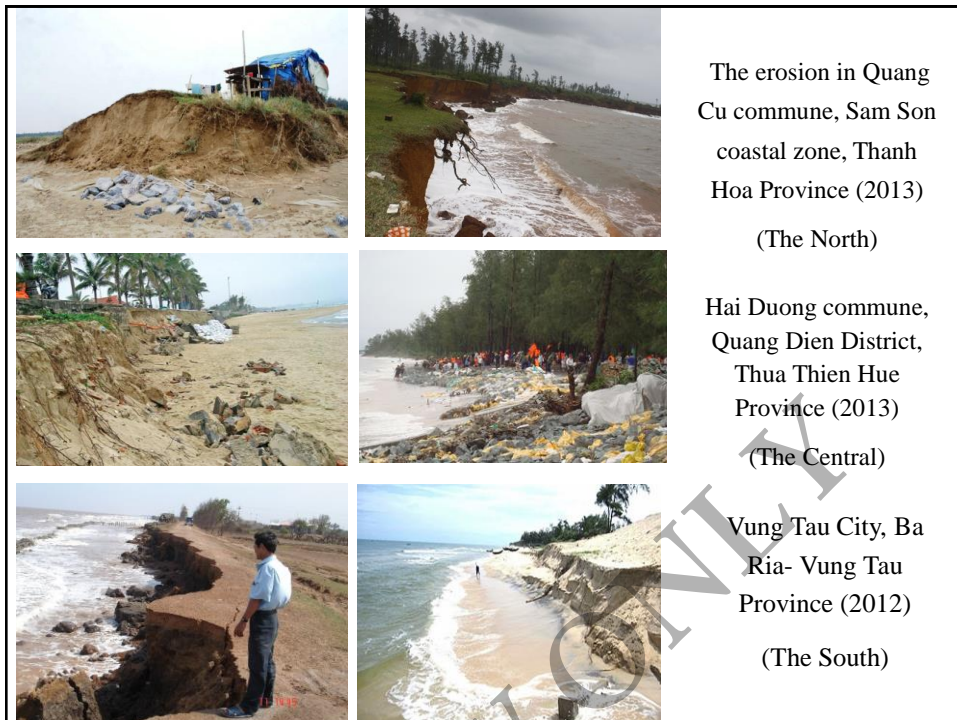


The historical Flooding in Hanoi (30 Oct- 7 Nov/2008)

The total rainfall: 350-500mm (Ha Dong City 707mm,
Thanh Oai Province: 914mm)

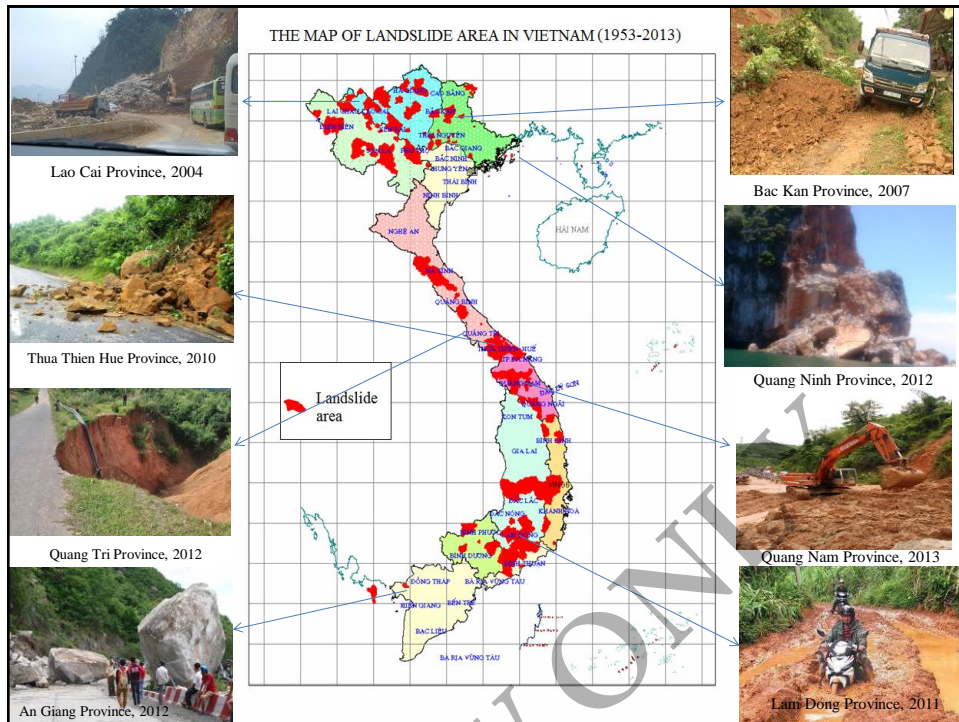
1.2. Erosion in coastal zone

- Erosion in coastal zone has changed complicatedly for 30 years in Vietnam.
- In the North (coastal zone with 750km length): there are 5 erosion areas (seriuos erosion happens in Cat Ba island, Hai Phong City) and Hai Hau District, Nam Dinh Province).
- In the Central (1960km length): seriously happens in coastal sand areas (accounting for 94% of erosion areas, about 160km.
- In the South (550km length): occurs at many areas during nearly 25 years at diffirent levels: Vung Tau (Ba Ria-Vung Tau Province, Dong Hai District (Tra Vinh Province) and Can Gio (Ho Chi Minh City).



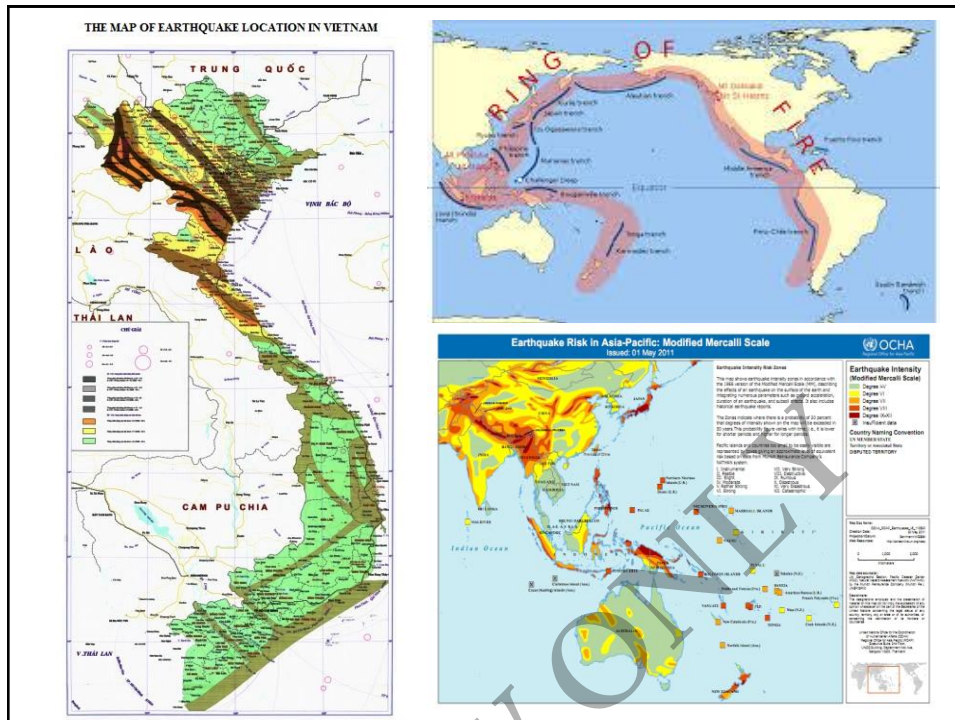
1.3. Landslide

- 75% of Vietnam area is slopehill topography and under tropical climate.
- There are about 200 landslides per year, mainly in East-West of Northern Mountainous area in Vietnam.
- It causes hundreds of dead and missing, damages housing, construction... And costs about \$5.000.000 per year.
- It occurs normally in rain season (from July to December), with rainfall from 300-700mm, at hillslope and thick weathering cover.
- Including: flashflooding, tuber flooding and 3 main types of mass movement (slide, flow and heave).



1.4. Earthquake

- Vietnam is located in “ring of fire” region in the Pacific-Asia area, so there are many earthquake activities in this area.
- From 1989 to 2013, there are 20 earthquakes (above 5 Richter degree). Vietnam has recorded the two largest degree earthquakes: in Dien Bien Province, 1935 with 6.75 Richter Degree and in Lai Chau Province in June 1983 with 6.8 Richter Degree.
- In South Central Coastal area, there was an earthquake with 6.1 Richter Degree (Vung Tau, Phan Thiet). It accompanied with a Hon Tro volcano.
- In 2010, there were some earthquakes in Vietnam, the largest one was 5 Richter Degree. Smaller degree earthquakes occurred along large faults such as: Muong Lai-Bac Yen, Cao Bang-Tien Yen, Ma River, Ca River...



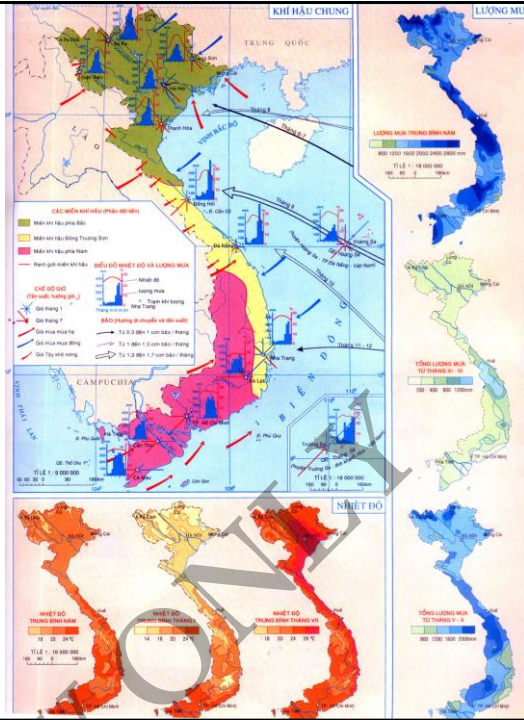
2. Causes and effects of natural hazards in Vietnam

2.1. Nature:

- Long coastal zone (>3260km): flooding, erosion in coastal zones.
- Special characteristics of neotectonic in Viet Nam: landslide, earthquake from electric power station and subsidence.
- Tropical climate zone: There 4 types of typical climate in Vietnam:



- In the North: **Subtropics climate**, with 4 seasons in a year
- In the South: **Tropical savanna climate**, with 2 seasons (dry and wet) in a year
- **Tropical monsoon climate**: Truong Son mountain.
- **South China Sea climate**:
➔ It creates advantages to weather processing, erosion, landslide.

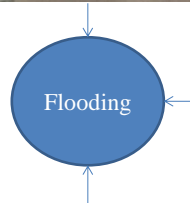


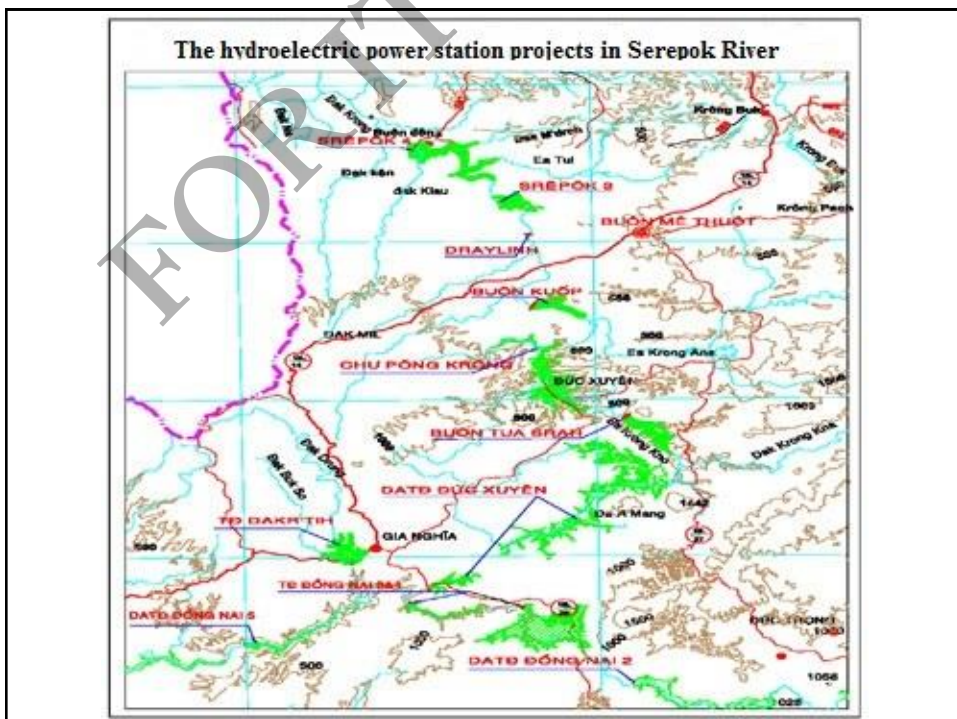
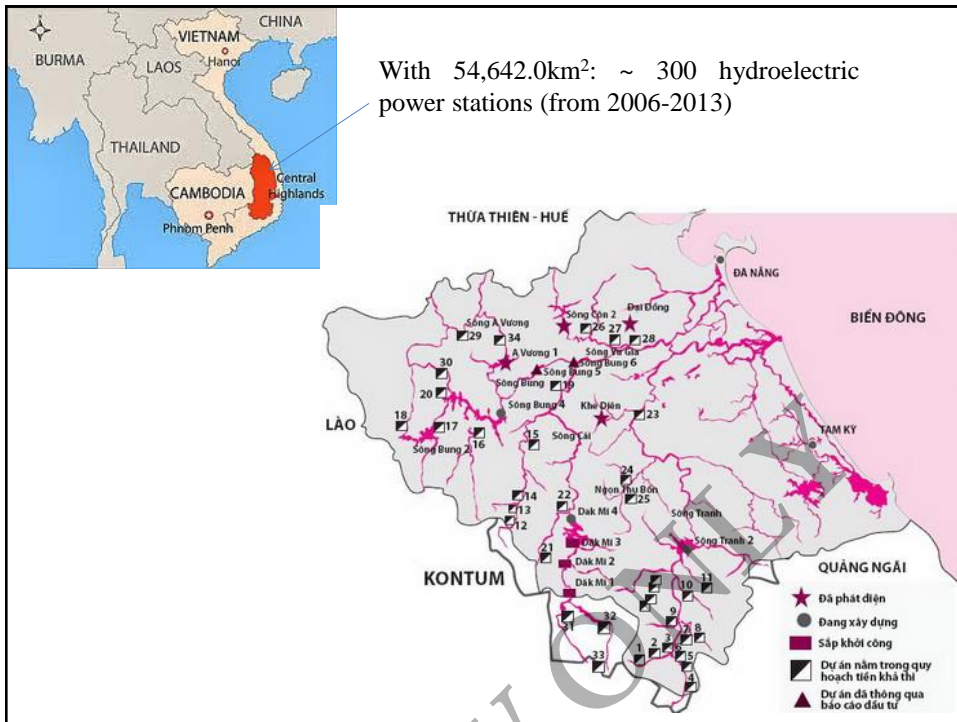
2. Causes and effects of natural hazards in Vietnam

2.2. Human:

Flooding:

- Deforestation: 3,5 million ha. Natural forest area has decreased from 12 million ha to 10 million ha; the cover has decreased from 41,3% to 39.1%
- Infrastructure building: urbanization reaches the rate of 3.4%, which is highest speed in the South East Asia region.
- Hydroelectric power station building: has extremely increased in the number of hydroelectric power stations.

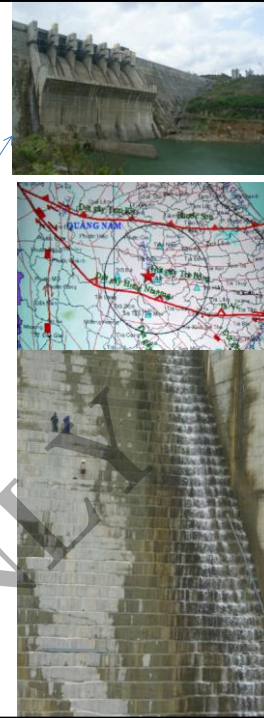




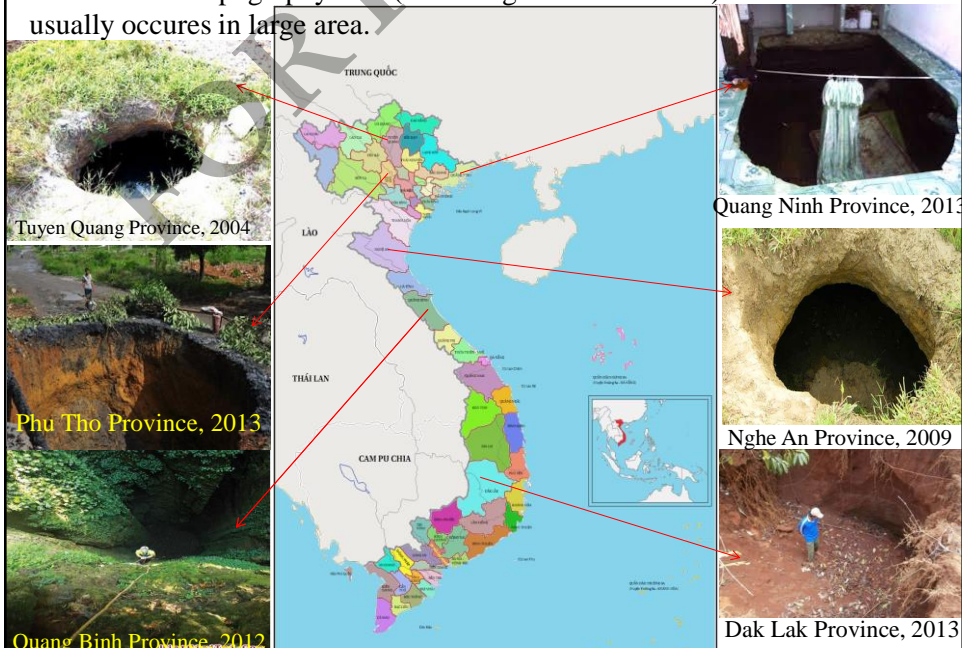
Earthquake: causes by hydroelectric power station, mainly in Central High Land (Lam Dong, Dak Lak, Gia Lai and Dak Nong Province): with 3-5 Richter Degree

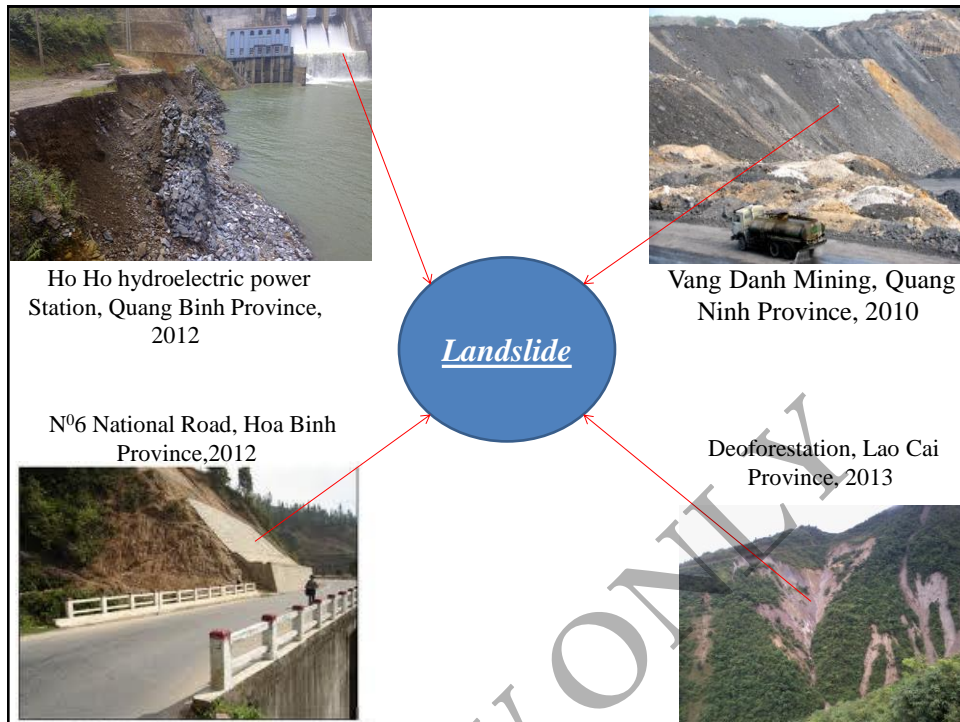


Tranh River II hydroelectric power station, Quang Nam Province



Earthquake causes by subsidence: Vietnam has 50.000km² of carbonate and limestone topography area (accounting for 20% of total). Subsidence usually occurs in large area.





3. Lessons from natural hazards mitigation in Vietnam

3.1. Improve governance in preventing and mitigating hazards:

- Vietnamese Government has ratified the Law of Hazard Prevention (June-19, 2013).
- Frequently organize training and practising opportunities for staffs on hazard adaptation and mitigation.
- Learn experiences from other countries.

3.2. Strengthening forecasting about hazards: early and exactly

- Early warning about hazards (in Vietnam, normally from 24 to 48 hours)
- Transfer people to safe areas to mitigate impact from hazards

3.3. Building infrastructure and applying new technology to adapt with hazard

- Application *Stabiplate* technology at erosion coastal zones: In Vung Tau beach (Vung Tau-Ba Ria Province).
- Application new technology with stone embankment in deep sea level (Mekong Delta)
- Application new biotechnology to mitigate hazards in landslide areas: cultivate *Ficus racemosa* and *Ficus benjamina* tree.



Vung Tau coastal zone (Ba Ria- Vung Tau Province, 2012)



Ca Mau Province, 2011



Ficus benjamina



Ficus racemosa

3.3. Building infrastructure and applying new technology to adapt with hazard

- Using *Polyacrylamide (PAM)* to dissolve in water to irrigate at taluy to prevent erosion at strong weathering process.
- Building housing to adapt with hazards (co-operation with Japanese Government, 9/2013).
- Application GIS and Remote Sensing to forecast and warn about geological hazards



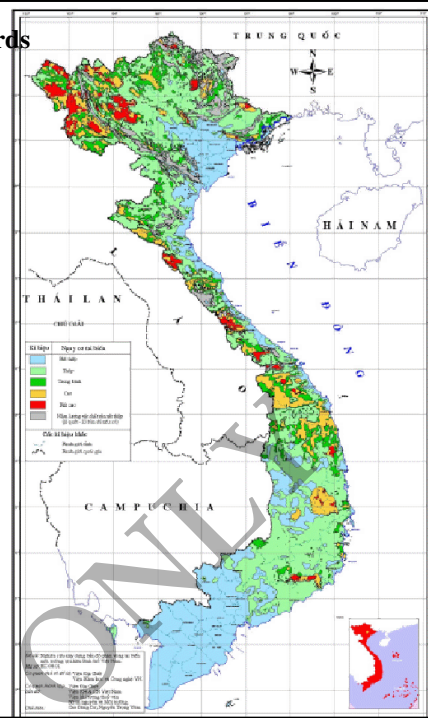
Polyacrylamide (PAM)



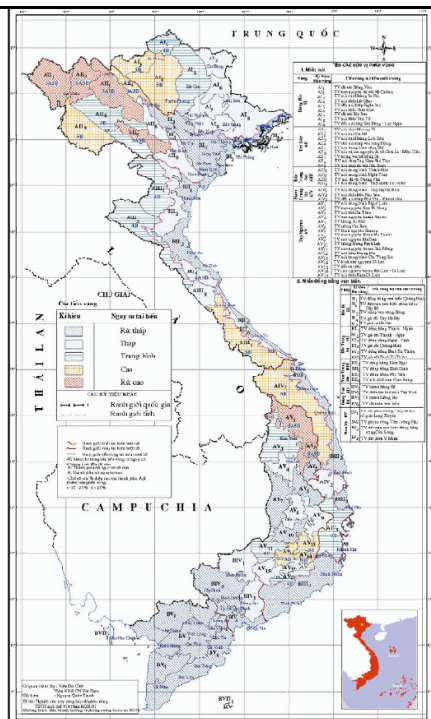
Before and after using PAM
Tuyen Quang Province

3.4. Building the data base of geological hazards

THE MAP OF FLASHFLOODING RISK IN VIETNAM



THE MAP OF LANDSLIDE RISK IN VIETNAM



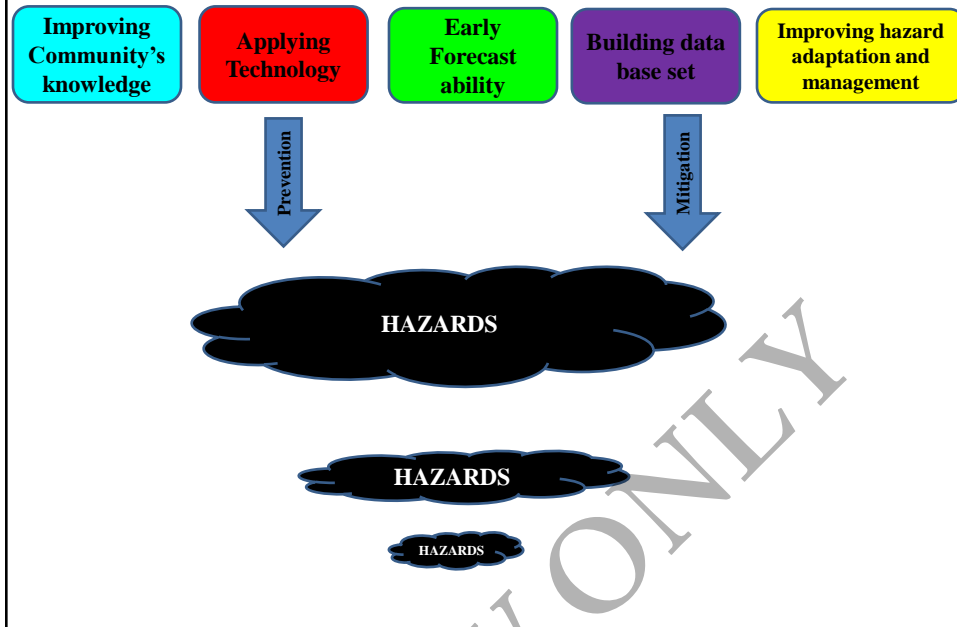
3.5. Increasing the role of community



3.5. Increasing the role of community

- There are about 100 training and workshops has organized in almost areas in Vietnam, particular in regions that usually suffer from natural hazards per year.
- Knowledge of community to prevent hazards has improved significantly.
- During 5 period year, from 2008-2013, preventing about natural hazards based on community has achieved many successes: decrease in the number of dead and missing and damaging of housing, construction, infrastructure and farming.

4. Conclusion



THANK YOU FOR YOUR ATTENTION!

Reference

- Nguyen N.P, 2012, “*Application new technology-Stabipalge to prevent erosion in coastal zone in Vietnam*”, Institution of Science and Technology.
- “*Building a strategies to prevent erosion in Vietnam from 2012- 2020*”, Ministry of Natural Resource and Environment.
- *Assessment erosion in Vietnam*, National Conference, Ministry of Natural Resource and Environment, 2013.
- Nguyen H.N., 2011, “*Method to reduce landslide in Mekong Delta*”, Reseach Center of Environment Geology, Ngo C. T., Nguyen H. N., Nghien H. H., 2010 “*Landslide in Quang Nam and Quang Ngai Province, Promoting strategies to prevent geological hazzard*”, Geological Journal, Vol. 3, pp.23-30.
- Dang V. B, Vu A.T., 2005, “*Environmental impact assessment on solid mineral exploitation in Vietnam*”, presented at the National Environmental Conference”, Hanoi.
- Dang V. B., Hoang V.L., Vu A. T., 2007, “*Applying the remote sensing method to research oceanography in West-South of South China Sea*”, Geology Journal, Series A, Vol. 229/3-4.
- Nguyen A. T, 2008, “*Earthquake in Vietnam, promoting a new strategy to reseach about earthquake*”, Institution of geological reseach”, presented at the National Geology Conference”, Hanoi.

Reference

- Nguyen, X. H., “*Research geological hazard forms to promote sustainable development in Tay Nguyen (Central Highland) in Vietn Nam*”, Institution of Geology, National Project, (2012-2014).
- Trinh, P. L., 2013, “*Research geological hazards in Thua Thien Hue and coastal zone by intergrating remote sensing and GIS*”, Technology and Natural Sciences Press.
- Nguyen T. L., Luu T. B., Nguyen T.H.V., Le Q. H., 2011, “*Application model of sustainable slopehill in geological hazard in Yen Bai City*”, Geological Journal, Series A, Vol. 324, I.3-4, pp.1-11.
- Dao V. T., Ho V.B., Phan X.T., Dinh V.P., Tran Q. T., Tran N.K., Pham V.H., 2011, “*Geological hazard situations in West of Hanoi City*, Geological Journal, Series A, Vol. 324, I.3-4, pp.11-24.