SOCIALIST REPUBLIC OF VIETNAM

DATA COLLECTION SURVEY ON STRATEGY DEVELOPMENT OF DISASTER RISK REDUCTION AND MANAGEMENT IN THE SOCIALIST REPUBLIC OF VIETNAM

FINAL REPORT

SEPTEMBER 2018

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

EARTH SYSTEM SCIENCE CO., LTD.
NIKKEN SEKKEI CIVIL ENGINEERING LTD.
IDEA CONSULTANTS, INC.

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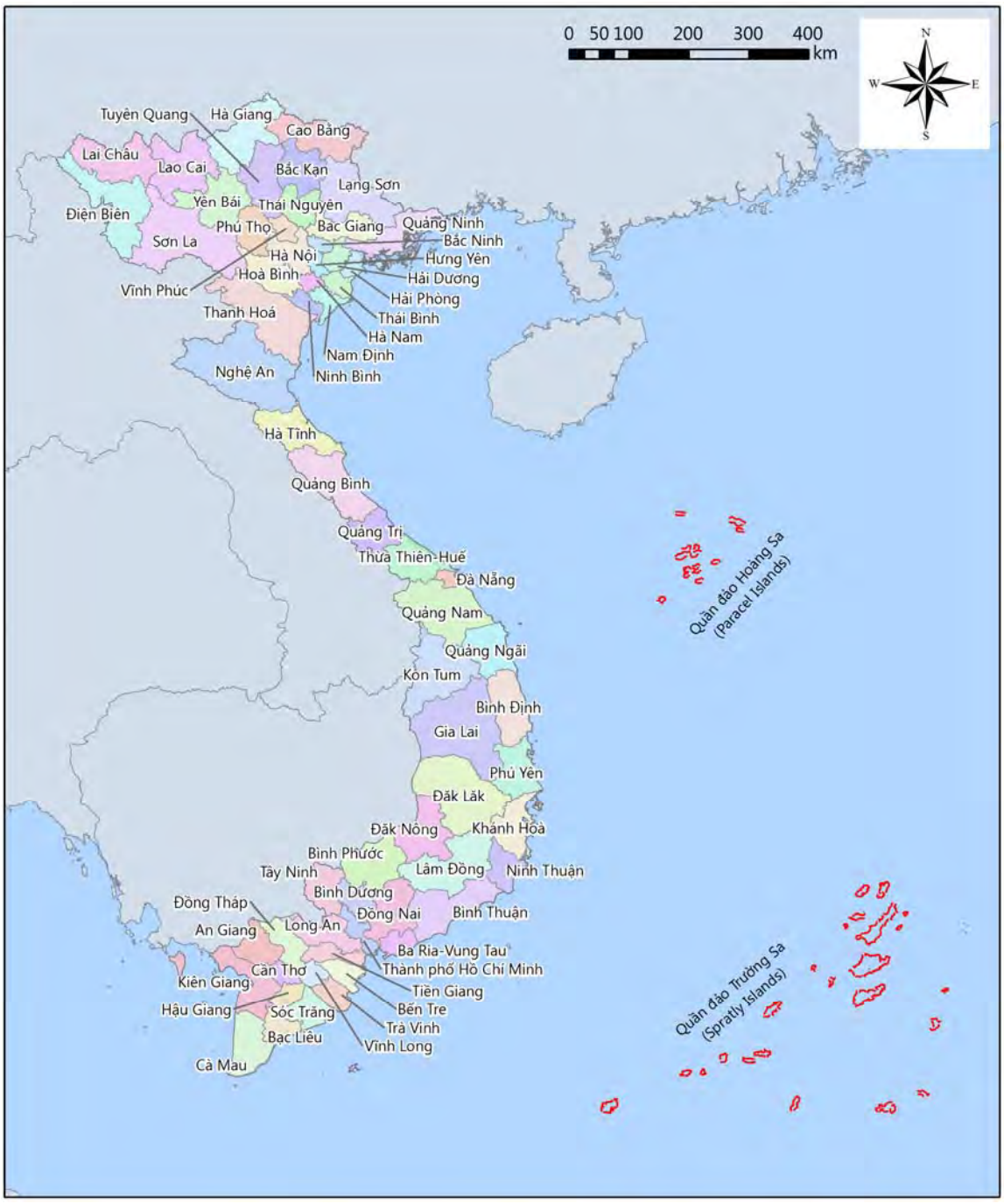
Following Currency Rates are used in the Report

Vietnam Dong	VND 1,000
US Dollar	US$ 0.043
Japanese Yen	JPY 4.800



Survey Targeted Area

（Division of Administration）

SUMMARY

1. Natural Disaster Risk in Vietnam

(1) Disaster Damages

According to statistics of natural disaster records from 2007 to 2017, the number of deaths and missing by floods and storms accounts for 77% of total death and missing. The number of deaths and missing of landslide and flash flood is second largest, it accounts for 10 % of total number. The largest economic damage is also brought by floods and storms, which accounts for 91% of the total damage. In addition, damage due to drought accounts for 6.4 %, which was brought by only drought event in 2014-2016.

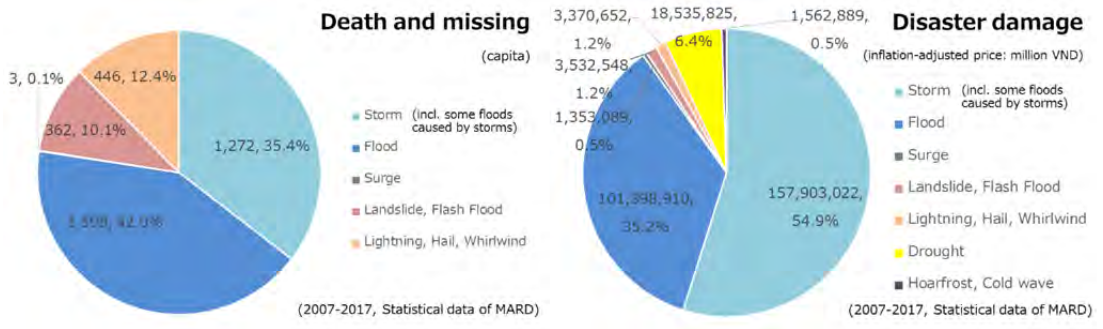
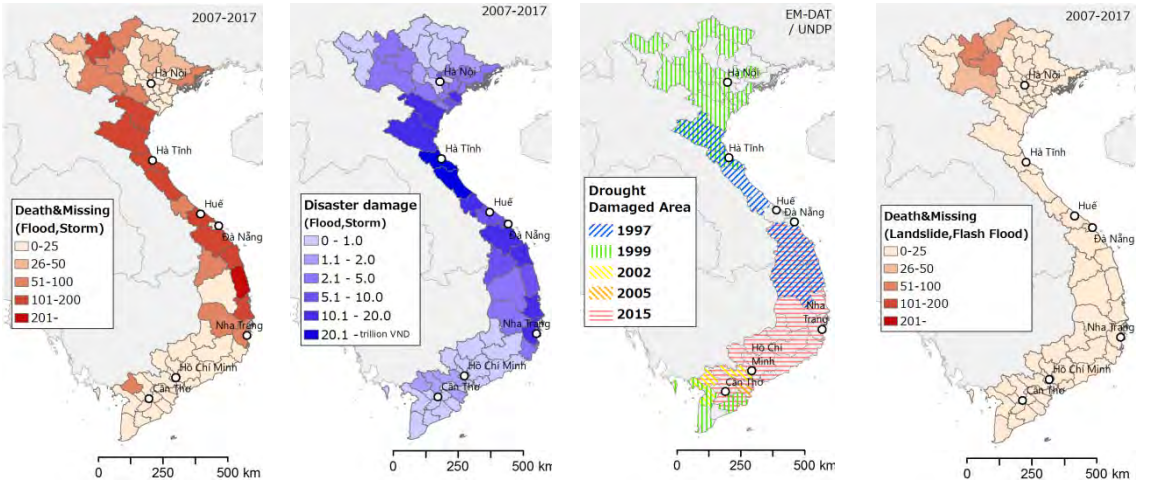


Figure 1: Disaster records in Vietnam

Regarding distribution of disasters, deaths and missing as well as damage amount caused by floods and storms are distributed countrywide centering on the coastal area. The damages especially in the Central region are severe. It seems that a lot of the direct hit of the storms and insufficient countermeasures in comparison with economic development in the Central region generated the considerable damages. Droughts are recorded in the whole country but the year of disaster occurrence varies from region to region. The number of the dead and missing by landslides and flash floods are high mainly in the northern mountainous region.



Floods and storms　　Droughts　　Landslides / flash floods

Figure 2: Distribution of disasters (2007-2017)

(2) Disaster Trend

The disaster damage on the economy has increased in the recent 30 years accompanying economic growth. The amount of disaster damage in 2016 is ca. 1% of GDP. The damage amount due to floods and storms accounts for a large portion of the each year disaster damage. The disaster damage due to drought in 2015-2016 is also large, which accounts for 38% of the disaster damage in the 2 years.

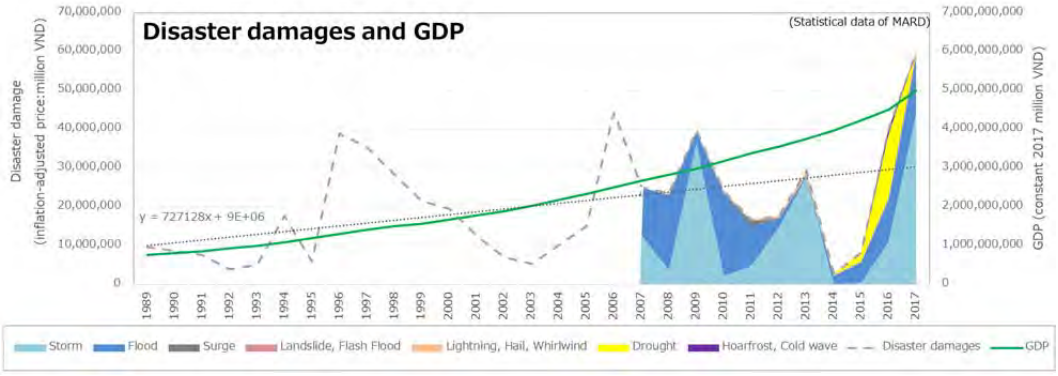


Figure 3: Trend of disaster damage and GDP in Vietnam (1989-2017)

2. DRR Sector in Vietnam

(1) Legal, Political and Institutional Arrangement

DRR institution in Vietnam was stipulated in the Law on National Disaster Prevention and Control (NDPC). The Law was approved in June 2013 and enforced in May 2014. In addition to the Law, a Decree on "Detailing and Guiding of Articles of the Law" (No.66/2014/ND-CP) regulates responsibility of central and local agencies and coordination mechanism on DRR. Based on the Law on NDPC, National Strategy and NDPC Plans and Natural Disaster Response Plans are formulated.

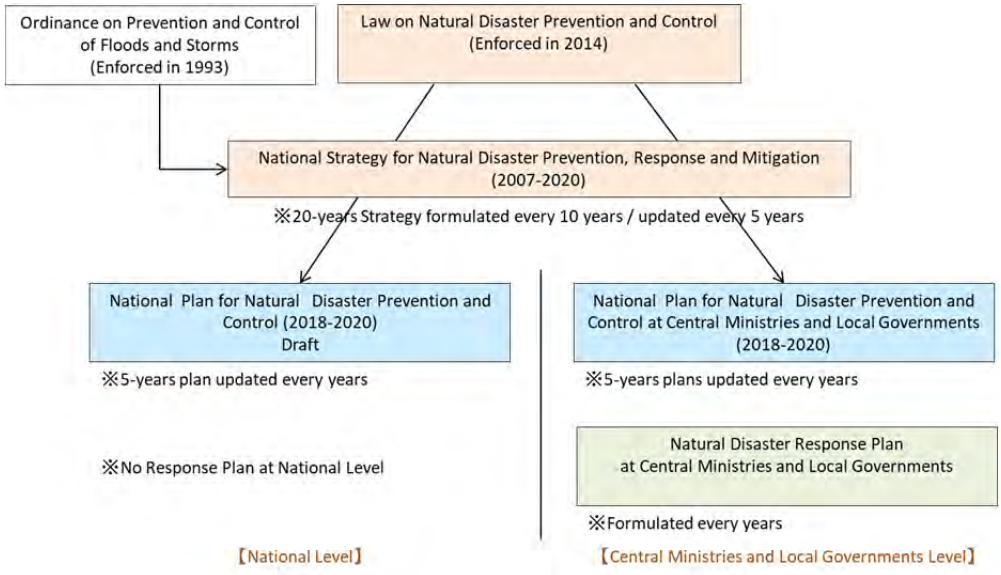


Figure 4: Law, Strategy and Plans on DRR in Vietnam

Central Steering Committee for Natural Disaster Prevention and Control (CSCNDPC) is the highest directing and commanding organization for natural disaster prevention and control in Vietnam. Directorate of Natural Disaster Prevention and Control (Vietnam Disaster Management Authority: VNDMA) under MARD is the standing office of the committee. The CSCNDPC is chaired by the Minister of MARD and composed of representatives from the central ministries and relevant agencies as shown in below:

Table 1: Members of CSCNDPC

Title	Members
Chair	Minister of MARD
Permanent Vice-Chair	Vice-Minister of MARD
Vice-Chair	Vice-Director of Government Office
Vice-Chair	Vice-Chair of National Committee for Incidents, Disaster Response, Search and Rescue
Permanent Member	Leaders of MARD, MONRE, Ministry of National Defense, Public Security, Information and Communications, Industry and Trade, Transport, Construction, Education and Training, Health, Culture, Sports and Tourism, Foreign Affairs, Labor, War Invalids and Social Affairs, Science and Technology, Planning and Investment, Finance, Vietnam Television, and Voice of Vietnam Heads of departments of MARD, MONRE, Ministry of National Defense National Committee for Search and Rescue Academy of Science and Technology of Vietnam
Non-permanent Members	Leaders of Vietnam Fatherland Front Central Committee, Central Women's Union, Central Ho Chi Minh Communist Youth Union, Central Vietnam Red Cross Society and other related organizations
Standing Office	Established in MARD (on Prime Minister's Decision No.1536/2015)

At local, the Decree No.66/2014/ND-CP stipulate the establishment of Commanding Committee for NDPC and Search and Rescue (CCNDPC/SR) at provincial, district and commune levels. The Committees are chaired by a chairpermam of the People's Committee in each level. In most provinces, Sub-departments of Irrigation under Department of Agriculture and Rural Development (DARD) are assigned as the standing office of the CCNDPC/SRs in addition to their mandatory tasks and responsibilities.

(2) National Disaster Prevention and Control Plan

The Law on NDPC stipulates that NDCP Plans shall be formulated every 5 years at national, central ministries and each level of local governments. The National NDPC Plan (2018-2020) was already drafted, and the Provincial NDPC Plans were formulated at 58 provinces out of 64 as of June 2018.

As the National NDPC Plan is not legally positioned as a superior umbrella plan, local Provinces and Ministries are able to formulate their NDPC Plan independently without referring to the National NDPC Plan. Because there is no direct relationship between national plan and provincial plan, the consistency is not sufficient. Therefore, it seems difficult to promote DRR measures in local level according to the national policies and plans.

(3) Disaster Response

In order to clarify the roles and responsibilities during disaster, the Law on NDPC stipulates to define Natural Disaster Risk Levels. The Natural Disaster Risk Level is classified into five (5) levels based on the intensity, range of influence and possible damage by the disasters. The CSCNPC and CCNDPC/SR at each level take actions for disaster response based on the Natural Disaster Risk Levels.

In central level, the CSCNDPC commands and coordinates for disaster response for disaster risk level 3 and 4, and NCSR commands search and rescue activities. VNDMA works as the standing office of the CSCNDPC, collecting disaster damage information, issuing letters, official announcements and reports and advising the CSCNDPC according to the regulation in the Prime-minister Decision and Decrees.

During disaster response, VNDMA monitor and summarize the hydro-meteorological information, human and infrastructural damages for the decision making by the CSCNDPC.

Natural disaster damage information is collected from the local to the central in bottom-up scheme. The detailed mechanism, report contents, frequency, means and responsible agencies are stipulated in the Joint Circular between MARD and the Ministry of Planning and Investment. However, as such information has been collected by traditional tools and on-line system has not been developed, it takes time and effort to analyze the information, so that it often disturbs prompt actions in emergency situations. In such circumstances, VNDMA is proposing to establish a "National Center for Disaster Operation and Response" to promote effective and efficient disaster response using integrated information and communication tools. It is highly expected that the disaster information management is improved and strengthened for effective disaster responses.

(4) Forecasting and Early Warning

Responsible agencies issuing forecasting and warning in Vietnam are Ministry of Natural Resources and Environment (MONRE) excepting for earthquake and tsunami. Vietnam Meteorology and Hydrology Administration (VNMHA), MONRE has 9 Regional Hydro-Met Services (RHMS) and Provincial Hydro-Met Services (PHMS). Nationwide weather forecasting and flood forecasting for major river basins are delivered by VNMHA whereas the local weather forecasting and flood forecasting for small to medium river basins are the duty of RHMSs and PHMSs.

Forecasting and warning mechanism and protocol among government agencies (central agencies > provinces > districts > communes) is systematized. However, the information delivery system to the community residents is not fully functional. The local people tend to take actions only based on their experiences without receiving warning message.

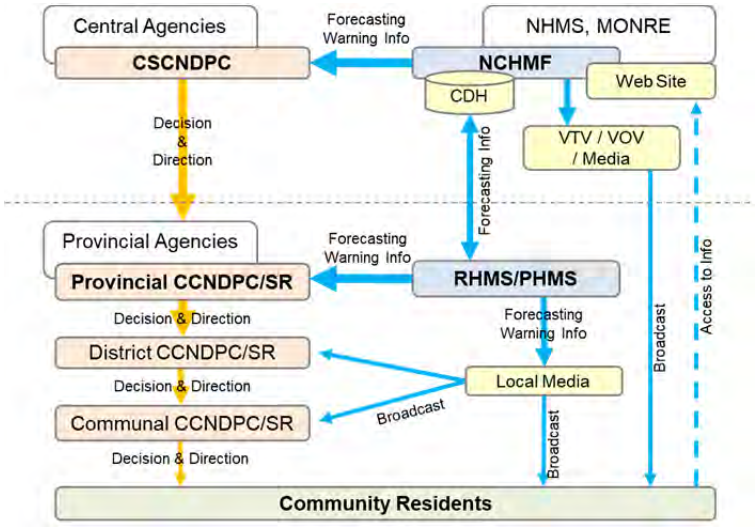


Figure 5: Communication Flow for Forecasting and Warning

(5) CBDRM / Disaster Education

CBDRM activities in Vietnam became full-scale in July 2009 after the promulgation of "Prime-minister Decision No.1002/2009/QD-TT "Community awareness raising and community-based risk management activities". This Decision states that nationwide CBDRM activities must be carried out in 6,000 communities vulnerable to disasters within a 12-year period from 2009 to 2020. CBDRM was implemented in 1,763 villages as of the end of 2015. It is less than one third of the target 6,000 villages.

Disaster education in Vietnam is conducted based on the "Education Development Strategy 2011-2020". MOET is the responsible organization for disaster education at the central government, education curriculum, training material and trainings on DRR / CCA (Climate Change Adaptation), under cooperation of MARD, and UN.

3. Issues and Challenges in DRR Sector

Based on the current situation of the DRR sector in Vietnam, the historical damages caused by each type of disasters, the disaster response by the government as well as international donor's support, the issues and bottlenecks were evaluated.

(1) Issues in Multi-sectoral Area

Issues	Bottlenecks
Mainstreaming DRR has not been advanced in each sector and province. CSCNDPC needs to be strengthened as an institution to instruct and coordinate several sectors.	The chairperson of CSCNDPC is the Minister of MARD and it is difficult to instruct and coordinate other ministries.
	There is no system to coordinate the content and amount of investment from DRR budget at the Central Government.
	The Central Government does not perceive DRR projects implemented/ planned by the other ministries and provinces.
	Specific actions required for DRR mainstreaming are not included in SEDS/SEDP (For this reason, sufficient budget allocation has not been implemented).
Human resource and capacity at VNDMA and province, which are responsible for DRR operations at normal time and emergency response, are lacking.	Officers are insufficient. Full-time officers are few, and officers at irrigation department in DARD are concurrently working.
	There is no permanent DRR institution at province. In fact, the irrigation department in DARD is working concurrently and coordination capacity between sectors is weak.
	Insufficient experience and knowledge of DRR related officers at VNDMA, provinces, districts and communes.
Activities for CBDRM and DRR education are not implemented based on a mid-/long-term plan and depended on annual budget and donor's aid. Therefore, activities are implemented only for a particular purpose.	The state of project implementation by international donors and NGO is not perceived in a centralized manner. The standard of activity content is not consolidated, and there is no consistency in activities.
	There is no determined budget, and educational materials and equipment are planned based on donors' aid.
	DRR education and CBDRM are implemented separately.
	Small-scale measures are broken during disasters because insufficient strength and effects of design and materials are utilized.
Disaster information is not utilized effectively for DRR activities and	DRR information (meteorological and hydrological information and disaster damage information etc.) is decentralized and managed and obtained by

Issues	Bottlenecks
disaster response	various institutions. The information is disseminated in real-time, so it is not effectively utilized during normal time and emergency. Especially, there is no basic facility which share information on the site precisely and promptly during emergency.
	Precision of data varies considerably although there is a mechanism in which the central government compiles the disaster damage information collected by provinces. Creation of disaster damage report during emergency is a heavy burden for provinces.
Accuracy and delivery of early warning information is not sufficient	Hydrological information is limited, and the current condition of disaster is difficult to understand. For this reason, early-warning for disaster response is not sufficient. Also, formulation of a DRR plan based on evidence has been a challenge. Hydrometeorology information etc. for a multi-dam operation is insufficient.
	There is no structure to inform an easily comprehensible warning to end residents, which influences actions to reduce disaster damage
A national and provincial DRR plan is not consistent. DRR measurements at each level consist of needs of lower institutions. DRR plans of national, provincial, district, and commune level are not consistent, and the contents are not validated and comprehended.	A national and provincial DRR plan is not consistent. DRR measurements at each level consist of needs of lower institutions.
	DRR plans of national, provincial, district, and commune level are not consistent, and the contents are not validated and comprehended.
DRR pre-investment based on a plan is insufficient.	DRR pre-investment is not prioritized in the DRR plan at each level. In the DRR plan at each level, the position of DRR investments for each sector is not clarified.
	There is no quantitative risk evaluation at each level, and measurements and implementation schedule based on risk reduction goal are not clear.
	Project evaluation (results of the reduction) towards risk reduction goal is not implemented.
	Budget is not allocated to DRR pre-investment due to budget limitation.
	Usage of Central Emergency Response Fund (CERF) is limited to humanitarian aid when disaster occurs.
System and budget to respond to a large-scale disaster is not sufficient	A national disaster response plan is not determined in the Law on Natural Disaster Prevention and Control.
	A viable disaster response plan is not formulated base on a simulation of a province at each level.
	Prompt budget implementation is not possible because the central government does not have an emergency response budget. Legal system for the central government to control the provincial NDPC fund is not consolidated.
	A system for disaster affected people and provinces to obtain disaster insurance and an inexpensive loan is not organized.

(2) Issues in Each Type of Disasters

Issues	Bottlenecks
Strategy and measures against flood disaster don't meet the needs	Draft "Resolution", which is based on the result of the disaster conference held at the end of March sponsored by the Prime Minister, specifies

Issues	Bottlenecks
in consideration of climate change and land use change (urbanization). [Flood]	acceleration of IFMP. However, the legal ground of IFMP is unclear. Budgets for implementing IFMP have not been allocated as planned in 2 provinces that JICA supported to make their IFMPs. Process and authority to make IFMP for an interprovincial river basin are unclear.
	Strategy of flood countermeasures against new risks associated with population growth and construction of industrial parks remains under the old-fashioned concept of “Living with Flood”.
	Aging dams and river dikes increase disaster risk. Facilities for flood discharge and discharge control are not functional in many irrigation dams.
Response to sea level rise and typhoon including high tide and storm is inadequate in major urban areas in coastal areas. [Typhoon]	The measures to reduce high tide risks are not implemented in major urban areas and development areas.
	Inundation spread widely, and prolonged climate change affects socio-economic activities in the coastal region. Damage scenario of multiple disasters due to typhoons and floods is not considered.
Experience and performance of response to sediment disasters are insufficient and system of prevention / mitigation / response for sediment disaster is inadequate. [Sediment disaster]	Information about sediment disaster (cause, condition, damages) is not collected. Disaster assessment is not conducted properly. Sediment disaster risk analysis and hazard map that can be utilized by local people is not properly prepared. Land development is expanded to high risk area.
	Hydro-meteorological information for sediment disaster forecast is insufficient. Warning is issued for wide area. Warning criteria specified in the local condition is not formulated.
	Experience and technology to protect critical infrastructures (road, railway, power plant, etc.) are insufficient.
Water use more than water resources potential worsens drought disaster. [Drought, saltwater intrusion, ground subsidence]	Water resources potential depends on water use in upstream countries in 7 international river basins.
	Coordination among related sectors is insufficient and water is not adequately used in consideration of water resources potential.
	It is difficult to efficiently operate water reservoir for cropping, harvesting and beneficial use of water resources because mid- and long-term weather forecast has low accuracy.
	Countermeasures against land subsidence such as control of excessive pumping of groundwater are insufficient because the effect of it is not quantitatively understood.
Countermeasures against coastal/river bank erosion is palliative because the cause is not revealed. [Coastal and riverbank erosion]	It is difficult to identify the cause of coastal/river bank erosion because various phenomena can be considered to contribute to the erosion.
	Sediment dynamics in a river basin e.g. sediment transport is decreased with dams, illegal sand mining and uncontrolled dredging.
	There is a guideline for common design of river dike and bank protection, but it is not a guideline for survey / design considering river characteristics and coastal current from viewpoint of integrated coastal management. There is not an assessment system of erosion.

4. Formulation of Priority Programs in the DRR Sector

(1) Consultation Meetings by JICA-MARD

To summarize the results and discussions through the survey until March 2018, the 1st consultation meeting was held on May 11th, 2018, co-hosted by JICA and MARD. JICA side JICA side presented disaster characteristics in Vietnam that are studied in the survey, keynotes of the Sendai Framework 2015-2030 and role and responsibility of the central government to implement the Sendai Framework.

Considering the Asia Ministerial Conference on DRR (AMCDRR) held in Mongolian on July 2018, JICA long-term expert, JICA Vietnam office and the survey team discussed with VNDMA, relevant ministries and provinces about necessary actions that the Vietnamese government should prioritize considering the Sendai Framework, and drafted a strategy paper. The drafted strategic paper was discussed in the 2nd consultation meeting held on June 27th, 2018 chaired by Mr. Thang, a Vice Minister of MARD, and it was finalized as "Priority Programs for DRR in Vietnam ~ to sustain socio-economic development ~".

1st Consultation Meeting
May 11th, 2018

2nd Consultation Meeting
June 27, 2018

(2) Priority Programs in the DRR Sector in Vietnam

Considering the current issues in the DRR sector in Vietnam as well as the "Global Targets" and "Priorities for Action" in the Sendai Framework 2015-2030, the following six (6) Priority Programs were concluded through the consultation meetings.

■Priority Program 1: Establish practical disaster information management

Disaster data and information provide basis for all evidence-based DRR activities, including future investment planning. It is crucial to establish appropriate data and information management, including hydro-met data, disaster damage data and disaster risk information.

- Disaster information management

Currently, disaster-related information such as disaster risk, hydro-met information and disaster damage information are individually collected and managed by different entities. Legal and institutional arrangement and information system will be developed to share data and information.

In addition, it is important to improve operation of information management in both emergency situations and normal times.

- Utilization of hydro-meteorological information

Through enhancement of hydro-met observation, disaster management including forecasting and early warning will be improved. Forecasting and early waring information will be transmitted in forms that can be utilized for appropriate responses by disaster management authorities and local residents.

- Dissemination of annual report on natural disaster and DRR

Annual report on natural disaster and DRR will be prepared and disseminated, utilizing collected information on disaster. It is also useful to educate and disseminate knowledge on DRR.

■ Priority Program 2: Complete the institutional arrangement for better coordination

In Vietnam, Law on Natural Disaster Prevention and Control (NDPC) was legislated in 2013 and Vietnam Disaster Management Authority (VNDMA) was established in 2017. The legal and institutional arrangement should be enhanced. Besides, the actions taken at the central and local levels should be coordinated in a better way. It is necessary to complete the institutional arrangement on DRR, with improved coordination mechanisms. Roles and responsibilities of relevant sectors and stakeholders should be clearly defined for effective implementation.

- Implementation of DRR policies based on existing laws

All of the DRR activities and policies should be implemented based on existing DRR-related laws such as Law on Water Resources, Law on Hydraulic Works, Law on Hydro Meteorology, Law on Forestry, Agricultural Restructuring Program and the Government Resolution 120 “Sustainable and Climate-resilient Development of the Mekong Delta”, in addition to Law on NDPC.

- Enhancement of coordination through CSCNDPC and VNDMA at central level

Through enhancement of leadership of CSCNDPC and functions and organizational capacity of VNDMA, coordination among all relevant stakeholders should be strengthened to mainstream DRR in all sectors. For this purpose, it should be considered that the Prime Minister will lead CSCNDPC as chairperson, because natural disaster has impacts on all sectors and provinces.

- Capacity development for DRR at local levels

Training mechanism on DRR for different levels should be reviewed and improved to be more practical and effective on the ground. Community awareness raising, understanding of the risk and knowledge sharing should be improved through the activities of CBDRM and communication. In addition, the capacity of officials should be enhanced to coordinate with relevant stakeholders as well as to implement activities on the ground.

■Priority Program 3: Develop DRR plans at all levels and prioritize investment based on the plans

To develop a plan for DRR at central and local levels is stipulated in Law on Natural Disaster Prevention and Control (2013). It is also encouraged in the Sendai Framework for DRR as an urgent target by 2020. To prioritize investment in DRR, it is important for Provincial People’s

Committees (PPCs) to develop their DRR plans including concrete countermeasures. Therefore, the government of Vietnam put first priority on formulation national and local natural plans for DRR.

- Development of risk-based DRR plans

It is necessary to strengthen local capacity on DRR planning with quantitative risk assessment. By doing quantitative risk assessments and setting concrete targets to reduce risks in the plan, appropriate countermeasures including structural and non-structural measures can be identified. It is important to establish an overall planning framework for DRR, which covers relevant sectors at the local level. The DRR plans should clearly define roles and responsibilities of all stakeholders. Involving local people is essential in developing a plan for DRR at commune level. It is also necessary to strengthen the capacity of formulating disaster response plans at central and local levels considering damage scenarios.

- Mainstreaming DRR in socio-economic development strategy / plans (SEDS / SEDP)

It is important to mainstream DRR in SEDS/SEDP, and to allocate a certain percentage of budgets as investment in DRR at central and provincial levels. It is also meaningful to develop a database for the investment in DRR to clarify the current scale of DRR-related budget and other relevant investment.

- Establishment of DRR fund

At the provincial level, almost all of the provinces have established local DRR Fund at local level. It is also necessary for the central government to establish a national level DRR Fund to manage disaster recovery and preventive measures.

■Priority Program 4: Implement comprehensive DRR relating storm, flood and drought

Structural measures will be strengthened as a main pillar to address flood disaster risks. Non-structural measures will be applied to address residual risks, which cannot be covered by the capacity of structures. Since disaster risk tends to increase due to rapid urbanization and economic development, appropriate development control and DRR investment should be promoted to reduce risks.

- Implementation of Integrated Flood Management Plan (IFMP)

Basin-based Integrated Flood Management Plan (IFMP) formulation / implementation will be promoted involving relevant sectors. Issues of drought and salinity intrusion will be addressed as parts of river-basin management.

Flood control capacity and safety of existing reservoirs and dikes will be reviewed for further improvement and rehabilitations. In particular, the review of flood control system in deltas (including Red River system) is important, since huge disaster risks exist in the region.

Real-time operation of reservoirs in emergency situation will be improved and extended by introducing disaster information system including hydro-met observation, river survey and discharge measurement.

It is important to consider sustainable exploitation of resources such as forest and river sand will be promoted from the viewpoint of river-basin management.

- Preparedness to strong and super typhoons

In order to reduce damages caused by strong and super typhoons, response plans will be developed based on damage scenarios.

For safety of fishing boats during storm, construction of boat shelters and development of boat monitoring system will be promoted. Besides, technical specification, standard and building codes for construction will be revised and updated to withstand strong and super typhoons.

- Erosion control

Basin-based approaches are essential to address coastal and river-bank erosion. A framework will be established for data and information management on sediment movement in river basins, including deposition in dam reservoirs and sand mining.

Warning system for coastal and river bank erosion will be developed based on erosion risk maps.

To secure more room for rivers, river training is promoted together with relocation of inappropriate settlement along river banks.

■Priority Program 5: Implement measures against landslide and flashflood

Regarding countermeasures against landslide and flash floods in the northern mountainous region, a comprehensive approach will be taken, covering 3 pillars of 1) structural measures, 2) warning and evacuation, and3) land use regulation and relocation as shown in Figure 8.7. From the viewpoint of cost-effectiveness, non-structural measures will be main countermeasures except in area adjacent to major infrastructures.

- Combination of structural and non-structural measures

Warning /evacuation, land use regulation and relocation will be implemented to protect human lives. Structural measures will be implemented to mainly protect major infrastructures.

Assessment and publication of risk of landslide and flash floods should be promoted with improved accuracy.

Regarding early warning system, pilot projects will be conducted to explore full-scale implementation. Collection and accumulation of information on disaster occurrence and hydro-met data should be promoted, since they are indispensable for improving accuracy of early warning for landslides and flash floods. Local communities should be involved in designing early warning systems to secure effectiveness.

As a long-term solution, reforestation and conservation will be promoted.

■Priority Program 6: Transform production and livelihood for sustainable Mekong Delta development to adapt to climate change

Mekong Delta is one of the most vulnerable regions severely affected by climate change. It is under the risks of not only floods, storms and storm surges, but also other disasters such as droughts, salinity intrusion, ground subsidence, river and coastal erosions. It is strongly required to implement countermeasures based on guidance of the Government Resolution No.120 “Sustainable and Climate-resilient Development of Mekong Delta”.

- Actively living with disasters

The traditional idea of “Living with floods” should be shifted to “Actively Living with floods,

inundation, brackish water and salty water". All of the investment should be made in line with the transformation of ways of living to adapt to different environmental conditions caused by climate change.

- Solutions proposed from the view of water resources management

All measures should be consistently planned and implemented in view of Integrated Water Resources Management of the river basin, including the upstream areas managed by other countries.

- Effective investment based on master plan

The "Master Plan for Sustainable and Climate-resilient Development of the Mekong Delta until 2030" will be prepared with a vision towards 2050 using the method of multi-sectoral integration.

Monitoring system of climate change and sea level rise will be upgraded, and climate change scenarios will be updated. Effective investment will be strengthened in flood drainage, salinity control, erosion control and mangrove forest protection. All measures will be implemented through integration of works by different sectors such as flood control, transportation and irrigation. Residents and infrastructures will be rearranged along rivers and canals to avoid risk of disasters and space for water will be preserved.

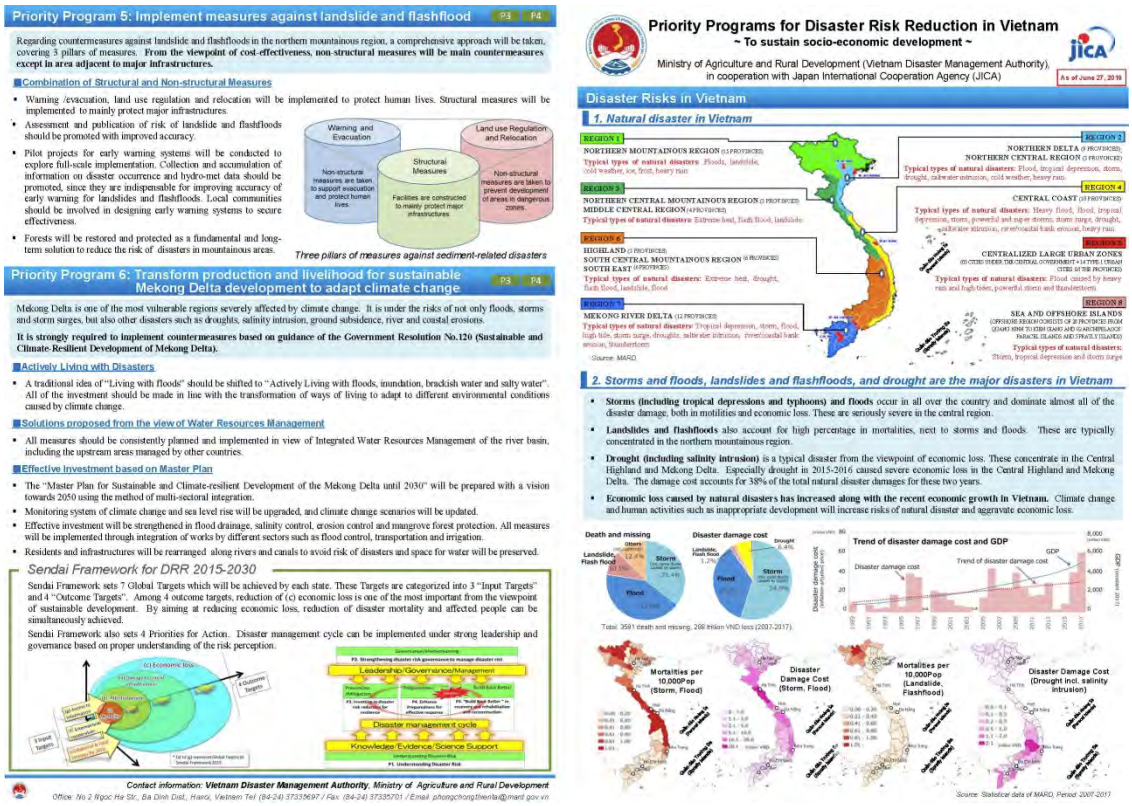


Figure 6: Leaflet for Priority Programs
"Priority Programs for DRR in Vietnam ~ to sustain socio-economic development ~"

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Annex 2: Major support projects on the disaster prevention by overseas donors

Annex 3: Priority Program for Disaster Risk Reduction in Vietnam -To sustain socio-economic development-

Annex 4: Minutes of Meeting on 1st and 2nd consultation meeting

ABBREVIATION

Abbr.	Full Name of English
ADB	Asian Development Bank
AFD	Agence Française de Développement (in French)
APEC	Asia-Pacific Economic Cooperation
BBB	Build Back Better
CBDRM	Community Based Disaster Risk Management
CCFSC	Central Committee for Flood and Storm Control
CCNDPC/SR	Commanding Committee for Natural Disaster Prevention and Control and Search and Rescue
CSCNDPC	Central Steering Committee for Natural Disaster Prevention and Control
DARD	Department of Agriculture and Rural Development
DMC	Disaster Management Center
DONRE	Department of Natural Resources and Environment
DWR	Directorate of Water Resources
EU	European Union
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (in German)
IADC	Italian Agency for Development Cooperation
IFMP	Integrated Flood Management Plan
INDC	Intended Nationally Determined Contribution
JICA	Japan International Cooperation Agency
MARD	Ministry of Agriculture and Rural Development
MOC	Ministry of Construction
MOET	Ministry of Education and Training
MOF	Ministry of Finance
MOH	Ministry of Health
MOIC	Ministry of Information and Communication
MOIT	Ministry of Industry and Trade
MONRE	Ministry of Natural Resource and Environment
MOST	Ministry of Science and Technology
MOT	Ministry of Transport
MPI	Ministry of Planning and Investment
NAP	National Adaptation Plan
NCSR	National Committee for Search and Rescue
NCHMF	National Center for Hydro-Meteorological Forecasting
NDC	Nationally Determined Contribution
NDPCP	Natural Disaster Prevention and Control Plan
NGO	Non-governmental Organization
PHMS	Provincial Hydro-Meteorological Service
PPC	Provincial People Committee
RBO	River Basin Organization
RHMS	Regional Hydro-Meteorological Services
SDGs	Sustainable Development Goals
SEDP	Socio-Economic Development Plan
SEDS	Socio-Economic Development Strategy
UN	United Nations
UNDP	United Nations Development Programme
VAST	Vietnam Academy of Science and Technology
VAWR	Vietnam Academy for Water Resources
VNDMA	Vietnam Disaster Management Authority
VNMHA	Vietnam Meteorology and Hydrology Administration
WB	World Bank

1. Outline of Survey

1.1. Background

Vietnam is one of the most vulnerable countries in natural hazards in the Asian and Oceanian region due to the severe meteorological conditions with heavy rainfall, storms and tropical cyclones. In particular, typhoons in September to November cause severe floods, which disturb sustainable economic growth in Vietnam. The Government of Vietnam has made efforts to tackle such frequent natural disasters especially by flood control. However, heavy rains and sea level rise due to the recent climate change have generated new disasters such as river bank / costal erosions and landslides, in addition to floods.

In the above situation, the Government of Vietnam formulated the "National Strategy for Disaster Prevention, Response and Mitigation to 2020" in 2007 and has strengthened the organizational structure on disaster risk reduction (DRR) led by the Central Committee for Flood and Storm Control (CCFSC). In 2013, the "Law on Natural Disaster Prevention and Control" was enforced. By 2017 the Vietnam Disaster Management Authority (VNDMA) was established based on the Law. The organizational structure in DRR was strengthened in Vietnam with the establishment of the VNDMA.

In parallel with such efforts by the Government of Vietnam, Japan International Cooperation Agency (JICA) implemented the Project for Building Disaster Resilient Societies in Central Region in 2009-2012 (Phase 1) in order to strengthen capacity for DRR in central and provincial governments. To disseminate the good practices experienced in Phase 1, Phase 2 project was also implemented in 2013-2016. Moreover, JICA has directly and indirectly supported the Government of Vietnam to strengthen the capacity of DRR through several projects of Grant Aid, Science and Technology Research Partnership and Basic Studies.

1.2. Purpose of the Survey

The Data Collection Survey on Strategy Development of Disaster Risk Reduction and Management in Vietnam (hereinafter referred to as "the Survey") aims to confirm the current situation, issues and policies on the DRR sector in Vietnam in consideration of the Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework 2015-2030). The Survey also proposes necessary priority actions by the Government of Vietnam.

1.3. Relevant Agencies

The survey team shall conduct interviews and studies through close communication with the following agencies:

Ministry of Agriculture and Rural Development (MARD)	Vietnam Disaster Management Authority (VNDMA) Directorate of Water Recourses (DWR) Vietnam Academy for Water Resources (VAWR)
Ministry of Natural Resources and Environment (MONRE)	Vietnam Meteorology and Hydrology Administration (VNMHA) National Center for Hydro-Meteorological Forecasting (NCHMF)
Provincial Governments	Department of Agriculture and Rural Development (DARD) Department. of Natural Resources and Environment (DONRE)
Members of Central Steering Committee for Natural Disaster Prevention and Control	Ministry of Transportation (MOT), Ministry of Planning and Investment (MPI), Ministry of Science and Technology (MOST), Ministry of Education and Training (MOET), Ministry of Construction (MOC), Ministry of Finance (MOF), Ministry of Health (MOH), Ministry of Industry and Trade (MOIT), Ministry of Information and Communication (MOIC) and others
Other related organizations	Provincial Hydro-Meteorological Service (PHMS)

1.4. Implementation Schedule and Scope of the Report

The Survey will be implemented by the personnel and the schedule shown in Figure 1.1.

Discipline	Name	2017	2018								
		12	1	2	3	4	5	6	7	8	9
Team Leader/ Comprehensive Disaster Management	Yukishi TOMIDA										
Vice Team Leader/ Comprehensive Disaster Management/ Organizational Structure	Toru KOIKE										
Disaster Management Planning (including Recovery and Rehabilitration Plan)	Yasuhiko KATO										
Urban Disaster Risk Reduction/ Economic Analysis	Akihiko NONAKA										
Flood Control Planning	Makoto KODAMA										
River and Coast Erosion Management	Minoru SAJI										
Hydrology and Meteorology/ Sediment Disaster Prevention	Hodaka IGO										
Coordinator/ Development of Human Resources	Tomoyuki WADA										
Disaster Risk/ Damage Amount Investigation	Masae KUROKI			TET							

Work	2017	2018								
	12	1	2	3	4	5	6	7	8	9
■Preparatory Work in Japan										
【1-1】Analysis of Existing Data and Information and Preparation of Inception Report										
【1-2】Completion of Inception Report										
■ 1st Phase										
【2-1】Review and Analysis of Disaster Risk in Vietnam										
【2-2】Review of Present Status of DRR Sector										
【2-3】Review of Efforts and International Trend in DRR Sector										
【2-4】Review and Analysis of Issues and Necessary Measures in DRR Sector										
【2-5】Preparation of Interim Report										
■ 2nd Phase										
【3-1】Consultation of Interim Report										
【3-2】Discussion of Strategy of Future Assistance of Projects										
【3-3】Preparation of Draft Final Report										
■ 3rd Phase										
【4-1】Consultation of Draft Final Report										
【4-2】Creation of Newsletter Leaflet and Promotional Video										
【4-3】Completion of Final Report										
Reports	▲ IC/R				▲ IT/R			▲ DF/R		▲ F/R

Figure 1.1 Implementation schedule and personnel

Source: JICA survey team

2. Analysis on Natural Disaster Risks in Vietnam

2.1. Topography, Climate and Administrative Boundary in Vietnam

2.1.1. Topography

The shape of Vietnam territory is elongated in the north-south direction (ca. 1,650km from the north-end to the south-end). Elevation in the territory ranges from 0m in the coastal area to 500m-1,000m in the central highland and 1,000m-2,000m in the northern mountainous region (Figure 2.1:left). Origins of rivers in Vietnam are generally located in the northern and western mountainous regions. The rivers flow into the East Sea, internationally known as South China Sea (Figure 2.1: right). The Red River located in the northern region and the Mekong River located in the southern region are international rivers. There are 10 international rivers in Vietnam. Basin areas of these international rivers are larger than those for domestic rivers in the central region. The large cities such as Hanoi, Ho Chi Minh and Da Nang are situated in the plain or coastal areas downstream of the rivers. Approximately 40% of the total population lives in lands less than 5 m above sea level in Vietnam.[1]

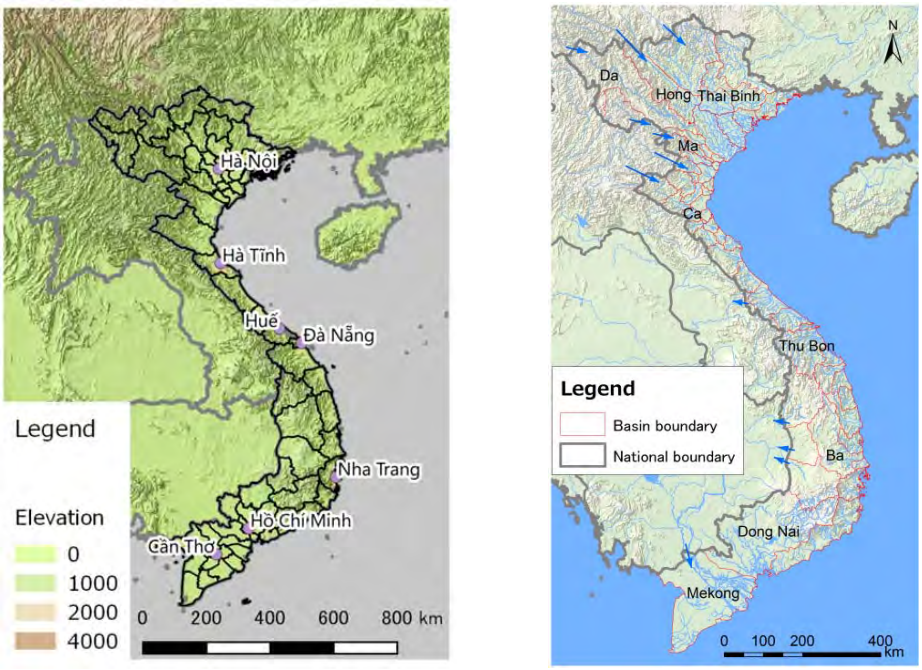


Figure 2.1 Topography (left) and basin boundary (right)

Source: Prepared by JICA Survey Team based on USGS, DIVA-GIS

2.1.2. Climate

With regards to climate class, most area of Vietnam is tropical. Nevertheless, since the northern area, including the mountainous region, is in temperate climate zone, there is a temperature difference. The mean annual rainfall in the south-central and central highland regions is highest (more than 3,000mm/year) in the country. On the other hand, the mean

1 The Impact of Sea Level Rise on Developing Countries: A Comparative Analysis, (2007) Dasgupta et al., World Bank

annual precipitation in parts of the northern and southern region is 1,000-1,500mm/year (Figure 2.2). The variation of mean annual rainfall is large in the central to southern region and small in the northern region (Figure 2.3). The rainy season in Vietnam is from May to October; the dry season is from November to April. In Hanoi, the monthly mean precipitation is less than 30mm/month in some regions in the dry season, but it is more than 250mm/month in the rainy season (Figure 2.4). Variation in precipitation is large in the south-central region and small in the northern region.

Figure 2.5 shows the best track data of tropical storms hitting the shore of Vietnam in the past 30 years. It shows that the tropical storms made landfall countrywide. Especially, the best tracks of the tropical storms are concentrated in the northern and central regions but less in the southern region.

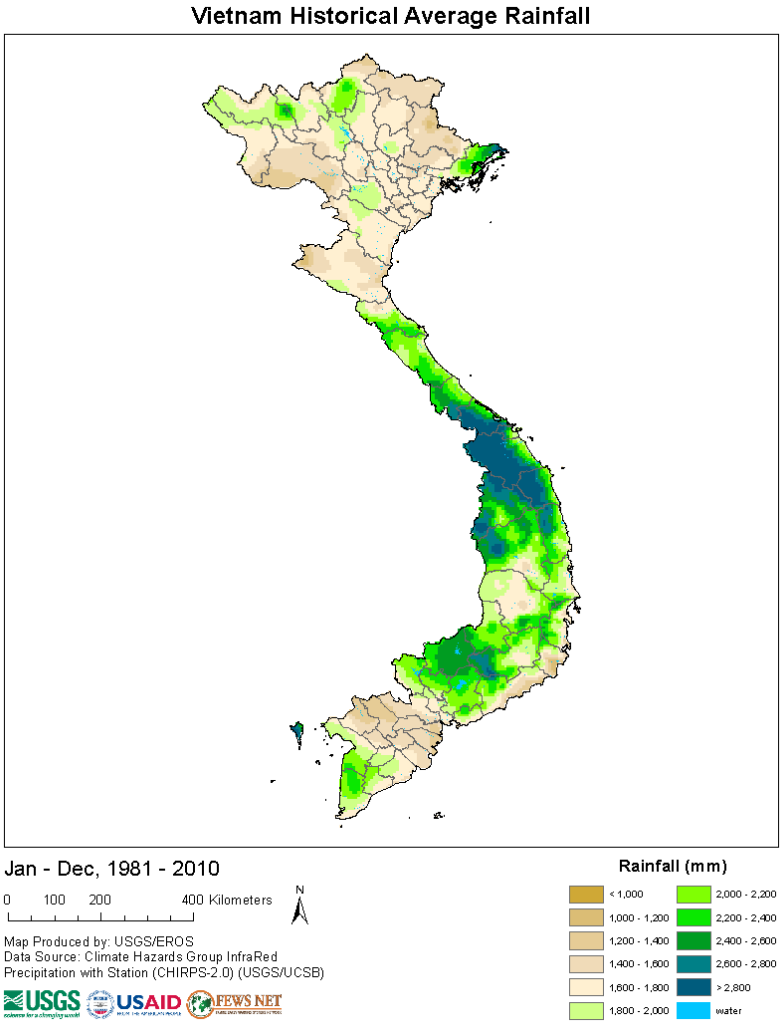


Figure 2.2 Mean annual precipitation in Vietnam

Source: USGS/US-AID https://earlywarning.usgs.gov/fews/product/435

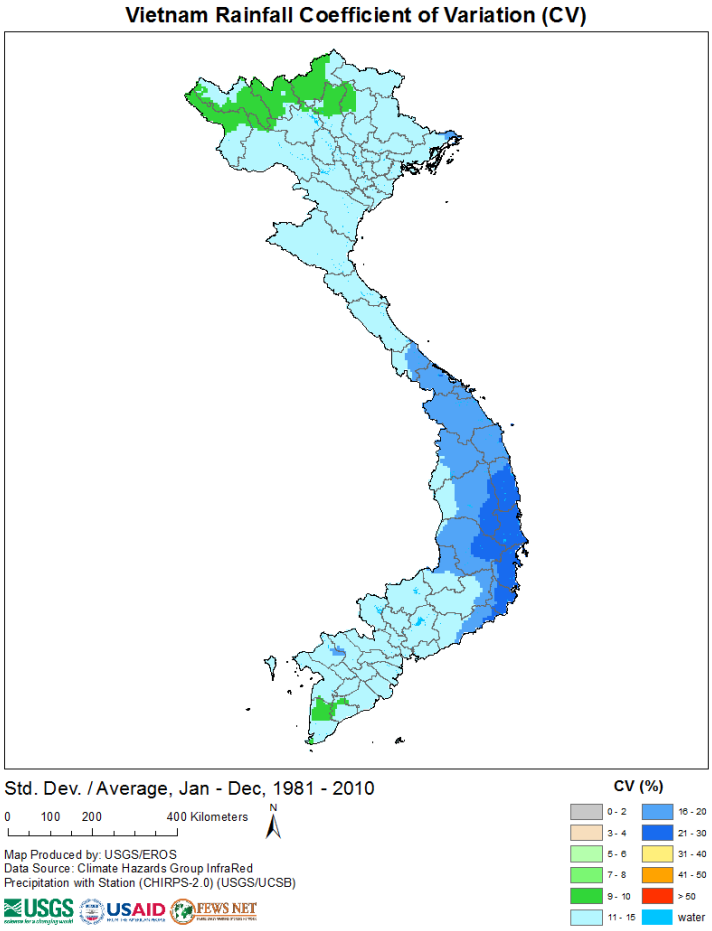


Figure 2.3 Mean annual precipitation and variation

Source: USGS/US-AID https://earlywarning.usgs.gov/fews/product/435

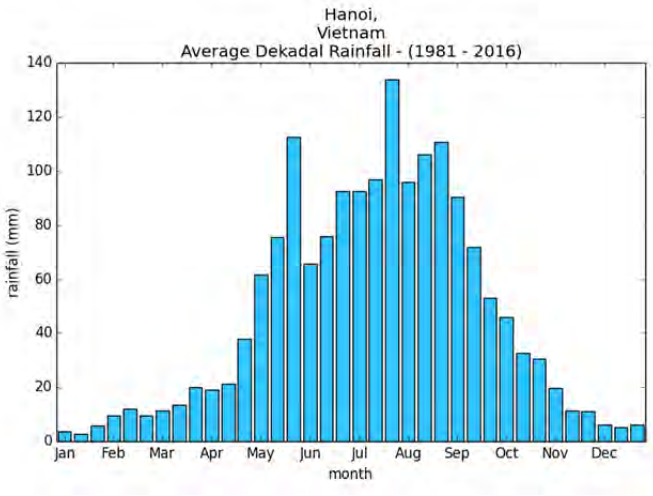


Figure 2.4 Mean rainfall in Hanoi

Source: USGS/US-AID https://earlywarning.usgs.gov/fews/product/435

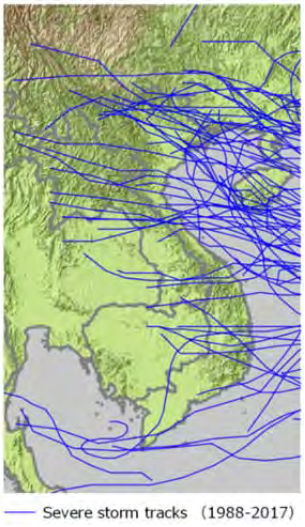


Figure 2.5 Best track of tropical storms in past 30 years

Source: Prepared by JICA Survey Team based on best track data of JMA

2.1.3. Administrative Boundary

There are 58 provinces and five centrally governed cities in Vietnam. In this survey, the provinces and municipalities are divided into the following six major regions and eight sub-regions.

1) Northern region (North-West / North-East)

2) Red River Delta region

3) Central region (North-Central / South-Central)

4) Central Highland region

5) South-East region (Dong Nai river basin)

6) Mekong River Delta region

The Central region and the Central Highland region do not overlap. The regions are divided into more detailed regions as necessary in this report. Figure 2.6 demonstrates the division described above. Table 2.1 indicates the provinces according to the defined regions.

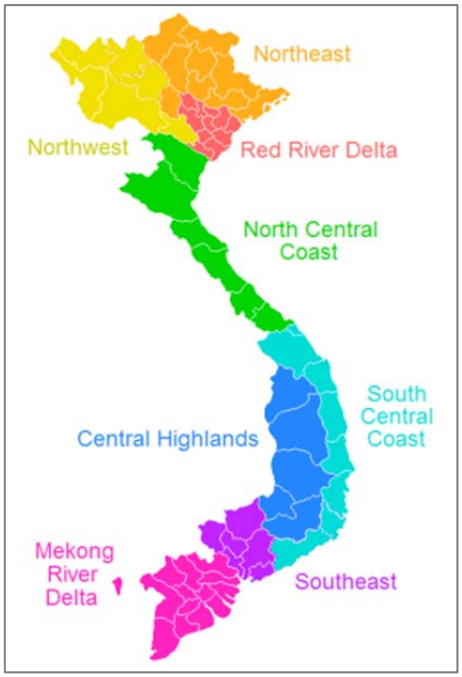


Figure 2.6 Regional map in Vietnam
Source: Wikipedia

Table 2.1 List of provinces and municipalities in each region

Region	Sub-region	Province or municipality
North	North-West(NW:6)	Hoa Binh, Son La, Dien Bien, Lai Chau, Lao Cai, Yen Bai
	North-East(NE:9)	Phu Tho, Ha Giang, Tuyen Quang, Cao Bang, Bac Kan, Thai Nguyen, Lang Son, Bac Giang, Quang Ninh
Red River Delta(RDD:10)		Vinh Phuc, Ha Noi, Bac Ninh, Ha Nam, Hung Yen, Hai Duong, Hai Phong, Thai Binh, Nam Dinh, Ninh Binh
Central	North-Central(CNC:6)	Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri, Thua Thien Hue
	South-Central(CSC:8)	Da Nang, Quang Nam, Quang Ngai, Binh Dinh, Phu Yen, Khanh Hoa, Ninh Thuan, Binh Thuan
Central Highland(CH:5)		Kon Tum, Gia Lai, Dak Lak, Dak Nong, Lam Dong
South-East(SE:6) (Dong Nai river basin)		Ho Chi Minh, Ba Ria-Vung Tau, Binh Duong, Binh Phuoc, Dong Nai, Tay Ninh
Mekong Delta(MD:13)		An Giang, Bac Lieu, Ben Tre, Ca Mau, Can Tho, Dong Thap, Hau Giang, Kien Giang, Long An, Soc Trang, Tien Giang, Tra Vinh, Vinh Long

Source: Prepared by JICA Survey Team based on annual statistic data of MARD

2.2. Major Disaster Types and Mechanism of Natural Disasters

2.2.1. Types and Definition of Natural Disasters in Vietnam

Various types of natural disasters such as floods and storms occur in Vietnam. Table 2.2 shows 19 types of disasters defined by the Law on Natural Disaster Prevention and Control (NDPC), 2013. The definition of each disaster type is regulated in the Prime-minister Decision No.46/2014/QD-TTG.

Table 2.2 Types of natural disasters in Vietnam (Law on NDPC)

Disasters defined by Article 3 of Law on NDPC	Regulation of Prime-minister Decision46	Words in this survey	Meaning of the words in this survey
(1) Flood (2) Inundation (3) Water rise	(1) Ground is flooded due to heavy rain, flood, high tide and seawater surge	1) Flood / inundation	Inundation of river water / inside levee
	(3) Seawater rises higher than the normal tide due to storm	2) Surge and high wave	Surge and high wave by storms and tropical depression
(4) Heavy rain	(4) Rainfall over 50mm/24h	3) Heavy rain	Heavy rain inhibiting human activities
(5) Storm (6) Tropical low pressure (7) Whirlwind	(5),(6) Storm levels are defined by wind-force (7) Strong vortex formed and abated in a short time in a few tens of km^2	4) Storm	Storms and tropical depressions
			Heavy rain and wind damaging properties and human lives (including gust and tornado)
(8) Lightning	(8) Discharge phenomenon between cloud and ground	5) Lightning	Lightning to buildings and peoples
(9) Flash Flood	(9) Flood suddenly occurring on small basins of river or streams in the mountainous area with accelerated flow often accompanied with debris.	6) Flash flood (part of sediment disaster)	Sudden swelling and overflow of rivers in mountainous area caused by heavy rainfall Debris flow and flash flood
(10) Landslide (11) Land subsidence due to floods or water currents	(10) Land failure, slides or collapses due to rain, flood or flow (11) Land slips lower than that of surrounding area due to rain, flood or flow.	7) Landslide / slope failure (part of sediment disaster)	Landslide / slope failure caused by rainfall
		8) Coastal / river bank erosion	Coastal / river bank erosion
(12) Seawater intrusion	(12) Salty water with the saline concentration equal to 4 % intrudes into the interior field upon occurrence of high tide, sea level rise or depletion of freshwater resources	9) Seawater intrusion	Seawater intrusion to inland caused by drought, surge and others
(13) Drought	(13) Serious water shortage which occurs for a long time due to lack of rain and depletion of water resources	10) Drought	Water shortage caused by less rainfall

Disasters defined by Article 3 of Law on NDPC	Regulation of Prime-minister Decision46	Words in this survey	Meaning of the words in this survey
(14) Extreme hot weather	(14) Highest air temperature during the day exceeds 35°C and air humidity is below 65%.	11) Extreme hot weather	Extreme hot weather damaging properties and human lives
(15) Damaging cold (16) Hail (17) Hoarfrost	(15) Average daytime air temperature is below 13°C (16) Hail (17) Hoarfrost	12) Damaging cold, hail, hoarfrost	Extreme cold weather damaging properties and human lives, hail, hoarfrost
(18) Earthquake	(18) Earthquake	13)Earthquake	Earthquake
(19) Tsunami	(19) Tsunami	14) Tsunami	Tsunami
Other types of natural disaster.	Volcanic eruption, meteorite collision and others	-	Other disasters

Note: two disaster types, snow and forest fire, have recently been added to the above 19 disaster types. Now, MARD utilizes 21 disaster classifications.
Source: Prepared by JICA survey team based on the Prime-minister Decision No.46/2014/QD-TTg

In the disaster classification, since triggers of disasters, e.g. heavy rain and storm, and related phenomena, e.g. flood and landslide, are treated as equivalent, it is necessary to pay attention when complex disaster records are analyzed (e.g. heavy rain and flood occurs sequentially). Additionally, when doing disaster risk analysis and disaster evaluation, careful attention is required because borderlines of some disasters (e.g. flood and flash flood) are not completely clear. Major points of attention are shown below.

Rainfall and strong wind

- The "flood", "inundation" and "surge" described in the Law on NDPC are generally caused by "storms", "tropical low pressure" and "heavy rain". When these disasters occur, disaster damage reports are submitted from provinces to VNDMA. In some cases, however, there is a possibility that disaster classification may be inconsistent during reporting and tallying. In fact, according to VNDMA, it is difficult to extract disaster damages of surges caused by low pressure from disaster damage records of storms which occur simultaneously, because the disaster damage records are basically prepared for each disaster event. A storm disaster record contains damages of flood, landslide and strong wind caused by a storm. Therefore, the accuracy of disaster damage records is ensured for a relatively large category of disaster event.

- A reason of the difficulty in terms of classification is considered to be due to incorporating most of the terms from the previous reports by the provinces in the process of the Law formulation.

- According to the provinces, which prepare primary disaster damage records, "Storm" usually signifies damage of strong winds (e.g. rollover of fishing boats, damage on fishery facilities, house damages and high waves). Those damages are separated from the damages caused by the "flood". Thus, in the occasion of organization and analysis of disaster records, it is required to ensure if floods and storms are classified correctly or if their classification is mixed.

Sediment disasters (landslide, slope failure and flash flood)

- "Landslide", "Slope failure" and "Flash flood" are categorized as parts of sediment disasters in Japan. Those disasters are classified as "Landslide and land subsidence due to floods or water currents" and "Flash flood" by the Law on NDPC in Vietnam. However, disaster damage of the "Landslide" and "Flash flood" caused by storms are usually recorded as parts of the storm disaster damage records in Vietnam. According to VNDMA, it is difficult to extract disaster damages of landslides and flash floods from disaster damage records of storms which cause landslides and flash floods. Therefore, it is necessary to pay attention to disaster record analysis not to underestimate sediment disaster damage.
- According to the provinces, "Flood" and "Flash flood" are subjectively judged by local staffs considering speed of flood flow and water level rising and duration of the event. The "Flash flood" generally includes rapid water level rising and debris flows. Thus, "Flash flood" in this report also means both rapid water level rising in mountainous river basins and debris flows.
- It seems that "Landslide and land subsidence due to floods or water currents" in the Law on NDPC includes river/coastal bank erosions (refer to the next section).

River/coastal bank erosions

- It seems that the problem on the river/coastal bank erosions is recognized and has become important in recent years. The problem is triggered by balance changing of sand supply and erosion in the basins, due to dam construction and broad sand mining under the condition of accelerated economic activities. Thus, the river/coastal bank erosion is not clearly defined by the Law on NDPC.
- According to the hearing in some provinces, the river/coastal bank erosions and collapse after floods and storms are included in the "Landslide and land subsidence due to floods or water currents". The damages of river bank erosions (e.g. eroded river bank length) are recorded by the provinces and VNDMA. However, the damage record of river bank erosions is included in the record of storms/floods or independently recorded as events of river bank erosion depending on the causes of the bank erosion.
- The damage of the coastal erosions is also included in the record of storms/floods or independently recorded depending on the causes of the bank erosion.

Disaster damage database

- In this survey, disaster records/reports prepared by the Government of Vietnam, international organizations and donors and international disaster databases (DesInventar and EM-DAT) are utilized to analyze disaster damages and risks in Vietnam. However, the classification of natural disasters in the database/report does not completely conform to the classification on the Law on NDPC. Furthermore, there are some unclear points for the classification of natural disasters as mentioned above.
- In some cases, the amount of disaster damage reported by MARD and other international organizations does not match the data on open databases (DesInventar and EM-DAT). The gaps between those data are mostly ca. 10-20% of the total damage amount, but there are large gaps in some cases. Especially, the gaps of disaster economic losses between the databases tend to be large. The disaster damage of each event reported by

MARD and other international organizations are mainly utilized in this report because data accuracy of these individual reports are deemed to be higher. The open databases are utilized to show long-term trends of natural disasters and to compare regional disaster characteristics only.

2.2.2. Mechanisms of Major Natural Disasters

The natural disaster types, scales and risks vary depending on the elongated shape of national territory from the north to the south, the difference of elevation between the mountainous regions and river delta regions and distributions of developed cities and industrial areas. Mechanisms of the major natural disasters in Vietnam are described in the following sections.

(1) Storms, Floods and Surges

The number of approaches of storms and tropical depressions in the South-Central and North-Central regions is highest (Figure 2.7); the storms cause floods. Moreover, the number of approaches of storms and tropical depressions in the North-East and Red river delta regions is also high. The number of storms tends to decrease in the internal North-west and Central highland regions because the storms are weakened as they approach the regions. The number of storms in the South-East and Mekong delta regions is 1/4 to 1/3 lower than those in the other regions. However, the large river basin and flat plain near Ho Chi Minh City and Mekong delta are the causes of wide-scale floods.

Approximately 10% of the total population live in the flat coastal plain less than 1m above sea level that is easily affected by the storms, tropical depressions, surges and high waves. Thus, the disaster risk due to sea level rise caused by climate change is high.

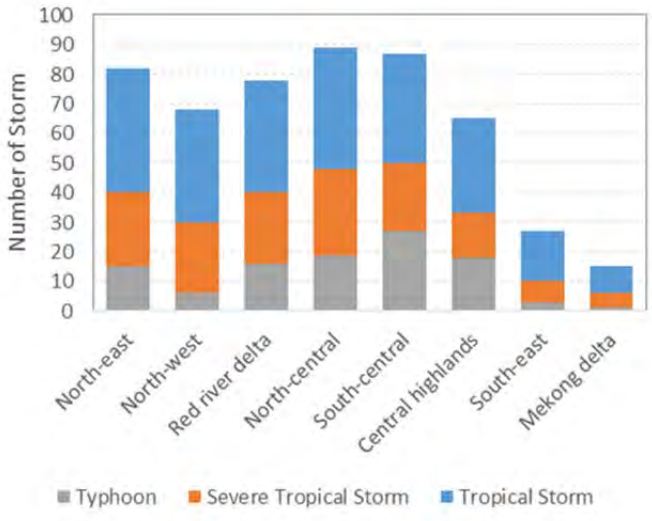


Figure 2.7 Number of approaches of storms and tropical depressions (1988-2017)
Source: Prepared by JICA survey team based best track date of JMA

(2) Drought and Saltwater Intrusion

The rainfall amount in North-central Vietnam is high in winter due to the wet monsoon. On the other hand, seasonal wind from the southwest, called Lao Wind, traverse the mountain range causing a Faehn phenomenon in the summer. As a result, the North-Central region becomes dry and hot. The total rainfall amount in the South-Central region is higher than other regions; however, variation in the annual rainfall is also considerable. For this reason, drought tends to occur in the South-Central region due to extreme lack of rainfall in the dry season (Figure 2.8).

Furthermore, high water demand exceeding potential capacity of water use due to development of large-scale agriculture is one of the causes of drought in the Central Highland region. [2]

Droughts widely occur in Vietnam. In addition, a decrease of fresh water flow due to droughts has triggered seawater intrusion into inland areas. The severe droughts and rainfalls tend to occur due to strong solar radiation compared with Japan. Furthermore, an increase of extreme weather caused by climate change is reported.

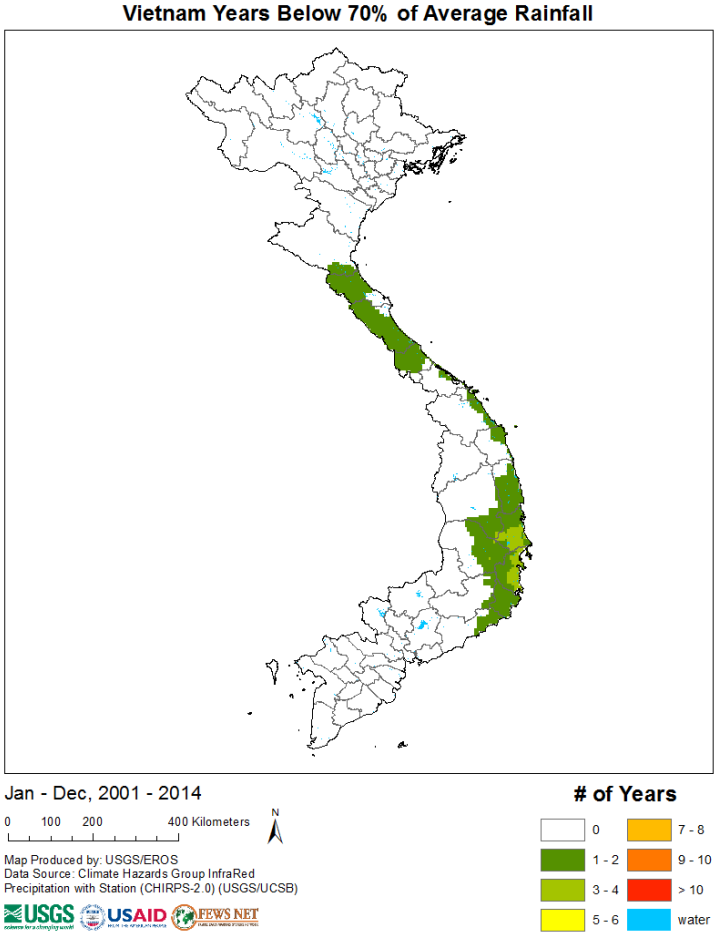


Figure 2.8 Number of years that have annual rainfall below 70% of mean rainfall (2001-2014)
Source: USGS WEB https://earlywarning.usgs.gov/fews/product/435

2 Data Collection Survey on Water Resource Management in Central Highland Region of Vietnam (JICA)

(3) Landslides and Flash Floods

Figure 2.9 shows distribution of steep slopes (more than 20% gradient) area ratio in the provinces and municipalities. The high ratio provinces (red color: more than 15%) are located in the Northern region because of steep terrains in the mountainous region. Also, the surrounding provinces of the Northern region and the Central Coastal provinces have a relatively high ratio (7-15%) of steep slope areas.

Moreover, potentials for landslides, slope failures and flash floods in the Northern and South-Central regions are estimated to be high due to a high distribution of faults (エラー! 参照元が見つかりません。), complicated geology, steep slopes and the large number of storms in those regions. On the other hand, the Central Highlands region contains a low ratio of steep slope because the highland geography is distinct although the altitude is relatively high in the region.

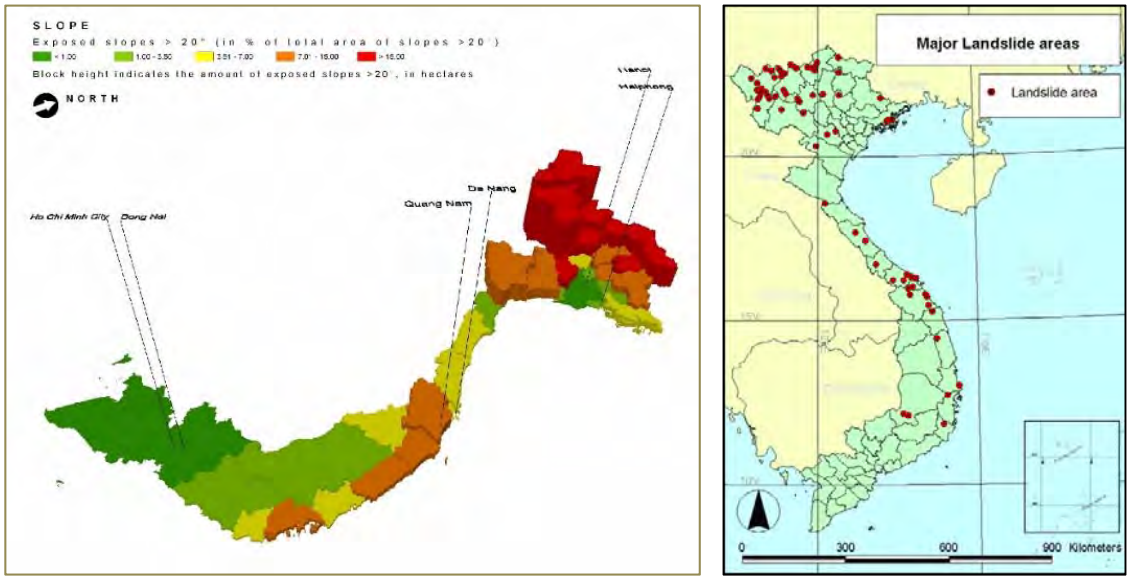


Figure 2.9 Distribution of steep slope area (left) and locations of major landslide area (right)

Source: (left) http://virtual-saigon.net/Asset/Preview/vcMap_ID-1233_No-1.jpeg

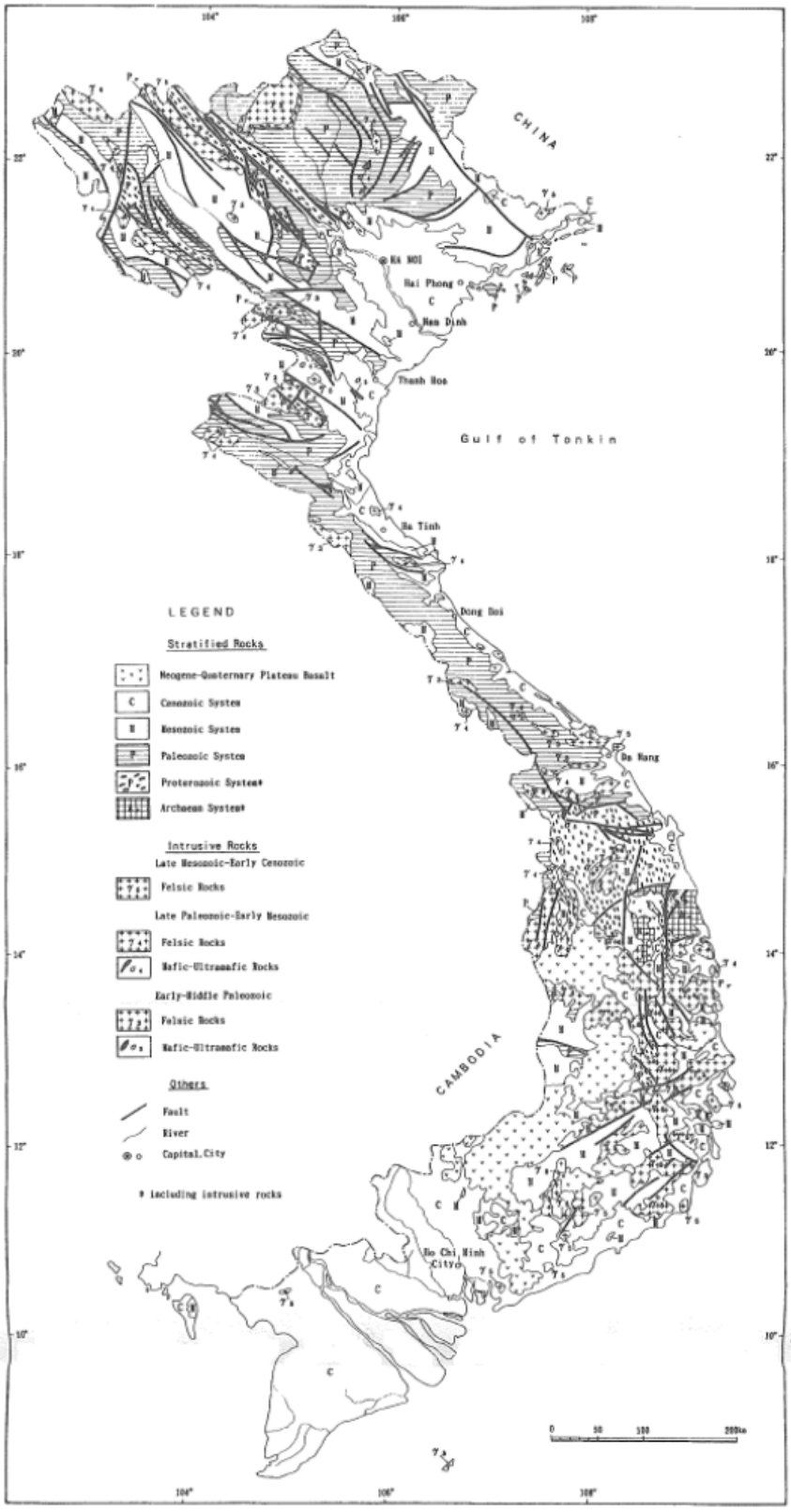


Figure 2.10 Geology in Vietnam

Source : Survey on resources development and environment

(4) River/coastal Bank Erosion and Other Disasters

River/coastal bank erosion is caused by high waves due to storms, floods, deforestation in upstream areas, decrease of sediment supplies due to reservoir construction, sand mining in mid/downstream area, and land subsidence.

On the other hand, volcanic disaster damage is not reported because Vietnam is not located in a volcanic area. A few historic data of earthquake and tsunami damage are recorded in Vietnam. Regarding earthquakes, there is a possibility of earthquakes in the northern Vietnam because of the existence of the northwest–southeast lineament structure formed by the past fault movement, which is the same direction as the flow of the Red river in the Northern region. As for tsunami, ocean trenches with the possibility of tsunami occurrences are distributed in the western and southern area from the Philippine archipelago. If a massive earthquake of M8 - 9 occurs at the Manila Trench, a tsunami will be expected to reach the coastal area of Vietnam; nevertheless, historical record of tsunami events is also very few.

(5) Risk Level of Natural Disasters in Each Region

Table 2.3 shows the risk level of natural disasters in each region published by the Government of Vietnam. The risk levels of storms and floods in the coastal area are relatively high. The risk levels of drought in high altitude regions such as the North-West, Central Highlands and South-Central regions are high. The risk levels of seawater intrusion, inundation and landslide (which may include coastal erosion and land subsidence) in the Mekong Delta region are high because of the low plain and large-scale rivers.

Table 2.3 Risk level of natural disasters in each region

Disaster type	North Mountain	North-East(Red river)	North-Central	South-Central	South-East	Central Highland	Mekong Delta	Other coastal
Storms	+++	++++	++++	++++	+++	++	+++	++++
Floods	-	++++	++++	+++	+++	+++	++++	++++
Flash floods	+++	-	+++	+++	+++	+++	+	+++
Typhoons	++	++	++	++	++	+	++	++
Drought	+++	+	++	+++	+++	++	+	+++
Desertification	-	-	+	++	++	++	+	++
Saline Intrusion	-	+	++	++	++	+	+++	++
Inundation	-	+++	++	++	++	-	+++	+++
Landslides	++	++	++	++	++	+	+++	++
Storm surges	-	++	++	++	++	++	+++	++
Forest fires	++	+	++	+++	+++	-	+++	+++
Environmental and industrial disasters	-	++	++	++	+++	+++	++	+++

Note) ++++: extreme danger; +++: danger; ++: moderate danger; +: less danger; -: safety.
Source; UNDP,2015(original: UNISDR, 2004)

2.2.3. Damage and Distribution of Major Natural Disasters

エラー! 参照元が見つかりません。 indicates statistics of natural disaster records from 2007 to 2017. The number of disaster records[3] regarding floods and storms is ca. 48% of the total disaster records. The number of deaths and missing by floods and storms is also high (77% of total death and missing). In this regard, however, a partial damage due to surges and landslides accompanied by floods and storms are also included in the records of floods and storms.

As looking into the number of dead and missing per disaster record, that due to landslides and flash floods is larger than that due to floods and storms. It indicates that although the total number of landslides and flash floods is relatively low, those disasters bring a devastating impact locally. In addition, the number of human loss by lightning, hail and tornados is enormous.

The largest economic damage is induced by floods and storms, which affects the country widely. The second largest economic damage is brought by drought (6.4% of total economic loss). The damage due to drought is brought by only one drought event in 2014-2016. Thus, the economy of Vietnam must be highly affected once a drought occurs because the Vietnamese economy is highly dependent on the agriculture sector.

3 Number of disaster records means number of report prepared by provinces for each disaster event

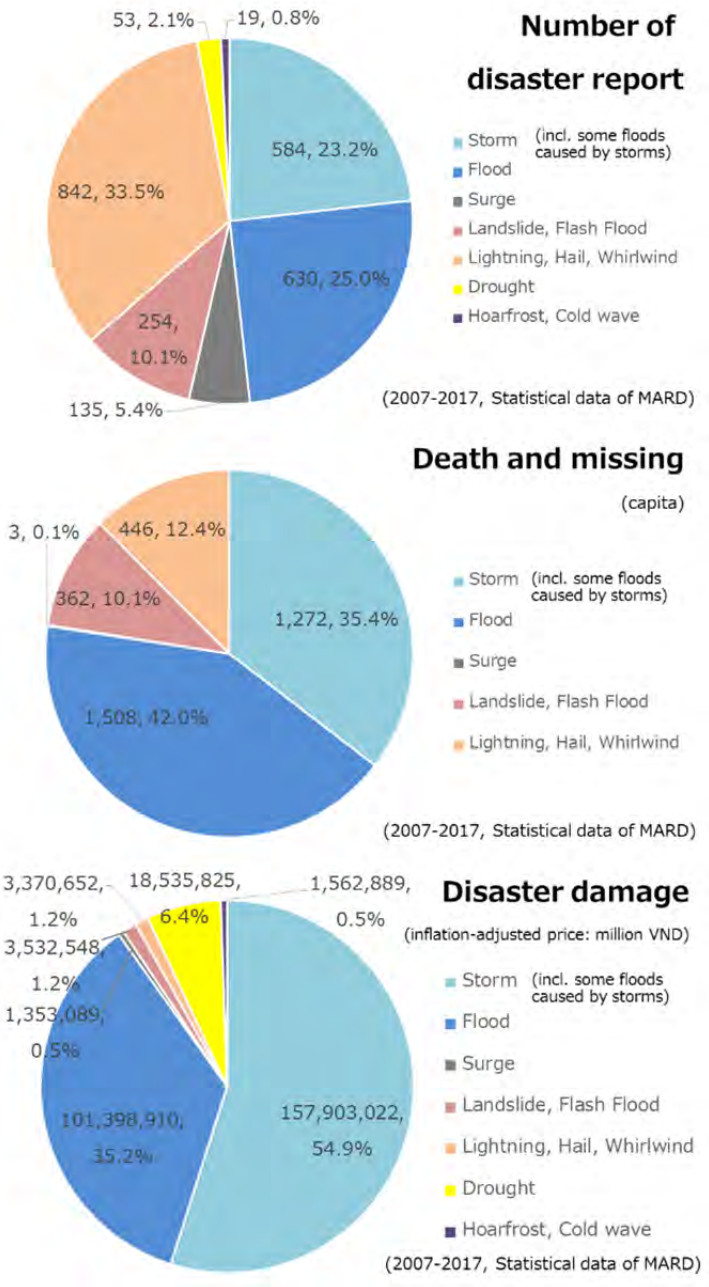


Figure 2.11 Disaster records in Vietnam

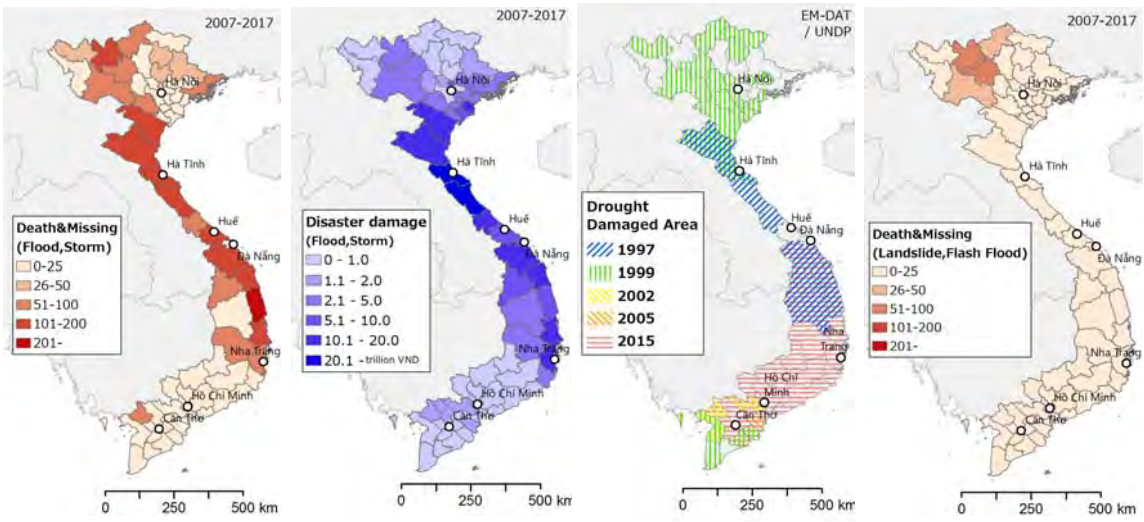
Source: Prepared by JICA survey team based on annual statistical data of MARD

Figure 2.12 illustrates the distribution of dead and missing and the amount of economic damage caused by floods and storms (including parts of surges, landslides and flash floods). The damages are distributed countrywide centering around the coastal area. The damages especially in the Central region are severe. It seems that a lot of the direct hit of the storms and insufficient countermeasures in comparison with economic development in the Central region generated the considerable damages. On the other hand, the flood and storm damages near Hanoi with a high concentration of the population are relatively low compared with the large

economy level in the area. It indicates that countermeasures reduce the property damages from the floods. Nonetheless, there is a large flood disaster record in 2008 in Hanoi and the Red river delta region. Thus, it is suggested that massive damages must be generated once a flood breaks out near the capital.

Droughts are recorded in the whole country but the year of disaster occurrence varies from region to region. The severe drought in 2015 mainly affects the South-Central to Mekong Delta regions. Number of the dead and missing by landslides and flash floods are high mainly in the northern mountainous region.

Details of each disaster type are described in the next section.



Floods and storms
(including parts of surges, landslides and flash floods)
Source: Prepared by JICA survey team based on annual statistical data (2007-2017) of MARD

Droughts
Source: Prepared by JICA survey team based on EM-DAT, UNDP reports

Landslides and flash floods
(including parts of floods and storms)
Source: Prepared by JICA survey team based on annual statistical data (2007-2017) of MARD

Figure 2.12 Dead and missing and economic damage by floods and storms, provinces affected by droughts and dead and missing by landslides and flash floods

2.3. Information on Major Disasters

2.3.1. Floods

(1) Rivers in Vietnam

Nine major rivers which have more than 10,000 km^2 in the river basins flow in Vietnam (i.e. Bang Giang - Ky Cung river, Thai Binh river, Hong river, Ma river, Ca river, Thu Bon river, Ba river, Dong Nai river, Mekong river). Six of these rivers, e.g. Bang Giang - Ky Cung river, Hong river, Ma river, Ca river, Dong Nai river, Mekong river, are international rivers and their river basins cover neighboring countries[4]. The nine major rivers and their river basin areas are listed in Table 2.4 and shown in Figure 2.13.

Table 2.4 River Basin Area of 9 Major Rivers

River	River basin area (km^2)		
	Out of Vietnam	In Vietnam	Total
Bang Giang - Ky Cung River	1,980	11,280	13,260
Thai Binh River	-	15,180	15,180
Hong River	82,300	72,700	155,000
Ma River	10,800	17,600	28,400
Ca River	9,470	17,730	27,200
Thu Bon River	-	10,350	10,350
Ba River	-	13,900	13,900
Dong Nai River	6,700	37,400	44,100
Mekong River	726,180	68,820	795,000

Source: Environment Report of Vietnam, 2006 MONRE

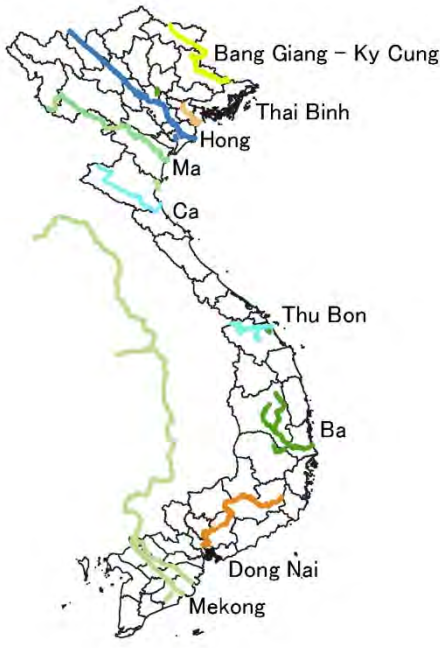


Figure 2.13 Location of the nine major river basins

Source: Prepared by JICA survey team

Fifty-nine percent of the total land area and 71 % of the population are located in the areas

4 National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020

with a high risk of meteorological disasters such as windstorms and flood disasters[5]. These areas suffer from recurrent typhoons and floods. Floods that caused massive damage in the past are described below.

(2) November 1999 Flood

Torrential rainfall occurred in central Vietnam on November 1 - 3, 1999 that brought inundation damage to Quang Binh, Quang Tri, Thua Thien Hue, Da Nang, Quang Nam, Quang Ngai and Binh Dinh provinces. 2,500 mm is recorded as the rainfall amount in Thua Thien Hue province during this period. This amount surpassed the annual average rainfall in Vietnam. Observed water levels in many hydrological stations reached water level III[6], and flood water overflowed into inland areas and damaged infrastructures.[7] Damage caused by the flood is summarized below.

- Deaths 491 persons
- Injured 166 persons
- Missing 76 persons
- Inundated paddy fields 66,038 ha
- Damaged bridges 1,470 bridges
- Damaged boats 1,162 boats

(3) November 2008 Flood

The flood caused by the torrential rainfall hit 16 provinces and Hanoi City in November 2008. Dead and missing reached 84 people and the economic loss was placed at VND 6.316 trillion (US$ 52.94 million). About 100 schools were inundated in Hanoi city. Inundation damages were especially severe in Chuong My, Thach That, Thach Oai, Hoai Duc and Dan Phuong districts of Ha Tay province. The inundated area in the Red river delta caused by the flood is illustrated in Figure 2.14.

5 Fiscal Impact of Natural Disasters in Viet Nam; GFDRR; 2011

6 Three warning water levels are defined at major stations. Level III is the highest warning level.

7 VIETNAM: FLOODS Appeal no: 32/99, 1999.11.25, IFRC

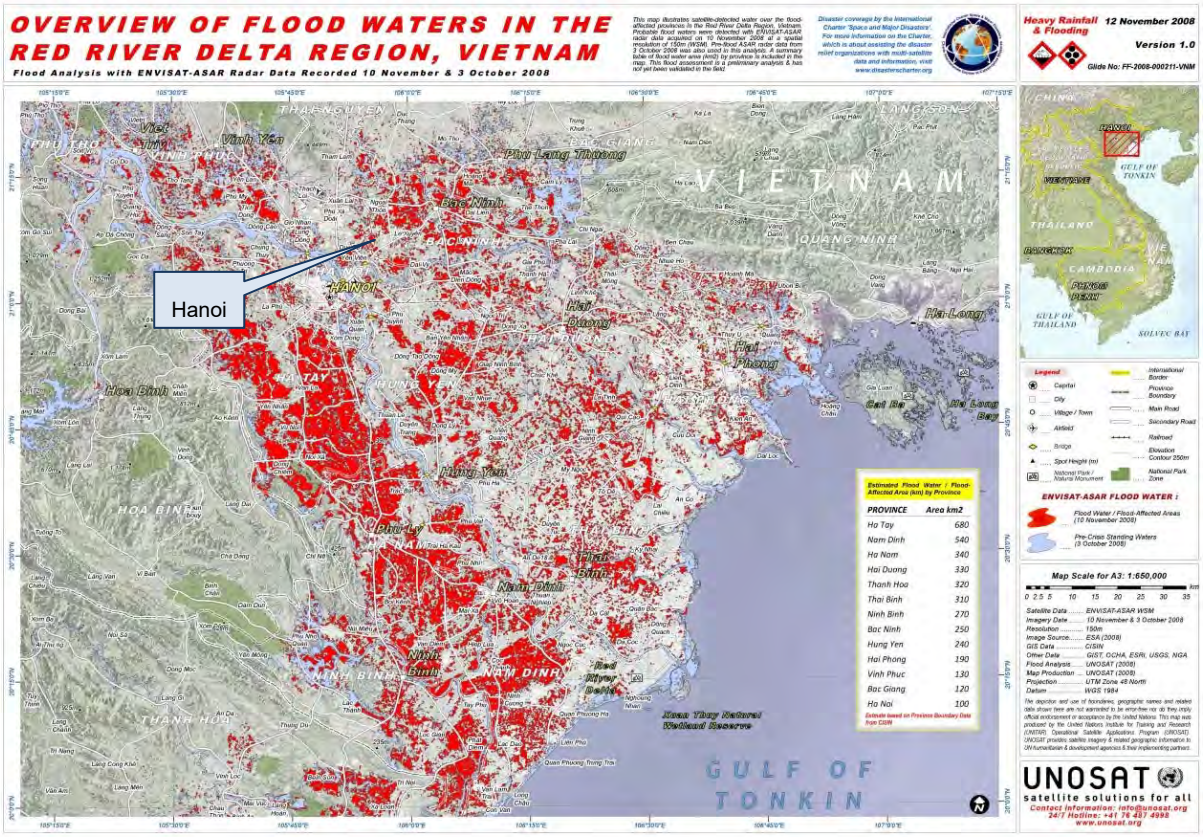


Figure 2.14 Inundated Area of Red River Delta (November 12, 2008)
Source: UNOSAT: https://reliefweb.int/sites/reliefweb.int/files/resources/

(4) October - December 2016 Flood

From mid-October to late December, torrential rainfalls and floods due to a tropical depression and northeast monsoon occurred successively and affected Central Vietnam, e.g. North Central, South Central Coast and Central Highland regions. Especially, Binh Dinh, Quang Ngai, Nghe An, Phu Yen, Quang Binh and Ha Tinh provinces were worst affected by the series of the floods. The Government of Vietnam declared a state of emergency on October 15, 2016.

The Central Committee for Natural Disaster Prevention and Control (CCNDPC) and United Nations (UN) jointly surveyed the damage of 18 provinces and announced the results in December 2016. The damage is summarized as follows: Infrastructures including flood control measures such as dikes were widely devastated.[8]

- Human damage: Deaths/missing 134, injured 151
- House: Inundated houses 233,271 (Water depth over 1 m for 163,682 houses among them.) Destroyed houses 4,093
- Agriculture: Paddy 18,371 ha, perennial crops 23,294 ha, vegetables 44,437 ha
- Livestock: Cattle 18,371, poultry 1,218,449

8 ANNOUNCEMENT OF FLOODING SITUATION IN CENTRAL PROVINCESOF VIET NAM ORGANIZED BY THE MINISTRY OF FOREIGN AFFAIRS OF VIET NAM, Central Committee for Flood and Storm Control

- Infrastructure: Roads 1,782 km, bridges/culverts 585, dike 60 km
- Economic loss: VND 10,520 billion (US$ 460 million)

The total rainfall in the period reached 2,000 mm, e.g. 2,611 mm in Quang Nam province, 2,729 mm in Quang Ngai province and 2,417 mm in Binh Dinh province. The amount of rainfall was equivalent to the probable rainfall of 10 to 50 years.[9] In response to the ceaseless heavy rain and flood damage for 2.5 months, World Bank decided to launch the Emergency Natural Disaster Reconstruction Project.

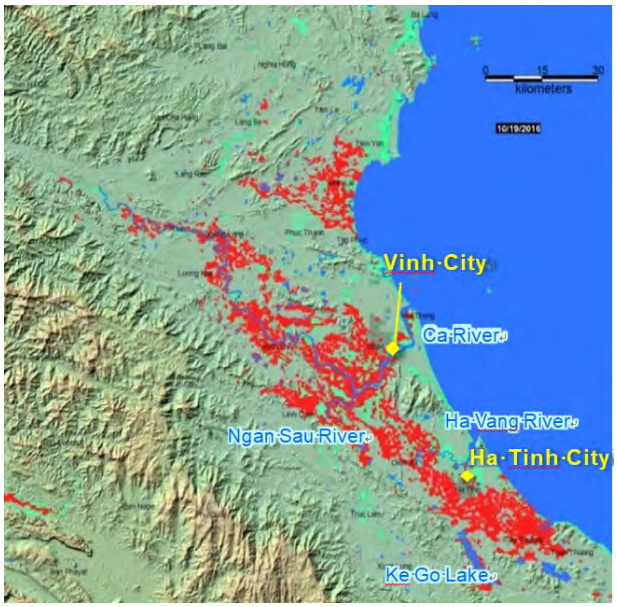


Figure 2.15 Inundation Map of North Central Region (October 14-19, 2016)
Source: Global Flood Partnership Web site
(https://floodobservatory.colorado.edu/Events/2016Vietnam4410/2016Vietnam4410.html)

(5) September 2017 Flood

Heavy rain continued from October 10 to 13 in 2017 in the Red River Delta region and brought floods in Hanoi city and Ha Nam, Nam Dinh, Ning Binh and Thanh Hoa provinces. The highest water level was recorded at Ben De station along Hoang Long river. Overtopping, erosion, seepage, piping, blow off on the bank slope were recognized at Lach Truong dike, Cau Chay dike, Hoat river dike and left dike of Hoang Long river. The total length of damaged dikes was 82 km. Table 2.5 indicates the main damaged dikes and Photo 2.1 shows their images[10].

9 Rapid Flood Damage and Needs Assessment; GFDRR; 2016
10 REPORT STATUS OF DIKE, CRITICAL SITES AFFECTED BY TYPHOON & FLOOD IN 2017, VDMA

Table 2.5 Dikes Damaged by October 2017 Flood

Province	Location	Damage
Ninh Binh province	Hoang Long river: K18+206 ~ +410	Flow water overtopped on the right bank.
Ninh Binh province	Hoang Long	Water level reached near dike top on the left bank.
Thanh Hoa province	Ta Chu: K17+000 ~ K17+250	Bank slope on river side was cracked and eroded.
Thanh Hoa province	Ta Chu dike: K2+800 ~ K2+905, K5+900 ~ K5+950, K17+250 ~ K17+337	Bank slope on river side was eroded.
Thanh Hoa province	Ta Chu: K27+330 ~ K27+342	Bank slope on river side was eroded.
Thanh Hoa province	Cau Chay: K25 ~ K26+800	Flow water overtopped on the right bank.
Ha Trung district, Thanh Hoa province	Huu Hoat: K17+070 ~ K18+910	Flow water overtopped.
Thanh Hoa province	Lach Truong	Flow water overtopped.

Source: Prepared by JICA survey team based on "REPORT STATUS OF DIKE, CRITICAL SITES AFFECTED BY TYPHOON & FLOOD IN 2017、VNDMA"

Water level reached the near dike top
Hoang Long River (Ninh Binh province)

Crack on dike slope
Ta Chu River (Thanh Hoa province)

Bank erosion and emergency measures (sheeting)
Ta Chu River (Thanh Hoa province)

Overtopping into land side and emergency measures (piling sand bags)
Huu Hoat river (Thanh Hoa province)

Photo 2.1 Case of Dike Damaged by October 2017 Flood

Source: "REPORT STATUS OF DIKE, CRITICAL SITES AFFECTED BY TYPHOON & FLOOD IN 2017, VNDMA"

2.3.2. Typhoon (Storms, High Tides)

(1) Typhoons in the past

Sixty-eight typhoons made landfall in the 21 years from 1997 to 2017 (Table 2.6). It means 3.3 typhoons per year on average. Among them, Typhoon Linda that struck the Mekong delta caused historical damage in 1997. Typhoon Linda and the recent typhoons are listed below.

Table 2.6 Typhoons in the past 20 years

Year	No	Name	Affected area
2017	1	Typhoon No.2 (Talas)	Thanh Hoa – Quang Binh
	2	Typhoon No.4 (Sonca)	Ha Tinh – Quang Tri
	3	Typhoon No. 10 (Doksuri)	Nghe An – Thua Thien Hue
	4	Typhoon No.12 (Damrey)	Khanh Hoa, Dak-lak, Lam Dong
	5	Typhoon No.14 (Kirogi)	Off-shore of Ninh Thuan – Ba Ria Vung Tau
2016	1	Typhoon No.1 (Mirinae)	Thai Binh – Ninh Binh
	2	Typhoon No.3 (Dianmu)	Hai Phong – Thai Binh
	3	Typhoon No.4 (Rai)	Da Nang – Quang Ngai
	4	Low tropical depression	Quang Tri – Da nang
2015	1	Typhoon No.1 (Kujira)	Nam Dinh, Thai Binh, Hai Phong, Quang Ninh
	2	Typhoon No.3	Quang Nam – Quang Ngai
2014	1	Typhoon No.2 (Rammasun)	Cao Bang, Lang Son
	2	Typhoon No.3 (Kalmaegi)	Quang Ninh, Lao Cai, Yen Bai, Ha Giang
	3	Typhoon No.4 (Sinlaku)	Binh Dinh – Phu Yen
2013	1	Typhoon No.2 (Bebinka)	Hai Phong – Thai Binh
	2	Typhoon No.5 (Jebi)	Quang Ninh
	3	Typhoon No.6 (Mangkhut)	Thanh Hoa
	4	Typhoon No.8 (Noname)	Thua Thien Hue – Quang Nam
	5	Typhoon Wutip	Ha Tinh, Quang Binh, Quang Tri
	6	Typoon No.11 (Nari)	Da nang – Binh Dinh
	7	Typhoon No.14 (Haiyan)	Quang Ninh
	8	Typhoon No.15 (Podul)	Khanh Hoa – Ninh Thuan
2012	1	Typhoon No.4	Northern mountainous area
	2	Typhoon No.5 (Kai-tak)	Quang Ninh
	3	Typhoon No.7 (Gaemi)	Binh Dinh – Phu Yen, Gia Lai
	4	Typhoon No. 8 (Sontinh)	Quang Ninh – Hai Phong
	5	Typhoon Pakhar	Binh Thuan - Ca Mau
2011	1	Typhoon Nock-ten	Thanh Hoa
	2	Typhoon Nesat	Quang Ninh – Hai Phong
	3	Typhoon Haitang	Quang Tri – Thua Thien Hue
2010	1	Typhoon Basyang	Hai Phong, Thai Binh, Nam Dinh
	2	Typhoon Mindulle	Nghe An – Quang Binh
2009	1	Typhoon Soudelor	Quang Ninh – Hai Phong
	2	Typhoon Mujigae	Thai Binh, Thanh Hoa
	3	Typhoon Ketsana	Quang Nam – Quang Ngai
	4	Typhoon Parma	Quang Ninh – Nam Dinh
	5	Typhoon Mirinae	Da nang
2008	1	Typhoon Kammuri	Quang Ninh
	2	Typhoon Mekkhala	Ha Tinh – Quang Binh
	3	Typhoon Noul	Khanh Hoa – Ninh Thuan
2007	1	Typhoon Toraji	Quang Ninh

Year	No	Name	Affected area
	2	Typhoon Lekima	Ha Tinh, Quang Binh
2006	1	Xangsane	Da Nang, Quang Nam, Quang Ngai and Thua Thien Hue
	2	Durian	Ba Ria Vung Tau, Ben Tre, Tien Giang, Vinh Long, Bac Lieu, Ca Mau…
2005	1	Typhoon Damrey	Quang Ninh - Thanh Hoa
	2	Typhoon Vicente	Nghe An – Quang Binh
2004	1	Typhoon Chanthu	Quang Ngai
	2	Typhoon Muifa	Ca Mau, Bac Lieu, Kien Giang
2003	1	Typhoon Koni	Quang Ninh – Thanh Hoa
	2	Typhoon Krovanh	Quang Ninh – Thanh Hoa
	3	Typhoon Nepartak	Quang Ninh – Thanh Hoa
	4	Low tropical depression	Nghe An – Quang Binh
2001	1	Typhoon Usagi	Nghe An – Quang Binh
	2	Typhoon Lingling	Binh Dinh – Ninh Thuan
	3	Typhoon Kajiki	Quang Tri – Quang Ngai
2000	1	Typhoon Wukong	Nghe An – Quang Binh
	2	Typhoon Kaemi	Quang Tri – Quang Ngai
1999	1	Typhoon Eve	Quang Binh
	2	Low tropical depression	Binh Thuan – Ca Mau
	3	Low tropical depression	Binh Dinh – Ninh Thuan
1998	1	Typhoon Chip	Ninh Thuan
	2	Typhoon Dawn	Khanh Hoa
	3	Typhoon Elvis	Binh Dinh – Phu Yen
	4	Typhoon Faith	Phu Yen – Khanh Hoa
1997	1	Typhoon Zita	Quang Ninh – Thanh Hoa
	2	Typhoon Fritz	Quang Tri – Quang Ngai
	3	Low tropical depression	Quang Ngai – Binh Dinh
	4	Typhoon Linda	Binh Thuan – Ca Mau

Source: MONRE HP

(2) Typhoon Linda (November 1997)

Typhoon Linda which struck the Mekong delta on November 1 to 2, 1997 brought historical damage to the area. The southernmost province, Can Tho, recorded 233 mm of rainfall and suffered from inundation widely spreading into farmland. A huge number of fishermen died in the sea because they hadn't experienced such a devastating typhoon and couldn't evacuate adequately. A fishing village lost most of the adult men. The damage included not only river flooding and inundation but also collapse of houses and felled trees caused by strong wind.

- Death/missing: 3,111 people
- Affected people: over 1 million people
- Collapsed house: 77,000 houses
- Shipwreck/capsized: 3,078 boats
- Total economic loss: VND 7,180 billion

(3) Typhoon Doksuri (September 2017)

On September 15, 2017 Typhoon Doksuri landed in Central Vietnam and hit Ha Tinh and Quang Binh provinces. It raised the sea level due to low-pressure and tidal waves generated by strong wind (maximum wind speed: 135 km/hr) broke coastal dikes in many places.

Coastal dikes were broken along the coast extending from Hai Phong province to Thua Thien Hue province, a length of 55 km in total.

Overtopping due to high tide
(Hai Binh coastal dike in Nam Dinh province)

Broken coastal dike and drainage sluice
(Ta Nghen dike in Ha Tinh province))

Collapsed revetment on coastal dike
(Ha Tinh province)

Emergency measures by sand bags to prevent scouring at toe of slope
(Nam Dinh province)

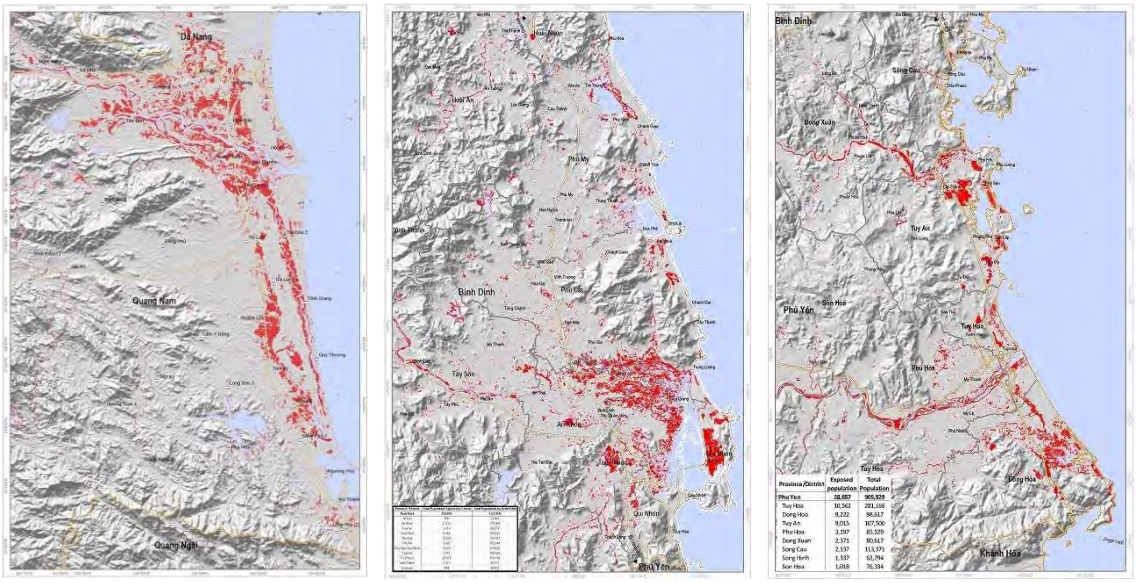
Photo 2.2 Coastal Dike Damaged by High Tide

(4) Typhoon Damrey (November 2017)

Typhoon Damrey landed on Khanh Hoa province on November 4, 2017 and severely damaged the central region. Damage in Khanh Hoa, Phu Yen, Binh Dinh, Quang Ngai, Thua Thien Hue, Quang Nam and Da Nang provinces was relatively enormous[11]. A lot of power poles fell due to the strong storm that caused prolonged blackout.

- Human damage: Deaths 104, missing 19, evacuation 35,000
- Houses: Inundated/partially destroyed 137,836 houses, fully destroyed 3,483 houses
- Agriculture: 33,153 ha including 9,163 ha of paddy and 20,783 ha of vegetables
- Infrastructure: Canals/dikes 128 km

[11] Typhoon Damery & flooding in the Central and Highland regions of Viet Nam, Situation Update No.2 (as of 11 November 2017); UN Reliefweb



Quang Nam province　　Binh Dinh province　　Phu Yen province

Figure 2.16　Inundation Map of Central Vietnam (Typhoon Damrey in November 2017)
Source: International Charter
(https://disasterscharter.org/web/guest/activations/-/article/cyclone-in-viet-nam-activation-557-)

2.3.3. Landslides and Flash Floods

(1) Landslides and Flash Floods in Vietnam

The country of Vietnam is elongated with a length of 1,700 km from north to south. Three quarters of the country consists of mountainous regions. The distribution of precipitation is extremely high from 3,500mm to 4,500mm per year due to tropical monsoon climate facing the East Sea. According to the statistics of the Ministry of Transport (MOT) in 2000, 3/4 of the total extension of the national highway was constructed in the slope topography and that 30 % of the total national highways pass through the mountainous area. In such a natural condition, landslides, especially in the rainy season, affect social economy in the mountainous region.

As shown in "2.2.3 Damage and Distribution of Major Natural Disasters", the damage caused by typhoons and floods accounted for a large proportion of the number of cases, dead, sufferers, and the amount of economic damage in Vietnam. In addition, the damages caused by landslides, slope failures, and flash floods have not been shown as prominent. As shown in "2.2.1 Types and Definition of Natural Disasters in Vietnam", sediment-related disasters records may be underestimated due to the uncategorized disaster classification among floods and flash floods. For other reason, the damage records of typhoons are inclusive of damages caused by sediment-related disasters and other disasters."

Serious damages due to sediment-related disasters are reported every year. In recent years, sediment-related disasters that occurred in several locations of the northern provinces in August 2017 and October 2017 are still remembered. These disasters affected the economy and resulted to deaths and damages to houses, infrastructure facilities, and agriculture.

It is deemed that these actual situations may have been due to all or any of the following: a) changes in rainfall patterns as influenced by climate change, b) changes in land use patterns

(development of residential land and industrial parks) due to economic growth, and c) the sediment discharge by deforestation.

(2) Disaster Areas

Landslides and flash floods occurred in October 2017 due to a tropical depression in several provinces in the northern part of Vietnam. It caused record damage of losses of 42 dead and multiple missing people and destroying more than 594 houses, damages to paddy field more than 5,000 ha, and damages to many infrastructures. Table 2.7 shows the disaster history due to landslides and flash floods with information of occurrence area and affected area. Disasters due to landslide and flash flood are concentrated in several provinces of the mountainous areas in the northern region, and damage to infrastructure such as national roads is also recorded in the Central provinces.

Table 2.7 Major landslide disasters in the past in Vietnam

Place	Date	Type	Dead / missing	Damages
Bac Kan Prov.	23.7.1986	Flash floods, Landslides	7 dead	Paddy field 120ha Road 20km
Lai Chau Prov.	27.6.1990	Flash floods, Landslides	More than 100 dead	House 607 Bridge 5 Collapse area 10km2
Lao Cai Prov.	6.1996	Landslides	7 dead	House 2
Lai Chau Prov.	17.8.1996	Flash floods, Landslides	56 dead	Village relocation
Lam Dong Prov.	10.10.2000	Flash floods, Landslides	－	37 landslides within 55 km 500 meters of the National Highway collapsed
Kon Tum Prov.	From 2002 Every year	Landslides	－	Damages of billions of VND each year
Ha Giang Prov.	19.7.2004	Flash floods, Landslides	48 dead	House 33 Paddy field 627ha
Lao Cai Prov.	8.8.2008	Floods, Flash floods, Landslides	88 dead	unknown
Lao Cai Prov.	8.2008	Flash floods	32 dead	unknown
Ha Giang Prov.	26.4.2010	Flash Floods	5 dead 3 missing	House 6 35 billion VND
Yen Bai Prov.	14.8.2010	Flash floods	7 dead	Houses and roads damaged
Lao Cai Prov.	31.8.2012	Flash Floods	11 dead 9 missing	Farmland 10ha Roads
Yen Bai Prov.	8.9.2012	Flash floods	29 dead	Unknown
Northern 7 Provinces.	19.8.2016	Floods, Landslides	9 dead 2 missing	House 874
Son La Prov	3.8.2017	Flash floods	13 dead 2 missing 5 injured	House 429 Bridge 14, Road 82km, Irrigation facilities 31, Dike 2km, Farmland 658km^2
Yen Bai., Son La, Lai Chau Prov.	7.8.2017	Flash floods, Landslides	27 dead 14 missing	House 231 Farmland 340ha
Dak Nong Prov.	10.2017	Landslides	－	House 50 Farmland unknown
Yen Bai, Son La	11.10.2017	Floods,	42 dead	House 594

Place	Date	Type	Dead / missing	Damages
Prov.		Flash Floods, Landslides	29 missing 48 injured	Bridges, Roads, electric facilities, public facilities, Farmland 5016km^2

Source: Formulation of Detailed Plan for Development of Landslide Risk Assessment Technology along Transport Arteries in Vietnam, JICA
Report on Managing Risk of Extreme Events, UNDP
Vietnam Floods and Landslides, Reliefweb
Added by this survey

(3) Damage situation

1) Damage to Life, Houses, Buildings

The damage data due to sediment-related disasters summarized by MARD show 870 deaths and missing, 471 injured people, 10,402 completely destroyed houses, 116,501 damaged buildings recorded between 2000 and 2017 (Table 2.8). It is not included in the statistical data such as that from DesInventar and EM-DAT.

Table 2.8 shows the occurrences of sediment-related disasters from 2000 to 2017. Compared with the number of disasters occurring from 2000 to 2010, the number has increased from 2011 to 2017.

Table 2.8 Human damage and building damage caused by sediment-related disasters (2000-2017)

Year	Number of disasters	Dead / missing	Injured	Loss of houses	Affected houses
2000	9	80	44	267	2,305
2001	14	45	15	33	6,228
2002	13	98	137	7,596	71,178
2003	4	16	3	15	69
2004	11	92	41	206	2,988
2005	17	99	25	664	9,057
2006	8	26	17	55	6,861
2007	17	38	6	92	198
2008	9	31	22	62	190
2009	6	19	5	349	1,061
2010	8	16	6	53	764
2011	38	23	8	102	692
2012	64	89	27	123	1,817
2013	23	57	37	89	1,399
2014	9	19	12	35	141
2015	8	20	18	202	4,530
2016	16	31	7	39	795
2017	14	71	41	420	6,228
Total	288	870	471	10,402	116,501

Source : Prepared by JICA survey team based on annual statistical data of MARD

2) Damage to Infrastructure Including National Highways and Prefectural Roads

In mountainous areas of the northwestern and central area of Vietnam, since the topography is steep and rock fractures due to crustal deformation is remarkable, sediment disasters are frequently caused by heavy rain. Sediment-related disasters cause not only human loss and damage of houses, but also serious damage to infrastructures such as blocking of traffic on the national and local highway and washing away bridges. The damage to these infrastructures has a devastating influence on the economy.

Photo 2.3 and Photo 2.4 show the situation of collapse of the road surface and slopes on major prefectural roads and the loss of bridges due to flash floods.

Photo 2.3 Collapse along the prefectural road (Son La Province)
Unstable slope continues. Recovery work in progress.
(Taken by the survey team, March 2018)

Photo 2.4 A bridge partially lost by flash flood (Son La Province)
Large-scale flash flood occurred in August 2017, the left bank side pier was damaged, and it is currently undergoing rehabilitation work.
(Taken by the survey team, March 2018)

In addition, there is a latent risk of the infrastructure being damaged in the future in area where no disaster has occurred yet. Photo 2.5 shows that soil mass of landslides occurred on the other side of the power generation reaches to the river. On the upstream, there is also a ground form of landslide which is not moving at present. It has a potential risk to be unstable with the future heavy rain. It is predicted that these soils will block the river channel and create a natural dam and also damage the infrastructure.

Photo 2.5 Status of the unstable slope close to the power generation facility (Lao Cai Province)
The landslide visible on the left side reaches the river. The slope on the right side shows landslide topography.
(Taken by the survey team, March 2018)

Photo 2.6 The situation of the unstable slope in contact with newly constructed roads and bridges (Yen Bai Province)
Collapse has occurred at the end of the slope in contact with the road.
(Taken by the survey team, March 2018)

(4) Flash Flood that Occurred in 2017

In August and October 2017, a torrential rain caused by tropical cyclones caused flash floods in many areas of the northern provinces. As shown in Photo 2.7 and Photo 2.8, the flash floods were caused by concentrated torrential rains seriously affecting the downstream area. The flood was caused by the temporarily accumulated sediments due to landslides and slope failures that occurred in the upstream. Damage to infrastructures such as roads and irrigation facilities has occurred in several places in the province by the relatively small-scale landslides, surface collapse of slopes and flash floods.

Photo 2.7 Flash flood reached the Mu Cang Chai City (Yen Bai Province)
Sediments including boulders of 3 m diameter hit the elementary school.
(Taken by the survey team, March 2018)

Photo 2.8 Damage situation at Nam Pam commune (Son La Province)
Several slope failures are found in the upstream part. Flash floods deposited soil and rocks in the valley with a width of 30m to 100m.
(Taken by the survey team, March 2018)

(5) Economic Loss due to Sediment-Related Disasters

1) Annual Damage Cost due to Natural Disasters

Figure 2.17 shows the trend of the annual damage cost of natural disasters and the ratio of the disaster types. An increasing trend has been recognized in recent years. The greatest economic loss in recent years (VND 60 trillion (US$ 2,580 million)) occurred in Vietnam in 2017 according to Viet Nam News in January 2018. Among the total damages in 2017, the amount of sediment-related disaster damage accounted for 18.3% of the total.

The proportion of the damage amount caused by Typhoon “Dolsuri” and Typhoon “Damrey” in 2017 was 70.3%. There is a possibility that damage amounts due to landslides and flash floods are included in damage amount by the typhoons. Therefore, it is estimated that damage amounts due to landslides and flash floods are recorded in the damage amount of 18.3% or more.

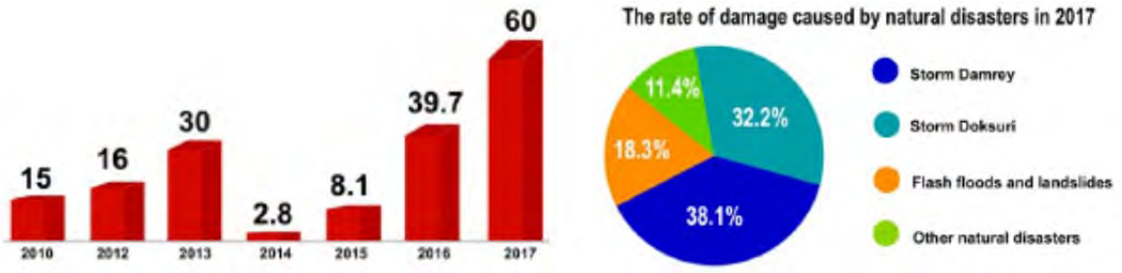


Figure 2.17 Changes in annual damage amount of natural disasters and percentage of disaster type in 2017 (Unit : trillion VND)

Source: Viet Nam News / MONRE, January 2018

2) Economic Loss due to Landslides and Flash Floods in Son La Province

Figure 2.18 shows the economic loss due to sediment-related disasters estimated from the disaster records (2009 - 2017) of the Son La Province in the North region. The disaster record of Son La province is classified into landslides, flash floods, and lightning. However, damage caused by lightning indicates a few deaths or missing persons, which does not significantly affect the damage cost. Because the damage due to lightning is insignificant, the disaster records maybe considered as disaster record of landslides and flash floods.

From 2009 to 2016, the dead and missing persons have was than 30 people on the average. The average damage amount is about VND 250 billion (US$ 10.75 million). However, due to flash floods that occurred in several provinces of the northern area in 2017, the total amount of damages is VND 2,628 billion (US$ 113.04 million) in the province.

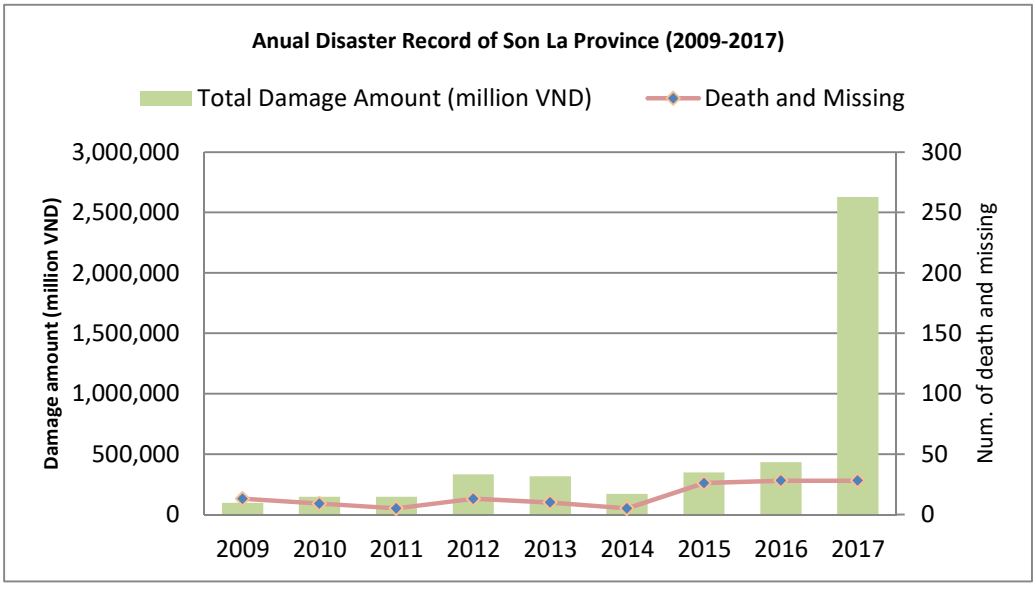


Figure 2.18 Economic loss caused by landslides and flash floods in Son La province

Source : Report of disaster record by Son La province

Table 2.9 shows the details of the damage and damage cost caused by landslides and flash floods in August and October 2017 from the report by standing office of CCNDPC / SR in Son La province. The disaster in August 2017 occurred in the Muong La district while the disaster in October 2017 occurred in several districts causing great damage to the infrastructure as well as damage to houses and agriculture.

Table 2.9 Damage records due to flash floods that occurred in 2017 in Son La Province

Damage	2/8/2017～3/8/2017 Muong La district	10/10/2017～12/10/2017 Phu Yen, Muong La, Van Ho, Bac Yen, Moc Chau District
Dead, missing persons, injured persons	Dead 13, Missing 2, Injured 15	Dead 6, Missing 2, Injured 8
Houses	Loss 279, Damaged 150 Relocation 140	Loss 76, Damaged 350 Relocation 307
Infrastructure	Bridge washout：1 Erosion and deposit on the road surface：82km, 50,570m^3 Suspension bridge washout：13 Irrigation facilities：31 point Riverbank damage：2km	Bridge and culvert washout：29 Road damage：National Road 1,195,Provincial road 592 Erosion on the road ：18 Power plant：2 (isolated) Electric poles：99 Water gate damage：61 School and health center damage：35 Public buildings and houses：Commune office1,Commune houses 8
Agriculture and Fisheries	Crop fields ：658.01ha Livestock： Cows 314, Pigs 1,477, Goat 700 Poultry 16,397 Fish ponds：58.6ha	Crop fields：1,343ha Livestock：Cow 498, Poultry 5,128 Fish ponds：58.86ha
Total amount	VND 705 billion (US$ 30.3 million)	VND 1,066 billion (US$ 45.8 million)

Report of disaster record by Son La province

3) Damage to Road Infrastructure Facilities due to Landslides and Flash Floods

Table 2.10 shows the damage situation and damageed number of national roads and provincial roads due to landslide and flash floods in Lao Cai province in 2017. The total damage amount is about VND 66.303 billion (US$ 2.85 million), which was huge amount as the damage of the road sector in one province. In 2017, damage caused by landslides and flash floods occurred in several provinces in the northern region. The damage amount of Son La Province can be utilized to estimate the total damage amount of road infrastructure damage in all the northern provinces.

Table 2.10 Road damage caused by landslides and flash floods that occurred in 2017 in Lao Cai province

Category	Damage	Damage Amount
National Road	Collapse of upper slope：300, 75,000m^3 Collapse of lower slope ：62, 1,200m^3 Erosion and damage on road surface：52, 8,500m^3 Soil deposit on road surface：49, 2,000m^3 Damage to drainage：15, 280m Damage to culvert：8, 34m Damage to guardrail：1, 30m	VND 20.526 billion (US$ 0.88 million)
Provincial Road	Collapse of upper slope：764, 101,000m^3 Collapse of lower slope：129, 2,300m^3 Erosion and damage on road surface：221, 12,403m^3 Soil deposit on road surface：205, 27,8000m^3	VND 45.777 billion (US$ 1.97 million)

Category	Damage	Damage Amount
	Soil deposit in drainage : 407, 19,200m Damage to drainage : 10, 375m Damage to culvert : 22, 103m Damage to guardrail : 3, 57m	
Total		VND 66.303 billion (US$ 2.85 million)

Source: Report of disaster record (2017) by Lao Cai province

2.3.4. Drought・Saltwater Intrusion

(1) Drought and Saltwater Intrusion in the Past Ten Years

Figure 2.19 shows the cumulative number of days without rain in Vietnam over the past 10 years. In Vietnam, droughts and saltwater intrusion have not been considered as major disasters so far. However, in the Law of NDPC established in 2013, drought and saltwater intrusion were clearly indicated as major natural disasters. In Vietnam, in the past decade, two large scale droughts of 2010 and droughts of 2014 - 2016, and droughts of 2014 - 2016 are known as major droughts in the last 100 years.

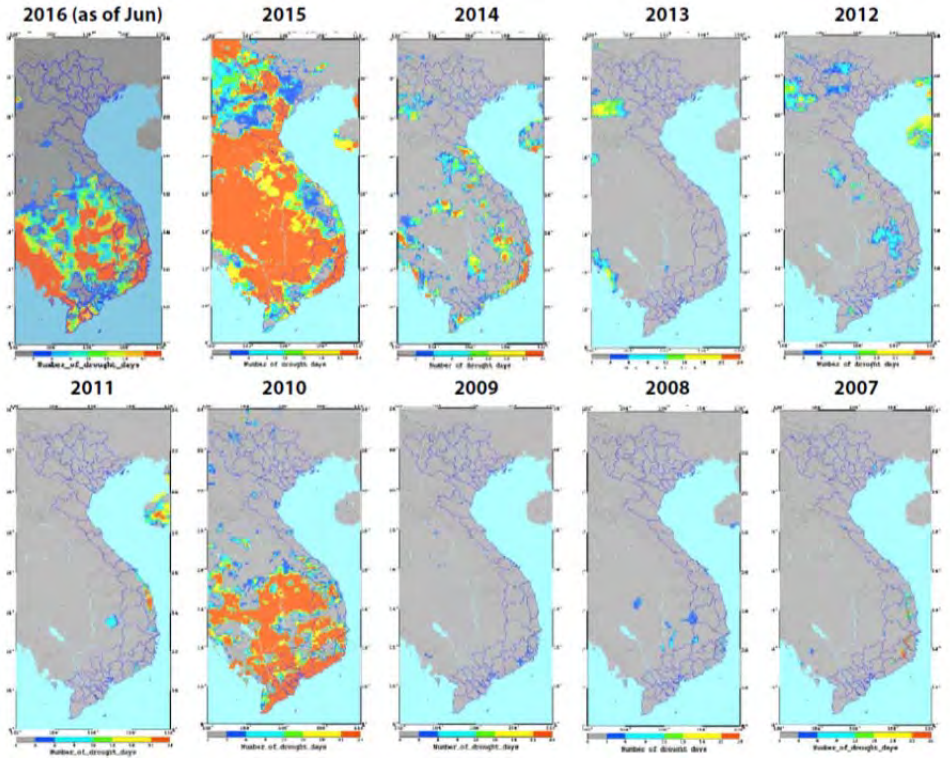


Figure 2.19 Cumulative number of days without any rain in the past 10 years (2007－2016)

Source: IMHEN-JICA-UNDP: http://dubaokhlhau.vn/DMEWS/

The drought in 2010 mainly occurred in the Mekong Delta area, disasters between 2014 and 2016 occurred from the Mekong Delta to the Chubu Highlands and the Central (Central and South) areas. In particular, in the Mekong Delta region, salt water also invaded up to 80 km inland due to a decline in the water level of the river, bringing damages not only to agriculture

and fisheries but also a great loss of human life and social infrastructure. The information of each disaster is summarized as below.

(2) 2010 Drought and Saltwater Intrusion

Droughts occurred nationwide due to the lack of rainfall and the rise in temperature in 2010. The South Mekong Delta area especially suffered from considerable damage. Also, in the North region, since no rain fell from September 2009 to 2010, wildfires occurred in Lao Cai province and Lai Chau province. In the Central region, several hundred people were transported to hospitals due to the high temperature. Harmful damage to the yield of rice crops was caused by abnormalities of insect pests eating rice due to the high temperature and high humidity. Normally, saltwater intrusion in the dry season reaches 30 km upstream from the estuary; however, in 2017 there is a report that the salt water reached up to 60 km upstream. It is said that the damage caused by saltwater intrusion has been increasing in the last 30 years due to climate change. As an emergency measure, the central government provided supports such as discharging the reservoir and installing a pump for pumping water.

(3) 2014-2016 Drought and Saltwater Intrusion

Droughts from 2014 to2016 unprecedentedly affected at wide area over a long period (24 months). At least one third of 63 provinces were damaged (Figure 2.20). This drought began with damage of water shortage and saltwater intrusion since the end of 2014 and seriously damaged more than 18 provinces in the Mekong Delta, the central highland and the southern central regions. In many provinces, shortage of drinking water and agricultural water damaged crops of about 60,000 ha, and affected more than 2 million people. Especially in the central highland and the southern central regions, the drinking water is insufficient due to depletion of groundwater. Figure 2.22 shows the cumulative days without rain in 2015 and 2016

Figure 2.20 Saltwater intrusion affected provinces (2014 - 2016)

Source: UN and GoV 2016, World Bank

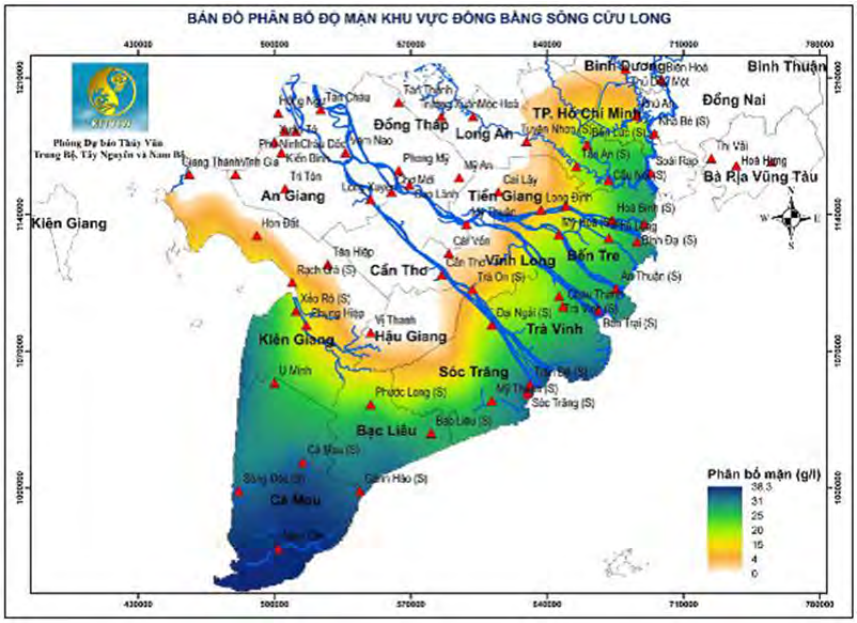


Figure 2.21 Saltwater intrusion map (2014 - 2016)

Source : Viet Nam Drought and Saltwater Intrusion, UNDP 2016 / MONRE-NCHMF

The saltwater intrusion in 2017 occurred two months earlier than the usual year and reached 90 km inland affecting agricultural crops and residents. These affected areas are famous for producing export crops such as rice, coffee, pepper, fruit and shrimp. It is noted that the poor, families with women as heads of households, residents without land ownership, people with disability, children, and elderly people were more affected. Damages were widespread including food and drinking water shortages, health damage, and loss of livestock. Although droughts and saltwater intrusion are periodic climate related phenomena, this disaster has been influenced by an abnormal El Niño phenomenon and the restriction of water release from the large dams located upstream of Vietnam.

The influence of the upstream dams is clearly stated in Government Resolution No.120 promulgated in November 2017 as “Sustainable and Climate Development of the Mekong Delta of Viet Nam” and which is shown below.

The Government Resolution No.120
Resolution on Sustainable and Climate Development of the Mekong Delta of Viet Nam
＜DECIDED: The third paragraph＞
The exploitation of water resources on the upper reaches of the delta, especially the construction of hydropower dams, has changed the flow of water, reduced sediment and fisheries resources, causing serious saltwater intrusion, negatively affects the socioeconomic development of the region.

According to the MARD damage reports, the economic losses in the 18 provinces were summarized as shown in Table 2.11. The direct economic loss was assumed to be VND 15,032 billion (US$ 646 million), and equivalent to 0.35% of the national GDP in the same year.

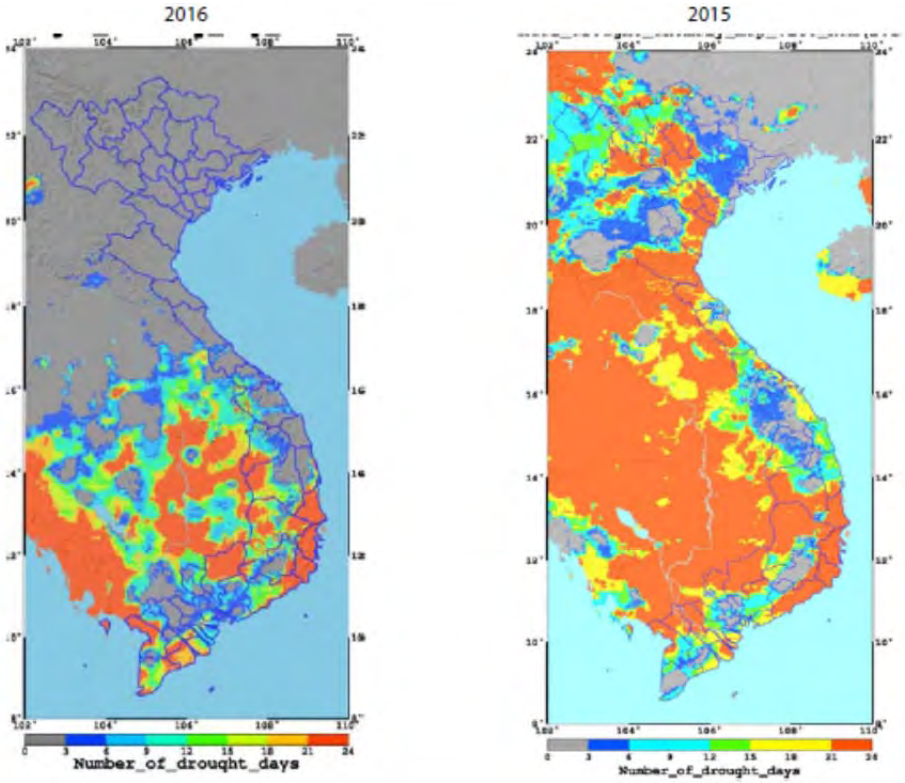


Figure 2.22 Cumulative days without rain in 2015 and 2016

Source : http://dubaokhilhau.vn/DMEWS/

Table 2.11 Damages by 2015-2016 drought and saltwater intrusion

Region	Number of severely affected provinces	Production area affected (ha)			Number of households lacking access to water for daily use	Number of livestock lost	Total economic loss (billion VND)
		Rice	Crops	Aqua culture			
National	18	243,762	168,064	69,008	457,796	-	15,023
South Central Coast	3 (Ninh Thuan, Binh Thuan, & Khanh Hoa)	10,776	15,000	-	43,482	5,126	1,457
Central Highlands	5 (Kon Tum, Gia Lai, Dak Lak, Dak Nong, & Lam Dong)	17,541	141,756	-	72,060	496	6,004
Mekong Delta	10 out of 13 (Long An, Tien Giang, Ben Tre, Tra Vinh, Vinh Long, Soc Trang, Hau Giang, Bac Lieu, Ca Mau, & Kien Giang)	215,445	-	68,916	342,254	933	7,517

Source : MARD report 2016

The Vietnamese government started relief from 2015, announced a request for international support in March 2016. In October 2016, "Drought / Saltwater intrusion Emergency Response Plan (2016/2017)" has been formulated. The content of the aid plan is as follows:

<Emergency Response plan (2016/2017)>

- Total emergency requirement (3-5 months): US $ 485 million
- Emergency support fields include: i) drinking water, toilets, hygiene, ii) food security, iii) nutrition, iv) health and v) other

<Recovery estimated funding by the Government>

- 2017: US $ 368 million,
- 2018-2020 US $ 687 million

2.3.5. Riverbank Erosion

(1) State of Occurrence of Riverbank Erosion

1) List of Erosion Locations

Riverbank erosion occurs at major rivers in all parts of Vietnam and the implementation of countermeasures has been challenged. In the southern part of the country, particularly in the Mekong River Basin, damage of riverbank erosion has been increasing.

The Central Steering Committee for Natural Disaster Prevention and Control (CSCNDPC) has released the state of riverbank and coastal erosion through publishing a list of erosion on its web site, DANH SÁCH CÁC ĐIỂM SẠT LỞ [12]. This section presents the situation of riverbank erosion throughout the country. The web site also introduces the following categories of erosion damage.

1. Locations of particularly severe erosion (covered by budget measures)
2. Locations of particularly severe erosion (not covered by budget measures)
3. Locations of severe erosion
4. Locations of normal erosion
5. Locations where the advance of erosion is confirmed.

Particularly severe erosion refers to categories 1 and 2; however, categories 3 and 4 also include locations of severe damage. Category 5 refers to locations where change occurs over time in the riverbank line or coastline at several spots.

Detailed descriptions of erosions presented on the web site are attached in Annex and outline of these locations and the distribution of damaged length are shown in Table 2.12 and Figure 2.23. The information confirms the following characteristics of the erosion distribution.

- Category 1 is with severe damage and budgetary measures implementation. There are 5 locations, concentrated in the southern part of the country, that are identified as Category 1. The condition of erosion is not severe as Category 4; however, it is concerned that the damage will expand centered in the southern Vietnam.

12 DANH SÁCH CÁC ĐIỂM SẠT LỞ（http://satlo.vndss.com/#11/20.3134/106.0884/c0c1c2c3）

- Location of the category in which damage is severe yet not covered by budgetary measures are concentrated in the North, and the scale of erosions tend to be large. For example, there are 10 locations with extended length of damage between 500 and 1,000 m, while there are 11 locations with damage ranging from 1 to 5 km.

- The longest damage under Category 1 is 15 km in length located inland of Vam Co river in the southern region.

Table 2.12 Number of locations/length of damage (m) of riverbank erosion announced by the Central Steering Committee for Natural Disaster Prevention and Control

Category	North		Central		South		Length not shown	Overall	
	Number	Total length	Number	Total length	Number	Total length	Number	Number	Total length
1	0	0	0	0	5	21,515	0	5	21,515
2	27	34,819	7	7,720	11	15,122	0	4	57,661
3	17	88,452	13	15,470	14	28,405	7	51	132,327
4	7	980	1	320	27	22,931	0	35	24,231
Total	51	124,251	21	23,510	57	87,973	7	136	235,734
Share(%)	38%	53%	15%	10%	42%	37%	5%	100%	100%

Note: Many locations of Category 5 are overlapped with the locations of other Categories. Hence, those are not described
Source: JICA survey team by using the data from DANH SÁCH CÁC ĐIỂM SẠT LỞ

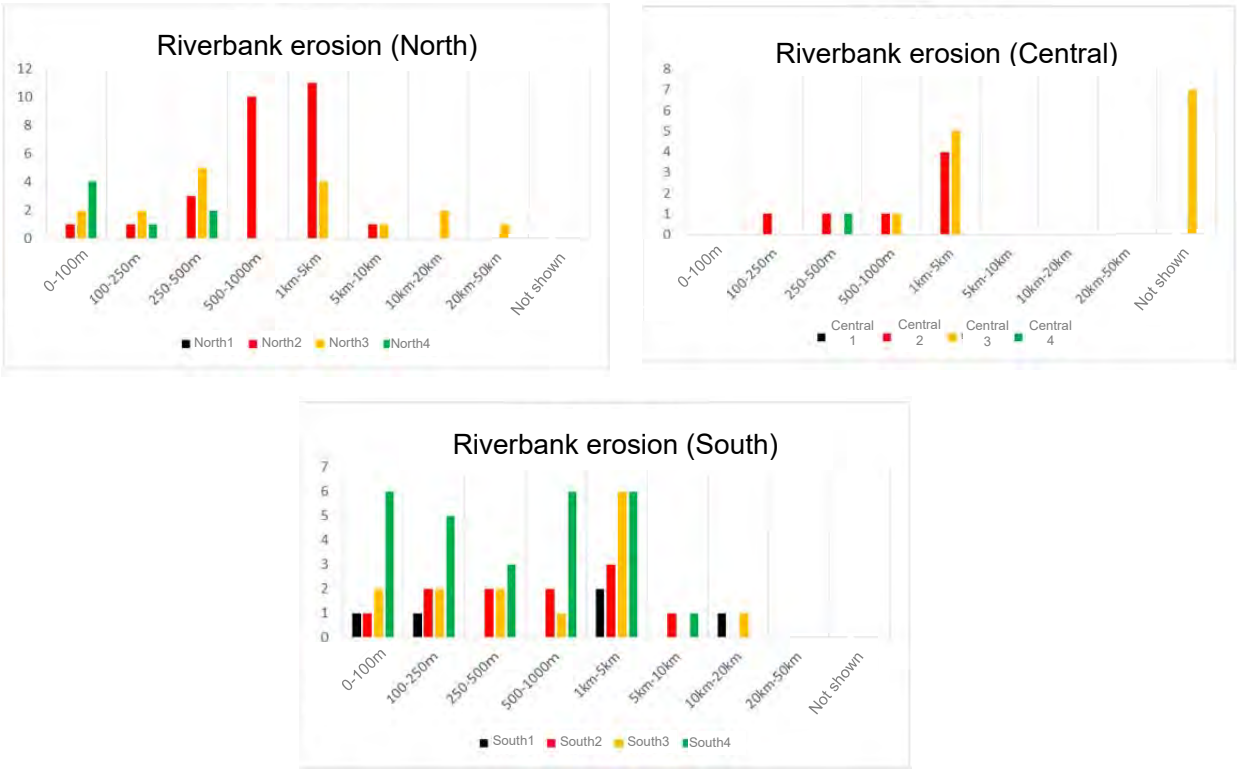


Figure 2.23 Number of locations of riverbank erosion by length of damage and category
Source: JICA survey team by using the data from DANH SÁCH CÁC ĐIỂM SẠT LỞ

According to interviews at the VNDMA and information from the web site "DANH SÁCH CÁC ĐIỂM SẠT LỞ" provided by CSCNDPC, the following locations have particularly severe damage that requires prompt countermeasures.

2) Riverbank Erosion in Dong Thap Province

From April 3 to May 2, 2017, from 4 to 15 m of erosion occurred for a distance of 600m along the Tien River at the Binh Thanh Commune in Thanh Binh District. This erosion endangered 108 households and National Highway 30 that connects Cao Lanh City to Cambodia. In recent years, erosion has become more severe, and erosion extended to 2,300 m which endangered 227 households.

Photo 2.9 View of riverbank erosion damage in Dong Thap Province
Source: DANH SÁCH CÁC ĐIỂM SẠT LỞ

3) Riverbank Erosion in An Giang Province

From 2010 to 2017, from 20 to 25 m wide and 600m long of erosion occurred along the Hong River. Some houses were washed away due to riverbank erosion. It had a serious impact on life and the economy in this area.

Photo 2.10 View of riverbank erosion damage in An Giang Province
Source: DANH SÁCH CÁC ĐIỂM SẠT LỞ

(2) Riverbank Erosion: Occurrence, Trends, and Causes

Riverbank erosion occurs mainly on curves of a river course or on other topography that speeds up the flow near the revetment. In some cases, the riverbank is eroded through scouring of the riverbed caused by a flood flow. Furthermore, if a flood sustains a high-water level for a prolonged period, a high infiltration water level in the levee (saturation) continues. In many cases, when a flood raises the water level or when the water level has fallen after a flood due to the influence of the remaining pore-water pressure, the riverbank collapses, resulting in

riverbank erosion. In addition, since the groundwater level is high in low-lying land in the downstream part of a river, riverbanks prone to saturation can collapse easily.

Presumed causes of the riverbank erosion include the impact of climate change (rising flood water levels caused by the rise of sea level, more frequent and larger scale typhoons), increase of flood discharge rate caused by deforestation of upstream regions, reduction of sediment supplied downstream as it remains in dam reservoirs, wave of sailing ships, and change in river flow (unbalanced flow) in the middle and lower reaches of rivers caused by excessive collection of sediment. Housing construction near river is one of the causes that increases the risk of disaster.

Most of these factors can be identified as the cause of river erosion by accumulating continuous hydraulic / hydrological data and river cross section data. However, the following case of river bank erosion in An Giang province was caused by excessive dredging sand.

Category 2 (No. 50): Khóm Long Thạnh, Phường Long Châu, Tx Tân Châu, An Giang

The damage at this location is explained as follows: “Riverbank erosion was started by abnormal deep scouring of the riverbed. The abnormal deep scouring was about 35m at a point 80 m from the levee. Cracks in this area were about 100 m long and about 80 m wide. The Thinh Phu joint export company (8 silos, VND 1 billion (US$ 50,000)) is damaged and one bridge and two piers on the river collapsed.” Clearly there was abnormal scouring of the riverbed near the levee. This scouring provoked riverbank erosion, and a company located along the riverside suffered severe damage.

A comparison of Google Earth images of the situation in2017 and in 2012 shows that a large factory had been constructed within that period. It is hypothesized, based on the above damage situation. that riverbank erosion damaging the factory’s silos and destroying the piers of its wharf occurred as a result of dredging of the facing riverbed to obtain soil for construction of this factory.

In 2017: Red line: Riverbank erosion, White circle: Constructed new factory

In 2012

Figure 2.24 Google Earth image of a category 2 riverbank erosion damage site (No.50)

2.3.6. Coastal Erosion

(1) Coastal Erosion in Vietnam

Damage caused by coastal erosion has become a serious public problem in recent years. According to the Proceedings of the Vietnam Emergency Preparedness Working Group of the Asia-Pacific Economic Cooperation: APEC), the damage has been confirmed at many locations throughout Vietnam as shown in Table 2.13. In regions where such large-scale coastal erosion occurs, homes and industrial infrastructure (tourism, fisheries facilities etc.) along coastlines are in threat of destruction. In the Central region, coastal erosion has caused damage at many

locations, and this damage has impacted coastal industries such as fisheries and tourism.

Table 2.13 State of River mouth and coastal erosion damage in Vietnam

	Total number of erosion locations	Number of severely eroded locations
All Vietnam	314	120
Northern region	36	24
Central region	170	35
Southern region	108	45

Source: 2017 Proceedings of the Vietnam Emergency Preparedness Working Group of APEC

1) State of Occurrence of Coastal Erosion

The nationwide occurrence of coastal erosion publicized on the web site, DANH SÁCH CÁC ĐIỂM SẠT LỞ, is summarized below.

Details of coastal erosion locations posted on the web site are attached in the Annex, and outlines and distribution of damaged length are shown in Table 2.14 and Figure 2.26. This information confirms the characteristics of the distribution of erosion as follows:

- In the North region, coastal erosion that corresponds to categories 1 to 4 does not exist.
- Category 1, severe damage with implementation of budgetary measures, is mainly located in the South region; while in the Central region, there are 7 locations in Category 2, severe damage without implementation of budgetary measures.
- Number of coastal erosions is only counted for the Central and South regions, but the damage in the South accounted for 2/3 of all locations and 3/4 of the length of the damage.
- In the North region, severe coastal erosion occurred on the Hai Hau coast, located at the Hong River Delta shown in Figure 2.25.

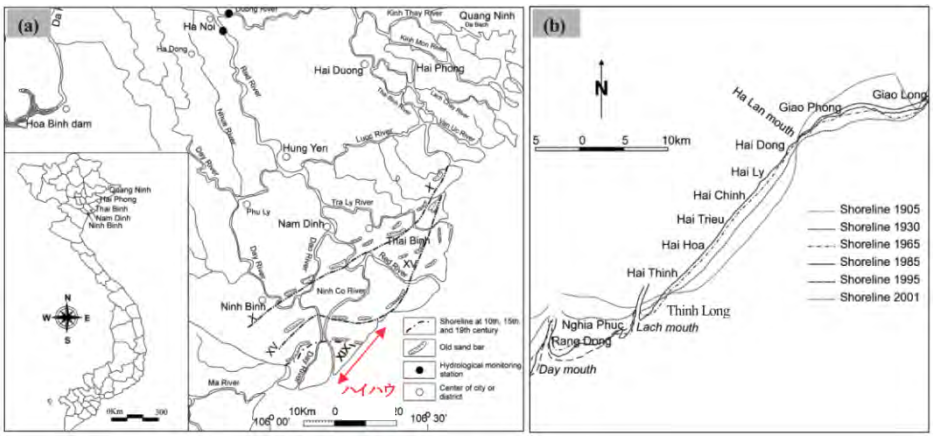


Figure 2.25 Location of the Hai Hau Coast and state of coastal erosion

Source: Japan Society of Civil Engineers, Collected papers B2 (Coastal engineering), Vol. 68, NO. 2, 2012, I 1441-I 1445, Analysis of the process of large-scale erosion on the Hai Hau Coast of Northern Vietnam

Table 2.14 Number of locations/lengths of damage (m) of coastal erosion

Category	North		Central		South		Length not shown	Overall	
	Number	Total length	Number	Total length	Number	Total length	Number	Number	Total length
1	0	0	2	7,260	9	52,507	0	11	59,767
2	0	0	7	16,191	6	22,800	0	13	38,991
3	0	0	6	6,000	5	6,700	1	12	12,700
4	0	0	0	0	9	5,956	1	10	5,956
Total	0	0	15	29,451	29	87,963	2	46	117,414
Share(%)	0%	0%	33%	25%	63%	75%	4%	100%	100%

Source: JICA survey team by using the data from DANH SÁCH CÁC ĐIỂM SẠT LỞ

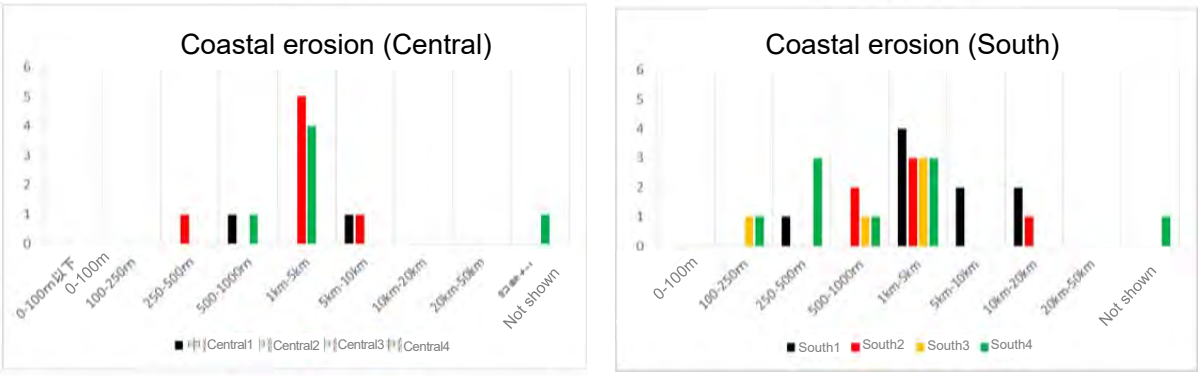


Figure 2.26 Number of locations of coastal erosion by length of damage and category

Source: JICA survey team by using the data from DANH SÁCH CÁC ĐIỂM SẠT LỞ

According to interviews at the VNDMA, particularly severe damage requiring prompt countermeasures are at the following six locations.

2) Coastal Erosion in Quang Nam Province

An estuary of the Cua Dai river on the northern coastline, located between the cities of Dien Ban and Hoi An, (2 points in Figure 2.27) has been subjected to severe coastal erosion for many years, resulting in erosion of 80m (maximum 200m) over a total length of 8km. Since 2014, the area has suffered extreme erosion, endangering roads and Cua Dai beach, which is a leading tourist region. Coastal resort hotels and restaurants have suffered particularly considerable losses as a result of this coastal erosion. As of 2018, the major erosion is shifting towards the North (adjoining Dien Ban), and such regions have been violently eroded by powerful winds in V to VI class (equivalent to wind speed 20-38 km/h). Many hotels, restaurants, and coastal levees have already been damaged.

Photo 2.11 View of coastal erosion damage in Quang Nam Province

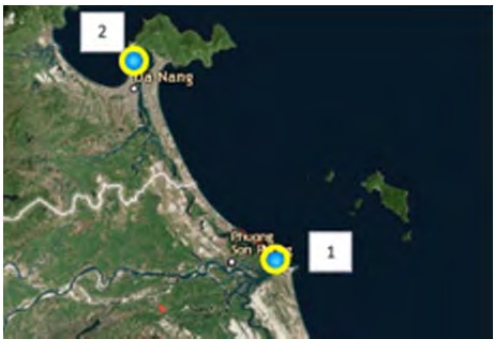


Figure 2.27 Locations of coastal erosion damage in Quang Nam Province (No.1)

Source : 「DANH SÁCH CÁC ĐIỂM SẠT LỞ」

3) Coastal Erosion in Binh Thuan Province

Since 2014, coastal erosion has caused damage centered on Lien Huong Town. From December 22 to 24 of the same year, a storm surge triggered by a typhoon harmed 95 members of 21 households, and endangered 14 more households. On December 22, 2015, 3 homes were damaged and 30 were impacted. A high tide on January 25, 2016 caused 20 to 30 m of erosion in one night, toppling 20 homes and endangering more than 100 other homes. DANH SÁCH CÁC ĐIỂM SẠT LỞ reports that erosion occurs at a rate of about 7.12 m/year (max. 15.2 m/year) over a total length of 1,200 m.

Photo 2.12 View of coastal erosion damage in Binh Thuan Province

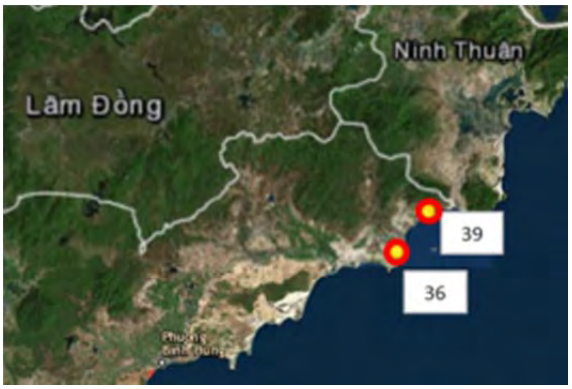


Figure 2.28 Locations of coastal erosion in Binh Thuan Province (No.36)

Source : 「DANH SÁCH CÁC ĐIỂM SẠT LỞ」

4) Coastal Erosion in Bac Lieu Province

Between mid-January and March of 2017, strong winds accompanied by high waves caused coastal erosion in various parts of Bac Lieu Province. It caused erosion about 10 m wide for a distance of 94 m on a levee in the Ganh Hao District, resulting in the collapse of the levee and the levee top road. The Nha Mat dike was also eroded for 24 m. Bridges and abutments were destroyed.

Photo 2.13 View of coastal erosion damage in Bac Lieu Province

Figure 2.29 Location of coastal erosion in Bac Lieu Province (No.56)
Source:「DANH SÁCH CÁC ĐIỂM SẠT LỞ」

5) Coastal Erosion in Ca Mau Province

Coastal erosion in Ca Mau Province has occurred at many locations in recent years. At the estuary of the Vam Xoay River in Ngoc Hien District, 50 to 80 m erosion occurred for a total distance of about 2,000 m, affecting 500 households, and endangering the Rach Tau Border Defense Base. At the estuary of the Rach Goc River, more than 750 households were endangered. This district is considered to be Category 1 in the DANH SÁCH CÁC ĐIỂM SẠT LỞ.

Photo 2.14 View of coastal erosion damage in Ca Mau Province

Figure 2.30 Locations of coastal erosion in Ca Mau Province（No.10）
Source：「DANH SÁCH CÁC ĐIỂM SẠT LỞ」

(2) Coastal Erosion: Occurrence, Trends, and Causes

Coastal erosion is often caused by an unbalanced sediment budget on the coastline or by another cause such as settlement of the land caused by ground settlements or by movement of the earth's crust. In Vietnam, it is assumed that almost all are influenced by the first factor; while in low-lying land in the Mekong Delta in the South, it is presumably caused by both factors. The impact of ground settlement due to excessive extraction of groundwater cannot be ignored.

In cases that the sediment budget becomes unbalanced, the quantity of supplied sediment become lower than the quantity of sediment transported on the coastline. However, in almost all cases, this imbalance is caused by human factors such as artificial structures rather than natural factors such as coastal drift sand. Other causes that lower the quantity of sediment supplied to the coastline are flood control measures such as reforestation, the construction of dams that lower the quantity of sediment produced upstream, or dredging, and others in the middle and lower reaches of a river

Moreover, “Data Collection survey on basin-based comprehensive sediment management in river systems of the central region” is a survey of coastal erosion in the Central region by JICA. In this survey, the Vu Gia-Thu Bon River in Quang Nam Province was investigated. It is hypothesized that other causes are reforestation, upstream dam construction, dredging of the river course or canals, plus bridges, weirs, and other artificial structures on rivers and jetties (partial protective facilities by resort owner) and revetments on the coastline.

The investigations conducted by MARD and Quang Nam province similarly highlighted the influence of dams, dredging in the river, and others. In addition, sand migration loss between sand dunes and coasts due to the construction of resort facilities, and the high tide increase in frequency in recent years are indicated.

2.4. Disaster Trend Analysis

2.4.1. Trend of Climate

A time series of annual total number of storms and tropical depressions that approached Vietnam in the past 30 years (1988-2017) is shown in Figure 2.31. Annual total number of approach and the total number of approached strong typhoons remains on the same level.

A previous study using climate model predicts that the number of typhoons approaching Vietnam will decrease in the future[13]. Comparing the trends for each typhoon intensity, however, the number of weak-moderate storms will decrease but severe storms will increase.

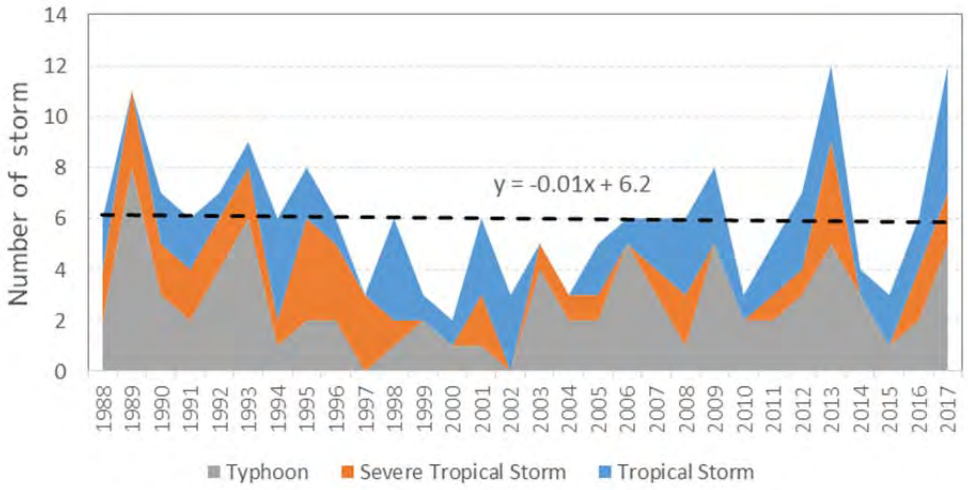


Figure 2.31 Number of storms approaching Vietnam (1988-2017)

Source: Prepared by JICA survey team based no best track data of JMA

Change in SDII (Simple Day Intensity Index: annual total rainfall per number of days when more than 1mm rainfall occurred) from 1950s to 2000s is shown in Figure 2.32. The rainfall in the Central and the South regions has increased in the recent 50 years. On the other hand, the rainfall in the North region has a decreasing trend. The trend of R50 (number of days when more than 50mm rainfall occurred) has also the same characteristics (Figure 2.32). However, the estimated future rainfall is inverse to the past trend. It is predicted that the annual rainfall and extreme rainfall (P90p: 90th percentile value of rainfall) in the North region will increase according to a previous study[14]. Moreover, increase of extreme rainfall in the Central Highlands and the South regions has been estimated. Since some analytical models estimates a rainfall increase countrywide, there is a possibility that the risk of floods and landslides will increase. The increase in landslide risk in the North region is a big concern because significant increase of extreme rainfall in the mountainous region has been predicted.

13 Climate Change and Sea level Rise Scenarios for Viet Nam – Summary for Policymakers, Tran et al., 2016

14 Raghavan et al., 2017: Ensemble climate projections of mean and extreme rainfall over Vietnam

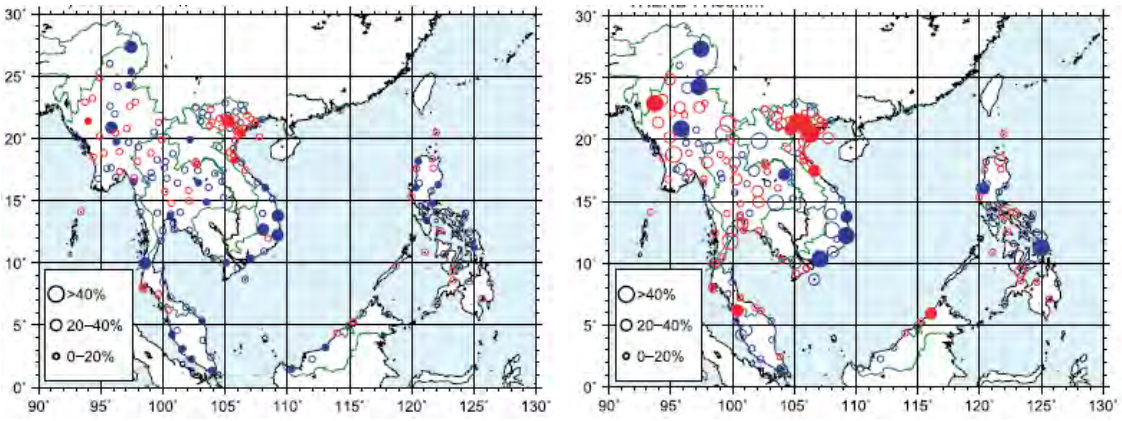


Figure 2.32 Change of SDII (left) and R50 (right)
(1950s-2000s, red: decrease, blue: increase)

Source: Endo et al. 2009 "Trends in precipitation extremes over Southeast Asia"

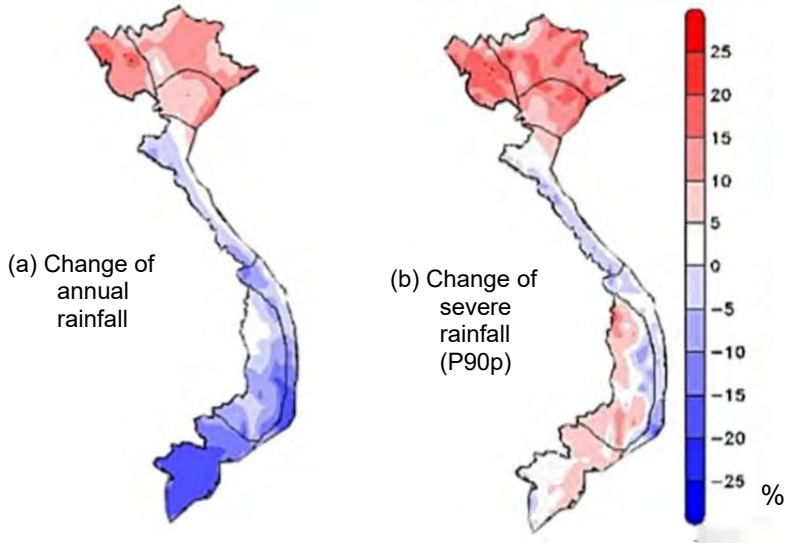


Figure 2.33 Future prediction of rainfall pattern change in Vietnam
(comparison of 1960-1989 and 2060-2089)

Source: Raghavan et al., 2017: Ensemble climate projections of mean and extreme rainfall over Vietnam

Regarding droughts, there is a possibility that drought will become severe in some regions because the rainfall amount will decrease in the dry season (e.g. decrease of rainfall amount in the coastal area of the South-Central region in spring to summer, in the South region in spring and in the North regions in winter).

The increase rate of air temperature in Vietnam was 0.42℃ in the past 30 years (1985-2014). The rate of sea level rise was 2.9mm/year. Vietnam is internationally regarded as a vulnerable country to the sea level rise. There is a possibility that ca. 10% of the total population and GDP will be affected by a 1-m sea level rise.[15]

2.4.2. Trend of Number of Deaths and Missing

A time series of the number of deaths and missing caused by natural disasters in Vietnam is

15 The Impact of Sea Level Rise on Developing Countries: A Comparative Analysis, (2007) Dasgupta et al., World Bank

shown in Figure 2.34. The most severe storm event in this record is "Linda" in 1997. "Linda" caused more than 3,000 deaths and missing in the country. Furthermore, a severe storm in 1996 and flood in 1999 in the Central region caused a considerable number of deaths and missing. The annual total number of deaths and missing not attributed to "Linda" is ca. 200-500; however, the numbers have been decreasing especially after the 2000s.

Majority of deaths and missing caused by floods and storms are from the Central region that is vulnerable to storms and monsoon rainfall (Figure 2.35). According to interviews at An Giang province, many people were killed by drowning accidents when they were moving in inundated areas and fell into less-visible ditches rather than accidents that happened to residents when they drifted away with the rapid flow of water. The major conceivable causes of injury are strong winds which destroy houses and make objects fly. A lot of death and missing in Ca Mau and Kien Giang, the south-end of the Mekong Delta, was caused by the storm "Linda" in 1997. "Linda" caused more than 1,000 missing fishing boats in the southern sea area and a lot of destroyed houses. A report pointed out that the local people did not recognize the risk of storms because there had not been any direct storm damage in the region for a long time.

As shown in 2.4.1, there is an increasing trend of rainfall intensity in the past 50 years in the Central and South regions which has a massive number of deaths by floods and storms. In addition, the number of storms and tropical depressions approaching Vietnam has not decreased. Therefore, the decrease of deaths and missing in Vietnam is not a result of changing meteorological conditions. Furthermore, effects of structural countermeasures to floods and storms seem limited because the economic damage of the disasters has increased in the past 30 years. Therefore, it is judged that the decrease in number of the death and injuries can be attributed to modernization of fishing boats (enhancement of communication and ship structures), community activities on Community Based Disaster Risk Management (CBDRM), resettlement, improving early warning/forecasting for typhoons, and early information dissemination with media development. According to the interview at Ninh Thuan province, disaster prevention activities (e.g. evacuation of local peoples and fishing boats based on the early warning, construction of evacuation shelters and strengthening of house roofs) are very effective at the local level.

It is necessary to promote those activities for disaster prevention because there is less possibility that the storms and floods in the Central and South regions will be dramatically reduced due to continuing climate change.

In the northern mountainous region that is vulnerable to landslides and flash floods, rainfall in the past 50 years decreased; the trend of the total number of deaths and missing remains at the same level or is decreasing. However, devastating landslides and flash floods have continuously occurred in recent years (e.g. landslide and flash floods resulted in more than 100 dead in total occurred in the North region in 2017; however, the original source of Figure 2.34 recorded the damage as partial damage due to storm). The number of deaths and missing caused by landslides and flash floods per population in the northern mountainous regions is high following that of floods and storms in the Central and Mekong Delta regions. Thus, it is presumed that landslides and flash floods have large impacts on human lives.

Increase of damage in the future in the Northern region is a concern due to the increase of rainfall in the future as Figure 2.33 demonstrates. Future economic development may also increase the possibility of resettlement in at-risk areas.

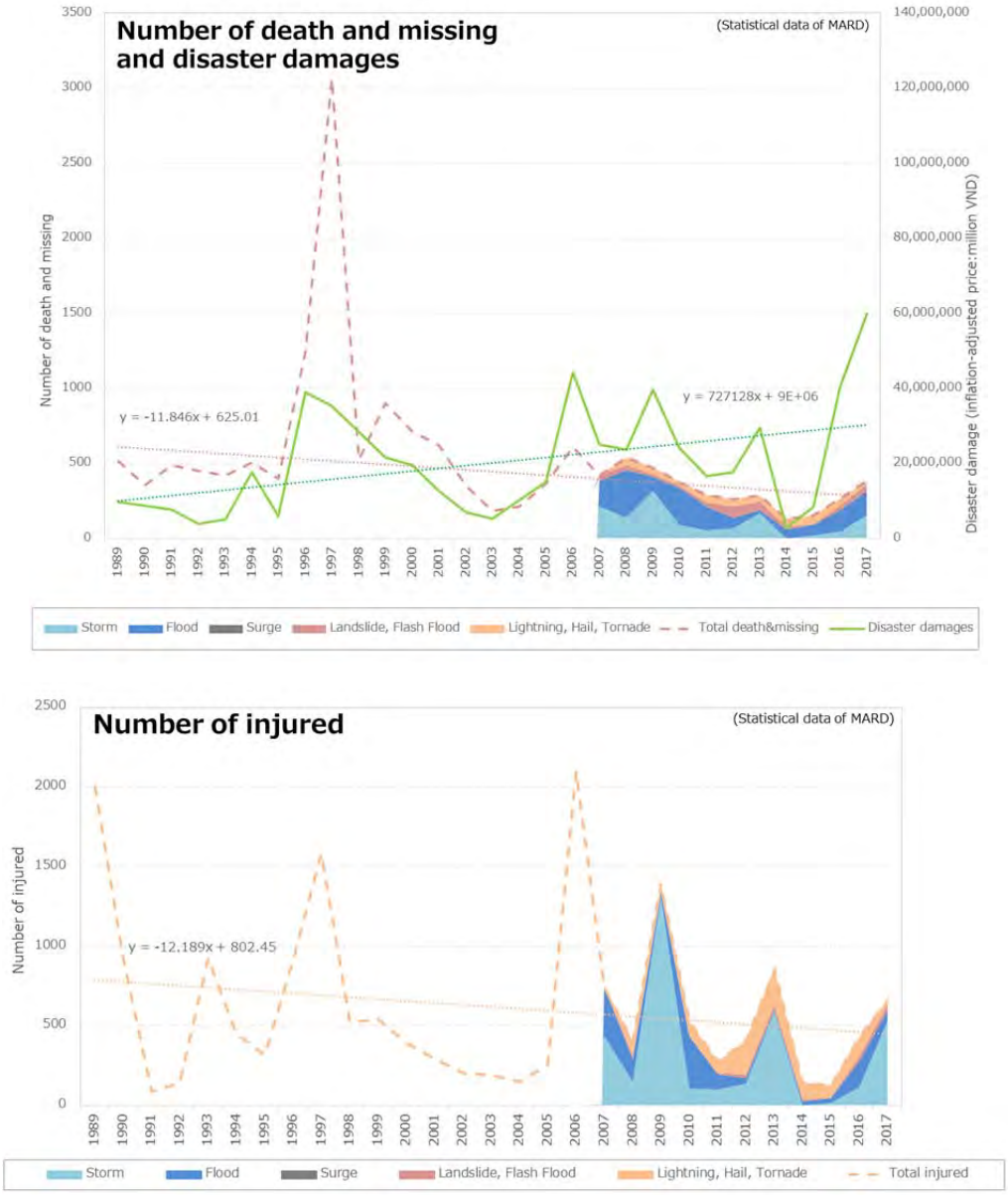


Figure 2.34 Number of death and missing (upper) and injured (lower) in 1989-2017
Note: regression line does not include Storm “Linda” in 1997
Source: Prepared by JICA survey team based on annual statistical data (1989-2017) of MARD

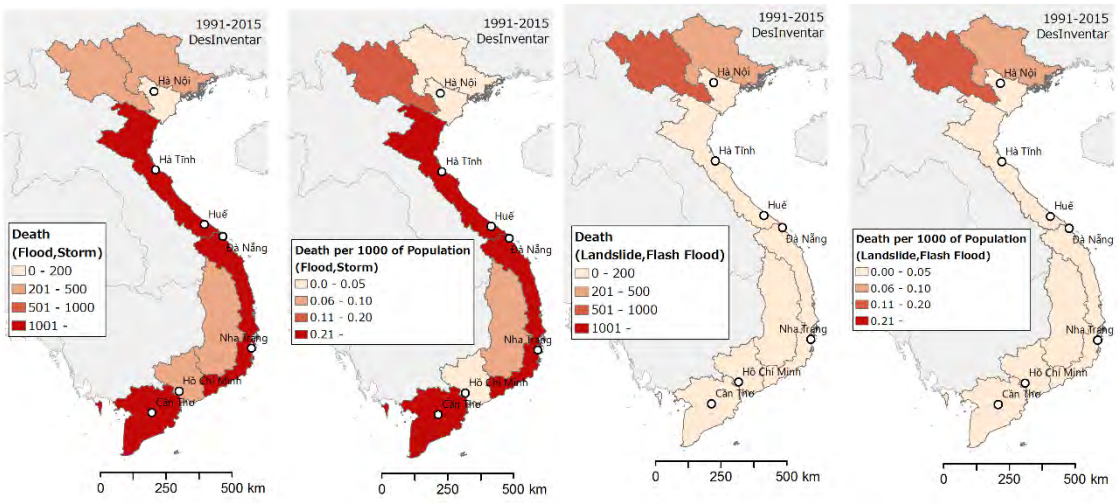


Figure 2.35 Distribution of death and missing (total number and number per 1,000 capita) caused by floods, storms, landsides and flash floods

Source: Modified after DesInventar: 1991-2015

2.4.3. Trend of Disaster Damage on Economy

Figure 2.36 shows a time series of disaster damage and GDP in Vietnam. The disaster damage on the economy has increased in the recent 30 years accompanying economic growth. The amount of disaster damage in 2016 is ca. 1% of GDP. The damage amount due to floods and storms (including parts of surge and landslide damage) accounts for a large portion of the each year disaster damage. The disaster damage due to drought in 2015-2016 is also large, which accounts for approximately 38% of the disaster damage in the 2 years.

Trends of disaster damages on roads and paddy fields are shown in Figure 2.37. The large part of the damages in the road sector occurs in the Northern regions. On the other hand, the damages to the paddy fields in the Red river delta and Mekong delta regions are large. Both damages (damage to roads and paddy fields) occur in the Central region where floods frequently occur. The road damage increases accompanying economic growth, but the paddy field damage decreases. Considering that the number of storms approaching Vietnam is stable, the decrease of disaster damage on paddy fields is the outcome of structural countermeasures in the agricultural sector and/or scale-down of paddy field areas. On the other hand, increase of damage on roads and total disaster damages on the economy indicates that enhancement of countermeasures to floods are not sufficient compared with rapid development and urbanization.

In the future, there is a concern that the amount of disaster damage will increase because of urbanization and increase of rainfall.

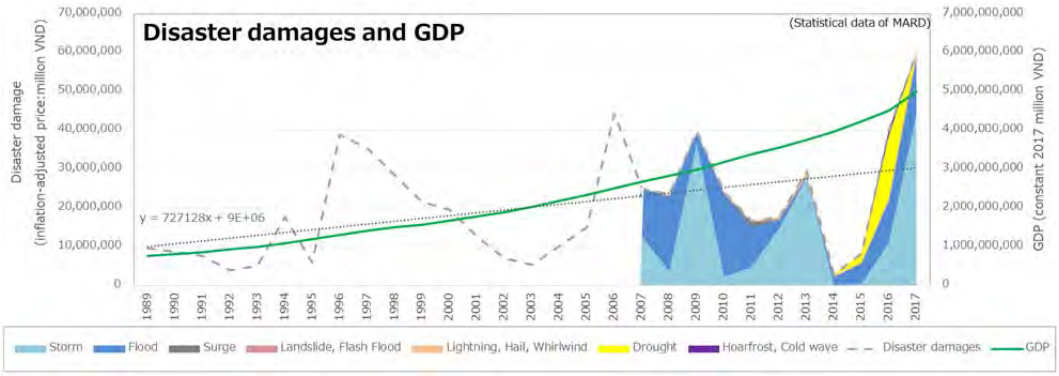


Figure 2.36 Trend of disaster damage and GDP in Vietnam (1989-2017)

Note: only total amount is available before 2006

Source: Prepared by JICA survey team based on annual statistical data (1989-2017) of MARD

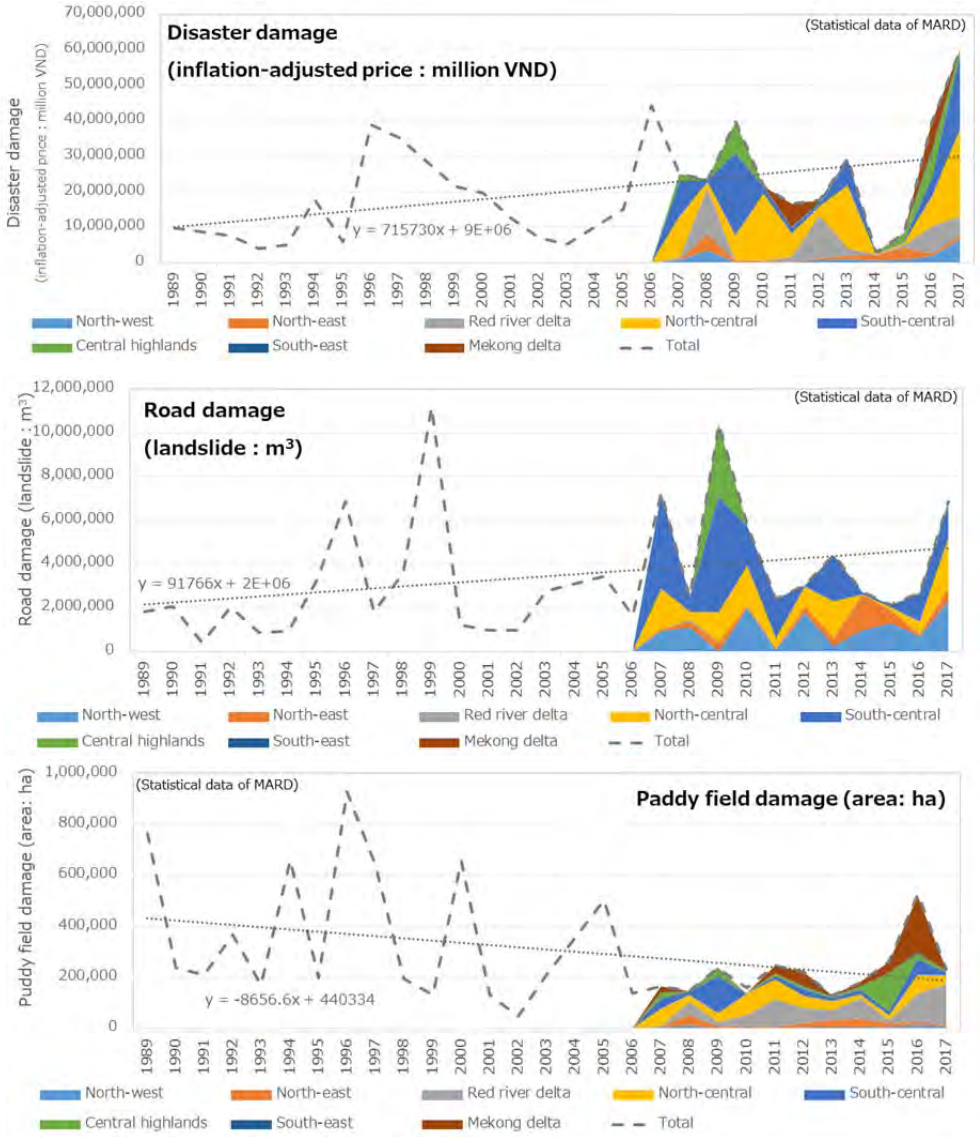


Figure 2.37 Trend of total disaster damage, road damage and paddy field damage in Vietnam (1989-2017)

Note: only total amount is available before 2006

Source: Prepared by JICA survey team based on annual statistical data (1989-2017) of MARD

2.5. Impact of Disaster on Social Development and Industry

2.5.1. Characteristics of Social Development and Industry

The GDP growth rate in Vietnam has been kept at more than 5% over the past ten years consecutively (Statistics Bureau of Vietnam). There is also a forecast that the growth rate will continue at around 5% per year through to 2030 (The World in 2050, 2017 - 2018 PwC). Looking at the composition of major industries in GDP in Vietnam, while the ratio of agriculture, forestry and fisheries industry declined, the ratio of industrial and services both rose to about 40% (Figure 2.38.). For many years, the economic base of Vietnam, which kept the image of an agricultural country, is, at present, mainly manufacturing and service industries.

In the working population in recent years, the workers in the agriculture, forestry and fishery industry generally remains the same level, while the number of workers in the mining and manufacturing industry has steadily increased. Until 2009, the number of workers in the agriculture, forestry and fishery industry was higher than the total for industrial and service industries, but this relationship was reversed in 2010. As of 2015, the total population of the latter is 1.27 times that of the former (Figure 2.39).

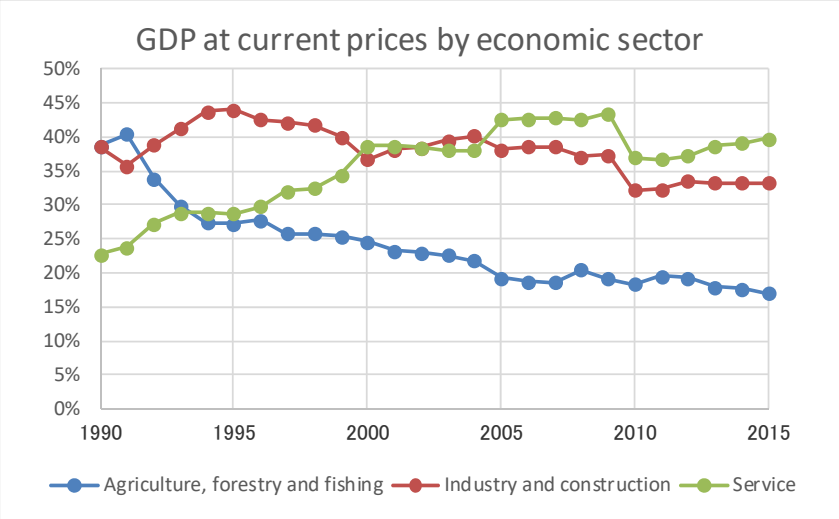


Figure 2.38 Changes in GDP ratios by industry

Source : https://www.alotrip.com/about-vietnam-economy/vietnam-economy-overview

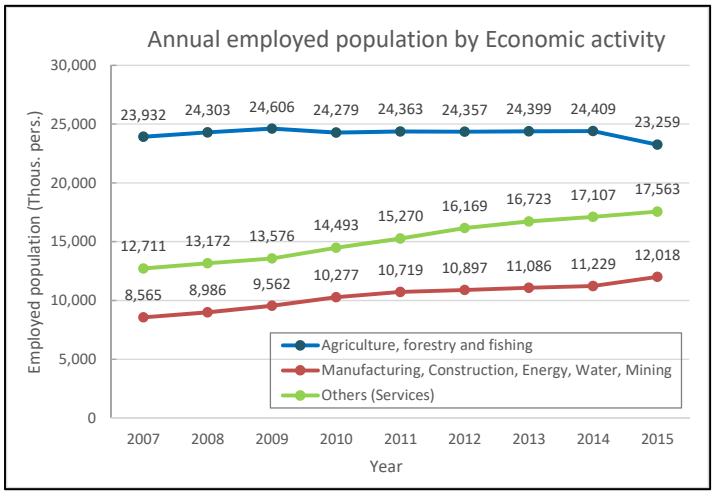


Figure 2.39 Changes in the Number of Workers by Industry

Source: Created from data of the Bureau of Statistics of Vietnam

2.5.2. Important Regions for Economic Production

With respect to industrial production by region, proportions of Ho Chi Minh City and the southeast region account for 44 % of the total. The ratio will increase to more than 50% in the South region as a whole, if Mekong Delta Region is added. In the second place, the North region including Hanoi City and Red River Delta accounts for 30 %. Moreover, the area with Da Nang city and the Coastal region of the North and the Central region accounts for 11%. The ratio of the Central Highland and the North Mountainous region only remain at small percentage (Figure 2.40).

Distribution of regions with high industrial production value are consistent with 3 major economic zones indicated in “Economic development plan, the economic development direction till 2010 and vision to 2020 (Decisions No. 145 , No. 146, and No. 148/2004 / QD-TTg)" conducted by Prime Minister Phan Van Khai in 2004 (see Figure 2.41, Figure 2.42). It means that the economic in each region is developing according to the plan.

Regarding the GDP ratio by region in 2010 shown below (エラー! 参照元が見つかりません。), the GDP of the Southeastern region is the highest followed by the Red River Delta. It accounts for about 74% of the total GDP in these two areas. From this result, it can be said that Vietnam has developed through two main economic centers: Ho Chi Minh City and Hanoi City. On the other hand, the proportion for the Central Highland is less than 1% and that for the Northern Mountainous area is less than 3%. Thus, the economic contribution by these regions to the country as a whole is relatively small.

Regarding the trend of GDP ratio during this period, the ratio in the Southeastern part has decreased by about 6%. In addition, the Red River Delta ratio has decreased by about 3% in this period. On the other hand, the ratio in the North and the Central Coast region (equivalent to northern and central south for disaster prevention) and Mekong Delta is increasing. In particular, the ratio of the Central North and the Central Coastal region has increased by approximately 30%, which indicates rapid growth. It can be said that the economic effects are due to industrial parks which have been locating in the Central region.

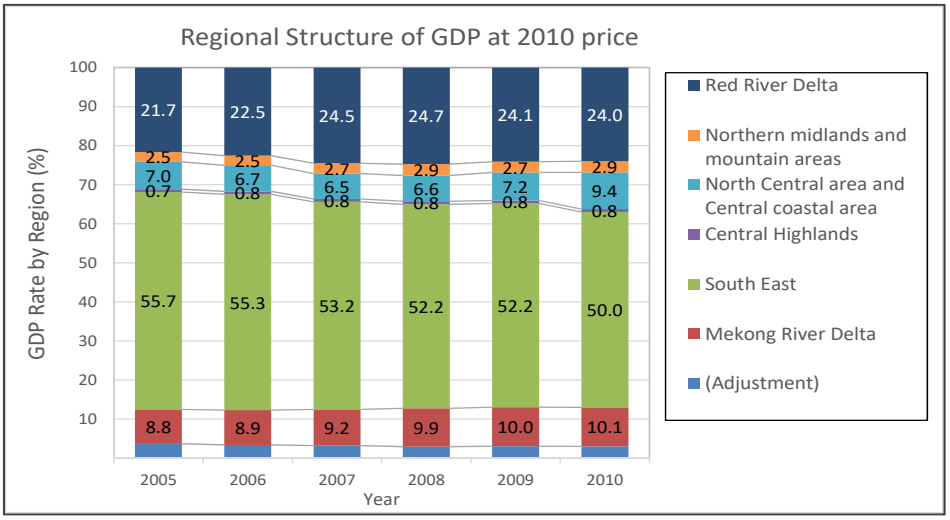


Figure 2.40 Trends of Regional Share of GDP

Source: Prepared by JICA survey team Compiling data of GENERAL STATISTICS OFFICE of VIETNAM

Regarding the ratio of industrial production value by region in 2013, the proportion of Ho Chi Minh City and the Southeastern region accounts for 44% of the total. It then accounts for 30% in the North region including Hanoi City and the Red River Delta. In addition, it is 11% in the combined area of Da Nang city and the Northern and Central coastal areas. The Northern Mountainous region and the Central Highland region are 3% and 1%, respectively.

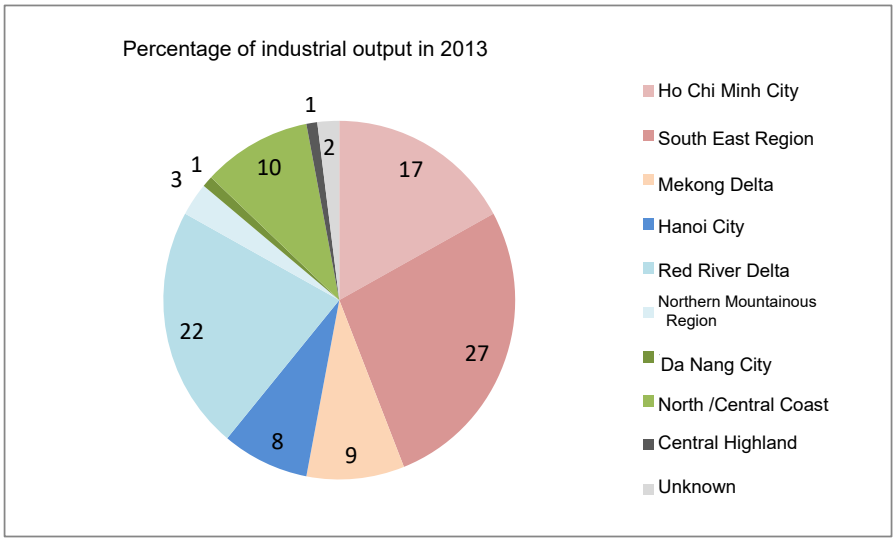


Figure 2.41 Percentage of industrial output by region

Source: "Recent Vietnamese Investment Environment" JICA advisor Hiroaki Yashiro, Excerpt November 2017

Figure 2.42 Important economic regions (Orange-colored) and cities designated in the economic development plan (2004)

Source: Outline of national land policy of each country, edited by Vietnam, Japan and Ministry of Land, Infrastructure and Transport
http://www.mlit.go.jp/kokudokeikaku/international/spw/general/vietnam/index.html

2.5.3. Changes in Social Structure

(1) Population of Urban and Rural Areas

Regarding the inhabited population in the rural and urban areas, the urban population is 35% and the rural population is 65% as of 2016. The rural population is about 2/3 of the whole population (Figure 2.43). On the other hand, the urban population has been consistently increasing over the past 20 years, and its increase rate is about 3% per year (Figure 2.44). However, the rural population is roughly constant. If this trend continues, it is estimated that relationship of the inhabited populations of the urban and the rural areas will reverse in the future.

"(Vietnam) Urban areas include inside urban districts of cities, urban quarters and towns. All other local administrative units (communes) belong to rural areas."

Source: Demographic Yearbook 2015, Table 6. The United Nations Statistics Division.

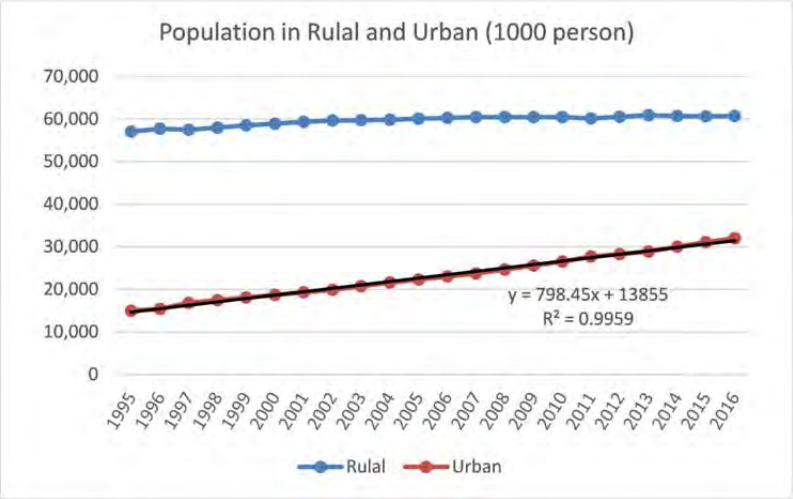


Figure 2.43 Population of the urban and the rural in Vietnam

Source : Published data of "GENERAL STATISTICS OFFICE of VIET NAM" compiled by JICA study team

In recent years in Vietnam, many people commute by motorcycles and buses from rural areas to factories or industrial parks located in local cities and others. In terms of the daytime population, the population gap between urban and rural areas is considered to be even smaller than that of the inhabited population.

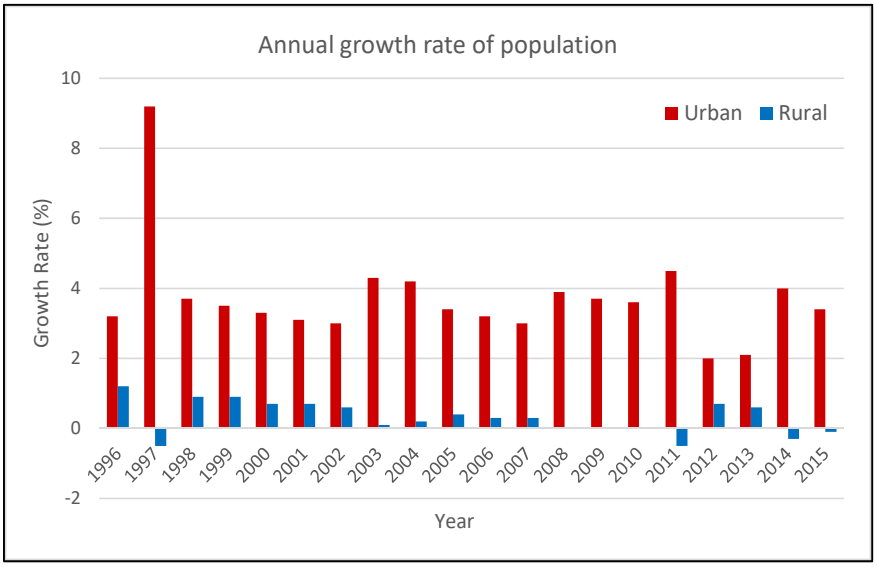


Figure 2.44 Population growth rate in urban and rural areas nationwide

Source : Published data of "GENERAL STATISTICS OFFICE of VIET NAM" compiled by JICA study team

(2) Population of each Provinces

Regarding the urban population by province (1995-2010), in Hanoi City it increased to 271% and it increased to 264% in Binh Duong Province. The increase in urban population in important economic areas in the North and South region is obvious. Meanwhile, the urban populations of other provinces are also increasing by more than 100%. It is remarkable that it is relatively high in the Central Highland region.

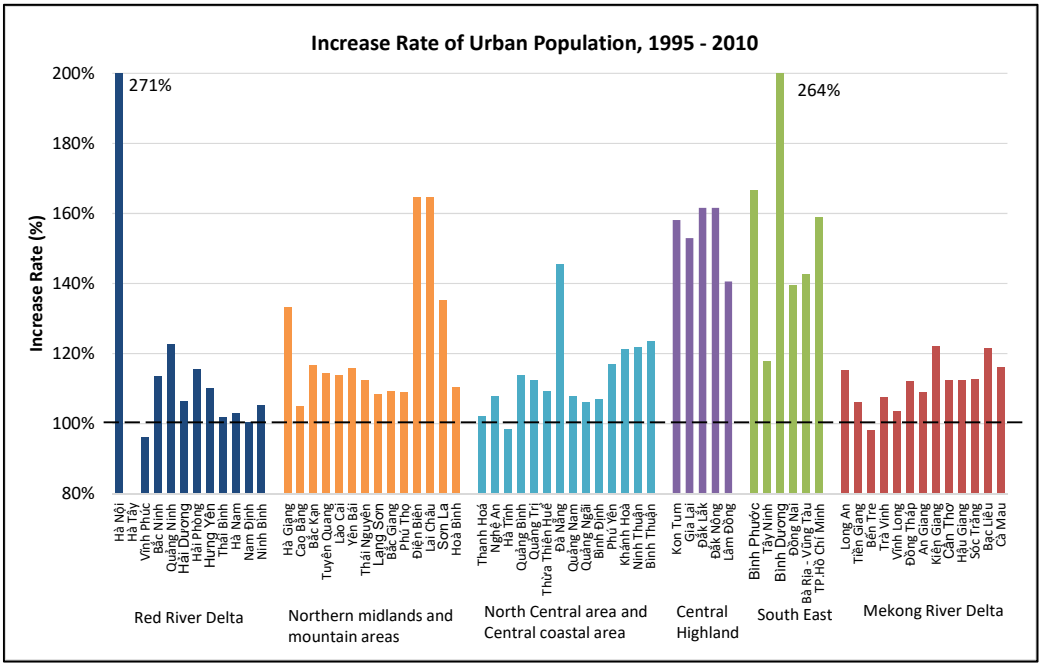


Figure 2.45 Changes in urban population of the Provinces: 1995 – 2010

("100%" means not changed)

Source : Published data of "GENERAL STATISTICS OFFICE of VIET NAM" compiled by JICA study team

2.5.4. Industrial Parks, Special Economic Zones

In terms of industrial economic development in Vietnam of recent years, industrial parks have played an important role. In order to promote rapid industrialization while there is a lack of decent infrastructure such as uniformed provisions of water supply and electricity throughout the country, the Central and Local Governments have intensively invested in infrastructure in the specific areas, which enabled industrial activities. In addition, several "Special Economic Zone" which provide incentives for tariffs and investment, etc. have been situated in various places. These are often far from the center of the traditional local cities and are often located on coastal and flat areas that are advantageous for shipping and land transportation. If these are located in an expected inundation area, the economic damage is likely to become rather enormous. It is obvious that the numbers of locations of the industrial estates are mainly in the provinces of the Red River Delta, the Southern regions, and the Central Coast region (Figure 2.46). In the Southeastern region especially, the industrial estates are found in the provinces around Ho Chi Minh City.

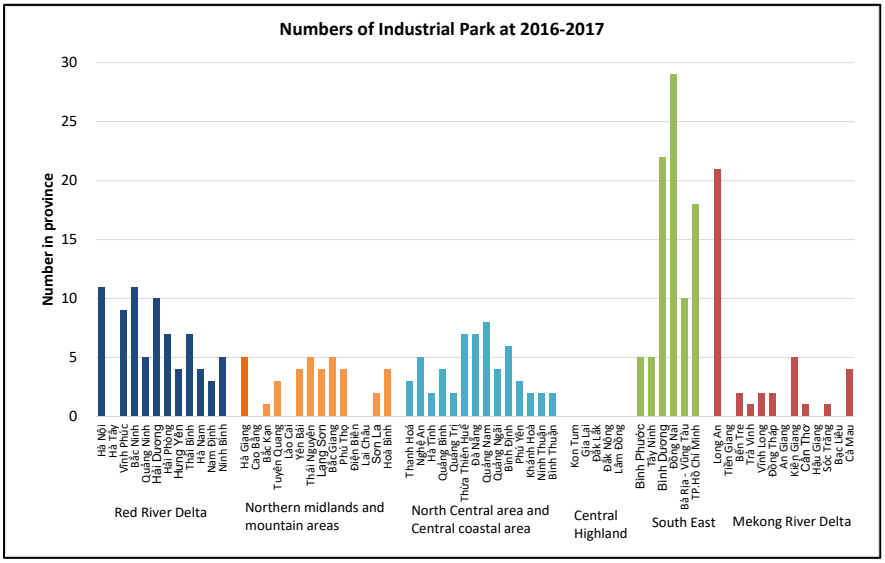


Figure 2.46 Numbers of industrial parks by Province (2016-2017)
Source: JETRO Survey Report "Northern and Central Industrial Estate Data Collection in Vietnam January 2017" and "Updated Industrial Complex Databases near Ho Chi Minh City in Vietnam City 2016" by JICA study team

2.5.5. Disaster Impact on Social Development and Industry

In Vietnam, the urban population is increasing in most of the provinces against a backdrop of the recent economic development. This urbanization can become a potential risk factor for increasing human and economic damage by floods and storms in urban areas. In addition, the urban area can be the core for activities of industrial and service industries leading to economic development in recent years. Therefore, declines in urban functions caused by natural disasters have direct impact on the regional and national economic growth.

In industrial parks and large-scale factories, the information such as land elevation, inundation records, and predicted inundation areas, are generally taken into consideration at the beginning of the planning, conforming to the guidelines of the relevant Ministry. Therefore, as for the large-scale production facilities, the damage risks by natural disasters is not considered so high. As seen in the damage in an industrial cluster in Thailand by flooding, suppressing the damage on industrial zones by flooding to zero is very difficult, in general. However, in Vietnam, highly productive facilities are gradually increasing and clustered together. Since the majority of the industrial production value especially comes from industrial parks and special economic zones, deterioration of crucial industrial functions at industrial parks etc. by natural disasters will cause a great damage to the national and the regional economies.

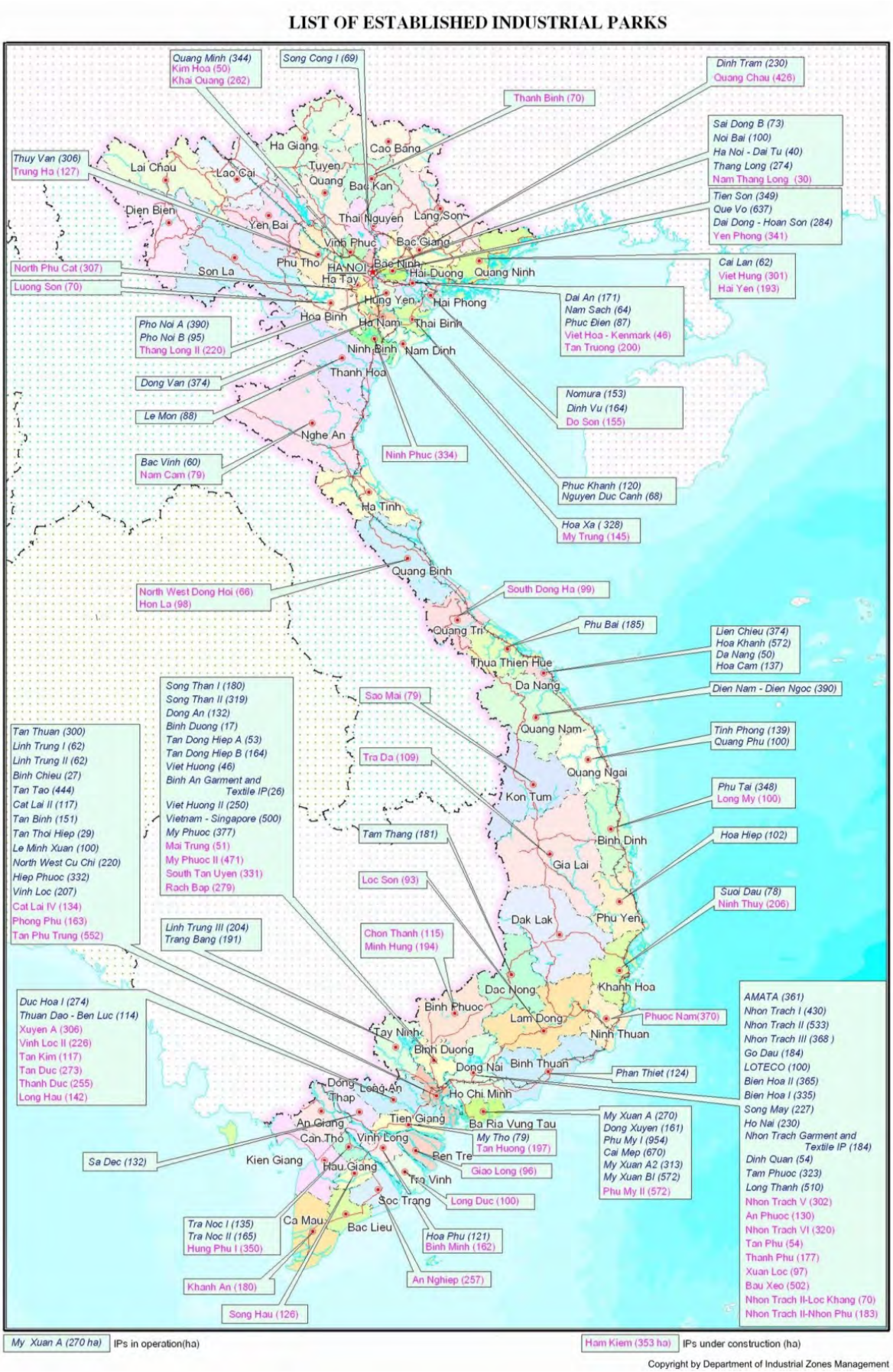


Figure 2.47 Location map of main industrial parks in Vietnam

Source : ECONOMIC ZONES IN THE ASEAN, INDUSTRIAL PARKS, SPECIAL ECONOMIC ZONES, ECO INDUSTRIAL PARKS, INNOVATION DISTRICTS AS STRATEGIES FOR INDUSTRIAL COMPETITIVENESS, UNIDO Vietnam office August 2015

3. DRR Sector in Vietnam

3.1. Current Situation of Legal, Political and Institutional Arrangement

3.1.1. History of DRR sector in Vietnam

(1) Beginning of DRR in Vietnam (~ 1995)

The basis of the legal arrangement of DRR in Vietnam was established when the Central Dike Protection Committee was created by Ho Chi Minh in 1946. In 1994, the "Ordinance on Prevention and Control of Floods and Storm Control" was enacted and the "Central Committee for Flood and Storm Control (CCFSC) was established. The CCFSC was chaired by the Minister of MARD and composed of representatives from the relevant central ministries. The "Department of Dike Management and Flood and Storm Control (DDMFSC)" in MARD was functioning as the standing office of the CCFSC. Since then, MARD has been the leading agency of DRR in Vietnam. This structure has since evolved into the current DRR system initiated by the Central Steering Committee for Natural Disaster Prevention and Control (CSCNDPC).

(2) Establishment of MARD and MONRE (1995 ~ 2005)

MARD was established in 1995 by unifying the Ministry of Agriculture, Ministry of Water Resources and Ministry of Forests. Hydro-meteorological management had been undertaken by the Ministry of Irrigation, but there was no conceptual mandate on "Water Resources". It was just for public services for agro-meteorology and irrigation purposes.

To strengthen the integrated water resources management, a "Law on Water Resources" was enacted in 1998. The Law aimed to promote "river basin management", such as 1) formulation of water resources management system, 2) establishment of national council on water resources, and 3) establishment of River Basin Organization (RBO). MARD was the responsible agency to implement the Law. Accordingly, MARD became an agency to control both "water resources management" and "river basin management".

On the other hand, as the implementation agency of Law on Environment, MONRE was established becoming independent from the Ministry of Science, Technology and Environment (MOSTE) in 2002. On this occasion, the functions on water resources management including hydro-meteorological management under MARD and its staffs were transferred to MONRE. However, the river basin management that is closely interlinked with irrigation works and flood and dike management remained in MARD. The Secretariat of RBO had also remained in MARD. Accordingly, the administration of "water resources management" and "basin management" was transferred to different ministries. It must be noted that both "Thuy Loi" (irrigation) and "Tai Nguyen Nuoc" (water resources) are translated as "water resources" in English. However, it is clearly different in Vietnamese. In the survey, the Department of Water Resources, MONRE pointed out that this often causes confusion with international donors. For instance, the Directorate of Water Resources and Vietnam Academy of Water Resources in MARD use "Thuy Loi" in Vietnamese. On the other hand, the Law on Water Resources uses "Tai Nguyen Nuoc".

(3) Heightened DRR Needs and Formulation of Law on NDPC (2005 ~ 2015)

After the Hyogo Framework in 2005, the needs of DRR have been heightened in the society of Vietnam. In 2007, the "National Strategy for Natural Disaster Prevention, Response and Mitigation till 2020" was formulated aiming at strengthening the disaster prevention organization structure centered on CCFSC for flood and storm control. This strategy focuses on floods and storms and shows strategies for mitigation and management of disasters. In 2009, the "Action Plan on implementing the National Strategy for Natural Disaster Prevention, Response and Mitigation" was established, in which each government agency, province, and city fulfill its obligation to formulate strategic action plans. In the same year, the Prime Minister's decision on CBDRM (No.1002/2009/QD-TTg) was issued to promote local resilience through community activities.

In 2010, the Central region suffered widely from extremely severe floods. The public and media criticized that inappropriate dam operations were one of the causes of the floods. At this time, an important decision was made by the Prime Minister (No.1879/2010/QD-TTg), that 61 dam reservoirs in major river basins should have integrated operation procedures and management, which shall be developed by MONRE who is responsible for hydro-meteorology and water resources management. In 2012, the "Law on Water Resources" was amended, in which MONRE became the responsible agency for basin management in addition to the water resources management.

Thereafter, the "Law of Natural Disaster Prevention and Control" was enacted in May 2013. In this law, the previous "Flood and Storm Control" was renamed to "National Disaster Prevention and Control", to cover all 19 types of disasters not only floods and storms (thereafter snow disaster and forest fire were added). The law stipulates that each authority level should take prime responsibility according to the "Natural Disaster Risk Levels". For instance, local governments should mitigate, prepare and respond to the disasters of levels 1 and 2 (the details of Natural Disaster Risk Levels shall be described in Section 3.3.3). In addition, the law stipulates the establishment of "Natural Disaster Prevention and Control Funds" that can be directly collected and utilized by provincial governments. It means that the law aims at decentralization of DRR. In response to the law, MARD proceeded to the reorganization and set up the "Department of Natural Disaster Prevention and Control (DNDPC)" in place of the "Department of Dike Management and Flood and Storm Control (DDMFSC) in 2014.

(4) Strengthening DRR Institution (2015 ~)

In August 2017, a new Directorate was established consolidating the DNDPC and the other departments of the Directorate of Water Resources. In this reorganization, the function of Disaster Management Center (DMC) which takes the role to promote CBDRM was integrated into the Directorate. A Department of International Cooperation and Science and Technology was established in the Directorate. It means that the Directorate became an independent authority to actively promote DDR in MARD. Considering the Sendai Framework and international appeal of the governmental efforts, the name of the Directorate in English was determined as "Vietnam Disaster Management Authority (VNDMA)".

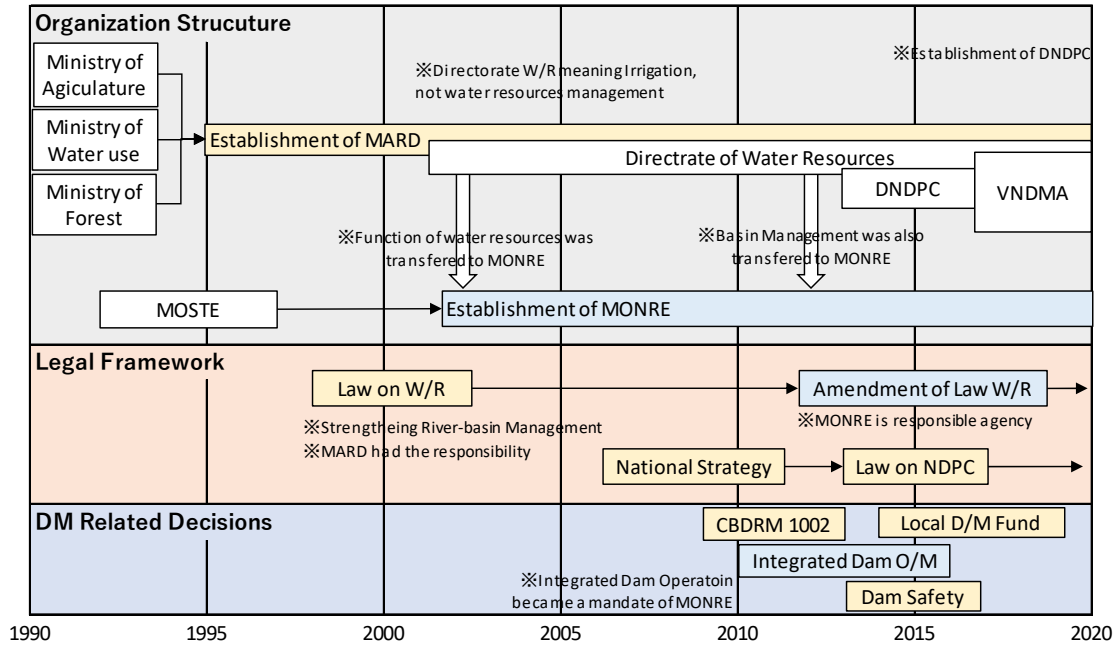


Figure 3.1 History of DRR organization and legal framework in Vietnam

Source: JICA Survey Team

3.1.2. Legal, Political and Institutional Arrangement

DRR institution in Vietnam was stipulated in the Law on National Disaster Prevention and Control (Law on NDPC). The Law was approved in June 2013 and enforced in May 2014. In addition to the Law, the Decree on "Detailing and Guiding of Articles of the Law" (No.66/2014/ND-CP) regulates responsibility of central and local agencies and coordination mechanism on DRR.

Formulation of National Strategy and NDPC Plans and Natural Disaster Response Plans are clearly regulated in the Law. The structure of law, strategy and plans are shown in Figure 3.2. The National Strategy was formulated in 2007 based on the previous "Ordinance on Prevention and Control of Floods and Storms". There has been no amendment of the Strategy until 2018. The NDPC Plans at national level and local levels are formulated individually. Therefore, a national-level plan is not an umbrella plan for lower levels. The Disaster Response Plan is not regulated at the national level.

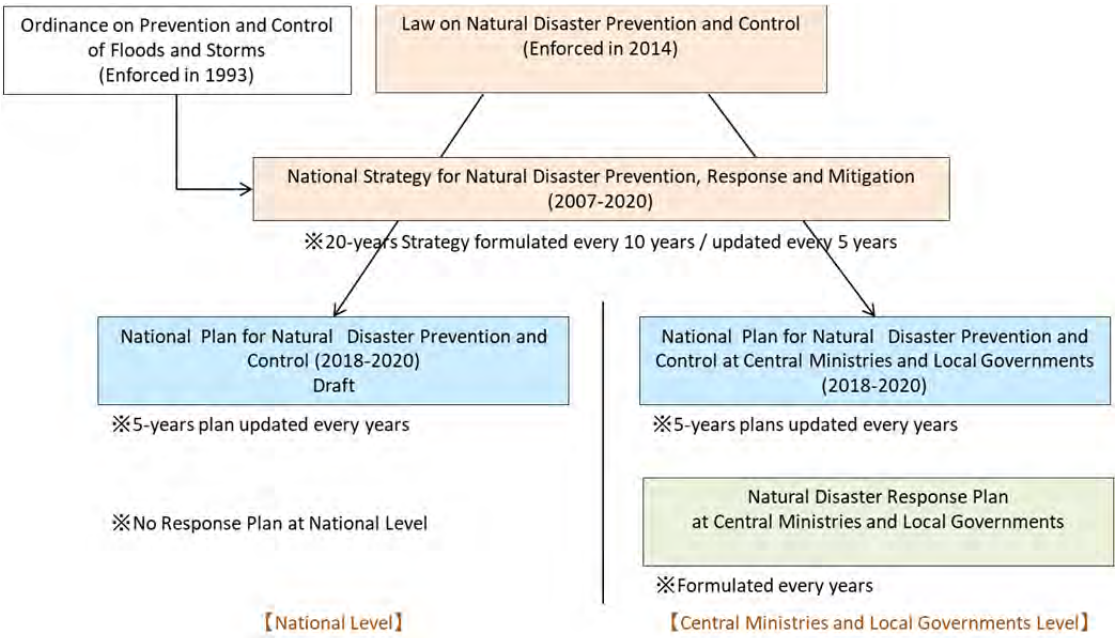


Figure 3.2 Law, Strategy and Plans in DRR

Source: JICA Survey Team

(1) Level Arrangement

Hierarchy of legal arrangement in Vietnam is shown in Table 3.1

Table 3.1 Hierarchy of Legal Arrangement in Vietnam

Hierarchy	Vietnamese	English
1	Hiến pháp	Constitution
2	Luật	Law
3	Pháp lệnh	Ordinance
4	Nghị định	Decree
5	Quyết định của Thủ tướng chính phủ	Decision
6	Thông tư của Bộ trưởng	Circular

Source: JICA Survey Team

DRR related laws, decrees and decisions are shown in Table 3.2

Table 3.2 DRR related Laws, Decrees and Decisions

Class / Number	English Title
■Law	
No.79/2006/QH11	Law on Dikes
No.17/2012/QH13	Law on Water Resources
No.33/2013/QH13	Law on Natural Disaster Prevention and Control
No.90/2015/QH13	Law on Hydrometeorology
No.8/2017/QH14	Law on Irrigation
■Decree	
No.72/2007/ND-CP	Dam Safety Management
No.66/2014/ND-CP	Detailed Guiding for Articles of Law on NDPC
No.94/2014/ND-CP	Natural Disaster Prevention and Control Fund
No.30/2017/ND-CP	Regulation on Disaster Search and Rescue
■Prime Minister Decision	
No.1002/2009/QD-TTg	Community Awareness Raising and CBDRM
No.1879/2010/QD-TTg	List of Reservoirs establishing Integrated Rules

Class / Number	English Title
No.1/2011/QD-TTg	Regulation for Riverbanks and Coastal Erosion
No.1061/2014/QD-TTg	Implementation Plan for Law on NDPC
No.44/2014/QD-TTg	Detailed Regulation on Natural Disaster Risk Levels
No.46/2014/QD-TTg	Disaster Forecasting, Warning and Communication
No.367/2015/QD-TTg	Establishment of the CSCNDPC
No.26/2017/QD-TTG	Regulation on functions and tasks of VNDMA
■Joint Circular	
No.43/2015/TTLT-BNNPTNT-BKHDT	Statistics and Assessments of Disaster Damages

Source: JICA Survey Team

1) Law on Natural Disaster Prevention and Control

The Law on NDPC is composed of the following chapters;

Chapter 1: General Provisions
Chapter 2: Natural Disaster Prevention and Control Activities
- Section 1: Prevention of Natural Disasters
- Section 2: Response to Natural Disasters
- Section 3: Remediation of Natural Disaster Consequences

Chapter 3: Rights and Obligations of Agencies, Organizations, Households and Individuals in Natural Disaster Prevention and Control
Chapter 4: International Cooperation in Natural Disaster Prevention and Control
Chapter 5: Responsibility for State Management of Natural Disaster Prevention and Control

The key articles and characteristics of the Law on NDPC are as follows:

a) Basic Principles of Natural Disaster Prevention and Control

Article 4 describes the basic principles of natural disaster prevention and control. In Vietnam, “Four on-the-Spot Motto” is widely acknowledged as a basic philosophy of DRR. “Four on-the-Spot” means command on the spot, manpower on the spot, supplies on the spot and logistic on the spot. The basis is the common sense that natural disaster is a local event, it is strongly indicated that DRR should be based on local efforts and strengthening local capacity is the most important. Article 4 also indicates that DRR should be integrated into natural and local socio-economic development plans and sectoral development plans to promote mainstreaming of DRR.

Article 5 stipulates national policy to invest in construction of key natural disaster prevention and control works and support localities as decentralized by the government.

b) Natural Disaster Prevention and Control Funds

Article 6 stipulates “Natural Disaster Prevention and Control Funds (NDPC Funds)”. The Fund can be collected and utilized for disaster management activities by provincial governments. All citizens in the provinces aged between 18 years and retirement age, and private enterprises contribute to the Fund. The Fund is also a very important financial resource in DRR. However, the Law describes the uses of the Funds only as emergency relief, repairing houses and infrastructures and handling environmental sanitation. There is no clear application for investment in DRR activities. The details of the Funds shall be explained later.

c) National Strategy and NDPC Plans

Article 14 describes the National Strategy. As shown in Figure 3.2, the National Strategy for NDPC shall be formulated every 10 years with a 20-year vision. The "National Strategy for Natural Disaster Prevention, Control and Mitigation till 2020" formulated in 2007 shall be updated by 2020 according to the Law.

Article 15 describes the NDPC Plans. The NDPC Plans shall be formulated every 5 years at national, central ministries and each level of local governments. The National NDPC Plan (2018-2020) was already drafted in February 2018, and the Provincial NDPC Plans were formulated in 58 provinces out of 64 as of June 2018.

Article 17 describes the identification, assessment and zoning of natural disaster risks. Out of 19 types of disasters, 17 disasters shall be the responsibility of MONRE while earthquake and tsunami are the responsibility of the Vietnam Academy of Science and Technology. In reality, however, risk assessment and hazard mapping at the local levels have been under MARD and the Department of Agricultural and Rural Development (DARD) in each province.

d) Responsible Agency

Article 44 stipulates the agencies directing and commanding natural disaster prevention and control. The CSCNDPC is the highest directing and commanding organization for natural disaster prevention and control in Vietnam. The Prime Minister shall organize the committee composed of relevant ministries and agencies. The law also regulates MARD activity as the standing office of the committee. In addition to the national level, it stipulates that the central ministries and the local governments should establish the "Commanding Committee for Natural Disaster Prevention and Control (CCNSPC)".

2) Other DRR Related Laws

a) Law on Water Resources

MARD was the responsible agency for the previous Law on Water Resources enforced in 1998. However, due to the establishment of MONRE, diverse needs for water resources and coping with climate change, the actual business had become discordant with the legal arrangement. Therefore, the Vietnamese government amended the Law on Water Resources in 2012, in which MONRE was appointed as the prime agency to implement the Law. According to the Law, basin management closely related to the water resources management became principally undertaken by MONRE.

The Law on Water Resources is composed of the following Chapters:

Chapter 1: General Provisions
Chapter 2: Water Resources Basic Survey, Strategies and Master Plans
Chapter 3: Protection of Water Resources
Chapter 4: Exploitation, Use of Water Resources
Chapter 5: Prevention and Control of Water Related Disasters
Chapter 6: Finance on Water Resources
Chapter 7: International Relationship on Water Resources
Chapter 8: Responsibility on Water Resources Management
Chapter 9: Inspection of Water Resources and Solving Disputes on Water Resources

Chapter 10: Implementation Provisions

Article 3 in Chapter 1 describes the river basin management that must be in conformity with water resources management. Chapter 2 stipulates the master plans for water resources that should be formulated every 10 years with a 20-year vision.

Regarding disaster related issues, Chapter 5 describes the "Prevention of droughts, floods and artificial waterlogging (Article 60)", "Prevention of saltwater intrusion (Article 61)", "Prevention of land subsidence (Article 62)", "Prevention of river and coastal erosion (Article 63)". Article 60 regulates the inter-reservoir operation for flood prevention as follows:

- MONRE makes the list of reservoirs that must be operated under process on inter-reservoirs operation and elaborate process of inter reservoir operation on river basins,
- MARD, Ministry of Industry and Trade and Provincial People's Committees and other organizations operate reservoirs within their tasks and submit the process of reservoir operation to relevant authorities.

b) Law on Hydro-Meteorology

The Law on Hydro-Meteorology stipulates the hydro-meteorological activities including management and operation of station networks, forecasts and warnings, hydro-meteorological information services, climate change monitoring and state administration, rights, responsibility and obligations of agencies, organizations, and individuals. The Law was enforced in 2015.

MONRE is the responsible agency to implement the Law. Article 11 in Chapter 2 stipulates the plan for the national hydro-meteorological station network which should be formulated every 10 years with a 20-year vision. This Article appoints MONRE as the responsible agency for forecasting and warning for natural disasters. Article 35 and 36 in Chapter 5 describe the development of climate change scenarios that should be issued every 5 years with an assessment period of 10 years.

c) Law on Dikes

The Law on Dikes stipulates flood control planning and dike planning for diked rivers, investment and construction of dikes, rehabilitation, upgrading and solidification of existing dikes, dike management, maintenance and uses.

MARD is the responsible agency to implement the Law, having important roles on comprehensive flood control in river basins. The Law stipulates the flood protections as follows:

- To determine the flood control orientation, targets and technical standards of the river systems to elaborate and implement flood control plans of the diked rivers,
- To determine the design floods of the rivers, including design flood discharges and high-water levels, and
- To determine the technical solutions for flood control of diked rivers, including construction of reservoirs, dikes and river bank protections, afforestation and forest conservation, identification of retarding basins and flood diversion to the other rivers.

(2) Institutional Structure

Institutional structure and responsibility of each level of governments are stipulated in the Law on NDPC and Decree on "Detailing and Guiding of Articles of the Law" (No.66/2014/ND-CP).

1) Institutional Structure at Central Level

The CSCNDPC was established by the Prime Minister to support the government and the Prime Minister initiating and commanding during disasters and to coordinate among relevant agencies. The CSCNDPC was officially established based on the Prime Minister's Decision No.367/2015/QD-TTg.

The CSCNDPC is chaired by the Minister of MARD and composed of members shown in Table 3.3.

Table 3.3 Composition of CSCNDPC

Title	Members
Chair	Minister of MARD
Permanent Vice-Chair	Vice-Minister of MARD
Vice-Chair	Vice-Director of Government Office
Vice-Chair	Vice-Chair of National Committee for Incidents, Disaster Response, Search and Rescue
Permanent Member	Leaders of MARD, MONRE, Ministry of National Defense, Public Security, Information and Communications, Industry and Trade, Transport, Construction, Education and Training, Health, Culture, Sports and Tourism, Foreign Affairs, Labor, War Invalids and Social Affairs, Science and Technology, Planning and Investment, Finance, Vietnam Television, and Voice of Vietnam Heads of departments of MARD, MONRE, Ministry of National Defense National Committee for Search and Rescue Academy of Science and Technology of Vietnam
Non-permanent Members	Leaders of Vietnam Fatherland Front Central Committee, Central Women's Union, Central Ho Chi Minh Communist Youth Union, Central Vietnam Red Cross Society and other related organizations
Standing Office	Established in MARD (on Prime Minister's Decision No.1536/2015)

Source: Decree No.66/2014/QD-TTg

According to Article 18 of Decree No.66/2014/ND-CP, the tasks of CSCNDPC is regulated as follows:

- To guide the formulation and implementation of National Strategy, Plans, Policies, and Laws on NDPC,
- To guide the formulation of Natural Disaster Response Plans,
- To direct the response to natural disasters of levels 3 and 4, to coordinate and support localities in responding to natural disasters of levels 1 and 2,
- To decide on urgent measures and mobilize resources to respond to natural disasters,
- To direct the preparation of statistics on damages and needs for relief and propose the Government or the Prime Minister to decide on measures and resources, and
- To examine and urge ministries, sectors and localities in carrying out NDPC activities.

The Directorate of Water Resources of MARD was appointed as the standing office of CSCNDPC based on the Decision No.1536/2015/QD-BNN. After the upgrading of the Department of Natural Disaster Prevention and Control into the Directorate, the VNDMA took over the function of the standing office. The Director-General of VNDMA is the head of the standing office.

In addition to the CSCNDPC, there is another central committee which is the "National Committee for Search and Rescue (NCSR)" chaired by the Vice-Prime Minister, to direct and command search and rescue activities. The Department of Relief under the Ministry of Defense is the standing office of the NCSR.

It seems that the highest decision-making body at central level is duplicated. However, according to the interview with MARD, search and rescue activities at the sites should be controlled under the strong command of the Ministry of Defense. Both committees assign vice- chair persons and members for each other, so there is no demarcation problem in coordination mechanism between the two committees. In fact, according to Article 23 in the Decree No.66/2014/ND-CP, The CSCNDPC shall take the prime responsibility for, and coordinate with the NCSR in issuing written directions for response to specific natural disaster circumstances.

Article 19 in the Decree No.66/2014/ND-CP stipulates to establish the Commanding Committee for Natural Disaster Prevention and Control, Search and Rescue (CCNDPC/SR) at MONRE, Ministries of National Defense, Public Security, Transport, Construction, Industry and Trade, Finance, Information and Communications, Health, Education and Training and Labor, War Invalids and Social Affairs. Although the Decision doesn't regulate detailed composition of the CCNDPC, according to the interviews with relevant ministries, the CCNDPCs are mostly chaired by vice-ministers.

2) Institutional Structure at Local Level

Articles 20 to 22 in the Decree No.66/2014/ND-CP stipulate the establishment of CCNDPC/SR and its organization and tasks at the provincial, district and commune levels. The Committees are chaired by a chairperson of the People's Committee in each level.

Vice-chairpersons of provincial CCNDPC/SR are the Director of Department of Agriculture and Rural Development (DARD) as in-charge of natural disaster prevention and control, and the commander of provincial military command as in-charge of search and rescue. Both natural disaster prevention and control, and search and rescue are directly commanded by the chairperson of Provincial People's Committee (PPC) who is the highest decision maker in the provincial government. It is different from the structure at the central level in which natural disaster prevention and control, and search and rescue are commanded by different committees.

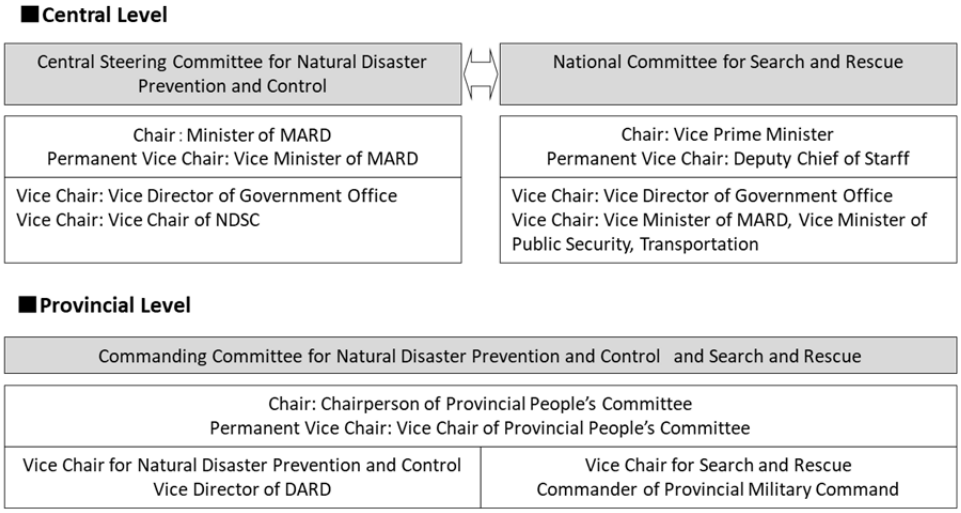


Figure 3.3 Comparison of Institutional Structures at Central and Provincial levels

Source: Decree No.66/2014ND-CP

At the provincial level, the "Sub-department of Irrigation" under DARD takes the same role as VNDMA at central level. In most provinces, the Sub-department was assigned as the standing office of CCNDPC/SR (in some provinces, the standing office was established directly under the PPC office). The Sub-departments are generally composed of 15 to 20 staffs. According to the interviews in the survey the average annual budgets are approximately 1 billion VND (US$ 44,000). The most of the budget is used for personal expense, administration and small amount of disaster management activities. The Sub-departments are responsible for managing and maintenance of irrigation reservoirs, canals, river dikes as well as natural disaster prevention and control activities. The budget for such activities is annually requested to the central governments. In most cases, only few staffs of the director, vice directors and in-charge of natural disaster management division of the Sub-department, are officially appointed as the permanent staff of the standing office. In an actual disaster situation, however, all staff of the Sub-department are mobilized for responding to the disasters.

The main task and responsibility of Sub-department of Irrigation as the standing office of provincial CCNDPC/SR has not been changed before/after the enforcement of the Law on NDPC. According to the interview with Thua Thien Hue province, the standing office can make decisions and actions more quickly in emergency situation after the enforcement of the Law. For instance, an emergency dam reservoir operation fell under the authority of the provincial committee and PPC before. After enforcement of Law on NDPC, the standing office can directly command the dam owners with retroactive approval of the committee.

3) Disaster Response in each Disaster Risk Level

Article 13 of the Law on NDPC stipulates to identify natural disaster risk levels and elaborate response plans for different levels. Chapter 2 in the Decree No.66/2014/ND-CP indicates five (5) classes of natural disaster risk levels and regulates responsible authority levels according to the risk levels to mobilize staff and budget for disaster response (Table 3.4). The detailed criteria of the natural disaster risk levels are regulated in the Decision No.44/2014/QD-TTg "Natural Disaster Risk Levels".

Table 3.4 Natural Disaster Risk Levels and Responsible Authorities

Risk Levels	Responsible Authorities
Level 1	Commune level CCNDPC/SR shall directly command and mobilize on-the-spot resources for prompt response to natural disasters. District level CCNDPC/SR shall directly command and mobilize resources when they receive requests for support from commune level People's Committee chairpersons.
Level 2	Provincial-level CCNDPC/SR shall command localities and local agencies and units to respond to natural disasters, mobilize resources to promptly and properly respond to natural disaster. In cases falling beyond the responding capacity of provinces, Provincial-level CCNDPC/SR may report to and request support from the CSCNDPC and the NCSR.
Level 3	The CSCNDPC shall direct localities, ministries, ministerial-level agencies and government-attached agencies in taking natural disaster response measures, decide on urgent measures, and mobilize resources to assist localities in responding to natural disasters when necessary.
Level 4	The Prime Minister shall direct ministries, ministerial level agencies, government-attached agencies and related localities in taking natural disaster response measures. The CSCNDPC shall advise the Government and the Prime Minister on natural disaster response measures.
Above Level 4 State of Emergency	The Prime Minister shall propose to the President to declare a state of emergency due to natural disasters. The assignment and decentralization of responsibilities and coordination must comply with the law on state of emergency.

Source: Decree No.66/2014/ND-CP

(3) Budget Allocation

Financial sources for natural prevention and control are composed of 1) State Budget, 2) NDPC Funds and 3) voluntary contributions of organizations and individuals.

1) State Budget

a) State Budget Mechanism

The state budget for natural disaster prevention and control include funds within annual expenditure estimates and state budget reserves. The state budget within annual expenditure estimates are used for elaboration of national strategy and plans, construction and upgrading facilities, DRR activities and regular operation of state management agencies. The state budget reserves are used for disaster response and search and rescue activities. The budgets are allocated based on the Law on State Budget (No.83/2015).

The financial year in Vietnam is from January 1st to December 31st. The Prime Minister promulgates regulations on formulation of socio-economic development plans and state budget estimation for the next financial year in May. According to the circular instruction of the Ministry of Finance, the budget estimations prepared by the central ministries and local governments are summarized and submitted to the national assembly by September. It is approved in the national assembly by November 11th and informed to the central ministries and provincial governments. Based on the allocated budgets, provincial People's Councils decide budget allocation plans by December 10th. Henceforth, it is delivered by PPC to lower levels of government in the provinces. The PPCs report the final budget allocation plans in the provinces to the Ministry of Finance by December 31st.

b) DRR Budget

DRR budgets are divided into the central budgets and the local budgets as well as other state budgets. The local budgets are individually planned, applied and allocated based on socio- economic development plans in each level. In the current system, CSCNDPC and VNDMA are taking responsibility for the central DRR budget and never involved in the budget allocation processes for the local levels although they are the prime responsible bodies for DRR activities and investments in Vietnam.

The allocated DRR budgets to VNDMA in 2017 and 2018 are shown in Table 3.5.

Table 3.5 Budget Allocation for VNDMA

Item	Allocated Budget	
	2017	2018
For all activities, as standing office of CSCNDPC	VND 9 billion (US$ 387,000)	VND 10 billion (US$ 430,000)
Dike rehabilitation projects under assigned management task of VNDMA	VND 407 billion US$ 17.5 million	VND 400 billion (US$ 17.2 million)
Implementing activities under Decision No.1002 “CBDRM” managed by VNDMA	VND 2 billion (US$ 86,000)	VND 2 billion (US$ 86,000)

Source: Interview to Department of Planning and Finance, VNDMA

In 2018, JICA has conducted a study “Estimation of Infrastructure Demand for Disaster Risk Reduction Project regarding to Research on Demand Estimate on Infrastructure in Asia” a study on demand estimation for disaster prevention infrastructure in Asian countries. According to this report, the trend of flood control expenses directly controlled by MARD from 2010 to 2016 (7 years) is as shown in Figure 3.4. Because the most flood control expense is expected to be the embankment rehabilitation cost, the VNDMA budget allocation (VND 407 billion) in 2017 in Table 3.5, seems harmonious compared to the trend until 2016.

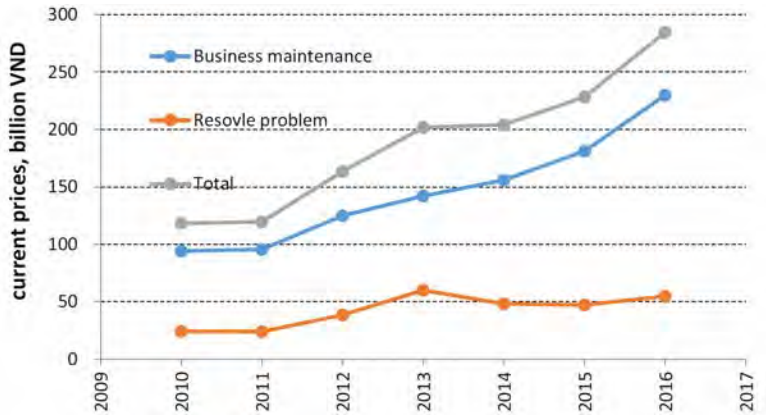


Figure 3.4 Trend of Flood Control Expense by MARD

Source: Estimation of Infrastructure Demand for Disaster Risk Reduction Project regarding to Research on Demand Estimate on Infrastructure in Asia”, JICA 2018

c) Relief and Recovery Budgets

The Law on State Budgets (No.83/2015) stipulates that the central and local budget shall include 2 to 5 % of total budget expenditure at each level as “State Budget Reserve”. The State Budget Reserve is used for unplanned expenditure on prevention, relief and recovery of

natural disasters.

In addition to the State Budget Reserve, the central and provincial governments shall establish "Financial Reserve Funds". The funds can be used when the State Budget Reserve is used up but still not sufficient for disaster recovery, response to widespread and serious disaster situations. According to the interview with VNDMA, there have been no cases to apply the Financial Reserve Funds for natural disaster relief and recovery as of March 2018.

d) DRR Budget in National NDPC Plan (Draft)

In the National NDPC Plan 2018-2020 (draft), a total of VND 108,000 billion (US$ 4,644 million) is planned for all DRR projects approved in central and local levels. In addition to the approved projects, another VND 5,000 billion is proposed. The source of the funds for the National NDPC Plan is shown in Figure 3.5.

The central and local budgets account for about 50% of the total budget sources. The government bond is about 30%. 15% of total budget depends on ODA.

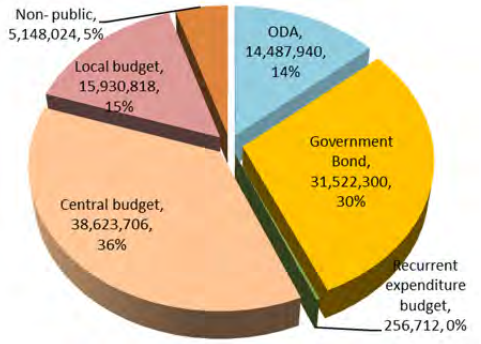
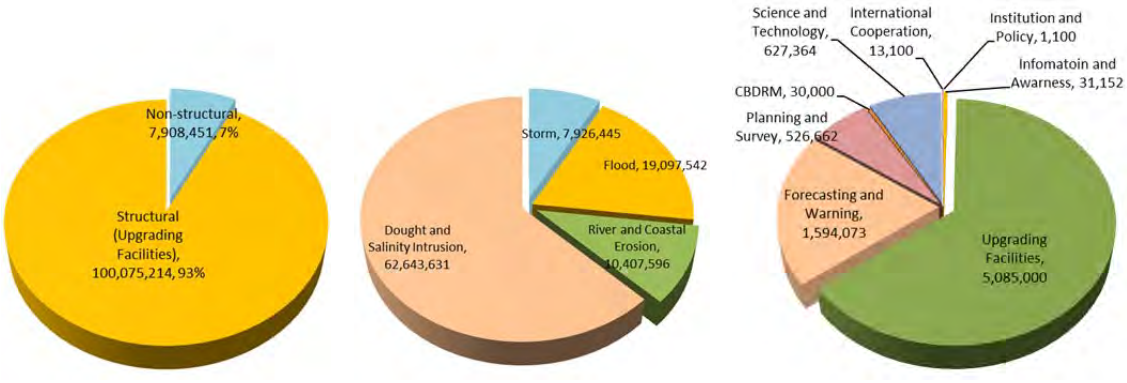


Figure 3.5 Source of Funds for National NDPC Plan (draft) in million VND

Sources: Prepared from National NDPC Plan 2018-2020 (draft)

The National NDPC Plan 2018-2020 (draft) shows the budget expenditure for each DRR categories (Figure 3.6).

Ninety-three per cent of the total expenditure is for structural measures which are mostly upgrading disaster prevention and control facilities and infrastructures such as dikes and river bank protections. The remaining 7% is for non-structural measures such as policy and planning, upgrading DRR facilities, improvement of forecasting and warning, CBDRM and science and technology activities. Out of structural measures, countermeasures for drought and saline intrusion account for over 60% in response to the heavy damages caused by the continuous drought situation since 2016.



Non-structural and Structural | Contents of Structural Measures | Contents of Non-structural Measures

Figure 3.6 Budget Expenditure for National NDPC Plan (draft) in million VND

Sources: Prepared from National NDPC Plan 2018-2020 (draft)

2) Natural Disaster Prevention and Control Funds

Regarding NDPC Funds stipulated in the Law on NDPC, Decree No.94/2014/ND-CP regulates its detailed specification, collection and uses.

According to Article 5, the NDPC Funds are collected from citizens between full 18 years and retirement age as follows:

- Government officials: one day's salary/person/year excluding taxes and insurance,
- Workers in enterprises: one day's wage/person/year based on minimum wage, and
- Other workers: 15,000 VND/person/year.

Article 9 regulates the uses of the Funds as follows:

- Providing emergency relief in food, drinking water, curative medicines and other essentials, supporting the repair of houses, health establishments and schools, and for dealing with environmental sanitation, repair of evacuation houses (under 1 billion VND/facility),
- Supporting evacuating people out of dangerous areas, providing food and drinking water to those in evacuation places; supporting observation, information, announcement, warning and alert of natural disasters at community,
- Disseminating the law on natural disaster prevention and control, making plans on and organizing drills of natural disaster prevention and control at the commune level, and
- Transferring funds to support other localities suffering from damage.

As described in Article 9, the Funds can be widely used for DRR activities. In most cases, however, the Funds have been spent for disaster response and relief activities, not for community awareness activities and improvement of early warnings.

As of February 2018, the NDPC Funds were established at 56 provinces, and started to collect at 41 provinces. According to the VNDMA, VND 952 billion (US$ 42 million) have been collected in total. 31 provinces have already used the Funds which amounted to VND 396 billion (US$ 17 million). Excepting centrally-governed cities such as Hanoi and Ho Chi Minh,

the Funds' amount is approximately VND 10 billion (US$ 444,000), which are important financial resources for provincial governments.

3.1.3. Functions and Responsibility of Central Ministries

Based on the Decree No.66/2014/ND-CP, the central ministries have functions and responsibilities as follows:

(1) Ministry of Agriculture and Rural Development (MARD)

VNDMA in MARD is the standing office responsible for overall state management in DRR under the direction of CSCNDPC. As mentioned in Section 3.1, this function had been taken by the Department of Dike Management and Flood and Storm Control under the Directorate of Water Resource before enforcement of the Law on NDPC.

Decision No.26/2017/QD-TTg "Regulation on Function, Mission, Authority and Organization Structure of VNDMA under MARD" regulates the functions and missions as shown in Table 3.6. The total fixed staff number of VNDMA is 198. Currently 157 staffs are assigned. There is still capacity to increase the number of staffs according to the organizational structure.

Table 3.6 Organization, Function and Mission of VNDMA

Department	Staff		Function and Mission *the functions of each department are assumed from the Decision No.26
	Fixed	Current	
Leaders of VNDMA	3	3	▪ Overall management of VNDMA ▪ Assist Minister of MARD in implementing NDPC as standing office of CSCNDPC (Articl2.10).
Administration Department	18	18	▪ Implement administration reformation based on the administration reform program of MARD (Article2.15) ▪ Administrate and organize the structure, officers and staffs (Article2.16) ▪ Implement formulation, policies, competition, award, discipline, training and fostering professional skills of officers, staffs and labors (Article2.16)
Department of Planning and Finance	8	7	▪ Formulate long-term, short-term, annual development strategies, planning, plans and policies (Article2.1b) ▪ Manage projects of planning and basic investigations (Article2.11) ▪ Control the assigned finance, properties and other resources (Article2.19)
Department of Legal and Inspection	7	7	▪ Organize the law propaganda, dissemination, education (Article2.2). ▪ Guide, inspect and organize the execution of law codes, rules, policies, plans and projects for NDPC (Article2.4& Article2.5c), ▪ Implement the professional investigation and inspection (Article2.18). ▪ Meet citizens, settle claims and complaints, prevent and control corruption, handle law violations (Article2.18) ▪ Control the construction investment (Article2.19)
Department of Natural Disaster Safety Control	8	8	▪ Formulate national strategies, national plan, MARD's plan and policies (Article2.5a) and organize implementation of strategies (Article 2.5.d') ▪ Instruct, inspect implementation of plans of natural disaster preparedness, plans in social-economic development plans (Article 2.5.b&d). ▪ Build and protect the work of NDPC, prepare human resources, materials, means, communication system and essential supplies (Article2,5e) ▪ Organize the implementation of the statistics and management of data within the authority of the Directorate (Article2.12). ▪ Manage Disaster Prevention Plan at provincial level
Department of Science and Technology and International Cooperation	9	9	▪ Coordinate international aid on disaster prevention. ▪ Receive forecast, alert and relevant information from international org. Provide natural disasters information to international org. ▪ Coordinate with ASEAN on natural disaster (Article2.14)

Department	Staff		Function and Mission
	Fixed	Current	*the functions of each department are assumed from the Decision No.26
Department of CBDRM	9	10	▪ Organize and implement education programs for improving community awareness and CBDRM. ▪ Organize training for disaster prevention and control. ▪ Inspect the education program (Article2.8)
Department of Dike Management	13	11	▪ Plan dike construction, create regulations regarding dike and agreement on dike projects, coordination on dike construction (Article2.9) ▪ Request localities in checking and reviewing dike-related facilities. ▪ Send leaders of Department to join the visit of CSCNDPC working team.
Department of Natural Disaster Response and Recovery	73	39	*20 staff at Hanoi, 10 staff at central / highland office, 9 staff at southern office ▪ Establish, operate and broadcast alerts of tsunami, preparedness plans for natural disasters, preparedness plans for emergencies. (Article2.5g) ▪ Guide and inspect implementation of preventing and controlling the erosion of river bank, coast and border embankment. (Article 2.6d) ▪ Organize monitoring, updates on forecasts and alert and respond to climate change and sea level rise under the Directorate (Article 2.6d'). ▪ Guide /inspect regulations on evacuation and emergency aids (Article 2.6c). ▪ Publicize damage data nationwide. Propose emergent aids long-term and short-term support. Guide and inspect summary and statistics of damage data. Direct disaster recovery activities (Article2.7). ▪ Manage Local emergency response plan at provincial level.
Disaster Management Policy and Technology Center	50	45	▪ This is a public non-business unit under the Directorate. ▪ Instruct professional skills under the management of Directorate (Article2.2). ▪ Organize scientific researches, technology transfer on NDPC, dikes and new rural building construction (Article2.13)
Total	198	157	

Source: Prime Minister Decision No.26/2017/QD-TTG

VNDMA's Department of Natural Disaster Response and Recovery has Sub-Departments at Da Nang and Ho Chi Minh City to respond to the regionally specific disaster phenomenon and to support local DRR activities in provinces. According to the interview to each Sub-Departments, these had been called the "Central Highlands Regional Sub-Department of Disaster Prevention and Control" and "Southern Regional Sub-Department of Disaster Prevention and Control" to support overall DRR activities of prevention and mitigation, preparedness, response and recovery in the regions. After enforcement of the Law on NDPC, the branch offices became affiliate sub-departments under the Department of Natural Disaster Response and Recovery of VNDMA The main tasks of the sub-departments are to collect disaster and disaster damage information and support formulation of ordinances and plans by provincial governments. Due to this organization structure, the number of staffs of Department Natural Disaster Response and Recovery is larger than the other departments as shown in Table 3.6.

MARD has a research institute in the fields of water resources and irrigation, so called "Vietnam Academy for Water Resources (VAWR). This is a similar organization to the National Institute for Land and Infrastructure Management or Public Works Research Institute under the Ministry of Land and Infrastructure, Transportation and Tourism (MLIT) in Japan. The VAWR has seven (7) specialized institutes, three (3) centers, and three (3) regional institutes. The total staff number is over 1,200. Regarding DRR, the VNDMA is an advisory body to VNDMA from science and technology in the fields of hydraulic and hydrology analysis, technical guidance of inter-reservoir operation, flood hazard mapping, managing disaster databases, river and coastal erosions, and salinity intrusions countermeasures.

(2) Ministry of Natural Resources and Environment (MONRE)

1) Department of Water Resources Management (DWRM)

The Department concerned with disaster prevention in the Ministry of Natural Resources and Environment (MONRE) is the Department of Water Resources Management (DWRM) that has jurisdiction over the operation of multipurpose reservoirs. Through the operation of the multipurpose reservoirs, the DWRM has jurisdiction over not only floods but also water resources management related to drought and saltwater intrusion. The DWRM has seven internal Divisions, three external research centers, and three regional offices.

MONRE is responsible for formulating multi reservoirs operation rules in 11 major river basins based on Decision 1879 QD-TTg. For example, regarding the integrated operation of the multipurpose reservoir in Huong river basin of Thua Thien Hue Province, the DWRM plays the role of advising the Minister of MONRE through the development of multipurpose reservoir operation rules and the review of the actual operation of multi-purpose reservoir operation. Although MARD and DARD are responsible agencies for individual reservoir dam operation, in order to effectively operate multiple reservoirs including hydropower dams, MONRE is the responsible agency to develop the operation rules under the Law on Water Resources in the viewpoint of river-basin management.

The water users of the multipurpose reservoir are hydraulic power (MOIT), irrigation (MARD) and tap water, and MONRE coordinates among these users from the top. The monitoring system of the multipurpose reservoirs was installed by MONRE and is not owned by MARD.

2) Vietnam Meteorology and Hydrology Administration (VNMHA)

VNMHA (formerly National Hydro-Meteorological Services: NHMS) is an organization under MONRE. The duties of VNMHA related to disaster prevention are the observation of atmosphere and water environment, the detection of lightning, disaster prevention and preparation, socio-economic development and climate change monitoring to secure national security and defense.

VNMHA has nine Regional Hydro-met Centers, Hydro-meteorology & Environment Technology Center and Hydrology Information Center. VNMHA has 54 Provincial Hydro Meteorological Forecasting Centers, over 500 observatories and over 1,000 rainfall observation stations.

The number of VNMHA staff is around 2,800. In terms of academic background, 20 staffs have doctoral degrees, 167 with master's degrees, 1,100 with bachelor's degrees, and 500 who have gone and obtained college education. The breakdown by job category is 500 forecasters, 280 control personnel and 1,600 observers. The organizational chart of VNMHA is shown in Figure 3.7.

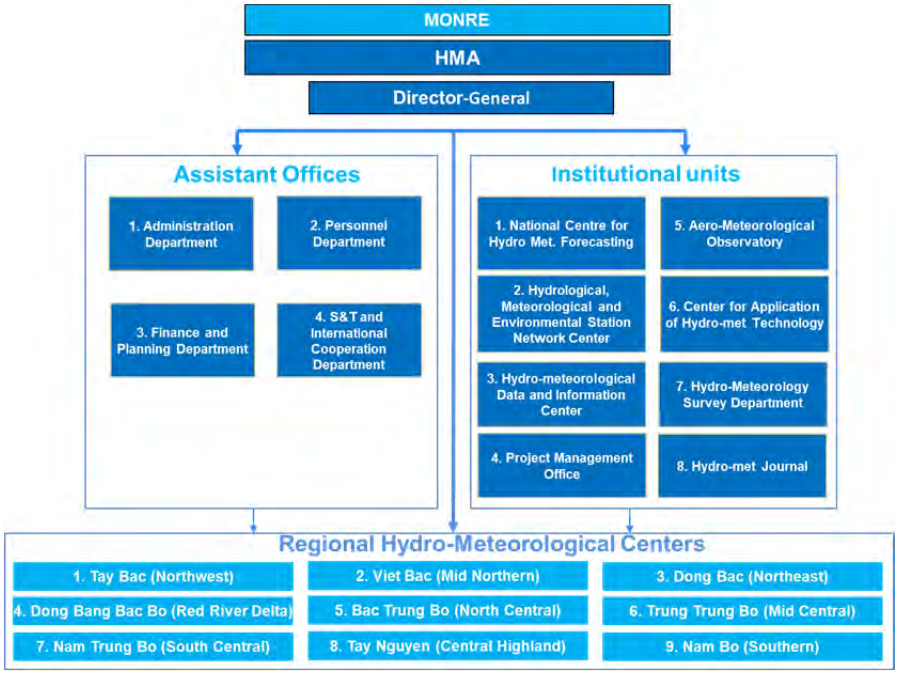


Figure 3.7 Organization of VNMHA

Source: Presentation material by VNMHA

3) Vietnam Institute of Geosciences and Mineral Resources (VIGMR)

The Vietnam Institute of Geosciences and Mineral Resources (VIGMR) was established as a government research institute in 1976, was renamed VIGMR in 1996, and was incorporated under MONRE in 2001. VIGMR has 250 staff, of which 201 are scientists.

The work related to disaster prevention of VIGMR is risk analysis concerning landslides. VIGMR has developed the landslide hazard map (scale 1: 50,000, 1: 10,000 depending on location) in the mountainous area. Regarding structural measures, VIGMR provides advice to other organizations but does not implement them. Under MONRE, there is the Directorate of Geology and Minerals, but VIGMR is an independent research institution and no coordination with the Directorate has been done.

(3) Ministry of Industry and Trade (MOIT)

1) Headquarters

MOIT responds to the problems related to various substances such as chemical substances, coal, petroleum, and gas as disaster prevention measures in the industrial field. MOIT has started the mainstreaming of the disaster risk reduction (DRR) in relation to the construction of industrial parks. MOIT is concerned with the management of industrial estates and power generation dams but has no direct responsibility for DRR. Securing the safety of industrial parks against disasters is under the jurisdiction of Provincial People's Committee (PPC). MOIT is in the position to demand the administrators of power generation dams to comply with the rules of operation and the instructions of the PPC chairman during floods.

MOIT has no specific organization dedicated to disaster prevention, however based on

Article 44 of the Law on Natural Disaster Prevention and Control (NDPC) and Decision 66, a Commanding Committee for Natural Disaster Prevention and Control, Search and Rescue of MOIT (CCNDPC) has been established with the Deputy Minister as the chairman. MOIT will provide food and water in case of disasters. The sectors in MOIT such as coal, oil and steel also cooperate with the CCNDPC. Department of Industrial Environment and Safety Techniques will coordinate as Standing Office of the CCNDPC within MOIT.

2) Electricity of Vietnam (EVN)

Electricity of Vietnam (EVN) is a state-owned company under MOIT. EVN owns a number of subsidiaries (three power generation companies, one transmission company and five distribution companies). There are seven hydropower subsidiaries under the power generation companies.

In relation to disaster prevention, EVN has jurisdiction over the operation of 37 hydroelectric dams during floods through these subsidiaries. Of these, 33 dams are operated by the affiliated companies under EVN in an integrated manner since they are located in eight of the 11 river basins subject to the integrated dam operation rule by Decision 1879 QD - TTg, and the other 4 dams are operated independently by the affiliated companies under EVN.

The hydropower dams are under the control of the power generation company and the irrigation reservoirs are under the control of PPC, etc. In general, the matters related to hydraulic power dam management are the subject of MOIT while the provincial level matters are the subject of the Department of Industry and Trade (DOIT).

(4) Ministry of Transportation (MOT)

There is no organization dedicated to disaster prevention in the Ministry of Transport (MOT). However, the Department of Transport Safety is in charge of disaster prevention related duties. The mandate on disaster prevention of MOT is mainly involving landslide occurrences including riverbank erosion along main roads. For this reason, the Disaster Prevention and Control, Search and Rescue Plan of MOT describes the arrangement plan of heavy machineries to deal with road closure, the review of disaster-stricken sites, securing detours in case of emergency, and transfer shipment when railway is damaged.

MOT has established the CCNDPC based on Article 44 of the Law on NDPC and Decree No.66/2014/ND-CP. The chairman of the CCNDPC is the Deputy Minister of MOT and the members are the directors of relevant departments. The CCNDPC has a Standing Office in the Transport Safety Department.

(5) Ministry of Construction (MOC)

The Ministry of Construction (MOC) has no organization dedicated to disaster prevention. However, the Department of Construction is in-charge of disaster-related duties. The mandate of MOC on disaster prevention is national level management such as creating policy mechanisms and urban drainage standards. For example, the Department of Infrastructure has reviewed national drainage technology standards for climate change. When disasters occur, PPC is responsible for the implementation of measures while the MOC advises according to the standards. For this reason, MOC has experts to support Provinces. MOC has established the CCNDPC in accordance with Article 44 of the Law on NDPC, Decree No.66/2014/ND-CP and Ministerial Order 960. The chairman of the CCNDPC is the Deputy Minister of MOC.

3.1.4. Issues on Legal, Political and Institutional Arrangements

(1) Coordination Mechanism and Decision Making

Provincial CCNDPC/SR is chaired by the chairperson of PPC, the highest decision maker in the provincial government. On the other hand, the CSCNDPC is chaired by Minister of MARD not by the Prime Minister. This institutional structure is not enough for CSCNDPC to control and coordinate leaders of other ministries. Reports on relevant information should be directly submitted from VNDMA to the higher political levels, so that VNDMA could initiate functions of CSCNDPC. It is strongly recommended that the Prime Minister should chair the CSCNDPC and give directions and commands on natural disaster prevention and control more systematically and effectively.

The National NDPC Plan 2018-2020 (draft) suggests the necessity of amending Decree No.66/2014/ND-CP which regulates institutional structures on DRR. According to the interview with VNDMA, such structural reformation is basically agreed in the government.

(2) Promotion of Mainstreaming of DRR

The Law on NDPC stipulates that DRR should be integrated into national and local socio-economic development plans and sectoral development plans to promote mainstreaming of DRR. The mainstreaming of DRR is essential to promote effective DRR investment within the limited budgets. The prime responsibility of mainstreaming DRR rests with the Ministry of Planning and Investment. In 2016, Minister's Circular No.5/2016/TT-BKHDT "Guideline for Mainstreaming of Natural Disaster Prevention and Control in Sector Development and Socio-economic Development Plans" was issued. However, it is very general, there are no concreate policies and decision-making mechanism for mainstreaming is unclear.

VNDMA is proposing to establish a "Partnership Coordination Office" to grasp and coordinate many DRR projects and activities implemented by the other ministries, provinces and international donors. For instance, there are DRR projects that VNDMA has not been involved in and informed on, such as road slope stability projects by MOT and flood drainage projects at industrial parks by MOC. If VNDMA could comprehensively coordinate such projects, more effective DRR investments will be realized.

(3) Promotion of IFMP supported by JICA

Previously, JICA has supported formulation of IFMP of Thua Thien Hue Province and Quang Binh Province. This resulted in obtaining official approval of PPC at each province. Since VNDMA highly values IFMP as integrated flood management by river basins, promotion of IFMP is clearly indicated in the draft National NDPC Plan and the Government Resolution No.76 on natural disaster prevention and control in June 2018.

Moreover, VNDMA is planning to implement IFMP formulation widely in other river basins using the World Bank funds. IFMP Formulation Guideline is necessary by adapting the characteristics of each basin considering a river basin involving more than 2 provinces and river basin where flash flood occurs, such as the Northern mountainous provinces.

(4) Insufficient Human and Technical Capacities of VNDMA

Total number of staffs at VNDMA is currently 157 out of the approved 198. Moreover, the number of staffs at the Department of Natural Disaster Response and Recovery is about half of the approved number of 73 despite the department being the core body in disaster response such as mobilization of human resources and means as well as technical advisory for natural disaster response plans at local levels. While provincial governments have more responsibility on natural disaster prevention and control because of decentralization under the Law on NDPC, the human and technical capacity of VNDMA is not sufficient to support local provinces.

Shortage of human resources is a chronic issue not only at the Department of Natural Disaster Reponse and Recovery but also at the other departments under VNDMA. The staff number of each department is still under about 10 people excepting the Disaster Management Policy and Technology Center. In the Disaster Response Monitoring Room, which is established in 2017, full-time staff is limited, and staff from each department are temporally assigned in shifts. On the other hand, the Vietnam Academy for Water Resources (VAWR), a research institution of MARD, is a huge organization composed of 1,200 staff members. It has extensive experience and track records in the field of disaster management. It is recommended that the human resources of VAWR could be effectively utilized to enhance capacity of VNDMA.

(5) Authority of VNDMA in DRR Budget Allocation

DRR-related state budgets for central ministries and local governments are individually requested from the government through MOF. CSCNDPC and VNDMA are not involved in the DRR budget allocation process. No assessments and inspections have been done by CSCNDPC or VNDMA. If VNDMA has any authority to verify the projects and activate those proposed by other ministries and local governments in terms of consideration of Build Back Better, it should be an effective solution to strengthen VNDMA in order to promote Build Back Better at the national level.

(6) States Contingency Budgets for Disaster Recovery

At the provincial level, NDPC Funds can be used for disaster relief and recovery. However, there is no contingency funds at the national level. In emergency cases, relief and recovery expenditures are mobilized from general state budget reserves. The Decree No.94/2014/ND-CP “Natural Disaster Prevention and Control Funds” stipulates that the NDPC Funds can be mobilized and transferred to support other provinces suffering from damage caused by natural disasters upon coordination between CSCNDPC and PPC. However, such coordination and agreement are not easy to make. Therefore, VNDMA proposes to amend the Decision No.94/2014/ND-CP to establish national level NDPC Funds in which CSNDPC can reallocate resources from provincial NDPC Funds to support other provinces in case extremely severe natural disaster occurs. It seems an issue how to define the consistency with the original purpose of NDPC Funds considering the “four on-the-Spot motto”.

(7) DRR Management Capacity in Provinces

At the provincial level, the sub-department of Irrigation under DARD is engaged in disaster management in most of the provinces. Since they don’t have full-time staff for disaster

management, they operate as if it is a side business. Staff at district and commune levels has limited capacity with insufficient facilities and tools. In addition, it is difficult to share their experiences beyond their governance area because experience and insights vary by regions. Also, in the formulation of disaster management plan, coordination with related departments is difficult (especially strong involvement of MOF and MPI is ideal). There is no uniformity in use of provincial disaster prevention fund because there are no operational guidelines. Evaluation of hazard and risk for formulation of disaster prevention plan is not enough, and since the assumption of disaster is ambiguous, detailed risk assessment cannot be done.

3.2. Status on Natural Disaster Prevention and Control Plan

3.2.1. Natural Disaster Prevention and Control Plan at the Central Level (including Response and Recovery Plans)

(1) Natural Disaster Prevention and Control Plan

1) National Level

The formulation of the Natural Disaster Prevention and Control Plan (NDPCP) is stipulated in Article 15 of the Law on Natural Disaster Prevention and Control (NDPC) enacted in 2013. The Law prescribed that a 5-year plan should be formulated as stated in Paragraph 1, Article 15 of the Law, "Natural disaster prevention and control plans are elaborated at local, ministerial and national levels for every 5 years corresponding to socio-economic development plans and adjusted annually". It is stipulated in Paragraph 6 of Article 15 that the NDPCP should be formulated with the following contents:

＜Paragraph 6 of Article 15 of the Law>
6. A national natural disaster prevention and control plan has the following principal contents:
- a/ Assessing and annually updating population and socio-economic characteristics and development of economic sectors and infrastructure nationwide;
- b/ Identifying and assessing natural disaster risks and levels of natural disaster risks that frequently occur, and impacts of climate change on the development of sectors and localities nationwide;
- c/ Identifying overall natural disaster prevention and control contents, measures, programs, schemes and projects suitable to each level of natural disaster risk and specific type of natural disaster to minimize natural disaster risks, paying attention to dangerous areas and vulnerable groups;
- d/ Identifying natural disaster prevention and control contents to be integrated into national socio-economic development master plans and plans;
- dd/ Identifying resources and schedules for implementation of the plan in each year and during the five-year period;
- e/ Identifying responsibilities of agencies and organizations in implementing, examining and supervising the implementation of, the plan nationwide.

Based on the above, the formulation of the National NDPCP (2018-2020) started in November 2016, a draft version was completed by January 2018. VNDMA is in the process of consolidating comments from relevant agencies. The Department in charge of VNDMA is the Department of Natural Disaster Safety Control. The timing of the approval of the National NDPCP is undecided as of May 2018. The table of contents of the Draft National NDPCP is as follows:

＜Table of Contents of Draft National NDPCP＞
I Viewpoint
II Objective
1. General objective
2. Specific objective
III Guidelines for planning
IV Contents and measures of implementation
1. General contents and measures
a) To perfect institutions and policies on natural disaster prevention and combat suited to natural

conditions and natural disasters in each region. Additional projects related to natural disaster prevention and control
b) Information, dissemination and dissemination of laws, awareness raising on disaster preparedness, response and recovery
c) Upgrading equipment, facilities to prevent natural disasters and search and rescue
d) Raising the capacity for forecasting, warning
dd) Planning and plans for natural disaster prevention and control suitable to the conditions of each region.
e) Community-based disaster risk management
g) Research and application of science and technology in natural disaster prevention and control
h) International cooperation in natural disaster prevention and control
i) To invest in upgrading the infrastructure for natural disaster prevention and combat.

2. Some Measures to Prevent Natural Disasters
a) Flash Flood and landslide prevention
b) Flood prevention, heavy rain, inundation
c) Strong storm and storm surge, sea level rise
d) Prevention of river bank erosion, coastal erosion, land subsidence
dd) Prevention of hot sun, droughts, saline intrusion, cold weather
e) Earthquake and tsunami prevention

3. To integrate natural disaster prevention and control into the national socio-economic development planning and plans

V Programs, projects, schemes and natural disaster activities

VI Budget and sources
1. Budget
2. Resources

VII Assessment of the plan

VIII Organization of implementation
1. Ministry of Agriculture and Rural Development
2. National Committee for Incidents, Disaster Response, Search and Rescue
3. Central Steering Committee for Disaster Prevention and Control
4. Ministry of Defense
5. Ministry of Natural Resources and Environment
6. Ministry of Transport
7. Ministry of Construction
8. Ministry of Planning and Investment
9. Ministry of Finance

Other ministries, branches, agencies and organizations in the Central
People's committees at all levels

The National NDPCP seems to cover only the prevention phase of the disaster management cycle judging from its name, but in fact the contents of the plan cover the whole cycle (prevention (mitigation, preparedness), response and recovery/ reconstruction) of the disaster like the plan of Japan. According to VNDMA, the National NDPCP was formulated reflecting the Sendai Framework for Disaster Risk Reduction 2015 - 2030.

In Vietnam, unlike in Japan, the National NDPCP is not a high-level umbrella plan under the provisions of the Law on NDPC. So, each central Ministry and Province have formulated their NDPCP independently without referring to the National NDPCP. Therefore, each Ministry and Province will not revise their NDPCP in accordance with the revision of the National NDPCP.

2) Central Ministerial Level

The formulation of the NDPCP by Ministries is stipulated in Paragraph 5, Article 15 of the Law on NDPC. All Ministries have already formulated their NDPCP as of January 2018.

There is no guideline for NDPCP formulation by VNDMA. For this reason, each Ministry is preparing their NDPCP in accordance with Paragraph5, Article 15 of the Law, so the composition and content of the NDPCP varies depending on the Ministries. As an example, in the case of MOT, the NDPCP is largely composed of four parts: organization improvement, preparation work, recovery and after storm and flood.

3) Natural Disaster Prevention and Control Plan and Climate Change Adaptation

It is stipulated that the National NDPCP will state the impact of climate change as prescribed in Paragraph 6 b, Article 15 of the Law on NDPC "Identifying and assessing natural disaster risks and levels of natural disaster risks that frequently occur and impacts of climate change on the development of sectors and localities nationwide". Specific description and content of climate change in the Draft National NDPCP formulated based on this are as follows:

- I Viewpoint: 6. Ensure implementation of the GoV commitments at global conferences, ASEAN regional cooperation, bilateral cooperation with countries and territories in disaster risk management and response to climate change,
- III Guidelines for planning: 3. Implement the guiding ideas of leaders of the Party, the State and the Government, as well as the urgent needs in practice to raise the capacity of natural disaster prevention and control to meet disaster reduction, adaptation to climate change,
- IV Contents and measures for implementation: 1. General contents and measures, d) Raising the capacity for forecasting, warning: Developing a system of tools to support meteorological and hydrological forecasting, network of climate change monitoring,
- IV Contents and measures for implementation, 1. General contents and measures, h) International cooperation in natural disaster prevention and control: Maintain cooperation, regularly provide information on natural disasters and keep in touch with international focal points to receive risk management trends in the context of climate change,
- 1V Contents and measures for implementation, 3. To integrate natural disaster prevention and control into the national socio-economic development planning and plans: Assess and identify the impacts of natural disasters and climate change as a basis for the elaboration of laws, mechanisms, policies, national standards, national technical regulations, technical and economic development strategies, and
- VI Budget and sources, 2. Resources: Mobilize ODA for natural disaster prevention and mitigation, adaptation to climate change

(2) Natural Disaster Response Plan

1) National Level

There is no National Natural Disaster Response Plan (NDRP). The national level is not involved since the subject of preparing the NDRP is prescribed in Paragraph 3, Article 22 of the Law on NDPC as "Natural disaster response plans are formulated for localities, ministries, ministerial-level agencies, government-attached agencies as well as other agencies and organizations; and annually reviewed, adjusted and supplemented".

The NDPCP is a 5-year long-term plan with general contents, and the NDRP is positioned to

determine the response on a case-by-case basis. The NDRP for responding to individual large-scale disasters (super typhoons, large scale floods, etc.) is formulated at the level below Provinces; there is no comprehensive National level NDRP.

As stated in Paragraph 4, Article 22 of the Law on NDPC, the organization responsible for the NDRP is stipulated not as the NCSR but as the CSCNDPC. Since NCSR is under the MOD, there is some information that VNDMA is not able to know. However, since the role of CSCNDPC includes the coordination of disaster response and NCSR is also a member of CSCNDPC, there is no specific operational obstacle.

2) Central Ministerial Level

The formulation of NDRP by each central ministry is stipulated in Paragraph 3, Article 22 of the Law on NDPC, but the progress of the formulation is delayed. Although Ministries are working on the formulation of the NDRP according to their mandate, there is no official approval of NDRP as yet.

VNDMA is developing a NDRP formulation guideline for central Ministries. The department in charge is the Department of Natural Disaster response and Recovery. As of January 2018, the final draft of the guideline has been completed, and each Ministry's comments to the draft are being received. VNDMA aims to complete the guidelines around mid or late 2018.

3.2.2. Natural Disaster Prevention and Control Plan in Local Provinces

(1) Natural Disaster Prevention and Control Plan

The content to be included in the NDPCP at the local Provincial level is stipulated in Paragraph 4, Article 15 of the Law on NDPC as below. Therefore, each Province has formulated their NDPCP based on it.

<Paragraph 4, Article 15 of the Law on NDPC>
4. A provincial-level natural disaster prevention and control plan has the following principal contents:
- a/ Assessing and annually updating population, socio-economic and infrastructure characteristics of the area covered by the plan;
- b/ Identifying and assessing natural disaster risks and levels of natural disaster risks that frequently occur, and impacts of climate change on local socio-economic activities;
- c/ Identifying natural disaster prevention and control contents and measures suitable to each level of natural disaster risk and specific type of natural disaster to minimize natural disaster risks, paying attention to dangerous areas and vulnerable groups;
- d/ Identifying methods of integrating natural disaster prevention and control contents into socio-economic development master plans and plans;
- dd/ Identifying resources and schedules for implementation of the plan in each year and during the five-year period;
- e/ Identifying responsibilities of organizations and individuals in implementing, and examining and supervising the implementation of, the plan.

As of July 2018, 58 Provinces/centrally-governed cities out of 63 provinces/ central-governed cities have already formulated their NDPCP. Out of the 47 Provinces, which already develop the plan as of March 2018, six Provinces have already formulated their 5-year plan while two Provinces have formulated both 5-year plan and annual plan. 29 Provinces have formulated only annual plans according to Paragraph 1, Article 15 of the Law on NDPC, “Natural disaster prevention and control plans are elaborated at local, ministerial and national

levels for every 5 years corresponding to socio-economic development plans, and adjusted annually.".

VNDMA has not yet formulated the guidelines for planning NDPCP. The National NDPCP is not the top umbrella plan, and since the National NDPCP is still in the development phase of the draft version in the first place, it has not been published yet. For this reason, each local Province has formulated their NDPCP based on Article 15 of the Law on NDPC, cases of other Provinces, information on the Internet and inquiries to related organizations as necessary. Because of this circumstance, the composition and contents of the NDPCP of Provinces are not uniform. It is different from the Japanese system that the National Disaster Prevention Basic Plan is first developed and then the Regional Disaster Prevention Plan of the local government (prefectures and municipalities) is formulated in accordance with the National Plan.

Similar to the National NDPCP, the content of Provincial NDPCP encompasses all cycles of disaster management. However, many Provinces focus more on disaster response than disaster prevention. Similar to the National NDPCP, the Provincial NDPCP is prescribed to describe climate change based on Paragraph 4.b., Article 15 of the Law on NDPC.

VNDMA is developing the guidelines (template) for the formulation of the Provincial NDPCP. As of March 2018, a draft version has been completed and will be made public after the consultation on the contents with related organizations.

(2) Natural Disaster Response Plan

As of March 2018, 46 Provinces/ centrally-governed cities out of 63 provinces/ central-governed cities have already formulated their NDRP according to Article 22 of the Law on NDPC. The basis of the NDRP and the content to be included are specified in Paragraphs 1 and 2, Article 22 of the Law below.

<Paragraphs 1 and 2, Article 22 of the Law on NDPC>
1. A natural disaster response plan is formulated based on the following grounds:
   a/ Types of natural disasters and levels of natural disaster risks which are likely to occur in localities and fields under management;
   b/ Natural disaster response capacity of organizations and individuals;
   c/ Ability of coordination among and support of different forces and local administrations at all levels.
2. A natural disaster response plan contains the following principal contents:
   a/ Protection of natural disaster prevention and control works and key works;
   b/ Evacuation and protection of people and properties and protection of production;
   c/ Assurance of security, order, transport and communication;
   d/ Coordination in directing and commanding the prevention of and response to natural disasters and search and rescue;
   dd/ Manpower to respond to natural disasters;
   e/ Reserves of supplies, means, equipment and essentials.

The NDRP will be formulated in response to five levels of disaster response in compliance with Decree No.66/2014/ND-CP which stipulated correspondence for each disaster level and Prime-minister Decision No.44/2014/QD-TTg prescribing the disaster level. The positioning of the NDRP is a detailed plan corresponding to the disaster level on the disaster response part of general and comprehensive NDPCP.

VNDMA is developing the guidelines for the formulation of the Provincial NDRP with the support of the World Bank project "Managing Natural Hazards Project (WB5)". As of March

2018, a consultant is preparing a draft. The contents of the guidelines will be different for the central Ministries and for the local Provinces.

(3) Status of Formulation of Plans at Each Administrative Level of Provinces

The status of the formulation of the NDPCP and NDRP for each administrative level of Provinces which was clarified through the interviews with the Provinces conducted in January to March 2018 in this survey is shown in Table 3.7.

Table 3.7 Status of the Formulation of NDPCP and NDRP for Each Administrative Level of Provinces

Region	Province	NDPCP			NDRP			Remarks
		Province	District	Commune	Province	District	Commune	
Northern mountain	Yen Bai	○ 2017/4	○	○	○	○	○	Annual NDPCP only
	Hoa Binh	○ 2015/7	○	×	○ 2015/10	○	×	NDPCP was formulated with reference to Binh Dinh's plan.
	Lao Cai	○ 2016	○	○	○ 2016	○	○	
Central	Quang Binh	○ 2014	○	○	○ 2015	○	○	
	Thua Thien Hue	○	○	○	○ 2015	○	○	NDPCP is in the process of approval
	Quang Nam	○	×	×	○ 2016	×	×	NDPCP is in the process of approval
	Quang Ngai	○ 2017/5	○	△ 60%	○	○	△ 50%	Formulated with reference to the plan by WB 4
Southern central	Phu Yen	○ 2016	○	○	○ 2016	○	○	NDPCP was formulated with the support of GIZ
	Ninh Thuan	○ 2017	○	○	○	○	○	
Central highland	Gia Lai	○ 2017	○	○	○ 2017	○	○	
South	Vung Tau	○	○	○	○	○	○	
	Ben Tre	○	○	○	○	△	△	
	Ai Giang	○	○	○	○	○	○	
	Ca Mau	○ 2016	○	○	○ 2016	○	○	

Legend ○: formulated, △: partly formulated, ×: not available

WB4: Natural Disaster Risk Management under World Bank, Source: Result of the interviews in this survey

Under the circumstances where the guidelines for the planning of Provincial NDPCP and NDRP have not been formulated by VNDMA, the Provinces have formulated their NDPCP and NDRP based on Articles 15 and 22 of the Law on NDPC. Among the Provinces, Hoa Binh Province has formulated their plans based on the NDPCP of Binh Dinh Province acquired through the Red Cross. Phu Yen Province has formulated their plans with the support of GIZ. For these reasons, there are variations in the planning methodology, composition, details and progress of formulation for each Province.

Many Provinces have formulated their plans in a bottom-up manner like Commune -> District -> Province. In this case, Commune level plans are prepared first, those plans go up to District, the District approve and consolidate them, then the District level plans are formulated. Then the District level plans will be submitted to Province, then the Standing Office of the Provincial Commanding Committee for Natural Disaster Prevention and Control, Search and Rescue (CCNDPC/ SR) summarizes provincial plan and finally provincial plan shall be approved by the PPC. In Hoa Binh province, the formulation of plans has started from the District level because Commune level has difficulty in planning due to the lack of staff capacity.

On the contrary, there are some provinces that formulate plans in a top-down manner. In Quang Ngai Province, the Provincial plans were formulated first, all the Districts formulated their plans with reference to the Provincial plans, and Commune level plans are currently being formulated. The methodology of Quang Binh province is also the same. In Ca Mau province, the Province dispatched staff to the Districts to support the District level planning.

(4) Example of Provincial Natural Disaster Prevention and Control Plans

As examples of the Provincial NDPCP, the plan of Binh Dinh Province, which is utilized as a good example by Vietnam Red cross when other Provinces formulate their plans and has substantial contents covering demands of the Law on NDPC, and the plan of Ca Mau Province with average level content covering most demands of the Law are introduced. The outline of these plans, especially securing disaster prevention budget through planning and climate change adaptation will be described.

The table of contents of the NDPCP of Binh Dinh Province, which is an example for other Provinces, is as follows, and the plan includes the whole cycle of disaster management.

<Table of contents of the NDPCP of Binh Dinh Province>

Part 1: The situation of natural disaster and the basic information about disaster prevention and control
- I. Overview of the natural, economic, and social considerations
- II The types of natural disasters and circle of influence
- III Infrastructure and the risk of damage
- IV Natural disaster prevention capacity
- V. Comments on the risk of the types of natural disasters that may occur

Part 2: The plan on prevention, response and remedy of consequences of natural disasters
- I. Organization of prevention
- II Response plans
- III Overcoming of the consequence after natural disasters
- IV Resources for implementation
- V. Information and reporting regime on natural disaster prevention, search and rescue
- VI The monitoring and assessment of the implementation of plan
- VII Organization of implementation

Regarding securing the disaster prevention budget of the Province, the roles and responsibilities of the Department of Planning and Investment and the Department of Finance are clearly stated in "Responsibility for financial planning" of Chapter IV "Resources for implementation" in Part 2. Under the involvement of these Departments, the "Implementation (budget) plan" was formulated by accumulating the national budget, the provincial budget, and the provincial natural disaster prevention fund, thereby ensuring the budget. Regarding climate change, it is stated in section V of part 1 “Comments on the risk of the types of natural disasters that may occur” that extraordinary weather which has not been experienced in the past has occurred in recent years, and as a result, the storms, floods and droughts will increase in the future. The trainings related to climate change, disaster prevention, fire protection and search and rescue are described in “c) Enhancing the capacity of NDP & SR of the armed forces” in Chapter I of Part 2 “Organization of prevention”.

Then, the table of contents of the NDPCP of Ca Mau Province, whose contents are considered to be an average level, are as follows, and the plan includes the whole cycle of disaster management.

<Table of contents of the NDPCP of Ca Mau Province>
Part I: Overview of natural and socio-economic conditions
- I. Natural and socio-economic conditions
- II Identification of disaster risk, disaster risk level and climate change impact on socio-economic activities in province

Part II: Disaster preventions, control and recovery plan
- I. Background for planning
- II Purpose and requirements
- III Key tasks
- IV Identifying areas and objects vulnerable to disaster and climate change
- V. Measures
- VI Mainstream of disaster prevention and control contents into socio-economic development planning
- VII Task assignment

As for disaster prevention budget, like Binh Dinh province, it is stated that the budget was secured under the involvement of the Department of Finance and the Department of Planning and Investment in Section 4, Chapter V of Part II “Evaluation of resources for disaster prevention and response”. Regarding climate change, "Identification of areas and objects vulnerable to disasters and climate change" is described in Chapter IV of Part II. As the description on monitoring and evaluation of implementation is absent in the plan, it should be revised in future.

3.2.3. Status and Issues of Natural Disaster Prevention and Control Plan

The current situation and issues related to the NDPCP and NDRP which became clear as of March 2018 are summarized below.

(1) Disaster Prevention and Control Plan based on Reduction Target

A major issue of the NDPCP is that the quantitative assumption of current disaster hazard and risk and future reduction targets are not clear. For this reason, it is difficult to formulate concrete measures for disaster prevention based on the hazards and risk assessments. The

measures are limited to general ones whose effectiveness is not sufficiently considered.

(2) Consistency of National and Provincial Disaster Prevention and Control Plans

As the National NDPCP is not legally positioned as a superior umbrella plan, local Provinces and Ministries are able to formulate their NDPCP independently without referring to the National NDPCP. Because there is no direct relationship between national plan and provincial plan, the consistency is not sufficient. Therefore, it seems difficult to promote DRR measures in local level according to the national policies and plans.

As there is no guideline for formulating the NDPCP as of May 2018, the NDPCP are formulated only based on Article 15 of the Law on Natural Disaster Prevention and Control. For this reason, the composition and contents of the NDPCP of the Provinces and Ministries have no uniformity.

(3) Provincial Natural Disaster Prevention and Control Plan Crossing Administrative Boundaries

As the NDPCP are formulated in each Province, it is difficult to cope with the disasters occurring across the Provincial boundary, for example the flooding of rivers crossing several Provinces. In this case, it is necessary to formulate an Integrated Flood Management Plan (IFMP) separately for each river basin.

(4) Absence of National Natural Disaster Response Plan

Although the National NDPCP has been formulated, there is no National NDRP. The formulation at the national level is not stipulated in Article 22 of the Law on NDPC. As for the NDRP as well as the NDPCP, the quantitative assumption of the hazard and risk is not clear, the assumption of the damage and the situation is ambiguous, and as a result, the measures are only general ones.

3.3. Coordination Mechanism for Disaster Information and Forecasting and Warning

3.3.1. Disaster Information Mechanism

Natural disaster damage information is collected from the local to the central in bottom-up scheme. The detailed mechanism, report contents, frequency, means and responsible agencies are stipulated in the Joint Circular between MARD and the Ministry of Planning and Investment, No.43/2015/ TTLT-BNNPTNT-BKHDT "Instruction on Statistics and Assessment of Damages Caused by Natural Disasters".

The report contents include the number of victims (deaths, missing, injured) and affected damages of each sector (housing, education, health, culture, firm land, irrigation and flood control facilities, traffic, aquaculture, information and communication, industries, etc.). The detail report formats are attached in the Joint Circular No.43/2015.

There are three types of report formats according to the report timings. Table 3.8 shows the report types, frequency and upper levels of agencies to which the reports will be sent. The reports are sent by E-mail, Fax and Telecommunication tools.

Table 3.8 Types of Disaster Information Reports, Frequency and Agencies to be reported

Report Type	Frequency	Agencies to be Reported
Quick Reports	Prepared within 24 hours after disaster occurs. Updated every day.	▪ Commune-level CCNDPC/SR shall report to Communal People's Committee and District-level CCNDPC/SR by 17:00. ▪ District-level CCNDPC/SR shall report to District People's Committee and Province-level CCNDPC/SR by 18:00 ▪ Province-level CCNDPC/SR shall report to Provincial People's Committee and CSCFSC/SR by 19:00
Summary Reports	Prepared within 15 days after end of disaster	▪ All levels People's Committee shall report to upper level People's Committee. Provincial People's Committee shall collect, summarize and report to the Prime Minister and send to MARD for synthesis within 15 days after end of disaster
Periodic Reports	Prepared every 6 months (6-monthly report and annual report)	▪ All levels People's Committee shall report periodically disaster prevention and control activities to the upper level People's Committee. PPC shall check, summarize and report to the Prime Minister and MARD (January to June in the year) by July 15th. ▪ All levels People's Committee shall report annual report to upper level People's Committee. PPC shall check, summarize and report to the Prime Minister and MARD (Jan-Dec) by January 31st.

Source: Joint Circular No./43/2015/ TTLT-BNNPTNT-BKHDT

All disaster damage information is collected and managed by "Disaster Response Monitoring Room" in the VNDMA office. The room was established in 2017 by states funds. One to five staffs are on-duty. The duty is 0800 to 2000 during dry season between January to March, and 24 hours operation during monsoon season between April to December. The key staffs are assigned from the Department of Natural Disaster Response and Recovery. Due to lack of human resources, some other members are dispatched from other departments in VNDMA on a part-time basis.

This room belongs to CSCNDPC not VNDMA. Generally, the official meetings of CSCNDPC are held at the other conference rooms. During disasters, however, the chairperson and the leaders of CSCDPC sit in this room. Although the room and the facilities are not enough as the core system of national disaster information, it is a great step forward considering strengthening comprehensive information management in Vietnam.

Photo 3.1 Disaster Response Monitoring Room

Source: JICA Survey Team

According to interview to the officials in the room and provinces, the reporting mechanism regulated by the Joint Circular No.43/2015/ TTLT-BNNPTNT-BKHDT is well functioned. However, it seems difficult for the commanding committees of each level in disaster affected area to complete the summary report within only 15 days right after the disaster occurs. The Joint Circular regulates quality inspection of the information, but in reality the information tends to be sum-up of reports from lower levels. It is an issue to secure quality of the information.

3.3.2. Natural Disaster Response

As mentioned in section 3.1.2, the Decree No.66/2014/ND-CP stipulates the responsible agencies for natural disaster response according to the national disaster risk levels. In central level, the CSCNDPC commands and coordinates for disaster response for disaster risk level 3 and 4, and NCSR commands search and rescue activities. VNDMA works as the standing office of the CSCNDPC, collecting disaster damage information, issuing letters, official announcements and reports and advising the CSCNDPC according to the regulation in Decree No.66/2014/ND-CP. The outline of disaster response procedure is as follows:

When natural disaster warnings are issued by MONRE, CSCNDPC or VNDMA issues official letters to relevant ministries and provincial governments for disaster preparation. Depending on the situation, on-line meetings with provincial CCNDPC/SRs shall be held. When an actual disaster occurs, the CSCNDPC directs responses to the ministries and provinces, and commands emergency relief based on collected and analyzed disaster damage information. The provincial CCNDPC/SRs report the disaster damages to CSCNDPC and give directions including evacuation orders to the affected communities. Regarding inter-reservoir operation, the CSCNDPC directly command for the Red Rivers and the provincial CCNDPC/SRs command for the other main river basins. At the end of a disaster, the CSCNDPC directs disaster recovery and reports on local needs to the Prime Minister and supports recovery and reconstruction.

On the other hand, the National Committee for Search and Rescue (NCSR) coordinates to mobilize search and rescue team to the affected area. CCNDPC/S in local level takes actions based on the direction of NCSR.

During disaster response, VNDMA monitor and summarize the hydro-meteorological information, human and infrastructural damages for the decision making by the CSCNDPC. However, as such information has been collected by traditional tools (E-mail, Fax and

Telecommunication) and on-line system has not been developed, it often disturbs prompt actions in emergency situations. It is also issue that it takes time and efforts to collect information. In addition to insufficient communication tools, there is not enough space for command by CSCNDPC. In such circumstances, VNDMA is proposing to establish a "National Center for Disaster Operation and Response" to promote effective and efficient disaster response using integrated information and communication tools. VNDMA is also planning to use this center for training for disaster response teams, awareness rising activities, disaster education, and media relation. The proposed center shall be established outside of MARD headquarters. It shall not be shared with NCSR.

3.3.3. Natural Disaster Risk Levels

The Law on NDPC stipulates to define natural disaster risk levels. The detailed criteria of the risk levels are regulated in Prime Minister's Decision No.44/2014/QD-TTg "Natural Disaster Risk Levels".

The Natural Disaster Risk Level is classified into five (5) levels based on the intensity, range of influence and possible damage by the disasters. The target disasters are 21 types in 15 categories as; tropical low pressure /typhoon, tornado / thunderbolt / hail, heavy rainfall, extreme heat, drought, cold / frost, fog, flood / overflow, flash flood, landslide / ground subsidence, salinity intrusion, high tide, strong wind, earthquake, tsunami.

For instance, as shown in

Table 3.9 to Table 3.11, the Disaster Risk Levels of tropical low pressure and typhoon are determined based on location and "storm levels[16]". The Disaster Risk Levels of floods are determined based on categories of river basins (small rivers, medium rivers, major rivers such as Ma / Ca / Dong Nai / Vu Gia-Thu Bon, Red-Thai Binh rivers, and Mekong Delta) and "flood alert levels[17]" regulated in each river. The Disaster Risk Levels of flash floods are determined based on 24-hour accumulated rainfall and the number of affected provinces. The Disaster Risk Levels of landslides are determined based on 24-hour accumulated rainfall and continuous days of the rainfall.

In tropical low pressures and typhoons, only Disaster Risk Levels over level 3 are defined regardless of the magnitude of "storm levels". On the other hand, in landslides, there is no disaster level over level 3. It is because the national disaster risk levels don't represent actual dangerousness at the site but represent the range of influence of the disasters. The tropical low pressure and typhoons always affect multiple provinces in which CSCNDPC should take responsibility to command (Disaster Risk Level is high). The landslides occur only within a province, therefore provincial CCNDPC should respond (Disaster Risk Level is low) regardless of its dangerousness and damages.

The Natural Disaster Risk Levels are identified by MONRE in cooperation with MARD and declared by Prime Minister.

16 16 levels are regulated based on the wind speeds
17 3 levels of flood alert levels are regulated at the major observation stations along the river lines

Table 3.9 Disaster Risk Levels in Tropical Low Pressure and Typhoon

Location		Storm Levels			
		Level 8-9	Level 10-11	Level 12-15	Level 16
East Sea		Level 3	Level 3	Level 3	Level 4
Coastal Territorial Waters		Level 3	Level 3	Level 4	Level 5
Main Land	Northern	Level 3	Level 3	Level 4	Level 5
	Central	Level 3	Level 3	Level 4	Level 5
	Southern	Level 3	Level 4	Level 5	> Level 5

Note: colored are indicates Natural Disaster Risk Level
Source: Prime Ministers Decision No.44/2014/QD-TTg

Table 3.10 Disaster Risk Levels in Floods

River Basins		Alert 2～3	Alert 3～+1m	Alert 3+1m to historical highest	Over historical Highest
Several Small-Sized Rivers			Level 1	Level 2	Level 3
Several Middle-Sized Rivers	Upper Stream		Level 1	Level 2	Level 3
	Lower Stream	Level 1	Level 2	Level 3	Level 4
Ma, Ca, Dong Nai, VuGia - ThuBon, Ba	Upper Stream	Level 1	Level 2	Level 3	Level 4
	Lower Stream	Level 2	Level 3	Level 4	Level 4
Red-Thai Binh	Branch Stream	Level 1	Level 2	Level 3	Level 4
	Lower Stream	Level 2	Level 3	Level 4	Level 5
Mekong Delta		Level 1	Level 3	Level 4	>Level5

Note: colored are indicates Natural Disaster Risk Level
Source: Prime Ministers Decision No.44/2014/QD-TTg

Table 3.11 Disaster Risk Levels in Debris Flows (Flash Floods) and Landslides

Debris Flows (Flash Floods)				Landslides		
Affected Province	24 hours rainfall (mm)			Continuous period	24 hours rainfall (mm)	
	100～200	200～500	> 500		200～300	> 300
Single Prov.		Level 1	Level 2	1 to 2 days		Level 1
Multiple Prov.	Level 1	Level 2	Level 3	> 2 days	Level 1	Level 2

Note: colored are indicates Natural Disaster Risk Level
Source: Prime Ministers Decision No.44/2014/QD-TTg

3.3.4. Forecasting and Warning Mechanism

According to Article 24 in the Law on NDPC, the responsible agencies issuing forecasting and warning in Vietnam are MONRE and Vietnam Academy of Science Technology (the latter is responsible for earthquake and tsunami). The roles and responsibilities on forecasting and warning and its communication mechanism are regulated in the Prime Minister's Decision No.46/2014/QD-TTg "Providing for Natural Disaster Forecasting, Warning and Communication". The Decision regulated details of content of warnings, frequency and timings for tropical low pressure /typhoon, floods, earthquake and tsunami.

Forecasting and warning except for earthquakes and tsunamis are issued by the National Center for Hydro Meteorology and Forecasting (NCHMF), Vietnam Meteorology and Hydrology Administration (VNMHA) in MONRE. The VNMHA has 9 regional offices "Regional Hydro Meteorological Services (RHMS)" and provincial offices "Provincial Hydro

Meteorological Services (PHMS)". Nationwide, weather forecasting and flood forecasting for major river basins are delivered by NCHMF whereas, the local weather forecasting and flood forecasting for small to medium river basins are the duty of RHMSs and PHMSs.

The Decision No.46/2014/QD-TTg regulates communication and delivery of forecasting and warning as shown in Figure 3.8.

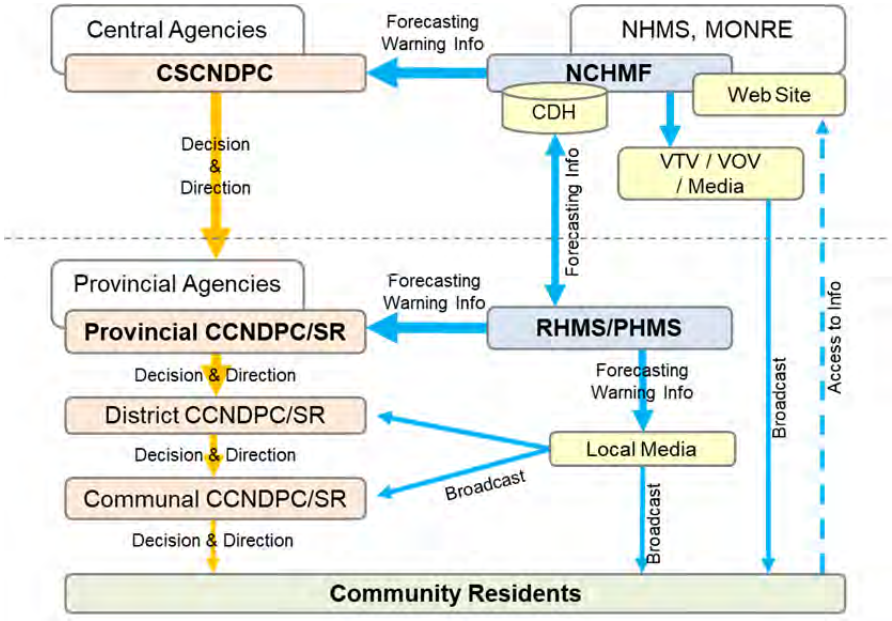


Figure 3.8 Communication of Forecasting and Warning

Source: prepared by JICA Survey Team based on Decision No.46/2014/QD-TTg

The NCHMF delivers forecasting and warning information to CSCNDPC, relevant central agencies, state channels of Vietnam Television (VTV), and Voice of Vietnam (VOV). In local level, the RHMSs and PHMSs deliver the information to provincial CCNDPC/SR and local media in the provinces. Neither NCHMF nor RHMSs/PHMSs has responsibility to directly deliver the forecasting and warning information to districts, communes and community residents. The people only receive the information via media or official letters from upper levels of CCNDPC/SR. Accordingly, the information doesn't reach the commune levels and residents in a timely fashion. In most cases, people must take actions based on their past experiences.

In such circumstances, some provinces adopt bulk SMS delivery services to directly warn the residents. However, such services tend to be stopped due to the high running cost.

The other issue is meaningful warning messages. Decision No.46/2014/QD-TTg regulates that the natural disaster risk levels must be shown in the forecasting and warning messages delivered by NCHMF and RHMSs/PHMSs. As mentioned in an earlier section, however, the natural disaster risk levels don't indicate dangerousness or imminent risks which the community faces at the sites. Unlike advisory and warning in Japan, there are no meaningful alert and warning levels in which people can understand the current and future risks at the sites to take actions for the coming disasters.

3.3.5. Hydro-Meteorological Observation and Monitoring

Hydro-meteorological observation and monitoring are the duty of VNMHA under MONRE based on the Law on Hydro-Meteorology. Currently, VNMHA operates 174 weather stations, 764 rainfall stations, 236 hydrological stations, 17 ocean weather stations, 6 radiosondes, and 7 weather radar systems. Using such observed data, VNMHA provides weather services such as daily forecast, 10- day forecast, monthly forecast, seasonal forecast, typhoon moving forecast and abnormal weather forecast. Such forecasted products are available at the VNMHA web-site.

In addition to the observation and monitoring services of VNMHA, the following disaster related monitoring services are available in Vietnam.

(1) Disaster Information Database System

Since 2010, VAWR is operating disaster information system (Figure 3.9). It is available at VNDMA web-site.

The system provides nationwide river water levels, rainfalls (including predicted rainfalls) and CCD live cameras at several dam reservoirs. The rainfall and water level data of each station are automatically collected from VNMHA and updated through the system. The data at manually operated stations are synchronized when the data are updated. In addition to the data from VNMHA, Electricity of Vietnam (EVN) under Ministry of Industry provides their observed data free of charges. Japanese weather service provider "HELEX" also provides 50 mesh predicted rainfall data for the system, in which user can obtain the predicted data at any location on the map. The system is an effective tool for central and local levels decision makers.

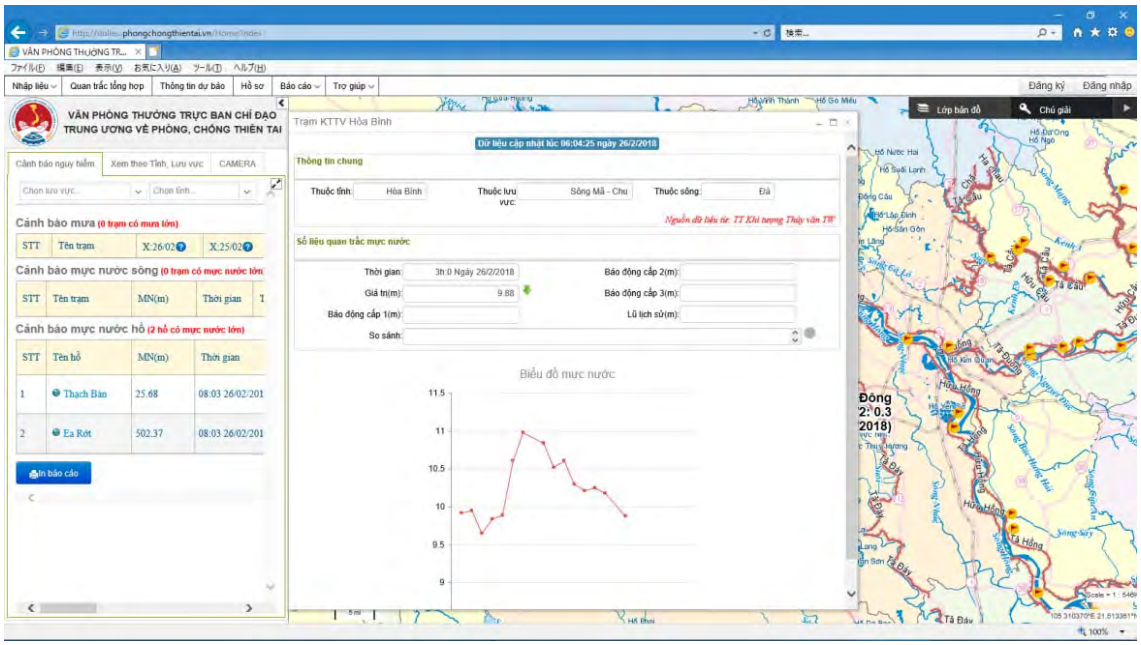


Figure 3.9 Disaster Information System operated by VAWR

Source: VNDMA web-site

(2) Rainfall Monitoring by Private Firm

Since landslides and flash floods are local disaster events that occur in a narrow area, the density of the rainfall observation network is important for early warning. However, the number of rainfall stations especially in the mountain areas is very limited in Vietnam. Recently, many provinces have started to develop their own rainfall observation system to provide accurate and prompt warning in the provinces.

Figure 3.10 Interface of VRAIN
Source: Application of VRAIN

WATEC is one of the private firms providing rainfall observation system. As of now, the firm has installed 360 rain gauges in the country. Approximately 15 to 20 gauges were installed per province. The rain gauges are installed especially in the mountain area where there are no observation stations by VNMHA. The collected data are used for warning as well as dam operations. The user can select purchasing or lease contract for the installation. In case of purchasing, the user pays about VND 720,000 (US$ 32)/set/year as maintenance fee. In case of a lease contract, the running cost is about VND 1.5 million (US$ 66)/set/month. Some provinces pay the fee using their NDPC Funds. The collected rainfall data can be seen using a smartphone application (Figure 3.10).

It seems an innovative solution from the viewpoint of utilization of private technology into DRR. At the moment, only accumulated rainfalls are available. But it is expected to be disseminated in a wider area so that it can be utilized for landslides and flash flood warning using extent rainfall distribution.

3.3.6. Issues on Disaster Information and Forecasting and Warning

(1) Strengthening Disaster Information Management

Disaster information collecting protocol regulated in the Joint Circular No.43/2015/TTLT-BNNPTNT-BKHDT is an excellent mechanism to prioritize DRR investments in the future. It is also appreciated that such regulation was developed in collaboration between MARD, which is the responsible agency for DRR, and the Ministry of Planning and Investment (MPI), which is the responsible agency for national socio-economic development.

However, the tasks and necessary reports regulated in the Joint Circular seem to be too detailed for local authorities to prepare during emergency situations. Considering the information quality and management, such a mechanism should be systematized in a database to reduce the burden on local authorities. Recently VNDMA is planning to develop an integrated disaster information database system using World Bank funds “Vietnam Managing Natural Hazard Project (WB5)”.

In addition to such database system, strengthening of disaster information management is strongly required in VNDMA. Insufficient data sharing among multiple ministries and agencies is obstacle to effective disaster response. In addition, data accumulated to the VNDMA from locals is only summarized information for each disaster event. There is no

detailed information such as damages by each disaster type, risk information and affected conditions that are essential for appropriated reconstruction, DRR investment and improvement of early warning and evacuation planning. All DRR related information such as hydro-meteorological data, hazard maps and DRR projects by relevant agencies and local governments should be comprehensively managed by VNDMA. Besides, the facilities and human resources for the information management should also be upgraded and strengthened for prompt disaster response initiated by Standing Office of CSCNDPC.

(2) Securing Warning Message Delivery to End Users

Forecasting and warning mechanism and protocols among government agencies (central agencies -> provinces -> districts -> communes) is systematized according to the Prime Minister's Decision No.46/2014/QD-TTg. However, the information delivery system to the community residents is not fully functional. The local people tend to take actions only based on their experiences without receiving warning message.

One of the reasons is that the warning messages are too difficult for the people to understand. The current used warning bulletin is for the commanding committees of each level, in which only text message describing longitude and latitude of storm direction and location, and water levels of certain hydrological gauging stations. Such information are meaningful for government officials and dam owners, but it is difficult for local people to know their imminent risk at the sites. Visualization of the risk information and regulation of warning levels for the people are required.

Regarding accessibility to the forecasting and warning information, it should be considered to improve VNMHA web-site and to deliver information via bulk SMS or other user-friendly communication tools. For that, an agreement between VNMHA and Telecommunication companies to deliver SMS free of charge is recommend.

3.4. Community Based Disaster Risk Management / Disaster Education

3.4.1. Community Based Disaster Risk Management (CBDRM)

(1) Current Activities

Many donors and NGOs such as the World Bank, UNDP, Ausaid, Red Cross, Oxfam, Save the Children, World Vision, etc. are currently supporting CBDRM activities in Vietnam. JICA conducted CBDRM activities in the Thua Thien Hue, Quang Nam and Quang Ngai provinces, which was part of the project titled the "Central Regional Disaster Resilient Society Building Project (2009 - 2012)" and in Quang Binh, Ha Tinh and Nghe An provinces titled “Disaster-Resilient Society Building Project Phase 2". Finally, a CBDRM promotion manual was created aimed at facilitating CBDRM smoothly and in a timely manner.

CBDRM activities in Vietnam became full-scale in July 2009 after the promulgation of "Prime Minister Decision Ref/1002/QD-TT: Community awareness raising and community-based risk management activities”. This Decision states that nationwide CBDRM activities must be carried out in 6,000 communities vulnerable to disasters within a 12-year period from 2009 to 2020 under the implementation responsibility of MARD with financial cooperation of MOPI and MOF. Also, in this Decision No. 1002, the focus is on floods and storms, and the sources of funding are State Budget: VND 546.9 billion (55%), Funds from residents: VND 45, 322 billion (5%), and Grant Aid from international donors: VND 45, 322 billion (5%).

The objective of the CBDRM activities described in this Decision No. 1002 is to minimize the loss of deaths and assets due to disasters and to ensure security such as sustainable development of the state, national defense, etc. Activity contents consist of the following two components.

- Component-1: Improve technical capacity of CBDRM for all levels of personnel who manage and execute CBDRM activities
- Component-2: Improve communication skills and disaster prevention education on disaster risk management in the community, strengthen community's disaster management ability.

Photo 3.2 CBDRM training at the commune (Ha Tinh Province)

Source: Vietnamese Country JICA Disaster-Resistant Society Project · Phase 2

According to VNDMA, CBDRM was implemented in 1,763 communes as of the end of 2015. It is less than one third of the target 6,000 communes. Because of the CBDRM activities,

the number of deaths has decreased in disaster-prone areas of Quang Nam, Quang Ngai, Nam Dinh and Thai Binh provinces. On the contrary the number of deaths increased in Khanh Hoa, , where the frequency of disasters is low. CBDRM activities have been delayed due to constraints in the government budgets. It is difficult to secure them for this activity. As a result, CBDRM often depends on activities of international donors and NGOs. Since donors and NGOs often carry out CBDRM directly with the provinces and districts, VNDMA has not fully grasped the necessary information.

(2) Recent New Activity

Although the Provincial Disaster Fund is expected to be used for CBDRM activity, detailed instruction on how to use it is unclear at present. Therefore, VNDMA intends to modify Decree 94 and clarify the direction of utilization. As part of the mainstreaming of disaster prevention, VNDMA has also incorporated CBDRM into the "National Target Program for New Rural Development (Sustainable poverty reduction)". VNDMA has prepared new guidelines that correspond to the law of disaster prevention and control. And in this guideline, VNDMA has designated eight regions by disaster type and characteristics. It is also developing CBDRM activities for each region. Recently, CBDRM activity in urban areas has been increasing and it is supported by donors of GIZ, CRS (Catholic Relief Services), US Red Cross, etc. The target groups for CBDRM in urban areas include not only the vulnerable people but also small and medium scale enterprises

Photo 3.3 New CBDRM Guideline (Issued in 2016)
Source: VDMA

3.4.2. Disaster Education

(1) Disaster Education System and Policies

Disaster education in Vietnam is conducted based on the "Education Development Strategy 2011-2020". Disaster education is an important educational activity in schools in disaster affected areas. Principally, disaster education teaches students knowledge and skills to respond to disasters and skills to protect themselves. The benefits of school education include children of elementary school age (8-10 years old) becoming transmitters of important regional CBDRM activities and are effective in raising awareness of disaster measures in homes and communities. MOET is the responsible organization for disaster education at the central government, education curriculum, training material, training on DRR / CCA (Climate Change Adaptation), under cooperation of MARD and UN. UNICEF and Save the Children are major donors in the disaster education field.

(2) Disaster Education by MOET

The basic policy of disaster education implemented by MOET is as follows:

- Child's education on the ability to adapt to the impact of natural disasters and climate

change,

- Development of teaching materials on prevention and mitigation of student's disaster risk,
- Organize education and training for emergency disasters for the core staff of local governments,
- Evaluation of disaster education at the time of emergency (before, during and after disaster occurrence) and development of tools for information management,
- Development of tools for self-evaluation of schools before and after the disaster, and
- Development of a swimming instruction program for all students

(3) Recent activities

1) Preparation of the Teacher Manual Concerning Education on Disaster Risk Reduction (DRR)

This manual was developed under the support of the Joint Advocacy Network Initiative (JANI), with the aim of capacitating teachers and educational practitioners to teach children about DRR. Upon creation, it was funded by ECHO (The Humanitarian Aid Department of the European Commission). Through the lessons in this manual, students learn the skills necessary to alleviate the potential impact of disasters, such as cyclones, droughts, earthquakes, floods, landslides, tornadoes, tsunamis and volcanoes. This manual is timely to support the implementation of the action plan of the education sector for the Vietnamese national strategy for 2011-2020 and has already been reviewed and approved by MOET.

2) Grassroots Technical Cooperation of JICA (International Cooperation Organization)

Since April 2011 Saijo city in Japan has implemented grassroots technical cooperation in Thua Thien Hue as "Hue City Disaster Education Support Project". Due to the typhoon disaster in 2004, the city has undertaken various initiatives aiming to "create a town strong against disasters" from the lessons learned. One of them, "12-year old child's education", teaches knowledge and skills on disaster through various experience activities in collaboration with schools and communities for 12-year old children (elementary school 6th graders in Japan) who will be able to develop self-judgment aimed at training young people (leaders) who will be responsible for the future.

Photo 3.4 Hazard map Preparation at elementary school in Thua Tien Hue province

3.4.3. Issues in Community Disaster Education

(1) Inadequate Coordination with Government Agencies and NGOs

Many donors are participating in CBDRM activities; especially, the number of NGOs are said to be 40-50 participants. The activities are educating residents about climate change adaptation measures and disaster risk reduction. There are many themes related to flood-related disasters. Many NGOs are engaged in a bottom-up approach, but communication between members of the community and government agencies, NGOs and government agencies are not necessarily functional. Implementation is limited due to incomplete teaching materials and lack of funds. Besides, the government agencies have limited staff, therefore there is not enough response.

(2) Community-Level DRR Based on Inadequate Experience and Knowledge

In Vietnam, many infrastructure projects have been implemented to deal with floods and storms, so far. Examples include construction of river banks, roads / bridges, drainage systems, irrigation facilities, etc. However, some of them have reported that they were damaged by recent large-scale disasters due to poor experience and limited design knowledge, and incompatible materials that do not meet the standards. Therefore, it is a challenge to implement community disaster prevention activities, form a society that is strong against disasters, and how to create a disaster resistant infrastructure.

Residents of the community are aware of improving the structure of the houses against floods and storms including raising the floor, using strong materials, etc. However, since many communities have no funds or knowledge to reduce risk, concrete measures are needed to improve this situation These might be in the form of disaster insurance and a low interest loan system.

(3) Guidelines for Disaster Education and System Improvement

Regarding disaster education, common guidance on prevention of natural disasters in schools in all areas is necessary. At the same time, disaster types differ for each area, so disaster education that is appropriate for that area is also necessary. As experience and knowledge of disaster prevention education in local governments in Japan seem to be very useful, systematic support using the Japanese experience is desired. Especially disaster education targeting 12 years old is considered to enhance the disaster prevention ability of the future generation.

Clear guidelines have not been issued at present on the utilization of disaster prevention funds. But from the perspective of DRR, it is necessary to clarify the system in terms of allocation to disaster prevention education. As of 2018, under the leadership of MOET, disaster education by major donors is systematically implemented. It is useful to incorporate those results and lessons into the school curriculum from the perspective of DRR / CCA.

3.5. Direction of Response Measures for Climate Change

As a response to climate change, the Vietnamese government has taken actions other than creating national and provincial disaster risk reduction plans in consideration of climate change impact. There are two ways of response measures against climate change: 1) mitigation measures focusing on reduction of greenhouse gases and 2) adaptation measures related to a disaster risk reduction sector. This section will introduce the adaptation measures in Vietnam.

3.5.1. Nationally Determined Contribution（NDC）

Based on the decision at the 19th Conference of the Parties of United Nations Framework Convention on Climate Change (COP19), the Vietnamese government submitted Intended Nationally Determined Contribution (INDC) including a goal of greenhouse gases reduction from 2021 to 2030, on September 25th, 2015. The target year for INDC depends on each country. The Vietnamese government submitted the INDC which target year was set from 2021 to 2030. The government ratified the Paris Agreement, and the INDC was registered as a "Nationally Determined Contribution (NDC)" by UN. The NDC indicates adaptation measures including disaster prevention in addition to mitigation measures.

In NDC, it is estimated that spending for adaptation measures will be over 3－5% of GDP by 2030, and that a third of this estimate will be covered by the Vietnamese government and the remainder will be sponsored by international support and private investments. Three main priority actions for climate change adaptation are the following:

1) Respond pro-actively to disasters and improve climate monitoring,

2) Ensure social security, and

3) Respond to sea level rise and urban inundation.

The detail priority actions are listed in Table 3.12.

Table 3.12 Priority actions for climate change adaptation

Items	Detail measures
Respond pro-actively to disasters and improve climate monitoring	・Modernize the hydro-meteorological observatory and forecasting system and develop the assessment and monitoring system on climate change and sea level rise ・Implement disaster prevention plans and measures ・Consolidate and develop prioritized and urgent disaster prevention projects; strengthen the capacity of search and rescue forces ・Develop infrastructure and make plans for residential areas; relocate and resettle households and communities from areas affected frequently by disasters ・Allocate and mobilize resources for community-based climate change adaptation and disaster management; raise awareness and build capacities for climate change adaptation and disaster risk management
Ensure social security	・Review, adjust and develop livelihoods and production processes that are appropriate under climate change conditions ・Develop mechanisms, policies, and strengthen the insurance system, and share climate and disaster risks ・Implement community-based adaptation, including using indigenous knowledge, prioritizing the most vulnerable communities ・Implement integrated water resources management in river basin systems; strengthen international cooperation in addressing transboundary water issues;

Items	Detail measures
	ensure water security ・Protect, restore, plant and improve the quality of coastal forests, including mangroves, especially in coastal estuaries and the Mekong and Red River deltas
Respond to sea level rise and urban inundation	・Implement integrated coastal zone management ・Use sea level rise scenarios in urban and land use planning for infrastructure, industrial parks, coastal and island resettlement areas ・Implement anti-inundation measures for large coastal cities ・Construct climate change resilient urban infrastructure; strengthen and build new large urban drainage infrastructure ・Consolidate, upgrade and complete crucial sea and river dikes ・Control saline water intrusion in the most severely affected areas

Source：INDC of Vietnam edited by JICA Research Team

In addition, challenges of implementing the adaptation measures described in NDC are listed in Table 3.13.

Table 3.13 Challenges of implementing climate change adaptation measures

Category	Challenges
Policies and institutions	・The legal framework for integrating climate change issues into national Socio-Economic Development Plans is still limited ・Coordination between line ministries, sectors and localities has been ineffective ・A lack of incentives to attract domestic and foreign investment and to mobilize the private sector to participate in climate change adaptation
Capacity	・There is a shortage of experts and technical staff who are specialized in climate change and the assessment of the effectiveness of adaptation measures, particularly at the local level ・There are limited capacities of forecasting disasters and early warning, as well as scientific research on climate change and adaptation technology; appropriate climate change adaptation models at the community level ・There are limited capacities to select and decide on prioritizing resources for the implementation of climate change adaptation activities
Finance	・While there are policies, plans and programs, climate change adaptation efforts were designed to collect funding for implementation, State resources can only meet 30% of the adaptation needs.
Technology	・There is a shortage of advanced technologies for hydrological and meteorological monitoring and forecasting, early warning of natural disasters and hazards, and climate change adaptation

Source：INDC of Vietnam edited by JICA Research Team

3.5.2. Plan for Implementation of the Paris Agreement and NAP

After the adoption of the Paris Agreement in December 2015, the Vietnamese government formulated a “Plan for Implementation of the Paris Agreement” on October 2016 (under Prime Minister’s Decision No.2053/QD-TTg) based on the NDC, and the plan indicates ways to accomplish NDC.

As a part of Implementation activities 2016-2020, formulation of the National Adaptation Plan (NAP) is written as a compulsory task required by the Paris Agreement. MONRE, a leading agency for this task, will create NAP by 2019 with cooperating inputs from related agencies such as MARD.

3.5.3. Resolution 120 and a Mekong Delta Integrated Master Plan

In September 2017, a meeting of "Conference on Sustainable and Climate Resilient Development of the Mekong Delta of Viet Nam" presided over by Prime Minister Nguyen Xuan Phuc was held in Can Tho City with participation of government officials and international donors. As the result of the meeting, Government Resolution No.120/2017/NQ-CP was issued in November 17, 2017. The Resolution indicates to shift the traditional idea of “living with floods” to “actively living with floods, inundation, brackish water and saltwater” as part of the integrated water resource management in the Mekong Delta Development Plan.

Resolution No.120/NQ-CP clearly lists the tasks of related ministries to accomplish the goal, and Table 3.14 indicates some tasks related to disaster prevention.

Table 3.14 Task related to disaster prevention for ministries indicated in Resolution No.120/NQ-CP

Ministry	Content of Task
MONRE	・Upgrade and modernize the system for monitoring, supervising, warning and forecasting ・Periodically update, complete and publish climate change and sea level rise scenarios for Vietnam by 2100. ・The volume of sand extracted and place and time of extraction shall be determined by analysis each year to prevent river bank and coastal erosion
MPI	・Prepare the master plan for sustainable and climate-resilient development of the Mekong Delta until 2030 with a vision towards 2050 using the method of multi-sectoral integration ・Effectively use existing investment to build a system of drains used for flood control, saline intrusion prevention and solutions for seriously eroded areas that directly affect people's houses and land and mangrove forest protection
MARD	・Set up a project on coastal protection, sea dikes consolidation and upgrade and coastal erosion prevention ・Focus on handling serious river bank and coastal erosion ・Formulate a river management planning associated with riverside land use planning ・Space for flood drainage shall be provided and traffic works combined with the irrigation systems shall be constructed

Resource：Resolution No.120/NQ-CP edited by JICA Research Team

After adoption of Resolution No.120, MPI formulated Mekong Delta Sustainable and Climate-Resilient Development Action Plan in January 2018, in which one of the components is the creation of Mekong Delta Integrated Master Plan. As of June 2018, with support of World Bank, the Master Plan, aimed to be completed by 2020, is intended to cover 13 provinces in the Mekong Delta Region.

Moreover, related ministries, other than MPI, are planning to implement the action plan for climate change adaptation based on Resolution No.120.

4. Implementation Status and Results of Disaster-Related Projects by Vietnamese Government

4.1. Flood Countermeasures

4.1.1. Status and efforts

(1) Law, Decree, etc. Regarding Flood Measures

1) The Law on Natural Disaster Prevention and Control (33/2013/QH13)

MARD is primarily responsible for structural measures for disaster prevention and control such as construction, rehabilitation and functional strengthening of dikes, dam, reservoirs, anti-inundation, anti-erosion, boat shelters, etc. (2nd clause of Article 42)

2) The Law on Dike (79/2006/QH11)

This Law provides a flood control plan for diked rivers, dike planning, construction, rehabilitation and operation and maintenance of dikes, etc.

- Basic principle of flood control is to discharge planned flood and historical flood discharges
- The Law classifies the river into class I to V according to population in the targeted protection areas, flood types, inundation depth for design floods in residential area, etc. The national budget is distributed to dikes with classes I to III, and the provincial budget is distributed to dikes with all classes in the annual budget plan for construction, rehabilitation and strengthening of dikes.
- River dikes, river mouths dikes, auxiliary dikes, ring dikes, etc. are planned securing safety against design high water level and past floods.
- Sand and gravel extraction from riverbeds require permission of provincial peoples' committees.

Table 4.1 Grades of river dikes

Protected Area by Dike (ha)	Grades				
	Protected Population				
	> 1,000,000	500,000 ~ 1,000,000	100,000 ~ 500,000	10,000 ~ 100,000	< 10,000
> 150,000	I	I	II	II	II
60,000 ~ 150,000	I	II	II	III	III
15,000 ~ 60,000	I	II	II	III	IV
4,000 ~ 15,000	-	III	III	III	V
< 4,000	-	-	III	IV	V
K47 + 980 to K85 + 689 of Hong river is classified as "Special Level"					

Source: Law on Dike

3) Decree on River Basin Management (120/2008/ND-CP)

River basin is classified as Table 4.2.

Table 4.2 Classification of rivers

River Class	River	
Major river basin	Hong (Red) river, Bang Giang river, Ma river, Vu Gia and Thu Bon river, Dong Nai river,	Thai Binh river, Ky Cung river, Ca river, Ba river, Mekong River
Inter-provincial river basin	The river basin covers more than 2 provinces and the river flows in city centers.	
Provincial river basin	The river basin is located within 1 province.	

Source: Decree No.120/2019/ND-CP

- River basin management plan describes a) water resources allocation, b) water resources preservation, and c) water-related disaster prevention.
- Item c) above includes the following:
  - To understand the current status, analyze the causes and determine the affected area,
  - To estimate the effects of structural/non-structural measures,
  - To improve the accuracy and the effect of flood/drought early warning system, and
  - To propose the structural/non-structural measures to minimize the damage.

4) National Strategy for Disaster Prevention 2020

- To strengthen the capacity to predict natural disaster such as flood, storm, drought, etc.
- To secure the safety of a dike system from the North region to Ha Tinh province. To enhance resistance of embankment against floods in the Central region.
- To assure the safety of reservoirs, especially the large-scale reservoirs and the reservoirs downstream at densely populated areas and important areas, etc.

(2) Flood Management Plan

1) Flood Prevention and Control Plan

The following table shows the rivers that have flood prevention and control plans.

Table 4.3 List of rivers having flood prevention and control plans

Region	River		
North	Da river (upstream of Hoa Binh dam),		Hong river,
	Duong river,	Luoc river,	Tra Ly river,
	Dao river,	Ninh Co river,	Thai Binh river,
	Van Uc river,	Hoa river,	Kinh Thay river,
	Kinh Mon river,	Da Bach river,	Cam river,
	Lach Tray river,	Rang river,	Thao river,
	Lo river,	Pho Day river,	Cau river,
	Thuong river,	Luc Nam river,	Tich river,
	Day river,	Hoang Long river	
North Central	Ma river,	Buoi river,	Len river,
	Lach Truong river,	Hoat river,	Ca river,
	Ngan Sau river,	Ngan Pho river,	Cay river,
	Rao Cai river,	Gia Hoi river,	Quen river,
	Tri river,	Quyen river,	Vinh river

Source: by JICA study team based on interview to MARD

2) JICA "the Project for Building Disaster Resilient Societies"

JICA conducted the "Project for Building Disaster Resilient Societies in Central Region" in 2009-2012 (Phase 1) targeting on Thua Thien Hue, Quang Nam and Quang Ngai provinces, and the "Project for Building Disaster Resilient Societies - Phase 2" in 2013-2016 targeting on Nghe An, Ha Tinh and Quang Binh provinces in order to strengthen the capacity for DRR in the central and provincial governments. In these projects, Integrated Flood Management Plans (IFMP) were prepared for pilot sites i.e. Huong River in Thue Tien Hue province, Gianh River and Nhat Le River in Quang Binh province. The PPCs of the 2 provinces approved these IFMPs.

In the progress meeting held on July 7, 2015 during the Phase-2 project, Mr. Hoang Van Thang, Vice-Minister of MARD suggested that the IFMP should be promoted and formulated in the eighteen provinces in the northern and north central regions. Although it has not been actual IFMP formulation after the Phase-2 project, World Bank is supporting to develop River-Basin Disaster Risk Management Plans for eight river basins under the "Managing Natural Disaster Project (WB5)" referring experience in IFMP formulation in JICA projects. Moreover, World Bank is planning to support IFMP formulation in the three river basins in the south central region under the "Emergency Natural Disaster Reconstruction Project". Figure 4.1 illustrates the targeted river basins in JICA and World Bank projects.

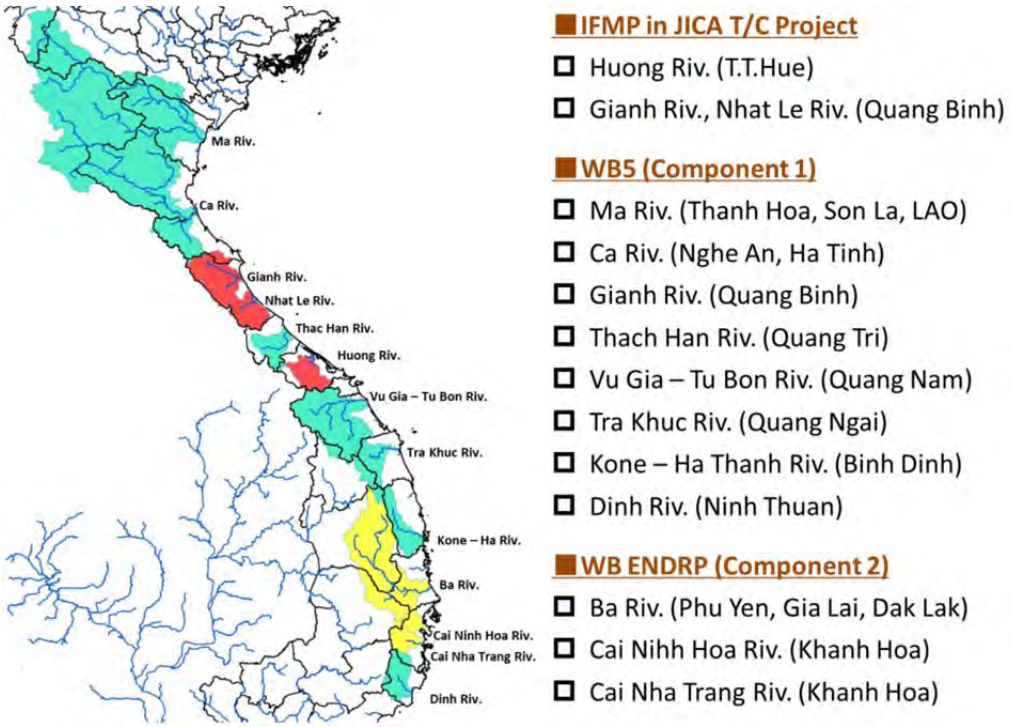


Figure 4.1 Target River Basins for IFMP in JICA and World Bank Projects

Source: Prepared by JICA Study Team

3) World Bank "Emergency Natural Disaster Reconstruction Project"

This 4-year project consists of three (3) components. The objectives of the project are a) to rehabilitate the infrastructures damaged by floods from October to December 2016 in Binh Dinh province, Phu Yen province, Quang Ngai province, Ninh Thuan province and Ha Tinh province in central region and b) to strengthen the disaster response capacity of relevant organizations.

Integrated river basin flood risk management plans for Ba River, Cai Ninh Hoa River and Cai Nha Trang River will be established in Component 2.

4) World Bank "Managing Natural Hazard Project"

The objective of this project is to enhance the resilience of people and economic assets against natural disaster for target river basins in consideration of realizing the National Strategy for Disaster Prevention 2020. Component-1 out of 5 components supports to prepare the river basin plan integrated with disaster risk management for the following 8 rivers:

Target river: Ma River, Ca River, Gianh River, Thach Han River, Vu Gia-Thu Bon River, Tra Bong-Tra Khuc-Ve River, Kone-Ha Thanh River, and Dinh River

(3) Flood Control by Reservoir

1) Integrated Reservoirs Operation

Decision 1879 QD-TTg "Approval of the list of irrigation and hydropower reservoirs on river basin that must establish integrated reservoirs operation process" designates the 11 river basins requiring integrated reservoirs operation process. Table 4.4 shows designated river basins and number of reservoirs. The integrated reservoirs operation processes for these river basins were already prepared and the target reservoirs have been operated complying with the processes.

JICA conducted the "Preparatory Survey for the Project for Emergency Reservoir Operation and Effective Flood Management using Water-related Disaster Management Information System", and the Grant Aid project is under implementation to develop an information system for control and operation of reservoirs in the Huong river basin.

Table 4.4 11 River Basins Requiring Integrated Reservoirs Operation Process

River Basin	Num. of Reservoirs	Reservoir
1. Hong river basin	8	Son La, Hoa Binh, Thac Ba, Thyen Quan, Huoi Quang, Ban Chat, Nam Na 3 and Lai Chau
2. Ma river basin	5	Cua Dat, Hua Na, Trung Son, Pa Ma and Huoi Tao
3. Ca river basin	4	Ban Ve, Khe Bo, Ban Mong and Ngan Truoi
4. Huong river basin	4	Binh Dien, Huong Dien, Ta Trach and A Luoi
5. Vu Gia – Thu Bon river basin	6	A Vuong, Dak Mi 4, Song Tranh 2, Song Bung 2, Song Bung 4, Dak Mi 1
6. Tra Khuc river basin	2	Dak Drink and Nuoc Trong
7. Kon – Ha Thanh river basin	3	Vinh Son A-Vinh Son B, Dinh Binh and Nui Mot
8. Ba river basin	5	Song Ba Ha, Song Hinh, Krong Hnang, Ayun Ha and An Khe-Kanak
9. Se San river basin	5	Plei Krong, Llaly, Se San 4, Thuong Kon Tum and Se San 4A
10. Srepok river basin	6	Buon Tua Srah, Buon Kuop, Srepok 3, Srepok 4, Duc Xuyen and Srepok 7
11. Dong Nai river basin	13	Dau Tieng, Tri An, Thac Mo, Don Duong, Da Mi, Ham Thuan, Can Don, Dai Ninh, Dong Nai 2, Dong Nai 3, Dong Nai 4, Srok Phu Mieng and Phuoc Hoa

Source: JICA Study Team prepared based on Decision 1879 QD-TTg "Approval the list of irrigation and hydropower reservoirs on river basin that must establish integrated reservoirs operation process"

2) Aging Reservoir

Table 4.5 shows dams in Vietnam. More than 6,000 dams are small-scale dams with less than 15 m in height and less than 3 million m^3 in storage volume. Many small and middle scale dams are earth dams and they were constructed from 1960s to 1980s without adequate survey and design. In addition, dam safety may not be assured due to the low quality of construction. 30 dams experienced collapse in the last 5 years because of floods. 1,150 irrigation dams need emergency rehabilitation or functional improvement by 2020 according to MARD. However, large-scale hydraulic dams are reported as ensuring the safety level.

Table 4.5 Irrigation and Hydraulic Dams in Vietnam

Dam type	Irrigation dam	Hydraulic dam
Dams > 50 m	3	32
Dams 15 m – 50 m or > 3 million m^3	661	54
Dams < 15 m and < 3 million m^3	6,648	201

Source: Department of Dam Safety Management, MARD

World Bank is implementing Dam Rehabilitation and Safety Improvement Project for the aging dam described above. This project supported by IDA of World Bank was launched on December 15, 2015 and will end on June 30, 2022. IDA would finance up to US$ 415 million. The project objective is to improve the safety of targeted dams under the Government's Dam Safety Program to protect downstream communities and economic activities through priority investments and capacity enhancement. The project consists of the following 3 components and covers 450 dams in 34 provinces. MARD is conducting the project as implementing agency in cooperation with MOIT and MONRE.

- Component 1: Dam Safety Improvement (US$ 412 million)
- Component 2: Dam Safety Management and Planning (US$ 20 million)
- Component 3: Project Management Support (US$ 11 million)

(4) Dike Construction

Table 4.6 shows the length of dikes in Vietnam. The length of dikes of Special Level – Level III is about 2,706 km in North – Central North regions. The dikes have insufficient height for 244 km and size for 713 km out of the total length[18]. The grade of dike is defined as shown in Table 4.1 based on protected area and population. However, the Hong River dike in Hanoi City has enough height because the height has been increased after each flood repeatedly. The ring dikes in Mekong Delta are small-scale and intended to protect the farm land only during the crop season. Therefore, flood water intrudes into the farm land overtopping the dike.

According to the interview to Department of Dike Management, VNDMA, the dike in the North region was constructed more than 1,000 years ago. Water leakage through the dike is confirmed and the Department of Dike Management of VNDMA grasps each critical location (エラー! 参照元が見つかりません。). The North region including Hanoi, the capital of Vietnam, has the expectation of technical assistance of Japan to improve dike safety.

[18] Report Status of Dike, Critical Sites Affected by Typhoon & Flood in 2017, VNDMA

Table 4.6 Length of River, Coastal and Ring Dikes

Region	Length
River dike (north – north central)	5,493.41 km
Special Level Dike	37.71 km
Dike Level I	618.05 km
Dike Level II	794.01 km
Dike Level III	1,256.56 km
Dike under Level III	2,787.08 km
River dike (middle central – south central)	904.00 km
Coastal dike	(2,897 km)
Quang Ninh province - Quang Nam province	1,729 km
Quang Ngai province - Kien Giang province	1,168 km
Ring dike (Mekong delta)	31,049 km

Source: REPORT STATUS OF DIKE, CRITICAL SITES AFFECTED BY TYPHOON & FLOOD IN 2017, VNDMA

Middle-sized cities scattering on the land lying in the north and the south have been developed. The highway and the North-South railway connect these cities, assure logistics and movement of people, and drive the economic development. Therefore, dikes need to be constructed for non-diked river to protect the important highway and railway from impassability caused by flood.

(5) Urban Flood

Flood countermeasures by dikes except ring dikes in the Mekong delta have been installed mainly in the Northern region as described in (4) Dike Construction. In the Central Coastal region, a certain level of flood has been accepted as a concept of living with floods. In recent years, economic development and urbanization have continued in the Central Coastal region. Once these middle-sized cities suffer from floods, the socio-economic impact becomes severe. For this reason, it is difficult to accept flood as before. Hanoi city is protected against Hong River flood by consolidated dikes but sometimes suffers from inland flood because of lack of capacity to drain rain water within the city (Figure 4.2). Inland floods in urban areas causes not only damage by inundation but also have environmental consequence such as contaminant diffusions (Photo 4.1).

Contaminant and communicable bacteria are diffused by flood

Mud is accumulated on road after flood.

Photo 4.1 Inland Flood in Urban Area

Source: Current situation and countermeasures of inundation in the urban area in Vietnam, Dr. Tran Thi Viet NGA

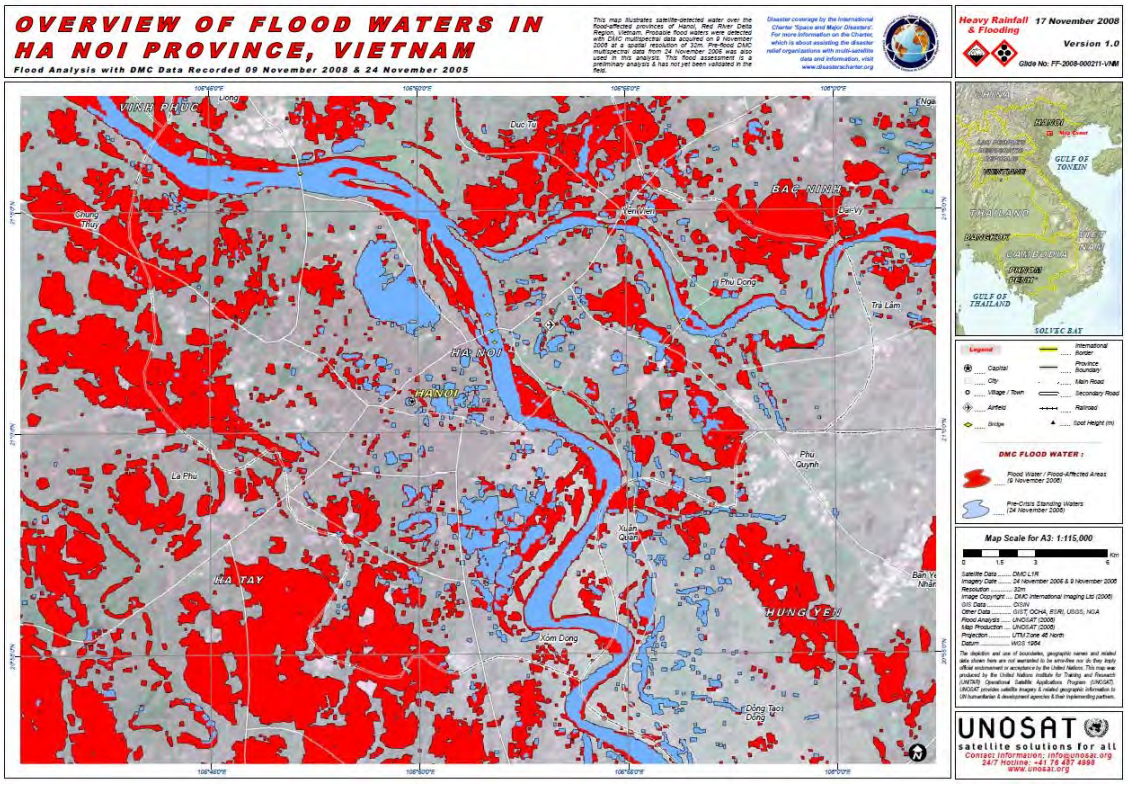


Figure 4.2 Inundation Map in Hanoi City (2008/11/17)

Source: UNOSAT

4.1.2. Challenge

(1) Capacity Enhancement of River- Basin Committee and CCNDPC/SR

Based on Decree No.120/2008/ND-CP, river basin management committees have been set up for main rivers. Its function is to coordinate the activities and management carried out by relevant agencies concerning prevention and mitigation of water-related disasters, water environment conservation, water resources development, etc. According to the interview to Vietnam Academy for Water Resources (VAWR), because a representative of each province in the river basin acts as a chairperson of the river basin management committee and the chairperson is changed every year on rotation basis, there is no consistent activity and the committee is not practically functioned. For appropriated river management, water use and environment conservation including IFMP for a river basin covering plural provinces, the rotating system of selecting a chairperson would be a hindrance.

The CCNDPC/SR in each province is responsible for damage assessment after flooding, but the assessment method has not been established. Flood damage needs to be assessed based on statistical data.

(2) Promoting Integrated Flood Management Plan

IFMP of Thua Tien Hue province and Quang Binh province established in JICA projects were approved by the PPCs and are officially flood countermeasures for both provinces

although lack of implementation budget may be an issue. After the above projects, the concept and method of IFMP on the basis of river basin are appreciated by MARD and World Bank and are ready for horizontal development. World Bank is supporting IFMP formulation at eight river basins under the "Managing Natural Disaster Project (WB5)", and plans to support at 3 river basins under the "Emergency Natural Disaster Reconstruction Project". The followings should be considered to accelerate horizontal development nationwide:

- Description regarding IFMP is added into laws and ordinances,
- IFMP manual is revised to adapt to the Central Highland, North region and Mekong delta, and
- IFMP formulation and implementation are stipulated in provincial NDCP plans.

(3) Measures for Aging Dams and Dikes

The number of aging dams dealt in the World Bank project is about 7 % of the total irrigation dams. There seems to be a considerable number of dams and dikes that need to be rehabilitated and improved. Regarding aging dams, safety assessment on risk of dam break caused by increased rainfall associated with climate change is required. Preparation of a dam database which stores dam type, sediment capacity in reservoir, spillway capacity, ground condition, operation status, etc., is advocated for dam safety assessment. Preparation of a safety assessment manual for aging dams is also needed. In Japan safety assessment for aging dams and dikes is conducted based on the manual and the assessment also conducts a geophysical exploration, which combines high-density resistivity two-dimensional exploration with elastic wave exploration (S wave); this assessment style is becoming common in Japan. Even small-sized dams and dikes would bring devastating consequences to downstream and social unrest, once they are broken. Therefore, the safety assessment based on the dam database for aging and risky dams/dikes is needed.

(4) River Channel Improvement

In the Central and South regions, flood control mainly depends on the upstream dams and most of the rivers are non-diked. Higher safety level of flood is desired with process of basin development in the future. In such case, dike construction, which is concentrated in the main rivers in the North region, will be expanded to other regions and the carrying capacity will be increased by river improvement such as excavation, widening, etc.

(5) Countermeasures against Urban Floods

In recent years, the Central Coastal region has been rapidly urbanized and industrialized. However, more active measures to protect the urban area from flood/high tide have not been examined in urban planning. Red River delta was widely inundated by a flood in October 2017. Many industrial parks were located in the area (Figure 4.3). When developing industrial parks, providing flood disaster risk information by the province and carrying out the measures by the developer are necessary countermeasures.

Risk of inland floods will be heightened because of increasing rainfall and rising sea levels caused by climate change and changing of run-off by urbanization (increasing discharge and shortened run-off time). Economic activity is susceptible to not only river floods but also inland

floods in middle-sized cities in the Coastal region. Therefore, urban planning should include sewerage/drainage system, open space with retarding function, drainage pump, etc. in order to minimize inland flood damage.

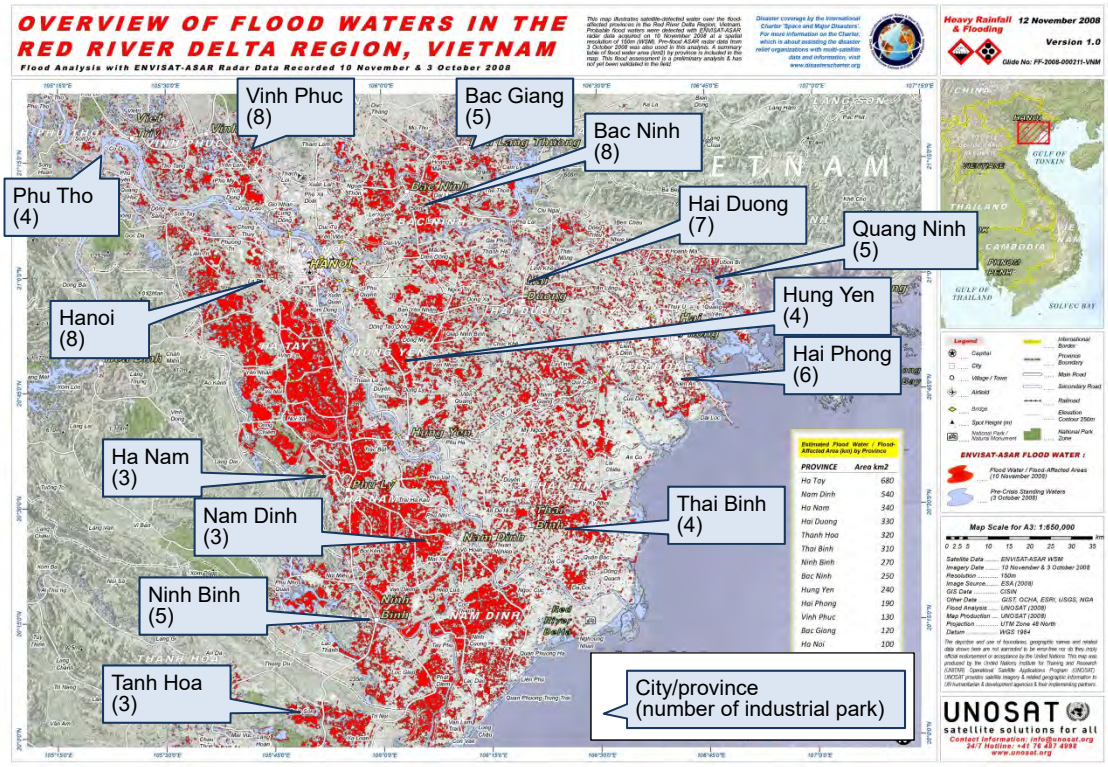


Figure 4.3 Inundation Area by 2008/11 Flood and Industrial Park in Red River Delta

Source: UNOSAT

4.2. Typhoon (Storm, High Tide)

4.2.1. Situation and Efforts

In recent years, climate change has escalated damage by strong storms and high tides. The damage mainly includes inundation by high tides, sea water intrusion, prolonged inundation, shipwreck and collapse of houses.

(1) Legal System, Organizational Structure, and Plan etc.

High tide caused mainly by typhoons raises the sea level around the river mouth and aggravates flood damage. In general, high tide brings damage in combination with other types of disasters e.g. floods, storms. Therefore, the damage information is not attributed to high tide alone. For this reason, a legal system, an organization structure and a plan focusing on countermeasures against high tide and strong wind do not exist.

(2) Risk Evaluations and Hazard map

As countermeasures against high tide, high tide hazard map, coastal and river dike construction and formulation of disaster response plan are supported by the government.

(3) Early Warning and Monitoring

MONRE is responsible for hydro-meteorological observation including the operation of 7 weather radars as described in “3.3.5 Hydro-Meteorological Observation and Monitoring”. The hydro- Meteorological organization issues marine warnings, approaching typhoon information, and emergency typhoon warning regarding typhoons.

(4) Structural Measures

International donors e.g. UNDP, GIZ, French Development Agency (AFD) are conducting rebuilding/strengthening of houses, afforestation of mangrove forest plantation/revegetation, etc. in the Mekong delta and the Central Coastal region. In 1997, typhoon Linda killed a thousand people by shipwreck/turnover. In response to the catastrophe, boat shelters have been constructed in order to temporarily evacuate boats during typhoons and high tides.

4.2.2. Challenges

Since Vietnam has a long coastal line oriented from north to south, the Coastal region is vulnerable to typhoons and high tides. In order to reduce the vulnerability, there is a need for weather forecasts, CBDRM in the Coastal region, and construction of coastal dikes. Further, coastal disaster prevention needs to be implemented from the viewpoint of sea level rise due to climate change and middle-sized city development in the coastal areas.

(1) Strengthening Weather Forecast

Though weather radars have been installed with support of donors, etc., the capacity of meteorological observation and forecasting using data obtained from the weather radar is insufficient. Strengthening the capacity for meteorological observations and forecasting is necessary to improve the accuracy of typhoon information. In addition, it is crucial to transfer

disaster information to coastal communities in order to properly conduct emergency response and to promote prompt evacuation activities.

(2) Maintaining Coastal Forest

Coastal dikes as high tide countermeasures have been installed along the coastal line. When a typhoon approaches the area, emergency measures e.g. sheeting on the slope and piling of sand bags are implemented. However, the locations protected by the emergency measures are limited compared to those protected by coastal dikes. For this reason, forming of coastal forests by afforesting mangrove on sea side and pine on the land side and combining the coastal forest with the existing coastal dike are recommended to improve resilience.

(3) Responding to High Tide Flooding

Capacity for response to wide spread and prolonged inundation by high tide in coastal area is insufficient. It is required to prepare a high tide prevention plan considering some scenarios covering larger typhoons, sea level rising, simultaneous occurrence of high tides and floods. Since a high tide inundation could bring considerable damage to economic activities at the middle-sized cities in the Coastal region, a city planning with the following features are necessary in order to minimize damage of high tides: implementation of road leveling in an expected inundation area, construction of drainage network systems, and installation of pumping stations, etc.

(4) Promoting Structural Measures

More boat shelters are required in preparation for stronger and larger typhoons due to climate change. In that case, the current design standard, technical guidelines, etc. need to be revised, if necessary. Reviewing the building code for housing is also necessary as a preparation for large typhoons.

4.3. Measures against Landslides and Flash Floods

4.3.1. Status and Efforts

(1) Legal System

Currently, no legal system has been enacted to systematically implement classification of disaster types, risk analysis, monitoring of risk areas, structural measures, early warning systems, and assessment after the occurrence of a disaster. In addition, there is no organizational structure for supervising countermeasures against landslides and flash floods. Regulations on land use are stipulated in the Law on Land (Law on Land No.13 / 2003 / QH 11), and the provinces need to update the land use plan map every ten years. At present, the land use regulation is not effectively used as a disaster risk reduction tool. The provinces that have land use plan including disaster risk reduction perspectives are limited.[19]

The official announcement systems of an early warning specialized for landslides and flash floods have not been institutionalized. There is no regulation for countermeasures against landslides and flash floods in the Prime Minister's decision about forecasting and transmission of natural disasters. There is no effective early warning system, and there are few observation facilities such as rain gauges and water level gauges.

(2) Risk Assessment and Hazard Mapping

The map of landslide risk area (1 / 50,000) created by Vietnam Institute of Geoscience and Mineral Resources (VIGMR) under MONRE is distributed to 14 provinces (see Figure 4.4). This hazard map is created by analyzing from multiple parameters such as topographic analysis using digital elevation model, geological condition and so on. The MOT requires high accuracy of this landslide hazard map for implementing the road construction plan.

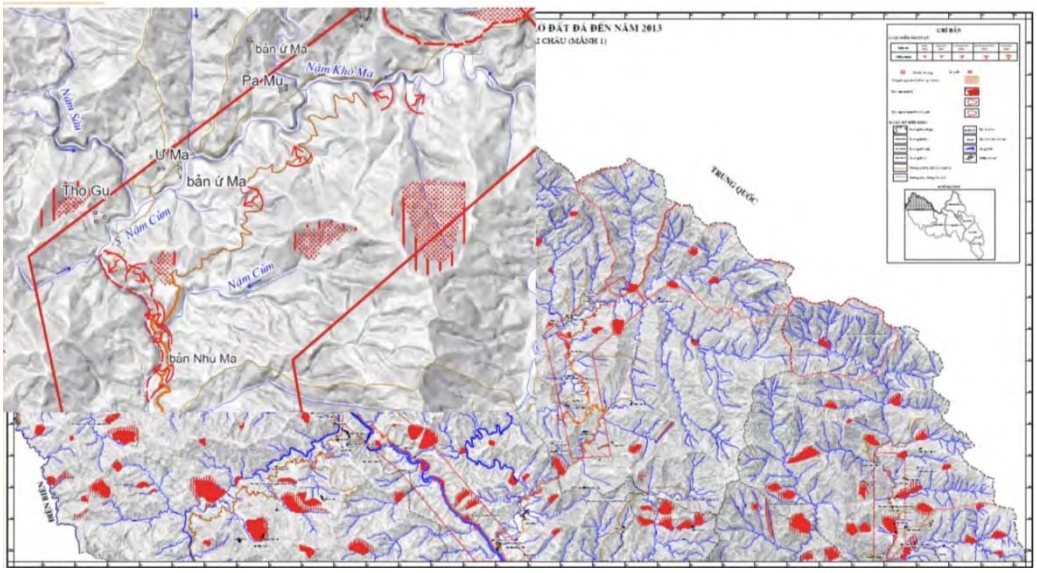


Figure 4.4 Landslide risk area map by MONRE (1/50,000)

Source: VIGMR, MONRE

[19] Vietnam: Country Case Study Report How Law and Regulation Support Disaster Risk Reduction, International Federation of Red Cross and Red Crescent Societies:2014

Source : MONRE

(3) Early Warning and Monitoring

Based on interviews with standing offices of CCNDPC / SR in provinces, it was found that the relation between NDPC / SR and PHMS in each province is good, and the transmission of meteorological and hydrological information is satisfactory. However, observation stations, historical observation data and its utilization are lacking. For this reason, meteorological and hydrological data do not have the accuracy of analyzing rainfall intensity, past disaster history, rainfall distribution, etc. As the central government has not institutionalized the issuance of forecasting and warning for disaster from landslides and flash floods, the evacuation instructions are implemented by each municipality with their own methods and standards.

The communication of meteorological and hydrological information is carried out through periodical transmission and reception of FAX and E-mail. It is not possible to operate the early warning system in real time. Also, the method of communicating to residents varies depending on the province, and it seems that it is difficult to use it for early warning and activities for community awareness.

(4) Structural Countermeasures

Structural countermeasures against sediment-related disasters are different among landslide, flash flood and slope protection measures on roads. In each province, preventive measures and deterrent countermeasures against landslides, preventive measures such as debris dams for flash floods etc. are hardly implemented due to lack of risk analysis and high cost of construction. As countermeasures after the disaster, improvements of flow paths in urban areas have been implemented (See picture).

Along the national and provincial highways, slope stability works such as slope cutting, slope protection and surface drainage are implemented. As mentioned in section 2.3.3, however, slope collapse, erosion and sediments inflow to the road occur every year. It causes serious damages to the countermeasures.

Photo 4.2 Construction of flow pass (Son La Province)
Damaged by debris flow, flow path work was done in urban area.
(Taken by the survey team, March 2018)

Photo 4.3 Road protection measures along the national road (Lao Cai Province)
Cutting, concrete spray, drainage hole has been constructed.
(Taken by the survey team, March 2018)

4.3.2. Challenge

Regarding the landslides and flash floods in Vietnam, the following issues can be extracted from the situation of the damage, the trend of the damage amount, and countermeasures.

(1) Systematic System of Countermeasures against Landslides and Flash Floods and Improvement of Legal System

As described in the previous section, the development of the legal system related to landslides and flash floods control has not been fully completed. It is necessary to improve the implementation structure of risk assessment for the following reasons: a) to establish implementation of an early warning system and monitoring, b) to establish appropriate countermeasures implementation system, and c) to create a systematic framework for landslides and flash floods countermeasures. In addition, it is required to restrict the development as mitigation measure in order to reduce exposure and to improve land use regulations.

(2) Establishment of Risk Evaluation System

1) Assessment and Evaluation after Disasters

Analysis without disaster history and causes, accumulation of damage situation, risk assessment of landslides and flash floods can not be carried out appropriately. For this reason, implementation of concrete countermeasures and an investment plan has been hindered. It is urgently necessary to develop a disaster assessment system and evaluation method that specify the classification of disaster types, its recording method, and the method of disaster damage survey.

In Vietnam, the establishment of department specializing in landslides and flash floods, and personnel allocation are not complete. As a result, it is not possible to respond adequately to disasters. For this reason, capacity enhancement of disaster response for landslides and flash floods is necessary in organizations.

2) Inventory Survey of Important Structures

Evaluation surveys on the safety of facilities related to living such as roads social infrastructure including road network are not appropriately conducted, so that economic damage can not be reduced. It is necessary to carry out inventory surveys of important structures and to be able to confirm the safety of important structures during the disaster assessment and evaluation.

3) Practical High-Accuracy Hazard Map

Currently, since the development of high-accuracy hazard maps is delayed, it is impossible to conduct analysis of risk areas, investigation of countermeasures, decision of priorities of countermeasures, non-structural measures such as relocation of residents, and implementation of CBDRM activities for raising public awareness. It is necessary to develop hazard maps larger than 1 / 50,000 for landslides and flash floods disaster.

(3) Establish Early Warning and Monitoring Mechanism

It is not institutionalized to release alarms and forecasting for landslides and flash flood

disasters. Also, since a risk assessment system has not been prepared, an effective early warning system has not been established. Under the framework of risk analysis implementation, it is necessary to exert efforts on the following: a) make effective warnings while utilizing the current observation facility, b) capacity enhancement of analysis for broader and more accurate rainfall prediction beyond provincial level, and c) observation data in real-time transmission.

Although monitoring and an early warning system for landslides and flash floods are required to be developed as soon as possible, it is necessary to consider countermeasures that combine transmission methods and community awareness based on the underlying risk analysis system.

(4) Implement Appropriate DRR Measures to Social Infrastructure Based on Risk Assessment

Since the structure of the risk assessment system for implementing preventive structural measures against landslides and flash floods is not in place, actions towards the implementation are delayed.

The emergency countermeasures planning includes early warning systems that can be appropriately implemented by implementing the risk assessment, post-disaster investigations, establishment of an implementation framework for structural inventory surveys, and improvement of high-accuracy hazard maps. In addition, it is possible to investigate cost effectiveness and investment effect on countermeasures.

4.4. Drought and Saltwater Intrusion Countermeasures

4.4.1. Status and Efforts

(1) Legal system, Institutional Structure, Plans etc.

Article 28 of the Water Resources Law stipulates that the legal responsibility of water resource management and basin water resource management in the provinces is MONRE. The water resources management within the province is under the jurisdiction of local ministries; however, each reservoir operation itself is carried out by different organizations such as MARD and MOIT. In addition, drought and prevention of saltwater intrusion are stated in Article 60 and Article 61 of Law on Water Resources, which is complemented by the Law on irrigation.

Although the Vietnamese government is making efforts to promote drought countermeasures, the drought situation is still complicated. In reality, there are no fundamental and effective measures implemented. In Vietnam, the central government and local governments have no particular short-term, medium-term and long-term plans on drought countermeasures from the viewpoint of DRR. Policies and plans concerning natural disaster prevention, agricultural and rural development, and water resource management in Vietnam are anticipated towards 2020 as listed below. However, these do not consider disaster prevention of drought and saltwater intrusion from the point of DRR.

1) 10-year Socioeconomic Development Strategy (SEDS) (2011-2020)

2) New rural development national target program (NTP-NRD)

3) Agricultural regional development strategy (2011-2020)

4) National strategy on water resources until 2020

5) National strategy on prevention, response and mitigation of natural disasters by 2020 (2007)

At present, drought and saltwater intrusion are closely related to agriculture, livestock farming, fishery industry, people's living (drinking water, health, sanitation, nutrition) etc. Measures are taken individually in each field.

(2) Risk Assessment

In some provinces, saltwater intrusion hazard maps have been created by DONRE.

(3) Support from Donors

The Vietnamese Government formulated the Emergency Response Plan (2016/17) for the 18 provinces in which disaster damage was high from 2014 to 2016 with support from the United Nations (UN), and provided humanitarian aid (drinking water, sanitation, food supply, nutrition, health, etc.). UNDP has been promoting "Transitioning from Emergency to Recovery" from the perspective of DRR. World Bank has made recommendations on reconstruction in the "Integrated Disaster Management: Investing in Long-Term Resilience." In addition, the Vietnamese Government has proposed the " Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods Project (WB9): August 2016 to June 2022)", strengthening adaptability against drought and saltwater intrusion, and embankments. JICA studied on implementing measures to cope with climate change adaptation for sustainable agricultural rural development

in the coastal areas of the Mekong Delta to prevent saltwater intrusion. On July 18, 2017, the both governments signed for a " Wastewater Management ODA Loan Project in Ben Tre Province".

(4) Countermeasures Underway

In Vietnam, water supply for agricultural production and drought management is under the responsibility of MARD and the Electricity of Vietnam (EVN). It is coordinating the water supply from the hydroelectric power reservoir to downstream areas. While the solution to the problem of droughts and saltwater intrusion has been implemented focusing on the reinforcement of irrigation facilities, there has been little understanding or reference to potential risks including vulnerability and disaster assessment. To cope with the water shortage problem, crops are replaced with other crops or fruits that do not use water or have strong salt resistance. This countermeasure is under the control of MARD while the actual execution is done at the local level. “Canal Upgrading Program", which reduces water loss by 20-25%, has been implemented as a measure to save water in the agricultural sector. The water level of the waterway is high in the case of gravity irrigation. Therefore, irrigation time can be shortened. Irrigation management became more active, and the administrative cost also became 60% of the soil waterway so far. Rice production is improved using new methods of rice production and innovative technology. In areas where drinking water and living water are in short supply, water conservation measures are being implemented by storing rainwater at individual households, and enlightenment activities by NGOs are also active.

4.4.2. Challenge

(1) Water Resources Problems in International Rivers

There is a major issue in promoting countermeasures against drought and saltwater intrusion in Vietnam today. There are ten international rivers in Vietnam, of which seven rivers flow from the neighboring countries. Construction of water resource intake facilities and large reservoirs at the upstream area limits the flow of water to the downstream area. Therefore, there is a risk that the downstream part will easily fall into a drought situation if the discharge amount is restricted.

(2) Adjustment among Water Resources in Related Sectors

Excessive water intake above the water resource potential is being carried out by irrigation, hydroelectric power generation and other water resource development projects, leading to depletion of surface water and underground water. Coordination between the relevant sectors in water use is still ineffective. Solving fundamental problem has not been achieved.

(3) Improvement of Accuracy of Hydrological and Weather Information

The quality of hydrology and meteorological forecasts is not up to standard. As a result, there is inadequate crop sowing and harvesting, and plans to store proper reservoirs are being carried out. This problem often occurs during the period of water shortages during the dry season.

4.5. Riverbank Erosion Countermeasures

4.5.1. Status and Efforts

(1) Legal System, Structure, Plan etc.

Article 63 of the Water Resources Law has provisions on riverbank erosion prevention, and it is stipulated that the People's Committee at each level must take measures to protect river levees and riverbanks. MONRE is also responsible for coordination with related organizations over multiple provinces concerning the protection of riverbank.

Regarding river erosion and coastal erosion, Prime-minister Decision No.01/2011 "Coast and Riverbank Erosion Control" is promulgated. Under the decision, the Provincial People's Committee of each province is responsible for implementing countermeasures against erosion directly affecting the levee, flood control facilities, residential area and important infrastructure in the province. Specifically, the PPC monitor the erosion situation, announce warnings to the affected areas, give guidance on housing redevelopment, formulate evacuation plans, etc. The PPC also conduct disaster education and awareness, observe illegal sand mining, manage construction works, etc. When erosion occurs, evacuation is carried out to protect the lives and assets of the people. The other responsibilities are to evaluate risk level of erosion, prepare investment plans for countermeasures.

MARD instructs means to implement countermeasures and leads implementation of projects approved by the Prime Minister to protect important facilities such as dikes level III to special class. In addition, MARD instructs academic and technical researches to protect erosion. MONRE is responsible for strengthen of sand mining control to prevent erosion.

(2) Risk Assessment

VNDMA has compiled a report on riverbank erosion coming up from the local province in accordance with Decision No.01/2011.

Classification of the degree of erosion risk shown in Decision No.01/2011 is the following three levels:

Level-1. Particularly dangerous erosions: causing direct danger to the objects to be protected in the short term, including:

a) Near dike toe or inside dike protection areas from special level[20] to level III, directly threatens dike safety,

b) Cause direct danger to urban centers, concentrated residential areas, and headquarters of agencies from the district level upwards, and

c) Directly affecting or going to affect the important infrastructure currently being used: airports, railways, highways, national roads, national ports, high voltage systems of 66 kV or higher; schools, hospitals from the district level upwards.

Level-2. Hazardous erosions, including:

a) Potentially affect a dike safety but outside the protection area of dikes from special

20 A grade of Dike which is based on Law on Dike

level up to level III or directly affect dikes below level III,

b) Affect urban centers, concentrated residential areas and agencies' offices, and

c) Potentially affect important infrastructures currently being used, including airports, railways, highways, national roads and provincial roads, harbors, high and medium voltage systems, historical and cultural relics, schools, hospitals, and clinics.

Level-3. Normal erosions: Other erosions, other than those specified in Clauses 1 and 2 of this Article.

Furthermore, riverbank erosion risk maps in some local provinces were developed by DONRE.

(3) Structural Measures

Each province is now constructing revetments at places they are urgently needed, but with restricted budgets, countermeasures to deal with the past riverbank erosion are delayed. The following is a description of riverbank erosion (750 m) that occurred in Hung Yen City in Hung Yen Province and the situation after construction of stone-pitched revetments as countermeasure works.

Figure 4.5 View of riverbank erosion in Hung Yen City

Source: DANH SÁCH CÁC ĐIỂM SẠT LỞ

Photo 4.4 View of riverbank erosion in Hung Yen City
(Left: before countermeasure, Right: after countermeasure)

Source: Photo by JICA survey team member in Aug. 2017

As a protection of the embankment from erosion, a stone protection method is mainly implemented. The method of integrating concrete stones is found near river management facilities such as drainage pumping plants, bridges, etc. in urban area. In rural areas, there are

many simple protections which include stacking only stone.


Photo 4.5 Riverbank protection major method by stacking stones seen in Vietnam
(Left: Stacking stone only, Right: Stacking stones between concrete frame)

Source: Photo by JICA survey team

A project implemented by JICA in the Central region executed small-scale low cost riverbank erosion prevention works considering the characteristics of each region and the flow of each river (Photo 4.6 presents a riverbank erosion countermeasure work executed under a JICA project to build a society able to withstand disasters in Vietnam (Phase 2)). In Phase 1, work was implemented at a location in Thua Thien Hue Province and in Quang Nam Province; in Phase 2, a location in Quang Binh Province and another in Ha Tinh Province were targeted. The countermeasure was designed by incorporating a traditional Vietnamese method with the participation of local residents. As shown in Photo 4.6, these work methods were elected to adapt to their surrounding environments. Planning and execution manuals for these work methods have already been completed.


View of repair of a riverbank slope on a tributary of the Gianh River in Quang Binh Province (work completed in September 2014)


View of repair of a riverbank slope on the La River in Ha Tinh Province (work in progress, April 2015)

Photo 4.6 Riverbank erosion countermeasure work executed under a JICA project to build a society able to withstand disasters in Vietnam (Phase 2)

Source: JICA project documents

4.5.2. Challenge

(1) Control Illegal Sand Mining

One of the factors considered as a cause of riverbank erosion is the unbalanced flow resulting from excess dredging of sediment in river courses and scouring riverbeds near revetments. Various permissible taxes such as environmental tax are imposed for sand mining. Therefore, people are collecting sand without permit or colleting over the officially permitted

amount. It is necessary to prevent unauthorized dredging, and at the same time, when dredging is authorized, the location and quantity of the dredging should be decided considering its impact on the revetment.

(2) Widely Introducing Low-Cost Work Methods

It is necessary to plan countermeasure sequence according to the priority of damage location (considering the risk of the damage expansion, economic loss of property such as farm land, etc.). Nonetheless, countermeasures for the frequent riverbank erosion in recent years have not been planned because of budget restrictions. Under such circumstances, the traditional low-cost methods which ensure durability at least equal to the currently used methods must be developed and widely introduced.

To apply traditional low-cost methods, appropriate supervisor who has enough experience is necessary. In recent years, however, such traditional technology has ceased and is replaced with easy methods which can be constructed by heavy machines. The cost of traditional methods is about half or less than currently used methods. Previous JICA project “Project for Building Disaster Resilient Society in Central Region” supported to apply traditional low-cost countermeasures and developed guidelines. Such guideline should be applied for the river erosion sites and to transfer the technology and know-how in local level.

4.6. Coastal Erosion Countermeasures

4.6.1. Status and Efforts

(1) Legal System, Structure, Plan etc.

MARD is responsible for the wide area plan on coastal levees to prevent storm surges and waves; however, the coastal levee plan of the province is the jurisdiction of the local province (Article 17 of the Dike Law). Meanwhile, unlike river bank erosion, provisions on coastal erosion are not found in the Water Resources Law.

Like riverbank erosion, countermeasures for coastal erosion are taken by provinces according to the Decision No.01/2011.

(2) Risk Assessment

VNDMA has compiled a report on coastal erosion reported by the local province in accordance with Decision 01/2011. It captures the current situation of the erosion.

Classification of coastal erosion degree shown in Decision No.01/2011 is the same as the riverbank erosion described above; namely, Level 1 as particularly dangerous erosion, Level 2 as hazardous erosion, and Level 3 as normal erosion.

(3) Structural Measures

At present, durable revetments are being constructed to stop coastal erosion. The following photos show views of execution of countermeasure on a coastline in front of a resort hotel in Quang Binh Province.

Photo 4.7 View of revetment work on the coast of Quang Binh Province

Source: JICA Survey team

In addition to constructing durable revetments as stated above, installing blocks to suppress erosion directly on the sandy beach and employing sandbags to prevent discharge of seashore sand, jetties, revetments, etc. have been undertaken.

Installation of erosion control concrete block (The blocks with the wave-absorbing effect have been arranged at the beachfront.)

Installation of sandbags (The sandbags are installed parallel to the shoreline as the jetty for accretion of sand)

Photo 4.8 Construction for coastal erosion countermeasure

Source: JICA Survey team

The photos below show the past damaged condition and the present condition provided with an urgent response measurement on Cua Dai Beach in Quang Nam Province. When JICA conduced "Data Collection Survey for Integrated Reservoir Managing using Comprehensive Disaster Information System and Disseminating Integrated Flood Management Plan", countermeasures using sandbags had been implemented in 2015. In 2018, only narrow locations can be used as a beach. The landscape is different from the original sandy beach, and some sandbags have collapsed in some places, etc. It seems that fundamental measures are necessary to restore the coastline as an international tourist destination.

Photo 4.9 Cua Dai Beach in Quang Nam Province

Source: JICA Survey team

As a measure against erosion on the Cua Dai beach, AFD and the Quang Nam research

proposed to expand the waterway of 50m width and 0.5m depth, which is made at the sandbank on the left bank side of the estuary after the flood of 2016. The proposed waterway will have the dimension of 200 m in width and 8 m in depth. It is assumed that this will assist the soil to flow to the north side of the estuary. Further, the dredged sand will be used for artificial beach nourishment, which will attenuate the damaging waves. It is also suggested that a strict control of the maritime police is required as part of dredge management.

According to the interview with VNDMA, as Phase 1, Hoi An City invested VND 80 billion (US$ 3.44 million) to construct 851m out of 1,339m of necessary extension of the embankment. Since the coastal erosion of Quadai beach became more acute between 2014 and 2015, Quang Nam province built a 415m embankment (with soft material such as sandbag) that cost VND 24 billion (US$ 1.03 million).

Since 2015, Hoi An City has invested VND 60 billion (US$ 2.58 million), with the central government budget, to build countermeasures against 1,300m coastal erosion. A half, 650m, has been reinforced, and the remaining 650 m will be carried out at upcoming occasion.

In addition, as a measure to protect the mangrove forest damaged by coastal erosion in the Mekong Delta, a porous protective facility, as shown below, is proposed by the research of AFD and others to promote inside sedimentation. The test is being conducted currently.

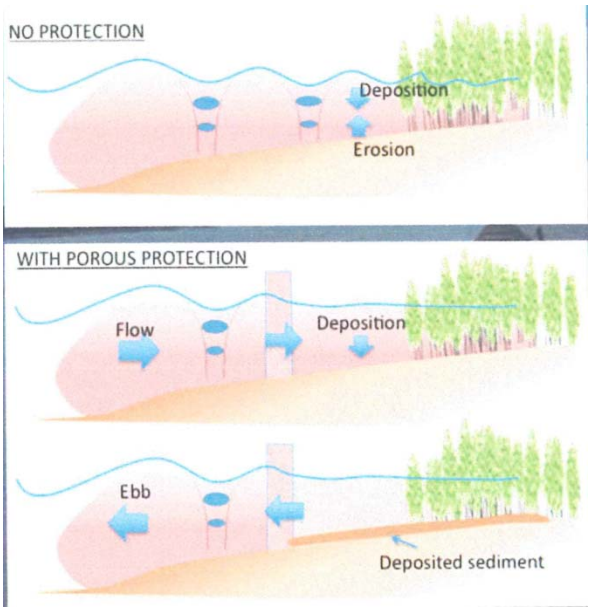


Image of porous protective facility function

Porous protective facility

Photo 4.10 Example of coastal erosion countermeasure in Mekong Delta

Source: Southern Institute of Water Resources research, Final Work Shop (H.C.M January 2018)

4.6.2. Challenge

The following challenges have been pointed out by the survey “Data Collection Survey on Basin-based Comprehensive Sediment Management in River Systems of the Central Region”, a survey of coastal erosion in the central region by the JICA

(1) Management activity that could Harm Sediment Transport and Sediment Control

- Change of sediment supply has not been considered in Plans for dams, infrastructure, sediment dredging etc.
- The quantity of coastal erosion caused by construction (levees, coastal structure etc.) has not been surveyed.
- A responsible organization has not been designated for sediment transport management in river basins.

(2) Technical Challenges Facing Sediment Management

- Basic data needed to survey causes and to study erosion countermeasures have not been obtained and accumulated.
- There are design standards for levees or jetties; however, there are no guidelines for evaluation and adaptation processes with a view of comprehensive coastline management.
- Coastal erosion countermeasures are limited to dikes. Beach replenishment, sediment bypasses or other countermeasures that ensure continuity of sediment transport are not adequately studied.

In addition to the issues above, in order to strengthen coastal living / industrial space against coastal erosion, it is necessary to establish regulations that adequately manage housing and resort developments in coastal areas (land use, building placement, construction of private coast facilities, etc).

4.7. Urban Disaster Countermeasures

4.7.1. Status and Efforts

(1) Current Situation

1) Definition of Urban and Rural

Urban (or City) is generally defined as an administrative area where populations of thousands to tens of thousands of people live at a certain density or more; more simply, it can be considered as "population concentration areas over a certain size".

According to UN definition, urban is (1) 50,000 or more inhabitants, (2) 60 percent or more of the houses located in the main built-up areas, (3) 60 percent or more of the population engaged in manufacturing, trade or other urban type of business. This report follows the UN definition of "urban".

Reference: United Nations World Urbanization Prospects (2012)
「Total of cities. The Definition of city : In general, municipality which satisfy the following conditions (1) 50,000 or more inhabitants, (2) 60 percent or more of the houses located in the main built-up areas, (3) 60 percent or more of the population (including their dependents) engaged in manufacturing, trade or other urban type of business. The definition of urban of previous revisions was based on DID (Densely Inhabited District).
(http://www.ninomiyashoten.co.jp/chiri_q_and_a/q010)

2) Current Situation of Urban Disaster

In provinces of Vietnam, the survey team examined the importance of disaster prevention focusing on "Urban" in which population is increasing in recent years.

In Vietnam, for many years the agriculture, forestry and fisheries industry have been the main economic base. However, in recent years, the following situations have been noted: 1) proportion of GDP from industrial and service industries has exceeded that of agriculture, forestry and fishery industry, and the former is still increasing, 2) the population of "urban area" which can be considered as the foundation of mining and manufacturing industry and service industry shows high increase rate of approximately 3% per year in most of the provinces, and 3) the number of deaths caused by natural disasters is currently decreasing due to various measures being taken, but the economic damage has been rapidly increasing in recent years. Therefore, with regards to the impact of natural disasters in the future, "damage in various assets in urban areas which shall be the productive base to support most part of GDP" will become more influential than the past.

Specifically, as the economic level of citizens and companies change, disaster prevention will become more significant in areas, where durable consumer goods such as home appliances, motorcycles, and automobiles exist. Production facilities of companies, such as factories, industrial parks and offices, and public infrastructure such as electricity, water supply and transportation etc., will quantitatively and qualitatively increase and concentrate in the future.

Economic damage caused by the natural disasters is not negligible. In fact, it will considerably reduce the GDP of Vietnam. Since the damage due to natural disasters in cities/urban area is increasing, disaster prevention measures that reduce the economic damage of cities are becoming an important issue.

3) Target of the Urban Disasters

From the result of damage analysis in the past, the survey team shall focus on "Flood", "Inundation" and "High tide" in the Law on NDPC as considering the most devastating damages that city/urban may confront in the future

(2) Countermeasure Implementation

1) Implementation of Countermeasures Against Floods

Regarding countermeasures against floods, in Hanoi City a dike has been built over the Red River for many years and responds to flooding from the upstream. The embankment was designed to prevent floods that probability occurred one in 500 years. When it is expected that the Red River will overflow the embankment near Hanoi City and there is a big threat that the flood might break the embankment, the Vietnamese army will bombard the embankment at Vinh Phuc province, located several tens of kilometers upstream from Hanoi city. This action will divert the flood inland to prevent any damage of large-scale flood n Hanoi City. In addition, several dams upstream of the Red River have also provided storage operations at the time of flooding.

Most of the urban areas near Saigon River in Ho Chi Minh City are located at an altitude of 2 to 3 m. Also, since Saigon River, near the urban area, is at a tidal zone, a large-scale embankment has not been built. Yet occurrences and damages by flooding are small. However, in Ho Chi Minh City, from October to January, it is high tide season in this zone. It sometimes reverses the water level of the river/ the canal in the tidal zone and height of water in relatively low ground area. During the rainy season, the monthly rainfall amount rises up to 250 mm or more. Due to the rainfall, partial inundation occurs especially with poor drainage capacity in areas.

In other cities, there are few flood control facilities like the Red River Embankment for Hanoi city. Therefore, urban areas are susceptible to flood damage in the case of heavy rainfall caused by typhoons. In the Central Coastal area especially, there are many cities that have been developed in low-lying areas along rivers. Therefore, floods frequently occur in these cities.

In addition, since the Mekong Delta is also generally low in altitude, cities in this region are susceptible to floods when it rains in the upper basin of the Mekong River. However, the history of Vietnam shows that the Mekong Delta region is relatively a newly developed land. Most cities do not have adequate flood control measures.

2) Implementation of Countermeasures Against Inundation

As measures against inundation in Hanoi City, the Government has installed pumping facilities to eliminate inland water by setting up a floodgate in the waterway leading to the Red River. The following pictures are examples of countermeasures against inundation: Yen So Pumping Station and Tanriet Flood Control Flood Gate. These were constructed as parts of JICA's "Hanoi Drainage Project for Environment Improvement Phase II". Also, wastewater pump facilities, etc. against rise of tide level and intensive rainfall mentioned above was constructed in Ho Chi Minh City under the JICA project "Ho Chi Minh City Drainage Project for Environment Improvement Phase II".

Photo 4.11 The flood countermeasure facilities
developed at JICA's "Hanoi Water Environment Improvement Project II"
(Left: Yen So pumping station, Right: Tanriet flood control flood gate)
Source: JICA homepage

However, in other cities, there are few flood countermeasure facilities or existing facilities which are old and no longer functioning efficiently. The following pictures show the pumping station of Thanh Ha County, Hai Duong Province located in the Red River Delta. At the pump facility, they operate 10 units of pumps at 2500 m^3/h, in total 20 units, but the pump facility is very dilapidated. (Quoted from "Integrated Dam Management Utilizing Japan's Comprehensive Disaster Management Information Management System and Information Gathering and Confirmation Survey on Development of Integrated Flood Management Plan", JICA, March 2008)

Photo 4.12 Drainage pump facility in Hai Duong province
Source: Participating companies of the study team photographed in the field in 2016

In particular, countermeasures such as drainage pump facility and the like are not sufficient in the lower area of the Red River Delta, coastal part of the Central region, the Mekong Delta region, and others. Therefore, it can be said that inundation frequently occurs in these areas.

4.7.2. Challenge

(1) Areas to be Targeted

Changes in economic losses caused by natural disasters in 8 regions in Vietnam are shown in Figure 4.6 in order to examine areas and cities where flood and its damage are severe. It can be analyzed that the economic losses have begun to increase after 2005. The regions that are heavily damaged in recent years are the Red River Delta, the Northern Central and the South

Central. The causes of these losses are mainly flooding (including Typhoon, Tropical cyclones, Storm). The increased losses in recent years can be due to an increase in value of assets due to economic development and the concentration and increase of population and assets in urban areas.

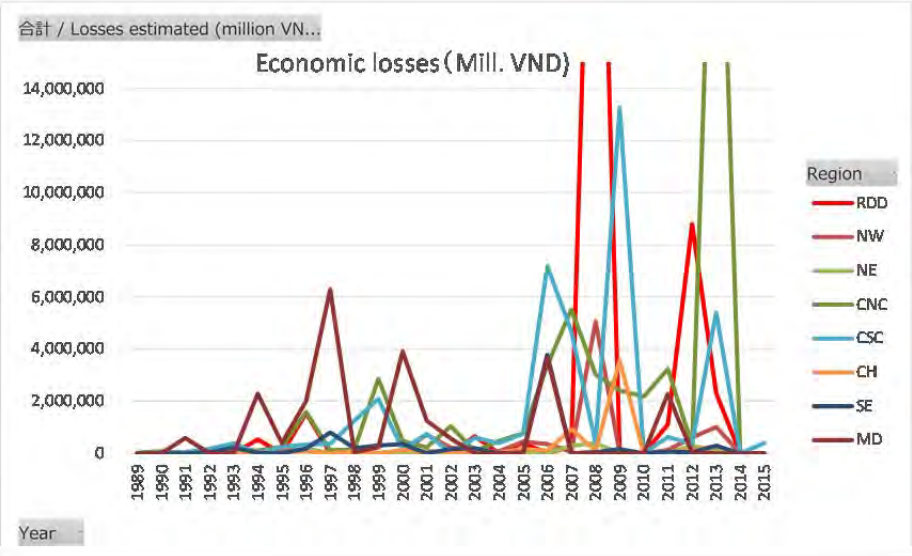


Figure 4.6 Economic losses caused by disasters by region

Note: RDD: Red River Delta, NW: North West, NE: Northeast, CNC: Central North, CSC: Central South,CH: Chubu Plateau, SW: Southeast, MD: Mekong Delta

Source : Desinventar (1989-2015)

Variations in the amount of economic losses of the provinces in the three regions in which economic losses are especially large after 2000, are shown in the following Figure 4.7.

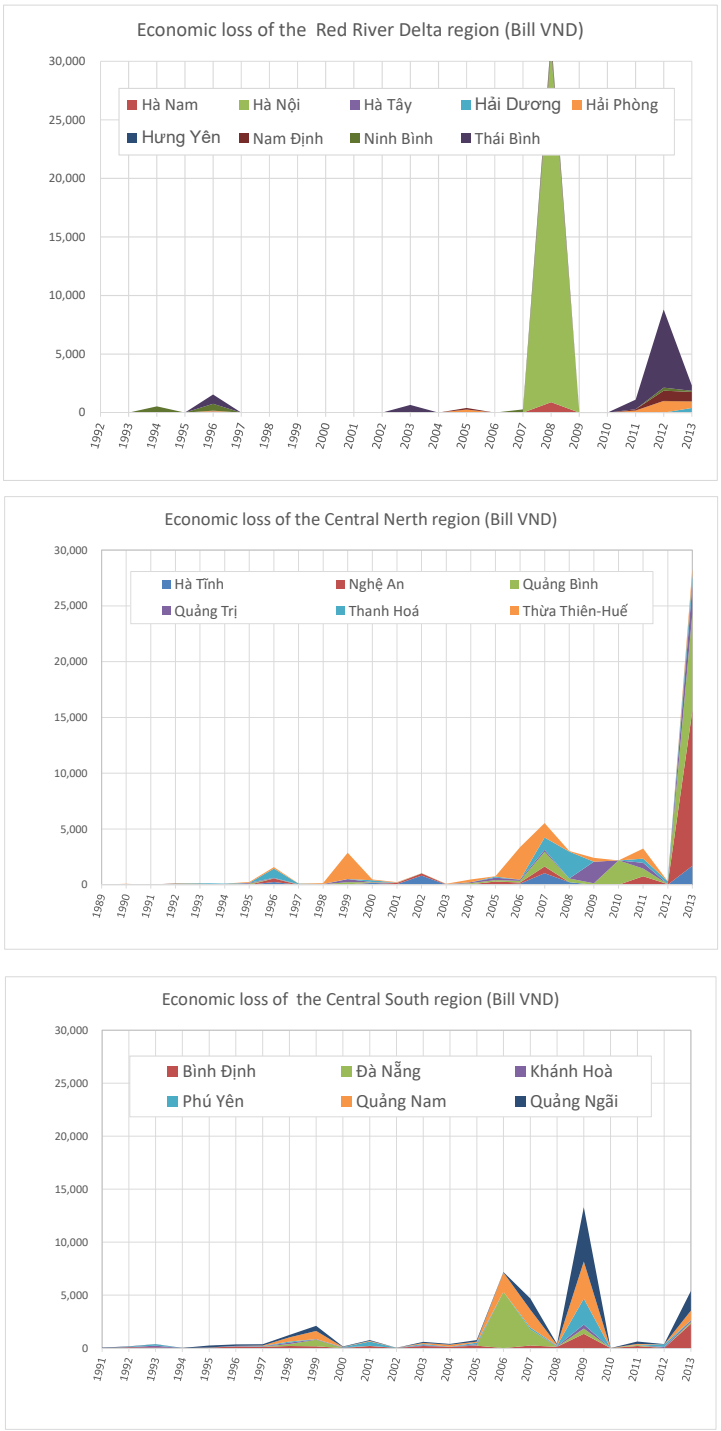


Figure 4.7 Changes in economic loss by province in the 3 regions showed large losses

Source: Compiled by the JICA study team from the Disinventar database

Based on this result, in years in which regional economic losses have exceeded 4000 Bill VND, the study team extracted largely damaged provinces by the amount of the losses. (Table 4.7)

Table 4.7 Outline of disasters with regional economic losses over 4000 Bill VND

Occurrence	Greatly economic damaged Region / Province	Factors and features	Information
1997	Mekong Delta	Large-scale accident of Fishermen in the Coastal areas of the Mekong Delta, by Typhoon Linda.	http://factsanddetails.com/southeast-asia/Vietnam/sub5_9h/entry-3490.html#chapter-15
2000	Mekong Delta (Upstream of the Delta)	From July to October the historical highwater level was observed, especially in September. The damage in the upper Part of the delta was large. Losses of about 4 Mill USD.	https://www.jstage.jst.go.jp/article/grj2002/80/12/80_12_663/_pdf/-char/ja http://factsanddetails.com/southeast-asia/Vietnam/sub5_9h/entry-3490.html#chapter-15
2006	Central Southern Part (Da Nang) Southeastern Part of the Mekong Delta	Typhoon Chanchu landed on Phu Yen province in May. Typhoon Xangsane landed on the Central region in October, and more than 70 people died and missing. Typhoon Durian landed in the South region in December, more than 70 people died and missing.	http://factsanddetails.com/southeast-asia/Vietnam/sub5_9h/entry-3490.html#chapter-15
2007	The Central Northern region (Thua Thien Hue, Tinh Hoa, Nghe An, Quang Binh, Ha Tinh Province)	Typhoon Lekima landed in October. It affected 100,000 houses and 15,000 hectares of paddy fields. In Nghe An Province and Tinh Hoa Province, etc., the damage was significant.	https://www.reuters.com/article/us-vietnam-floods/dozens-killed-in-worst-vietnam-floods-in-decades-idUSHAN2657120071007
2008	The Red River Delta (Ha Noi City) North west Part (Tinh Hoa, Thua Thien Hue Province)	The economic loss is serious in Hanoi City in this year. Typhoon Hagupit landed on China's territory on the North side of Vietnam in September. The damage was also severe in the Northern Mountainous area. About 800,000 people were affected, the economic loss was 6.3 billion USD.	https://en.wikipedia.org/wiki/Typhoon_Hagupit_(2008) https://www.reuters.com/article/us-vietnam-floods/floods-landslides-kill-50-in-vietnam-thailand-idUSTRE48R06Y20080928
2009	The Central South region (Quảng Ngãi, Quang Nam, Phu Yen Province)	Typhoon Ketsana landed on the Central region in September. At least 163 people died, and the economic loss was 14.3 Trillion VND.	http://factsanddetails.com/southeast-asia/Vietnam/sub5_9h/entry-3490.html#chapter-15
2012	The Red River Delta (Quang Binh, Ninh Bình, Nam Định Province)	Typhoon Kai - Tak landed on the Northern region in August. Nearly 12,000 houses were damaged, 23,000 ha of farmland was inundated.	http://www.bbc.com/news/world-asia-19312295
2013	Central northern Part / Central south Part	Typhoon 19 (Haiyan) landed on the Northern part of Quang Ninh Province in November. Approximately 600,000 people in 17,4000 households evacuated.	http://www.abc.net.au/news/2013-11-11/an-weakened-typhoon-haiyan-makes-landfall-in-vietnam/5082576
2015 -2016	Downstream part of Mekong Delta, The Southeastern, and the Central Highland region	Drought It Inflicted the largest damages in the Mekong Delta in the past 90 years.	http://www.vn.undp.org/content/vietnam/en/home/library/environment_climate/viet-nam-drought-and-saltwater-intrusion.html http://www.un.org.vn/en/publications/cat_view/226-emmergency-situation-report.html?start=10
2017	The Red River Delta, the Northern region (Hoa Binh Province etc.)	Typhoon 20 (Khanun) caused landslides at Hoa Binh Province, etc. and floods at lowlands, and more than 70 people died. More than 22,000 ha of paddy fields were damaged.	http://www.afpbb.com/articles/-/3146928?pid=19459039 https://www.reuters.com/article/us-asia-storm-vietnam/vietnam-braces-for-typhoon-khanun-after-floods-kill-72-idUSKBN1CL0AK

Source:1) http://factsanddetails.com/southeast-asia/Vietnam/sub5_9h/entry-3490.html#chapter-15
Other sources: Each published data

Provinces, which have suffered from relatively large economic losses due to past floods were selected. The survey team has identified capital cities of the selected provinces as model cities

to study and plan countermeasures. The objective of the study is to reduce the damage caused by urban disasters. Table 4.8 identifies the selected provinces and the cities to serve as model cities for the study.

Table 4.8 Examples of cities that need measures to mitigate the natural disasters

Area	Large provincial provinces with flood / flooding damage	Assumed city
Red River Delta Downstream	Hanoi City, Thai Binh Province, Ninh Binh Province, Nam Dinh Province	Hanoi City Thai Binh Province Thái Bình City Ninh Binh Province Ninh Bình City Nam Dinh Province Nam Định City
Central Northern Part / Central South Part	(Central northern Part) Nghe An Province, Thua Tien Hue Province, Thanh Hóa Province, Quang Binh Province, Ha Tinh Province (Central south Part) Da Nang Province, Quang Nam Province, Quảng Ngãi Province, Phu Yen Province	(Central northern Part) Nghe An Province Vinh City Thua Tien Hue Province Huế City Thanh Hóa Province Thanh Hóa City Quang Binh Province Đồng Hới City Ha Tinh Province Ha Tinh City (Central south Part) Da Nang City Quang Nam Province Tam Kỳ City Quảng Ngãi Province Quảng Ngãi City Phu Yen Province Tuy Hòa City
Mekong Delta	All local provinces	Provincial capitals such as Bến Tre City

(2) Countermeasures Assumed

General countermeasures for urban disasters are listed below.

Table 4.9 Major Challenges for the urban disaster

Type of Countermeasure	Main countermeasure method	Outline
(1)For Flooding	-River widening and excavation of river bed -Strengthening and raising of river bank -Installation of bypass channel -Filling of the flood prone area -Establishment of polder with embankment, drainage pump etc. in the target area	-these are the fundamental measures to protect cities from flooding. -Enough investigation and planning study are necessary. -Land expropriation often occurs, and construction period is long. For this reason, agreement formation and financing are likely to be problematic.
(2)For Inundation inside the levee	-Improve capacity of drainage canals in cities -Installation of a sluice gate between river and canals. -Installation of drainage pump -Filling of flood prone area	· Reduce damage caused by repeated inundation inside the levee. · Investigation of damage and appropriate planning are necessary. · Land expropriation is rather small, so project plan is relatively simple
(3) For Storm surge (Water rise)	・Construction of breakwater and water gate for Storm surge ・Installation of drainage pump	· It is necessary to investigate and analyze damage in detail and determine targets. · Land expropriation often occurs. Consequently, construction period tends to be longer. For this reason, agreement formation and financing are likely to be difficult.

(3) Summary of Necessity of Urban Disaster Prevention and its Issues

- Although many disaster countermeasures projects have been progressing for some decades, in the rural and urban areas of the Hong River Delta region, the Central region and the Mekong Delta region, the damages from floods and storm still frequently occur. Economic damage is especially increasing due to industrialization and economic development of the nation. That is now becoming an important issue for disaster prevention.
- Many of the provincial capitals in the Central region are susceptible to flooding since they have developed river ports. The cities located along river mouths are also susceptible to storm surges due to typhoons and others. The provincial capitals in the Mekong Delta are susceptible to floods from the upstream and damage from storm surges.
- Based on these issues, it is a challenge to develop disaster prevention projects targeting flood and inundation in order to limit the spread of economic damage in the future at the economic development cities in Vietnam.

5. Achievements Supported by Foreign Donors

5.1. Cooperation Results and Issues of JICA

5.1.1. Achievement of Cooperation

Regarding water-related disaster prevention, JICA has implemented the "Project for Building Disaster Resilient Societies (Phase 1 and 2) from 2009 to 2016. In these projects, JICA assisted in the formulation of IFMP against repeated damages caused by flood and storms in the Central region, and also provided technical assistance for CBDRM. As a background of the projects, the consciousness on disaster prevention and proactive actions by facilities against floods and storms was not emphasized. Costs and efforts were spent on the restorations after damage and recovery. In order to reduce damages by floods and storms, prediction of flooding in each river basin and effective and proactive countermeasures were needed for effective use of the resources.

In response to these issues, the projects assisted provincial governments in the Central region and MARD regarding the formulation of IFMP, and CBDRM, etc. Among the targeted provinces, the People's Committees of Thua Tien Hue Province and Quang Binh Province approved IFMP assisted by the JICA projects. Through this activity, the ability to formulate disaster prevention plans in target organizations, and capacity of the local residents and the regional organizations against floods and storms were improved.

Table 5.1 Summary of DRR related projects by JICA

Project name	Area	Project Overview
Project for Building Disaster Resilient Societies in the Central region (2009-2012)	Thua Tien Hue Quang Nam Quang Ngai Provinces	To strengthen the supportive capacity for disaster prevention in Provincial governments in the Central region and the Central Government, JICA implemented technical assistance related to the formulation of IFMP in T.T.Hue Province etc. in the Central region. The main initiatives were as follows. (1) Strengthening the disaster prevention capacity and structure of administrative organizations of the provinces, counties and communes. (2) Preparation of a manual for promotion of CBDRM. (3) Development of a design standard and a construction manual for the small scale and low-cost countermeasures to control river bank erosion.
Project for Building Disaster Resilient Societies Phase-2 (2013-2016)	Thua Tien Hue Quang Binh Ha Tinh Nghe An Province	To strengthen the structure of the integrated flood management in the Central Government and to strengthen capacity of development of IFMP and flood risk analysis in Provincial Governments, JICA implemented the following activities. (1) Activities at the Central Government level - Clarification of organizational structure and roles to implement IFMP. - Preparation of manual to promote IFMP based on practical tasks. - With MARD and MONRE, formulation of a joint action plan for effective use of information on weather and hydrology. (2) Activities at local government - Implementation of run-off analysis and flood analysis by computer modeling, and preparation of hazard map. - Support the formulation of IFMP based on impact analysis regarding damages of flooding. - Low-cost construction of revetment, etc. - Preparation of manual for effective operation of dam reservoirs, and manual for river bank inspection. - CBDRM in the pilot area, support of education for disaster prevention.

Source: JICA website

5.1.2. Challenges

JICA's assistance in Vietnam is based on Country Assistant Policy by Ministry of Foreign Affairs, Japan. It addresses to analyze issues and support DRR projects based on Sendai Framework. Fore climate change adaptation, it addresses to aim at implantation of projects which contribute mitigation and adaptation toward NDC targets, and support formulation of government decrees in legal basis.

JICA has supported IFMP formulation through the projects indicated in Table 5.1. For the next step, dissemination of the IFMP planning to other provinces is one of the future challenges. Continuing evaluation of the effects of the aforementioned technical assistance projects may identify problems after the project implementation. If problems are identified, follow-up activities to solve the problems may pose additional challenges.

In addition, JICA is implementing a "Project for Emergency Reservoir Operation and Effective Flood Management using Water-related Disaster Management Information System" at the Huong river basin in Thua Thien Hue province in the Central region. JICA is also implementing a project to support the construction of sluice gates to prevent agricultural damage caused by saltwater intrusion in Ben Tre province in the Mekong Delta region. The summary of on-going JICA project is shown in Table 5.2.

Table 5.2 Summary of JICA's planned and on-going projects related to DRR

Name of Project	Site	Category	Project Overview
Project for Emergency Reservoir Operation and Effective Flood Management using Water-related Disaster Management Information System (2017-2019)	Thua Thien Hue Province / the Central Government	Grant Aid JPY 1.844 billion in maximum	The objective is to enhance the capacity for disaster prevention management on rivers and dams in Huong river basin in Thua Thien Hue province in the Central region, and to prevent water related disasters and to reduce its damages. The following projects were planned. (1) Facilities and equipment procurement: Equipment: An X-band radar system, hydrology observation stations (10 locations), closed-circuit televisions (14 locations), real-time dam operation systems, direct communication networks (seven lines), an information management system, a multiple information display, a digital signage system for fighting floods, a direct commanding unit, a topographical survey, a river channel cross-section survey. (2) Consulting services Guidance in managing detailed design work of the facilities, bidding assistance, procurement supervision, (as guidance in managing the facilities) capacity development for operation and maintenance of the provided equipment.
Ben Tre Province Water management project (2017-2022)	Ben Tre Province (in Mekong Delta region)	Loan JPY 24.257 billon	By the saltwater intrusion in tributaries of the Mekong river, which is considered to be an influence of climate change, etc, damages like a decrease in yield and miniaturization of fruits has become serious on low salt-tolerance crops. In this project, the saltwater control facility e.g. sluice gates etc., will be upgraded in the southern part of Ben Tre province where agricultural damage caused by saltwater intrusion repeatedly occurs.

Source: Created from information provided by JICA and information on JICA web site

5.2. Results of Support by Other Donors

5.2.1. Achievements of Other Donors

In this section, the results and programs of other major donors on disaster restoration and disaster prevention in Vietnam are collected and compiled, and several important points are extracted.

(1) World Bank

Due to the flood and storm disaster that caused 749 people's[21] death in the Central region in 1999, World Bank has been assisting disaster recovery and disaster prevention activities, mainly in the Central region and the Mekong Delta.

Including the "Natural Disaster Risk Management Project (WB4)" launched in 2005, seven projects which are ongoing and planned after the WB 4 by the World Bank against natural disasters are outlined. (Table 5.3). The average cost of these projects is over US$ 100 million and the total project cost of 7 projects is about US$ 1,650 million.

The targets of the 7 projects are mainly, restoration and strengthening of rivers, roads and other public facilities damaged by floods and storms, measures against aging earth dams, development of water resources to cope with drought, irrigation facilities for agriculture, and provision of a disaster-related information system. These are combined with soft-components such as improvement of an administrative system related to the Disaster Risk Management (DRM) and strengthening of management capacity.

Since these projects were triggered by the historic disaster of the Central region in 1999, the target area of the projects covered mainly the Central region along the coast. There are few projects in the Northwest, the Northeastern (Red/Hong River Delta), the Southeastern (Dong Nai River basin), and the Central Highland region. Because the river banks of the Red River near Hanoi City had been considerably developed under the influence of the former Soviet Union, and the Dong Nai River basin has been assisted for many years in terms of flood control and development of water resources for Ho Chi Minh City by AFD, and other areas were not in line with the supporting policy of the World Bank. It is considered that the World Bank did not target these river basins.

All local implementation entities, i.e. local counterparts, of these projects are MARD and local PPCs of the target area. MONRE and DONRE sometimes joined in these depending on the project contents.

Table 5.3 Summary of DRR-related projects by the World Bank in Vietnam

Project name (AKA)	Area	Targets	Period (Year)	Budget USD million
(1)Natural disaster risk management (WB4)	The Central, the Me Kong Delta	＜Flood, Storm, Drought＞ ▪ DRM training for administration and residents ▪ Development of design standards for rural roads and irrigation facilities ▪ Management system for agricultural risk	2005-2013	102.5

21 http://www.adrc.asia/nationinformation_j.php?NationCode=704&Lang=jp&NationNum=15

Project name (AKA)	Area	Targets	Period (Year)	Budget USD million
		information		
(2) Managing natural hazards project (WB5)	10 Provinces in the Central region	<Flood, Storm (Strengthening of organizations related to the disaster risk management)> ▪ Strengthening Disaster Risk Management Institutions, ▪ Information Systems and Planning Strengthening ▪ Weather Forecasting and Early Warning Systems ▪ Community-Based Disaster Risk Management ▪ Priority Disaster Risk Mitigation Investments ▪ Project Management, Monitoring and Evaluation	2013-2019	167.0
(3) Mekong delta water resources management for rural development project (WB6)	7 Provinces in the Mekong Delta	<Drought, Water resources> ▪ Water management plan on agricultural land and measures to promote efficient water-use ▪ Improvement and restoration of water resource infrastructure such as canal dredging, reinforcement of river bank, installation of secondary control dams ▪ Water supply facilities to about 60 thousand households in rural area	2011-2017	206.6
(4) Irrigated agriculture improvement project (WB7)	Thanh Hoa, Ha Tinh, Quang Tri, Quang Nam, Ha Giang, Phu Tho, Hoa Binh, Provinces	<Drought, Water resources> ▪ Improvement of water management system for irrigations ▪ Improvement of irrigation and drainage plan ▪ Support for smart agriculture	2014-2020	210.0
(5)Dam rehabilitation and safety improvement (WB8)	34 Provinces (From Bắc Giang to Yên Bái) in the Northern and the Central region	<Flood> ▪ Restoration and capacity recovery for dam safety ▪ Dam safety management and planning ▪ Project management support	2016-2022	443.0
(6) Mekong delta integrated climate resilience and sustainable livelihoods project (WB9)	9 Provinces An Giang, Dong Thap, Ben Tre, Tra Vinh, Soc Trang, Bac Lieu, Ca Mau, Kien Giang, Vinh Long in the Mekong Delta region	<Flood, Storm, Drought, Erosion, Saltwater intrusion> ▪ 1: Enhancing Monitoring, Analytics, and Information Systems ▪ 2: Managing Floods in the Upper Delta ▪ 3: Adapting to Salinity Intrusions in the Delta Estuary ▪ 4: Protecting Coastal Areas in the Delta Peninsula ▪ 5: Project Management and Implementation Support	2016-2022	387.0
(7) Emergency Natural Disaster Reconstruction Project (Currently Adjusting)	5 Provinces, Binh Dinh, Phu Yen, Quang Ngai, Ninh Thuan, Ha Tinh And the Central Government	<Flood, Storm, Drought> ▪ 1: Reconstruction and rehabilitation of damaged infrastructure, especially irrigation, flood control, and road and bridge. ▪ 2: Disaster recovery capacity enhancement, to strengthen the institutional capacity of the government at the central and provincial levels. ▪ 3: Project management support to support project management, safeguards, audits, and monitoring and evaluation.	2018-2021	135.8
Total			2005-2022	About 1,650

Note: This is an excerpt from the Project Approval Document of each project.
For this reason, actual business termination time and project cost may differ from actual.
Source: Materials World Bank published

(2) GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit)

A summary of recent disaster-related projects by GIZ is compiled in Table 5.4. GIZ implemented technical cooperation on flood prevention and improvement of wastewater in midsized cities, targeting provinces in the Central and Mekong Delta region from 2005 to 2013. The characteristic of this project is to focus on disaster prevention for cities.

The Integrated Coastal Management Programme (ICMP) is on-going in 4 provinces in the Mekong Delta region as technical cooperation (T/A) as of August 2018. It aims to conserve and develop mangrove forests and to introduce a T-shaped breakwater (Photo 5.1).

Photo 5.1 T-shaped breakwater on the Mekong Delta coast by GIZ

Source:https://www.giz.de/en/worldwide/18661.html

By hearing about this research, the focus by GIZ on F/S regarding infrastructure was mainly the water gate and waterway, embankment, water supply and sanitation improvement, waterway, coastal levee, disinfestation, rehabilitation of mangrove forest, and rehabilitation of various facilities. It can be said that GIZ is investigating the possibility to support infrastructures construction through various technical cooperation.

Table 5.4 Outline of DRR related projects in Vietnam by GIZ etc.

Program	Area	Targets	Period (Year)	Type
Improving flood protection and drainage in medium-sized coastal towns and cities to help them adapt to climate change (With MOC etc.)	Phu Yen Province, Binh Dinh Province, etc.	Support the construction of an early warning system and improve urban disaster prevention system in Phu Yen Province and Binh Dinh Province. In residents' training, to teach how to respond when a flood occurs. To work with related organizations to improve emergency plans and organizational procedures.	2005 -2013	T/A
Integrated Coastal Management Programme ICMP (With MARD etc.)	4 Provinces in the Mekong Delta: Soc Trang, Bac Lieu, Ca Mau, Kien Giang province	The main instrument is the integrated coastal protection plan of four Mekong Delta provinces, including recommendations for coastal protection investments. ▪ -Two policy packages on forest management and irrigation management have been produced. ▪ -Planting of 46,000 hectares of new coastal forest by 2020. ▪ -Introduction of T-shaped breakwaters. ▪ -25 new livelihood models have been introduced to 10,800 households.	2013 -2019	T/A
Land Use and Climate Change Interactions in Central Vietnam (LUCCI) (Cologne University conducts with VAWR etc.)	Quang Nam Da Nang (Vu Gia-Thu Bon River Basin)	Providing a scientific basis to develop optimized land use and water resources management strategies. To develop such strategies, interdisciplinary research methods are applied which consider both natural and social science approaches. 1) Creation of spill analysis model 2) Development of strategy by analysis result	2010 - 2015	T/A Research and study

Source: Compiled from published materials of GIZ etc.

(3) AFD (Agence Française de Developpement)

AFD supported the construction of a water conveyance facility associated with Phuoc Hoa Dam Reservoir (Total water storage capacity 3,300 m^3) from 2010 to 2015 in cooperation with ADB for supply irrigation water and a countermeasure against saltwater intrusion at the river mouth in the Dong Nai River Basin, which is the source of Ho Chi Minh City.

In cooperation with the European Union (EU) and others from 2016 to 2017, AFD has been conducting research projects on coastal erosion mechanisms and countermeasures for Hoi Anh coast of Quang Nam province and coastal zone downstream of Mekong Delta. From now on, in cooperation with the EU on this theme, it announced that it shall plan and implement a coastal erosion countermeasure project of US$ 98 million scale[22].

Table 5.5 Outline of DRR related programs by AFD

Program	Area	Targets	Period (Year)	Type
(1)Study of erosion processes and protection measures for the Lower Me Kong Delta coastal zone (LMDCZ-AFD project)	Downstream area of Mekong Delta Ca Mau, Tien Giang, Quang Nam Provinces	▪ Understand the mechanism responsible for the erosion process in these two zones; ▪ Establish a solid scientific basis for integrated managements of the Vietnamese coastal zones; ▪ Propose soft and hard measures for sustainably protecting these coastal zones from erosion	2016 -2017	T/A
(2)Study on the coastal erosion process Hoi An and the measures	Quang Nam Province	▪ Field survey and analysis by simulation models for the coastal erosion process and protection measures. ▪ Planning of countermeasures and evaluation of its effectiveness	2016 -2017	T/A
(3)Phuoc Hoa Funding for Water Resource Utilization Project -Phase II-	Tay Ninh Long An Phuc Hoa Province	▪ Irrigation facility for area of 6,725 ha in Tay Ninh Province's Tan Bien districts ▪ Construction of canal of Duc Hoa District ▪ Water use in irrigation, living, and industrial use for 13,821 ha in Duc Hoa district of Long An Province ▪ Water supply to 900ha in Thai My district of Ho Chi Minh City	2010 - 2015	Loan EUR 50 million

Source: Compiled from published materials of AFD etc.

(4) IADC (Italian Agency for Development Cooperation)

Italian Agency for Development Cooperation (IADC) started "Improvement of Flood Prediction and Alarm System in Vietnam (Phase 2)" with MONRE as the counterpart in the period of 2016-2020. This project cost is about EUR 6.5 million in total of which EUR 4.0 million is a soft loan. The project supports the introduction of meteorological and hydrological facilities to respond to floods and typhoons for 5 provinces in the South-Central region. Specifically, in order to observe hydrological, meteorological, oceanic, and precipitation data from a remote location, this project consists of 1) introduction of facilities as 114 automatic observation stations and improvement of flood forecasting and warning system, 2) provision of a data network at regional to national level, and 3) necessary soft component for these operations.

This project is a similar to a JICA planned project from a point of view of the introduction project of hydrological and weather information management system for a basin. JICA is planning to implement this project in Thua Thien Hue Province under grant aid.

22http://vneconomictimes.com/article/vietnam-today/eu-supports-fight-against-coastal-erosion

(5) Netherlands

The Netherlands has continued to support the preparation of the Mekong Delta Master Plan since 1993. The latest plan is the 2013 version and this plan aims at strategic advice on long-term integrated development of Mekong Delta, under the strategic partnership on climate change adaptation and water management, with MONRE and MARD as the main counterparts. The object of the 2013 version plan ranges from the land use to the nature and water resources, socioeconomic development, impact of climate change and development scenario in the upstream area. Major issues on disaster in this plan are saltwater intrusion damage in the middle and downstream of the Delta area, coastal erosion and ground subsidence in coastal areas, and flooding in upstream areas. As a disaster prevention measure for these problems, this plan proposes countermeasures such as land use and transformation of economic activities besides improving facilities such as tidal gates and drainage canals.

(6) ADB

ADB has supported the construction of water conveyance facility associated with the Phuoc Hoa Dam Reservoir (Total water storage capacity 3,300 m^3) from 2010 to 2015. This is in cooperation with AFD for supply irrigation water and a countermeasure against saltwater intrusion at the river mouth in the Dong Nai River Basin, which is the source of Ho Chi Minh City.

(7) UNDP

From 2012 to the present, UNDP has provided a grant aid of US$ 1.4 million to promote development of strong infrastructures for climate change in the Northern Mountainous region. This includes road refurbishment, renovation of the irrigation system, and conservation of river dikes. Basically, UNDP's natural disaster-related projects are, in many cases, related to climate change, and the type of those projects is mainly Technical Assistance or Grant Aid.

In addition, UNDP implemented the project "Strengthening Institutional Capacity For Disaster Risk Management In Viet Nam Including Climate Change Related Risks (SCDM Phase II)" from 2012 to 2016, with MARD as the counterpart, totaling US$ 4.95 million (Grant Aid US$ 4.7 million). The main challenges of this project were to enhance national and sub-national institutional capacities of CSCNDPC and CCNDPC members and main stakeholders to consolidate disaster risk reduction legislative, policy and a strategic framework. For this purpose, UNDP has planned, implemented, monitored, and evaluated the CBDRM program effectively and efficiently and improved the capacity of DMC and CFSC members.

Furthermore, UNDP is planning a project “Improving the resilience of vulnerable coastal communities to climate change related impacts in Viet Nam” in order to improve the resilience of the vulnerable coastal communities against the impact of climate change (tentative name) ". It plans to implement the planned project through US$ 295.2 million of Grant Aid from the UN’s climate change fund, such as GCF. This project has double aspects of disaster prevention and climate change adaptation. The theme of the project is to restore housing, afforestation and recovery of mangrove forests, and integrated climate risk assessment in the area to protect coastal communities from storms and floods and reduce damage. As of August 2018, a budget of about 10% of the total is approved, and projects that could be funded with the approved amount are being implemented. It is expected that the whole project will take about 20 years.

(8) UN

When a large-scale natural disaster event occurs, the UN quickly collects disaster information through its Vietnam office and disseminates information on necessary funds and type for projects support to overseas donors and NGOs. As an example, in collaboration with the Vietnamese government, the UN finalized "Viet Nam's Drought and Salt Water Intrusion Recovery Plan", announced in 2016, for large-scale droughts that occurred in the Central and South region and Mekong Delta region from 2014 to 2016. Through the planning and information collection activities, the UN provides urgent necessary support for items and costs and seeks cooperation from other countries.

(9) GFDRR (Global Facility for Disaster Reduction and Recovery)

The GFDRR, which has World Bank as its secretariat, is a funding mechanism to promote mainstreaming of DRR in low-medium income countries. The Japanese Government contributes substantial donation to the fund. The GFDRR investigates the damage situation when large-scale disasters occur, prepares and reports for necessary support and countermeasures for restoration. The GFDRR is promoting support of donors and NGOs through surveys of such disasters and information dissemination.

(10) Others, NGOs, etc.

The Red Cross Society of each country, Oxfam, Save the Children, etc. are carrying out disaster relief activities in Vietnam from the viewpoint of humanitarian aid. Unlike government-affiliated organizations, the support from such organizations can be the implementation of CBDRM and related activities by their human resources on a daily basis and in each region. Also, in the event of a disaster, these NGOs collect information promptly through their local staff. Although done in a relatively small scale, it can be said that providing relief supplies in a focused manner is a feature thereof.

As an example of disaster relief assistance by NGOs, the distribution of support in 2017 against the drought that occurred between 2014 and 2016 are illustrated below (Figure 5.1). It is understood that NGOs provide food and drinking water, small water purification facilities, medicines etc. to each region

Among them, the Red Cross Society of Japan implemented mangrove reforestation activities for eight provinces located in the North region with the Vietnam Red Cross through the International Red Cross between 1997 and 2011. As of 2012, the plantation area of mangroves has reached 1,777 ha, accounting for 23.8% of the mangrove forests of the eight Provinces.

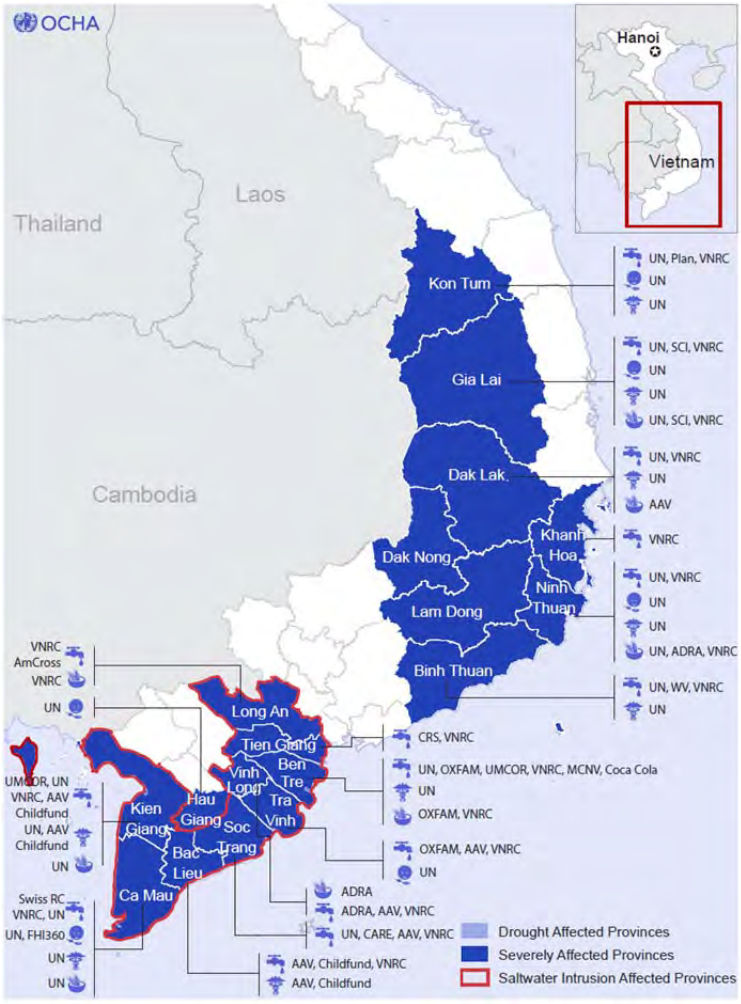


Figure 5.1 Implementation status of relief projects by local ministries and NGOs and others significantly damaged by recent drought

Source: Drought recovery plan 2016/2017, UN-OCHA

5.2.2. Results and Issues of Other Donors

From the results of the information gathering, the following are considered as activities of donors from other countries and international NGOs:

- The World Bank has been continuously implementing large-scale loan projects in response to large-scale disasters, mainly in the Central and the Mekong Delta region. As a result, it can be said that World Bank has greatly helped in the improvement of restoring infrastructure and establishing facilities for securing water resources. In addition, the World Bank has also strengthened the disaster prevention capacity of the central and the local government agencies. ,Further, the World Bank is the donor who has performed the most active support in Vietnam for disasters from floods and storms . When planning the disaster prevention project by JICA, it was necessary to understand the progresses of "Mekong delta integrated climate resilience and sustainable livelihoods project" and" Emergency Natural Disaster Reconstruction Project" targeting the Central region, from the point of view of these projects having started in recent years.

- For other donors who are involved in coastal erosion, it is necessary to understand the movement towards future development of GIZ and AFD, which are the leading donors for technical cooperation and research projects. Since 2016, IADC has started a project to introduce weather and hydrological observation facilities, forecasting and alarm systems, like JICA's project in Thua Thien Hue Province in the Mid-Central region. It is necessary to monitor and understand the future business development. AFD and ADB have been making consistent efforts on the development and use of water resources for Ho Chi Minh City.
- Measures against natural disasters such as floods and storms, coastal erosion, and drought are linked closely with climate change adaptation measures. The World Bank's WB9 Mekong Delta Project and technical cooperation and research on coastal erosion of GIZ and AFD also show the aspect of measures against climate change. UNDP also launched large-scale projects such as strengthening housing and facilities utilizing Grants of GCF, regenerating mangrove forests, as an adaptation measure to coastal erosion and wind storms due to climate change. In Vietnam, the vulnerability to climate change is high because the coastline is long and there are a lot of lowlands along the coast. For disaster prevention aid in the future, project plans should consider the impacts of climate change.
- International NGOs, in response to disasters, provide relief supplies and support CBDRM activities daily in each region. In many cases, these systems continuously allocate talent to various places. They are also very effective in gathering detailed information on disasters locally.

Considering other donor’s supports, methodology, target area and project scale, it is important to design the future assistance to package Japanese technologies, institutions and engineering know-how for capacity development in the field that JICA has advantages. It is also important to identify cooperative issues that anticipate the needs of Vietnam such as climate change adaptation.

Table 5.6 Major projects supported by foreign donors on disaster prevention
(1/2)

Region	Type of disaster	Activity	Past			Present			Future	Note
			-2005	2006-'10	2011-'14	2015	2016	2017	2018-	
Central Government	-	Restoration and recovery of facilities	WB(4) 1 Disaster risk manage			WB(5) 2 Managing natural hazard		WB(10) Emergeny reconstruction		· Improvement of disaster prevention capability at central government institutions is an important issue. · With the WB loan project, strengthening the disaster prevention capability of MARD is ongoing and will be supported in the future.
					UNDP 11 Strenthening Capacity					
					JICA 17 Resilient Societies					
1.Northwest Moutain (NW)	Flood/Storm	1) Restoration and recovery of facilities					WB(8) 6 Dam rehab. and improve			· Relatively few support are implemented for disasters in the northern mountainous areas. · In the large-scale loan project, WB (7) has been carrying out irrigation facility development in Phu Tho, Ha Giang, Hoa Binh province and several earth dams restoration projects are being run by WB (8).
		2) Observation, Information system								
		3)Preventive facilities			UNDP 12					
		4) Enhancement of system and capacity								
	Land Slide	1) Restoration and recovery of facilities								
	Drought	1) Restoration and recovery of facilities				WB(7) 5 Irrigated agriculture management				
2.Red River Delta (RDD)	Flood/Storm	1) Restoration and recovery of facilities					WB(8) 6 Dam rehab. and improve			· As a large-scale loan project, some earth dams are being repaired by WB (8). - The Italian IADC has been conducting a project on integrated management of multipurpose dams in the past to reduce flood risks in the Hong Tai Bin River basin.
		2) Observation, Information system			IADC 33					
		3)Preventive facilities								
		4) Enhancement of system and capacity								
	Land Slide	1) Restoration and recovery of facilities								
	Drought	1) Restoration and recovery of facilities								
3.Central Coast (Cental North, Central South: CN、CS)	Flood/Storm	1) Restoration and recovery of facilities	WB(4) 1 Disaster risk manage			WB(5) 2 Managing natural hazard	WB(8) 6 Dam rehab. and improve	WB(10) Emergeny reconstruction		· The Central coastal region is susceptible to typhoons etc, so organizations of foreign countries are implementing various kinds of support. · In the large-scale loan business, the World Bank is carrying out, WB (4) "Natural disaster risk management", WB (8)"Dam rehabilitation and safety improvement project", WB (10) "Emergency Natural Disaster Reconstruction Project", etc. · In addition to conducting research and study projects on coastal erosion in Hoi An City, AFD is implementing support projects for the sea level rise. · UNDP began implementing climate change adaptation measures in 2016, utilizing GCF funds, restoring damaged houses caused by storms and floods, and reforesting mangroves. · As a T/A project, JICA implemented "Project for Building Disaster Resilient Societies (Phase 1 and 2)", and now is implementing "Mitigating flood disaster risk by providing forecast/warning systems and other equipment using Japanese technology " in Thua Thien Hue Province.
		2) Observation, Information system				WB(5) 2 Managing natural hazard	IADC 36 Flood forecasting	JICA 19		
		3)Preventive facilities	WB(4) 1 Disaster risk manage			WB(5) 2 Managing natural hazard	UNDP 13 Improving resilience of …			
						AFD 32 Supporting regions rising water levels				
		4) Enhancement of system and capacity	WB(4) 1 Disaster risk manage	JICA 16	JICA 17 Resilient Societies					
					GIZ 24 Flood protection in coastal towns & cities					
					GIZ 25 Land use and Climate Change					
		5)Capacity enhancement on residents				WB(5) 2 Managing natural hazard	UNDP 13 Improving resilience of …			
		6)Supply					UNDP 13 Improving resilience of …			
	Land Slide	1) Restoration and recovery of facilities								
	Drought	1) Restoration and recovery of facilities				AFD 32 Supporting regions rising water levels				
	Erosion						AFD 29 Study on Hoian	AFD 31 Erosion		
						AFD 32 Supporting regions rising water levels				

Note: Organization name in the table is abbreviated. In addition, the number at the left in the table indicates number of supporting projects in other paper.

Source: Published resource, edited by JICA Survey Team

Table 5.6 Major projects supported by foreign donors on disaster prevention
(2/2)

Region	Type of disaster	Activity	Past			Present			Future	Note
			-2005	2006-'10	2011-'14	2015	2016	2017	2018-	
4.Central Highland (CH)	Flood/Storm	1) Restoration and recovery of facilities					WB(8) 6 Dam rehab. and improve			· In the Central Highland region, flood damage is relatively small, so there are few support projects by other donors.
		2) Observation, Information system					IADC 35 Monitoring			
		3)Preventive facilities								
	Land Slide	1) Restoration and recovery of facilities								
	Drought	1) Restoration and recovery of facilities		JICA 18 G.W						
5.Southeast(SE)	Flood/Storm	1) Restoration and recovery of facilities								· In the Dong Nai River system, which is the water source of Ho Chi Minh City, AFD and ADB are continuously carrying out projects related to water resources development and irrigation facilities development.
		2) Observation, Information system					IADC 34 Flood forecast			
		3)Preventive facilities								
		4) Enhancement of system and capacity		AFD 27		AFD 28				
	Land Slide	1) Restoration and recovery of facilities								
	Drought	1) Restoration and recovery of facilities	ADB/AFD 14 Phuoc Hoa Water Resources		ADB/AFD 15 Phuc Hoa phase-2					
					AFD 27					
6.Mekong Delta	Flood/Storm	1) Restoration and recovery of facilities		WB(4) 1 Disaster risk manage						· In the Mekong Delta, the World Bank will implement WB (6) "Mekong delta water resources management for rural development" from 2011, and started WB (9)"Mekong delta integrated climate resilience and sustainable livelihoods project" from 2016. · JICA started a project for facility development for saltwater intrusion in Ben Tre Province from 2017. AFD and GIZ are separately conducting research and study projects on the coastal erosion. · AFD is considering coastal erosion loan project jointly with EU. · Since 1993, the Netherlands has continued to support the creation of the Mekong Delta Master Plan.
		2) Observation, Information system					WB(9) 7 Mekong integrated CC			
		3)Preventive facilities		WB(4) 1 Disaster risk manage			WB(9) 7 Mekong integrated CC			
						AFD 32 Supporting regions rising water levels				
		4) Enhancement of system and capacity		WB(4) 1 Disaster risk manage			WB(9) 7 Mekong integrated CC			
			Netherlands Mekong Delta Master Plan							
	Land Slide	1) Restoration and recovery of facilities								
	Drought	1) Restoration and recovery of facilities			WB(6) 4 Water resource management					
							WB(9) 7 Mekong integrated CC			
								JICA 20 Ben Tre		
						AFD 32 Supporting regions rising water levels				
		2)Provision of Supplies						JICA 22		
	Erosion				GIZ 23 Integrated coastal management programme					
							AFD 30 Study on LMDZ			
									AFD 31 Erosion	
						AFD 32 Supporting regions rising water levels				

Note: Organization name in the table is abbreviated. In addition, the number at the left in the table indicates number of supporting projects in other paper.

Source: Published resource, edited by JICA Survey Team

6. International Trends and Initiatives in the Disaster Prevention Sector in Vietnam

In Vietnam, the Sendai Framework for Disaster Risk Reduction 2015 -2030 (SFDRR) and Sustainable Development Goals (SDGs) are incorporated into the national strategy, and specific activities are taking place. However, VNDMA is a new organization that was established in August 2017, and concrete activities have not been started at present. However, with regard to SFDRR, it is stipulated that DRR measures should be included in central and regional socioeconomic development plans and development master plans of each sector. In addition, the law of disaster prevention and control enacted in 2013 clearly specified "Strengthening Governance of Disaster Risk Management" and "Importance of Proactive DRR Investment". In addition, “the Priorities for Action in SFDDR” shown below are also specifically included in the activity items in the National Disaster Management Plan and the Climate Change Adaptation Plan, and actual activities are in progress

1. Understanding disaster risk

2. Strengthen disaster risk and governance to manage disaster risk

3. Invest in disaster risk reduction for resilience

4. Enhancing disaster preparedness for effective disaster response and to "Build Back Better" in recovery, rehabilitation and reconstruction

6.1. Initiatives to Realize the Sendai Disaster Prevention Framework

The responsible organization for realizing SFDRR in Vietnam is MARD (currently at VNDMA), which has been carrying out several activities until now. For instance, in cooperation with UNDP on 2 June 2015, MARD held a workshop "Development of plan and roadmap to realize the Sendai Framework in Vietnam". The main topics of this workshop, planning for SFDRR and creation of a roadmap, are discussed among relevant agencies.

With support from FAO, MARD held a regional council on March 15-16, 2018,with its main theme as "Strengthening resilient food and agriculture systems - Implementing the Sendai Framework for DRR in the agriculture sector in Asia and the Pacific". Attendants discussed how to strengthen the agricultural sector against climate change and natural disasters. These include food security, improvement of agriculture system, and urban disaster management.

Also, the SFDRR activity has been started in Da Nang City in central Vietnam, one of five government designated ordinance cities with a population of 1 million people. The Da Nang Climate Change Coordination Office has been progressively conducting DRR activities with private enterprises since June 2015 because of the increase in the risk of typhoons and floods due to the most rapid urbanization in Vietnam.

In Da Nang city, typhoon Xangsane, one of the largest in the past 40 years, came in September 2006. and caused economic damage (US$ 300 million) equivalent to 50% of the previous year's city GDP (damages to roads, communication, electricity, 30 people dead). Under this situation, Da Nang City proceeds to create disaster-resistant cities involving private enterprises and urban communities from the viewpoint of business continuity.

6.2. Approach to Realization of SDGs

SDGs call for universal action aimed at terminating poverty, protecting the earth and allowing all people to share peace and affluence. The 17 objectives of the SDGs are all linked with the focus areas of UNDP's strategic plan of sustainable development, democratic governance and peacebuilding, climate change and resilience to disasters. SDGs were adopted in January 2016 and will guide UNDP's policy and financial support over the next 15 years. In particular, the DRR in Vietnam seems to be strongly related to No.1: No Poverty, No. 6: Clean Water and Sanitation, No.11: Sustainable Cities and Communities, and No.13: Climate Action.

In May 2017 the Prime Minister signed "The National Action Plan on the Implementation of the 2030 Agenda for Sustainable Development". This action plan has 17 SDGs and 115 goals related to SDGs. The plan shall be executed in two periods of 2017-2020 and 2021-2030. The national body responsible for SDGs in Vietnam is MPI. GIZ will support the Vietnamese government's capacity building regarding monitoring and reporting on Agenda 2030.

7. Issues and Solutions in DRR Sector in Vietnam

At the first field survey (January 9th - February 7th, 2018) and the second field survey (March 1st - March 28th, 2018), the current situation of the DRR sector in Vietnam, the type of disasters, the disaster response by the Government of Vietnam, international donor's support, etc., were investigated. In this Chapter, the issues indicated in the Chapter 3 and 4 and the bottlenecks are summarized. In addition, the future direction and necessary solutions were evaluated.

The issues and solutions in multi-sectoral area are given in Table 7.1. Those in each type of disasters are given in Table 7.2. The results are discussed with VNDMA and relevant agencies in the consultation meeting mentioned in the next chapter and considered to formulate Priority Programs in the DRR sector in Vietnam.

Table 7.1 Issues and solutions in multi-sectoral area

Issues	Bottlenecks	Directions	Solutions
▪ Mainstreaming DRR has not been advanced in each sector and province. ▪ CSCNDPC needs to be strengthened as an institution to instruct and coordinate several sectors.	▪ The chairperson of CSCNDPC is the Minister of MARD and it is difficult to instruct and coordinate other ministries.	▪ Upgrade CSCNDPC and VNDMA as higher-level institutions.	▪ Designate the Prime Minister as the chairperson of CSCNDPC. ▪ Set VNDMA as an independent institution from MARD directly under the government office in the future, and strengthened as a coordinating institution among a cross-sector field.
	▪ There is no system to coordinate the content and amount of investment from DRR budget at the Central Government.	▪ Establish a structure to incorporate a perspective of DRR in the process of budget distribution according to SEDP.	▪ Mainstreaming DRR should be more emphasized in the next SEDP (2021-2025), which will be revised in 2019. ▪ Introducing a structure to assess all applications for the DRR budget from a perspective emphasizing prevention. ▪ Create a structure to distribute rehabilitation budget from the Central Government with a perspective of BBB based on disaster assessment.
	▪ The Central Government does not perceive DRR projects implemented/ planned by the other ministries and provinces.	▪ Introduce a structure to manage information and data related to DRR projects in the nation.	▪ Establish a database for budget and projects related to DRR ▪ Publish a White Paper annually with the cooperation of related ministries and provinces.
	▪ Specific actions required for DRR mainstreaming are not included in SEDS/SEDP (For this reason, sufficient budget allocation has not been implemented).	▪ Consider and monitor/ evaluate specific actions required for DRR mainstreaming in the next SEDP （2021-2025）. ▪	▪ Indicate specific DRR targets for each sector in next SEDP by VNDMA creating a draft after coordinating with other ministries. ▪ VDMA, an executive office of DSCNDPC, monitors and evaluates the progress of mainstreaming DRR.
▪ Human resource and capacity at VNDMA and province, which are responsible for DRR operations at normal time and emergency response, are	▪ Officers are insufficient. ▪ Full-time officers are few, and officers at irrigation department in DARD are concurrently working.	▪ Ensure sufficient number of officers. ▪ Offer capacity enhancement trainings on DRR to cultivate officers who can respond during emergency period.	▪ Ensure sufficient number of officers and utilize functionally. ▪ Offer capacity enhancement trainings on DRR to cultivate officers who can respond during emergency period.
	▪ There is no permanent DRR institution at province. In fact, the irrigation	▪ Establish a permanent institution	▪ Establish a permanent DRR institution under PPC and make it function as Standing Office of CCNDPC/SR.

Issues	Bottlenecks	Directions	Solutions
lacking.	department in DARD is working concurrently and coordination capacity between sectors is weak.		
	▪ Insufficient experience and knowledge of DRR related officers at VNDMA, provinces, districts and communes.	▪ Create training programs and facilities for DRR related officers at VNDMA, province, districts and communes ▪ Utilize existing personnel	▪ Introduce and implement training programs at VNDMA ▪ Utilize officers of VAWR etc. as DRR specialists (disaster damage assessment during emergency). ▪ Install a structure to provide direct support from the central government to establish and strengthen new VNDMA regional offices.
▪ Activities for CBDRM and DRR education are not implemented based on a mid-/long-term plan and depended on annual budget and donor's aid. Therefore, activities are implemented only for a particular purpose.	▪ The state of project implementation by international donors and NGO is not perceived in a centralized manner. ▪ The standard of activity content is not consolidated, and there is no consistency in activities.	▪ Establish a coordination mechanism among donors ▪ Promote an activity guideline	▪ VNDMA will control all CBDRM projects and formulate an implementation plan according to risks. ▪ Implement trainings for staff at province, district and commune based on a renewed CBDRM guideline.
	▪ There is no determined budget, and educational materials and equipment are planned based on donors' aid.	▪ Ensure a fixed source of finance.	▪ Install a structure to ensure a stable financial resource by utilizing provincial Natural Disaster Prevention and Control (NDPC) Funds etc.
	▪ DRR education and CBDRM are implemented separately.	▪ Formulate DRR education curriculum incorporating the local characteristics.	▪ Under the guidance of CCNDPC/SR in Province, DRR education and CBDRM will be implemented jointly . ▪ Lessons from the previous efforts and local characteristics will be reflected on the DRR education curriculum.
	▪ Small-scale measures are broken during disasters because insufficient strength and effects of design and materials are utilized.	▪ Strengthen capacity of design and construction of small-scale measures by communities.	▪ A design and construction guideline for CBDRM will be formulated.
▪ Disaster information is not utilized effectively for DRR activities and disaster response	▪ DRR information (meteorological and hydrological information and disaster damage information etc.) is decentralized and managed and obtained by various institutions. The information is disseminated in real-time, so it is not effectively utilized during normal time and emergency. ▪ Especially, there is no basic facility which share information on the site precisely and promptly during emergency.	▪ Formulate a structure to share DRR information.	▪ Coordination structure to share DRR information among different institutions will be created. ▪ Rule and system for DRR information sharing will be created. ▪ Monitoring office for DRR information management will be strengthened (Establishment of a DRR center). ▪ Training for a provincial DRR institution for DRR information management will be conducted.
	▪ Precision of data varies considerably although there is a mechanism in which the central government compiles the disaster damage information collected by provinces. ▪ Creation of disaster damage report during emergency is a heavy burden for	▪ Introduce an efficient mechanism to collect, validate, accumulate, and share disaster damage information.	▪ The current condition of the mechanism to collect, validate, accumulate, and share disaster damage information will be improved, and a commanding structure during emergency at each level will be strengthened.

Issues	Bottlenecks	Directions	Solutions
	provinces.		
▪ Accuracy and delivery of early warning information is not sufficient	▪ Hydrological information is limited, and the current condition of disaster is difficult to understand. For this reason, early-warning for disaster response is not sufficient. Also, formulation of a DRR plan based on evidence has been a challenge. ▪ Hydrometeorology information etc. for a multi-dam operation is insufficient.	▪ Strengthen the observation of hydrometeorology. ▪ Formulate an integrated management of hydro- meteorological information.	▪ A network of hydro- meteorological information will be strengthened. ▪ Cross-sectional and flow volume surveying for rivers will be strengthened. ▪ A river basin-based information management system for a multi-dam operation will be expanded. ▪ A seamless structure of weather forecasting by integrating an existing radar system will be established. ▪ A network of hydro- meteorological information which is manageable at local level will be created.
	▪ There is no structure to inform an easily comprehensible warning to end residents, which influences actions to reduce disaster damage	▪ Deliver a reliable warning message to the residents.	▪ Formulate an easily comprehensible warning message (Warning level). ▪ Deliver SMS message with cooperation of telecom companies.
▪ A national and provincial DRR plan is not consistent. DRR measurements at each level consist of needs of lower institutions. ▪ DRR plans of national, provincial, district, and commune level are not consistent, and the contents are not validated and comprehended.	A national and provincial DRR plan is not consistent. DRR measurements at each level consist of needs of lower institutions.	▪ Create a structure of formulating plans at each level based on the national DRR strategy.	▪ Positions of the national and provincial DRR plans in the Law of DRR will be clarified. ▪ Enforce a mechanism of DRR plan formulation at each level based on the national DRR strategy.
	▪ DRR plans of national, provincial, district, and commune level are not consistent, and the contents are not validated and comprehended.	▪ Strengthen guidance by the central government on DRR plan formulation at each level. ▪ Strengthen capacity of DRR plan formulation at each level.	▪ Establish a structure in which VDMA is involved in the formulation, validation and monitoring of the provincial DRR plan. ▪ Create a guideline for a DRR plan formulation and expand it in consideration of applying at pilot area.
▪ DRR pre-investment based on a plan is insufficient.	▪ DRR pre-investment is not prioritized in the DRR plan at each level. ▪ In the DRR plan at each level, the position of DRR investments for each sector is not clarified.	▪ Prioritize DRR pre-investment and clarify the position of the investment in the DRR plan at each level. ▪ Strengthen involvement of each sector in the formulation of DRR plan.	▪ In the DRR plan at each level, clarify the budget distribution of DRR pre-investments by separating the recovery from rehabilitation projects. Also, promote involvement of each sector in the plan formulation. For this reason, create a guideline for the DRR plan formulation and expand it in consideration of applying at pilot area. ▪ Formulate a structure to build the budget by prioritizing the DRR pre-investment. ▪ Establish a structure to utilize provincial NDPC funds for pre-investment.
	▪ There is no quantitative risk evaluation at each level, and measurements and	▪ Conduct a risk evaluation for a provincial DRR plan,	▪ In a provincial DRR plan, clarify the risk evaluation and the reduction goal. Create a guideline for a provincial

Issues	Bottlenecks	Directions	Solutions
	implementation schedule based on risk reduction goal are not clear.	define surplus risks and a reduction goal, and create a structure to implement DRR in a gradual approach.	DRR plan formulation and expand it with a consideration of applying at pilot area. ▪ Promote hazard evaluation (MONRE・DONRE).
	▪ Project evaluation (results of the reduction) towards risk reduction goal is not implemented.	▪ Establish a structure of DRR projects evaluation and monitoring.	▪ Create a database of DRR projects. ▪ Establish a structure of DRR projects evaluation and monitoring led by VDMA.
	▪ Budget is not allocated to DRR pre-investment due to budget limitation.	▪ Strengthen pre-investment by using opportunities of recovery and rehabilitation through promoting BBB for recovery and rehabilitation projects.	▪ For budget implementation, establish a structure that VNDMA and others are involved when a proposal of recovery and rehabilitation project is submitted to check if the proposal reflects the BBB aspects.
	▪ Usage of Central Emergency Response Fund (CERF) is limited to humanitarian aid when disaster occurs.	▪ Establish a fund which can be utilized for BBB and prevention measures.	▪ Establish the national DRR fund and make it possible to allocate budgets for recovery from the perspective of DRR. In addition, make DRR investment lead to implement a proper budget allocation for prevention in the future.
▪ System and budget to respond to a large-scale disaster is not sufficient	▪ A national disaster response plan is not determined in the Law on Natural Disaster Prevention and Control.	▪ Formulate a national disaster response plan.	▪ Revise the Law on Natural Disaster Prevention and Control to define a national disaster response plan formulation.
	▪ A viable disaster response plan is not formulated base on a simulation of a province at each level.	▪ Strengthen a capacity to formulate a viable disaster response plan base on a possible situation of a province at province.	▪ Create a guideline of a disaster response plan, and expand it with a consideration of applying at pilot area.
	▪ Prompt budget implementation is not possible because the central government does not have an emergency response budget. ▪ Legal system for the central government to control the provincial NDPC fund is not consolidated.	▪ Create a legal framework to ensure the national emergency response budget.	▪ Amend the Law on Natural Disaster Prevention and Control（the Decree No.66）and the Law on State Budget. Create a national emergency response budget. ▪ Amend the Decree No.94 “Provincial Natural Disaster Prevention and Control Fund”. Simplify and clarify the process of diversion of the NDPC fund for the response of large-scale disaster.
	▪ A system for disaster affected people and provinces to obtain disaster insurance and an inexpensive loan is not organized.	▪ Create disaster insurance and an inexpensive loan.	▪ Make the disaster insurance satisfactory by the nation and private sector. ▪ Introduce disaster stand-by finance loan and risk finance by international donors (World Bank is considering disaster/ climate risk finance towards MOF/State of Bank).

Table 7.2　Issues and solutions in each type of disasters

Issues	Bottlenecks	Directions	Solutions
▪ Strategy and measures against flood disaster don’t meet the needs in consideration	▪ Draft “Resolution”, which is based on the result of the disaster conference held at the end of March sponsored by the Prime Minister, specifies acceleration of	▪ To clarify legislating, budget allocation, planning mechanism for acceleration of IFMP.	▪ To specify promotion of IFMP in Law of Natural Disaster Prevention and Control (No.66/2014/ND-CP) and National Strategy for Natural Disaster Prevention, Response and Mitigation to expand IFMP nationwide based on

Issues	Bottlenecks	Directions	Solutions
of climate change and land use change (urbanization). Flood	IFMP. However, the legal ground of IFMP is unclear. ▪ Budgets for implementing IFMP have not been allocated as planned in 2 provinces that JICA supported to make their IFMPs. ▪ Process and authority to make IFMP for an interprovincial river basin are unclear.		the process and experiences in making IFMP supported by JICA and World Bank. ▪ To legislate IFMP manual in central level and to apply it to the investment plan for each river basin ▪ To activate discussion with MPI on prior injection of sector loan based on IFMP formulation. ▪ To strengthen the authority and the function of River Basin Organization (RBO).
	▪ Strategy of flood countermeasures against new risks associated with population growth and construction of industrial parks remains under the old-fashioned concept of “Living with Flood”.	▪ To examine positive flood countermeasures in consideration of future population concentration and industrial parks. ▪ To assess the capacity of flood control facilities, to strengthen them and to construct new ones.	▪ To review flood control system in Red River delta facing mega disaster risk. ▪ To promote the land use plan to secure a retarding pond. ▪ To construct river dike and ring dike in the central region. ▪ To improve inland flood drainage in major urban areas.
	▪ Aging dams and river dikes increase disaster risk. ▪ Facilities for flood discharge and discharge control are not functional in many irrigation dams.	▪ To construct database of existing facilities e.g. dams, dikes, etc. ▪ To assess the safety-level of existing facilities e.g. dams, dikes, etc. and to systemize their rehabilitation and strengthening.	▪ To construct a data base of aging dams and dikes (including structure, sedimentation volume, state of ground, operation, etc.) ▪ To quantitatively assess safety-level of facilities and to make step-by-step rehabilitation and strengthening plans.
▪ Response to sea level rise and typhoon including high tide and storm is inadequate in major urban areas in coastal areas. Typhoon (high tide, storm)	▪ The measures to reduce high tide risks are not implemented in major urban areas and development areas.	▪ To strengthen hard and soft measures against urban flood risk.	▪ To strengthen ring dike and drainage capacity to protect development areas. ▪ To conduct Urban CBDRM including making BCP of private companies. ▪ To implement the resilient measures against high tide combining coastal dike and mangrove forest.
	▪ Inundation spread widely, and prolonged climate change affects socio-economic activities in the coastal region. ▪ Damage scenario of multiple disasters due to typhoons and floods is not considered.	▪ To use sophisticate weather forecast technology and to assess future risks associated with climate change.	▪ To improve the forecast technology for ocean weather, typhoon and heavy rain, and to provide timely information. ▪ To assess the latest high tide risk and to reflect it in provincial disaster prevention and control plan.
▪ Experience and performance of response to sediment disasters are insufficient and system of prevention/mitigation/response for sediment disaster is inadequate.	▪ Information about sediment disaster (cause, condition, damages) is not collected. Disaster assessment is not conducted propery. ▪ Sediment disaster risk analysis and hazard map that can be utilized by local people is not properly prepared. ▪ Land development is expanded to high risk area.	▪ To promote land-use plan/regulation based on risk assessment. ▪ To protect critical area by hard measures.	▪ To define responsible and cooperating agencies for sediment disaster. ▪ To make a risk map showing possible affected area. ▪ To legislate land-use regulation about land development in high risk area and to apply it to land-use plan. ▪ To implement hard measures as a pilot project in critical area.
	▪ Hydro-meteorological	▪ To enhance	▪ To improve accuracy of rainfall

Issues	Bottlenecks	Directions	Solutions
Sediment disaster (land slide, debris flow)	information for sediment disaster forecast is insufficient. ▪ Warning is issued for wide area. Warning criteria specified in the local condition is not formulated.	observation network and to decide adequate warning criteria.	information utilizing existing radar system. ▪ To develop warning criteria based on rainfall information (rainfall intensity, soil moisture content, etc.) ▪ To construct a system to collect and accumulate records of past sediment disasters, hydro-meteorological information, etc. And to implement a pilot project for early warning. ▪ To enhance early warning and evacuation through CBDRM.
	▪ Experience and technology to protect critical infrastructures (road, railway, power plant, etc.) are insufficient.	▪ To invest in DRR to protect critical infrastructures.	▪ To make an inventory of vulnerable infrastructures, road sections, etc. ▪ To obligate to assess disaster impact for construction of infrastructure. ▪ To preferentially invest in measures against sediment disaster to protect critical infrastructures.
▪ Water use more than water resources potential worsens drought disaster. Drought, saltwater intrusion, ground subsidence	▪ Water resources potential depends on water use in upstream countries in 7 international river basins.	▪ To promote international efforts and a key strategy.	▪ To facilitate consensus building for water resources management through Mekong River Commission (MRC), etc. ▪ To implement water resources management according to Government Resolution No.120 (Resolution on sustainable and climate-resilient development of the Mekong Delta)
	▪ Coordination among related sectors is insufficient and water is not adequately used in consideration of water resources potential.	▪ To strengthen coordination mechanism among sectors related to water resources. ▪ To improve operation of water reservoirs and to construct new ones based on assessment of demand and supply of water resources.	▪ To strengthen water resources management system centering on River Basin Organization (RBO). ▪ To assess water demand and potential of water resources, and to formulate a plan for proper water resources use. ▪ To upgrade operation of water reservoirs, etc. ▪ To construct a new reservoir if necessary.
	▪ It is difficult to efficiently operate water reservoir for cropping, harvesting and beneficial use of water resources because mid- and long-erm weather forecast has low accuracy.	▪ To improve the accuracy of mid and long-term weather forecast.	▪ To improve technology of mid and long-term weather forecast using numerical analysis model.
	▪ Countermeasures against land subsidence such as control of excessive pumping of groundwater are insufficient because the effect of it is not quantitatively understood.	▪ To monitor and assess land subsidence.	▪ To strengthen monitoring and assessment of land subsidence.
▪ Countermeasures against coastal/river bank erosion is palliative because the cause is not revealed.	▪ It is difficult to identify the cause of coastal/river bank erosion because various phenomena can be considered to contribute to the erosion.	▪ To collect fundamental data and scientifically investigate the causes.	▪ To develop a system to collect, accumulate and share data of sediment dynamics in cooperation with research institutions (VAWR, WRU, etc.). ▪ To construct mid- and long-term monitoring system and to secure the budget.
	▪ Sediment dynamics in a	▪ To promote integrated	▪ To build a system to promote sediment

Issues	Bottlenecks	Directions	Solutions
Coastal and riverbank erosion	river basin e.g. sediment transport is decreased with dams, illegal sand mining and uncontrolled dredging .	basin sediment management.	management in a river basin. ▪ To study measures to ensure continuous of sediment transport. ▪ To control development action disturbing sediment transport and to ensure EIA is considered at the time of project planning. ▪ To strictly crackdown illegal sand mining/dredging.
	▪ There is a guideline for common design of river dike and bank protection, but it is not a guideline for survey / design considering river characteristics and coastal current from viewpoint of integrated coastal management. There is not an assessment system of erosion.	▪ To make a guideline for survey and design.	▪ To prepare a guideline instructing survey/monitoring to define the causes and base the design on it. ▪ To disseminate small-scale and low-cost measures constructed under JICA projects against river bank erosion.

8. Formulation of Priority Programs in the DRR Sector

8.1. Consultation with VNDMA and Relevant Agencies

8.1.1. 1st Consultation Meeting

To summarize the results and discussions through the activity until March 2018, the 1st consultation meeting was held on May 11th, 2018, co-hosted by JICA and MARD.

The meeting was co-chaired by Mr. Takeya, a distinguished technical advisor to the president of JICA, and Mr. Son, a vice-director of VNDMA. At the beginning of the meeting, JICA side presented disaster characteristics in Vietnam that are studied in the survey, keynotes of the Sendai Framework 2015-2030 and role and responsibility of the central government to implement the Sendai Framework. After the presentations, discussion on current issues in the DRR sector in Vietnam was made. The issues have been identified as follows:

- Disaster impacts in Vietnam have changed due to rapid development. In Mekong Delta, disaster damages to traffic infrastructures and residential area become severe. In addition to reduced economic damages, reduction of human loss is still important in Vietnam (Mr. Son, vice-director of VNDMA),
- Government of Vietnam is aiming at strengthening early warning system against sediment-related disasters. International support on this field is strongly required (Mr. Son, vice-director of VNDMA),
- At local levels, the commanding committee for natural disaster prevention and the committee for search and rescue are combined as one committee. At central level, however, both committees function separately. It is required to unite these two committees into one, which shall be chaired by the Prime Minister, so that strong leadership can be expected (Ministry of Public Security),
- To ensure the implementation of the Sendai Framework 2015-2030, VNDMA should collaborate with Vietnam Academy for Water Resources (VAWR) in institutions, methodology and tools (VAWR),
- There is no full-time specialized agency on disaster management at provincial level. Only few staffs are assigned to take charge of disaster management on a part-time basis. Human resources, budget and equipment are still very limited. It is requested to develop guidelines to strengthen coordination capacity of provincial commanding committee (Yen Bai province),
- At present, VNDMA just started to formulate the national plan for natural disaster prevention and control. Majority of provincial plans are still general. VNDMA shall make efforts to update both national and provincial plans to be more effective (Mr. Son, vice-director of VNDMA).

After the consultation meeting, JICA and VNDMA had discussions and agreed to consider necessary actions that the Vietnamese government should prioritize based on the Sendai Framework 2015-2030 and prepare a leaflet as a strategy paper that shall be delivered to participants of the Asia Ministerial Conference on DRR (AMCDRR) held in Mongolian on July 2018.

Prior to the 2nd consultation meeting, the draft of the above strategy paper was prepared.

JICA Long-term Expert working at VNDMA and JICA Vietnam officials visited related departments of MARD, relevant ministries and local agencies to gain their opinions about the prepared strategy paper. Strategic paper was finalized as Priority Programs for DRR through discussion with Deputy Director General (DDG) and officials of VNDMA.

8.1.2. 2nd Consultation Meeting

The 2nd consultation meeting was held on June 28th, 2018. In the meeting, proposed Priority Programs to implement the Sendai Framework 2015-2030, titled "Priority Program for Disaster Risk Reduction in Vietnam ~ To sustain socio-economic development ~" was mainly discussed among participants.

The meeting was co-chaired by Mr. Takeya, a distinguished technical advisor to the president of JICA, and Mr. Thang, vice-minister of MARD. JICA side presented keynotes on the Sendai Framework 2015-2030 and the AMCDRR and explained the proposed Priority Programs. After the presentations, discussion on the Priority Programs was made and summarized as follows:

- In Vietnam, many infrastructural developments have been done without consideration of DRR. Many structures such as housing and sewage increase risk of natural disasters. Many roads block flood flow and increase the flood level. We should consider development targets in line with DRR (Mr. Thang, vice-minister of MARD),
- Each country has different institutional structures, which should be revised and improved every after huge disaster. The current institutional structure in Vietnam includes both advantages and disadvantages. Strong leadership by the central government is a crucial issue for better institution for DRR (Mr. Takeya, JICA),
- Regarding priorities, the first should be organization structure, the second is institutions and the third is enhancement of investment (Mr. Thang, vice-minister of MARD),
- Both forecasting and early warning don't meet the requirements of end-users. Current monitoring and early warning system are only until the district level. In future, it should cover commune level (MONRE),
- Regarding strengthening DRR governance, interagency coordination mechanism is important. In addition, it should be considered how to mobilize human resources and materials from society as a strategy (UNICEF),
- The word of "Investment" gives the impression that only structural measures are prioritized. It should be carefully used (VAWR),
- The current national strategy was established in 2007 with the Hyogo Framework for Action 2005-2015. Now the Government should review the strategy based on Sendai Framework 2015-2030. Moreover, Vietnam has poor experience in insurance on DRR (Mr. Chinh, VNDMA),
- If DRR investment is insufficient, insurance companies cannot provide the service because the risk is too high. To promote insurance system in natural disaster, national initiative to invest in DRR is important (Mr. Takeya, JICA),
- Institutional arrangement is one of the priorities. We need to review the existing legal

frameworks and regulations and define the roles and responsibilities of relevant agencies for DRR (Mr. Thanh, vice-minister of MARD).

Photo 8.1 1st Consultation Meeting
May 11th, 2018

Photo 8.2 2nd Consultation Meeting
June 28th, 2018

8.2. Priority Programs to implement Sendai Framework 2015-2030

Based on the 1st and 2nd consultation meeting as well as individual discussion with VNDMA and relevant agencies, the Priority Programs were concluded aiming at proactive investment to implement Sendai Framework 2015-2030.

The priority programs were summarized in an A3 size leaflet titled “Priority Programs for Disaster Risk Reduction in Vietnam ~ To sustain socio-economic development ~” as shown in Figure 8.1. The leaflet was presented in the AMCDRR in Ulan Bator, Mongolia, and distributed to participant countries.

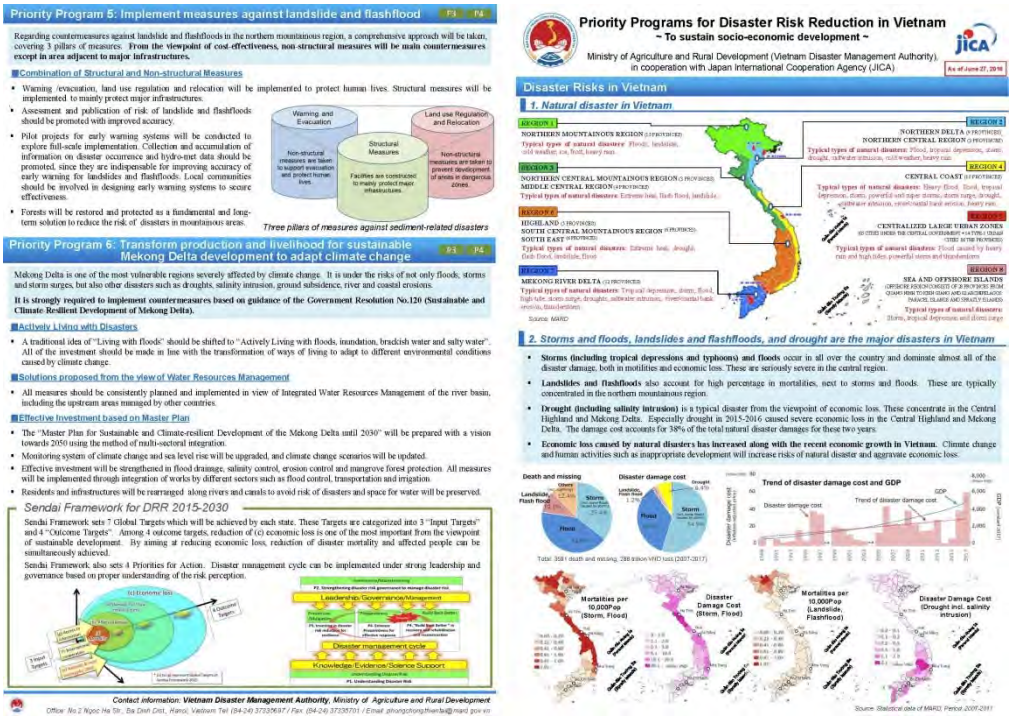


Figure 8.1 Leaflet for Priority Programs in DRR in Vietnam

8.2.1. Extraction of Priority Programs

(1) Global Targets and Priority Actions in Sendai Framework 2015-2030

The Sendai Framework 2015-2030 sets seven (7) global targets and four (4) priorities for action.

The seven global targets are composed of (a) reducing global disaster mortality, (b) reducing the number of affected people, (c) reducing direct disaster economic loss, (d) reducing disaster damage to critical infrastructure and disruption of basic services, (e) increasing the number of counties with national and local DRR strategy, (f) enhancing international cooperation to developing countries and (g) increasing the availability of access to disaster information and assessment. The (a) to (d) are so called as "Output Targets", which shall be achieved through the activities aiming at "Input Targets" of the (e) to (g).

The main objective of the priority programs in Vietnam is "to sustain socio-economic development". As shown in Figure 8.2, if the government aims at reducing mortality, reduction of economic loss cannot be achieved. However, by aiming at reducing economic loss, reduction of disaster mortality and affected people can be simultaneously achieved. Therefore, the government of Vietnam should promote disaster risk reduction especially focusing on reduction of economic loss.

Regarding four "Input Targets", the Sendai Framework 2015-2030 set the target year of the "(e) increasing the number of developing countries" by 2020. The government of Vietnam has already implemented the national strategy and established the Law on NDPC. Based on the Law on NDPC, the national plan for NDPC has been drafted. At local levels, however, the provincial plans for NDPC still have issues such as consistency with the national plan and unclear risk reduction targets in the plans as mentioned in Chapter 7. The government of Vietnam should accelerate and promote formulating effective local DRR plans in consistency with the national plan.

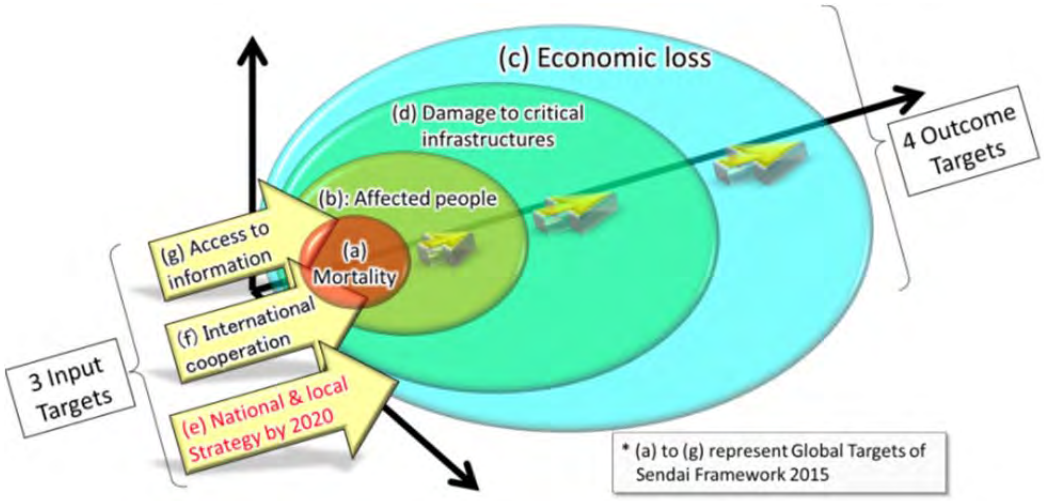


Figure 8.2 Implementing images of global targets in Sendai Framework 2015-2030

Source: Prepared by JICA

On the other hand, four priorities for actions are composed of (P1) understanding disaster risk, (P2) strengthening disaster risk governance to manage disaster risk, (P3) investing in disaster risk reduction for resilience and (P4) enhancing preparedness for effective response and "Build Back Better" in recovery and rehabilitation and reconstruction.

As shown in Figure 8.3, (P3) and (P4) are the actions to contribute strengthening disaster management cycle of "prevention / mitigation", "preparedness", "response" and "recovery". Such disaster management cycle can be implemented under strong leadership and governance by central and local governments (P1) based on proper understanding of the risk perception at all the levels (P2).

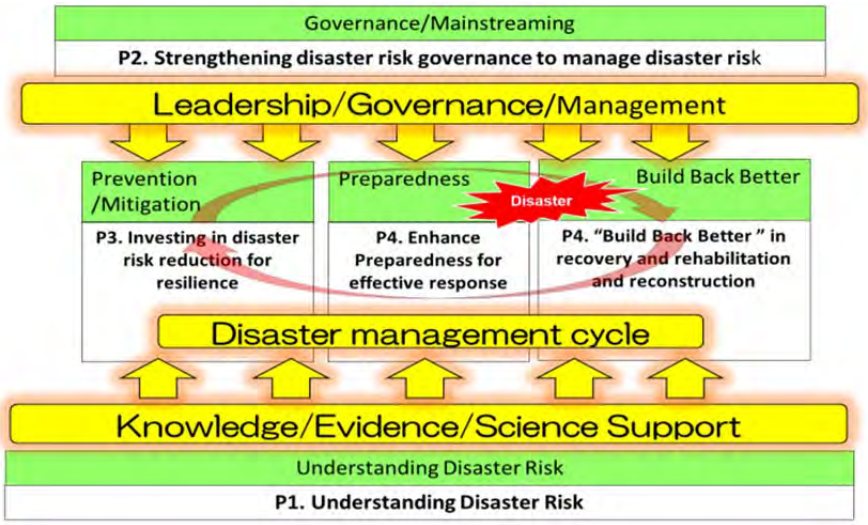


Figure 8.3 Implementing image of priority actions in Sendai Framework 2015-2030

Source: Prepared by JICA

(2) Identification of Priority Programs

Considering the current issues in the DRR sector in Vietnam as well as the global targets and priorities for action in the Sendai Framework 2015-2030, JICA and Vietnamese side discussed and concluded the six (6) Priority Programs, which shall be implemented under the initiative of VNDMA. Figure 8.4 indicates the Priority Programs with the corresponding priorities for action in the Sendai Framework 2015-2030.

Figure 8.4 Six Priority Programs in the DRR in Vietnam

Source: Prepared by JICA Expert

8.2.2. Priority Program

(1) Priority Program 1: Establish practical disaster information management

Disaster data and information provide basis for all evidence-based DRR activities, including future investment planning. It is crucial to establish appropriate data and information management, including hydro-met data, disaster damage data and disaster risk information.

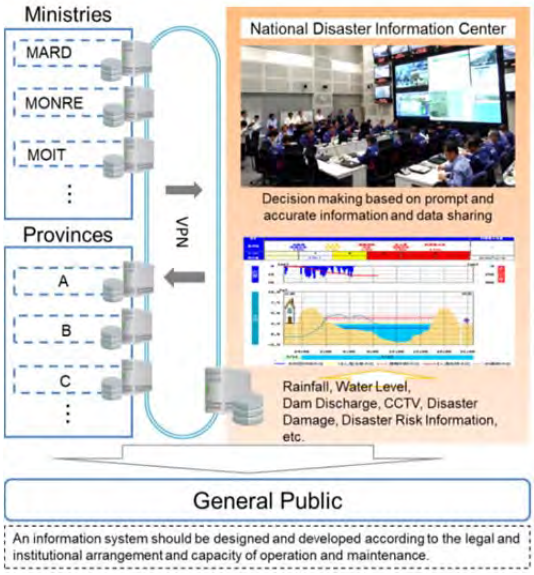


Figure 8.5 Conceptual diagram of disaster data and information sharing

Source: Prepared by JICA Expert

Disaster information management

Currently, disaster-related information such as disaster risk, hydro-met information and disaster damage information are individually collected and managed by different entities. Legal and institutional arrangement and information system will be developed to share data and information. In addition, it is important to improve operation of information management in both emergency situations and normal times.

Utilization of hydro-meteorological information

Through enhancement of hydro-met observation, disaster management including forecasting and early warning will be improved. Forecasting and early waring information will be

transmitted in forms that can be utilized for appropriate responses by disaster management authorities and local residents.

Dissemination of annual report on natural disaster and DRR

Annual report on natural disaster and DRR will be prepared and disseminated, utilizing collected information on disaster. It is also useful to educate and disseminate knowledge on DRR.

(2) Priority Program 2:
Complete the institutional arrangement for better coordination

In Vietnam, Law on Natural Disaster Prevention and Control (NDPC) was legislated in 2013 and Vietnam Disaster Management Authority (VNDMA) was established in 2017. The legal and institutional arrangement should be enhanced. Besides, the actions taken at the central and local levels should be coordinated in a better way. It is necessary to complete the institutional arrangement on DRR, with improved coordination mechanisms. Roles and responsibilities of relevant sectors and stakeholders should be clearly defined for effective implementation.

Implementation of DRR policies based on existing laws

All of the DRR activities and policies should be implemented based on existing DRR-related laws such as Law on Water Resources, Law on Hydraulic Works, Law on Hydro Meteorology, Law on Forestry, Agricultural Restructuring Program and the Government Resolution 120 “Sustainable and Climate-resilient Development of the Mekong Delta”, in addition to Law on NDPC.

Enhancement of coordination through CSCNDPC and VNDMA at central level

Through enhancement of leadership of CSCNDPC and functions and organizational capacity of VNDMA, coordination among all relevant stakeholders should be strengthened to mainstream DRR in all sectors. For this purpose, it should be considered that the Prime Minister will lead CSCNDPC as chairperson, because natural disaster has impacts on all sectors and provinces.

Capacity development for DRR at local levels

Training mechanism on DRR for different levels should be reviewed and improved to be more practical and effective on the ground. Community awareness raising, understanding of the risk and knowledge sharing should be improved through the activities of CBDRM and communication. In addition, the capacity of officials should be enhanced to coordinate with relevant stakeholders as well as to implement activities on the ground.

(3) Priority Program 3:
Develop DRR plans at all levels and prioritize investment based on the plans

To develop a plan for DRR at central and local levels is stipulated in Law on Natural Disaster Prevention and Control (2013). It is also encouraged in the Sendai Framework for DRR as an urgent target by 2020. To prioritize investment in DRR, it is important for Provincial People’s Committees (PPCs) to develop their DRR plans including concrete countermeasures. Therefore, the government of Vietnam put first priority on formulation

national and local natural plans for DRR.

Development of risk-based DRR plans

It is necessary to strengthen local capacity on DRR planning with quantitative risk assessment. By doing quantitative risk assessments and setting concrete targets to reduce risks in the plan, appropriate countermeasures including structural and non-structural measures can be identified. It is important to establish an overall planning framework for DRR, which covers relevant sectors at the local level. The DRR plans should clearly define roles and responsibilities of all stakeholders. Involving local people is essential in developing a plan for DRR at commune level. It is also necessary to strengthen the capacity of formulating disaster response plans at central and local levels considering damage scenarios.

Mainstreaming DRR in socio-economic development strategy / plans (SEDS / SEDP)

It is important to mainstream DRR in SEDS/SEDP, and to allocate a certain percentage of budgets as investment in DRR at central and provincial levels. It is also meaningful to develop a database for the investment in DRR to clarify the current scale of DRR-related budget and other relevant investment.

Establishment of DRR fund

At the provincial level, almost all of the provinces have established local DRR Fund at local level. It is also necessary for the central government to establish a national level DRR Fund to manage disaster recovery and preventive measures.

(4) Priority Program 4: Implement comprehensive DRR relating storm, flood and drought

Structural measures will be strengthened as a main pillar to address flood disaster risks. Non-structural measures will be applied to address residual risks, which cannot be covered by the capacity of structures. Since disaster risk tends to increase due to rapid urbanization and economic development, appropriate development control and DRR investment should be promoted to reduce risks.

Implementation of Integrated Flood Management Plan (IFMP)

Basin-based Integrated Flood Management Plan (IFMP) formulation / implementation will be promoted involving relevant sectors. Issues of drought and salinity intrusion will be addressed as parts of river-basin management.

Flood control capacity and safety of existing reservoirs and dikes will be reviewed for further improvement and rehabilitations. In particular, the review of flood control system in deltas (including Red River system) is important, since huge disaster risks exist in the region.

Real-time operation of reservoirs in emergency situation will be improved and extended by introducing disaster information system including hydro-met observation, river survey and discharge measurement.

It is important to consider sustainable exploitation of resources such as forest and river sand will be promoted from the viewpoint of river-basin management.

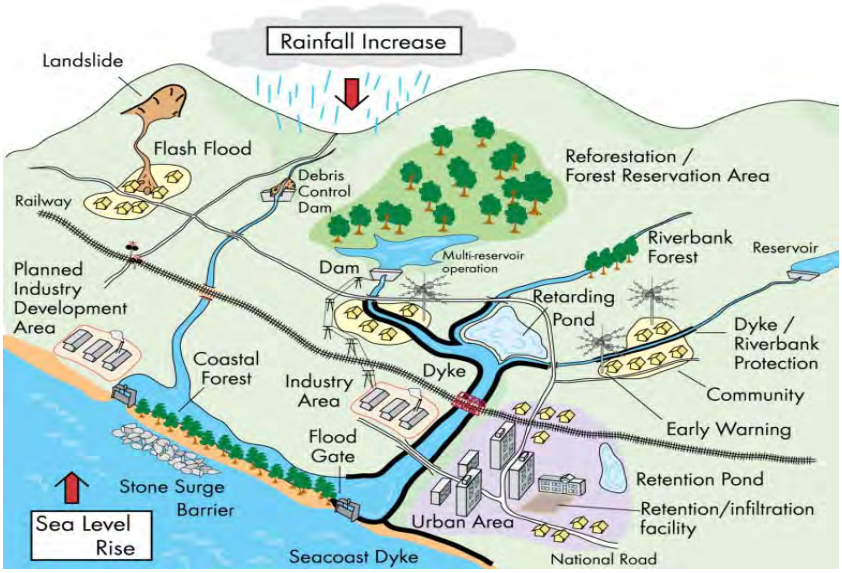


Figure 8.6 Concept image of Integrated Flood Management

Source: Prepared by JICA Team

Preparedness to strong and super typhoons

In order to reduce damages caused by strong and super typhoons, response plans will be developed based on damage scenarios.

For safety of fishing boats during storm, construction of boat shelters and development of boat monitoring system will be promoted. Besides, technical specification, standard and building codes for construction will be revised and updated to withstand strong and super typhoons.

Erosion control

Basin-based approaches are essential to address coastal and river-bank erosion. A framework will be established for data and information management on sediment movement in river basins, including deposition in dam reservoirs and sand mining.

Warning system for coastal and river bank erosion will be developed based on erosion risk maps.

To secure more room for rivers, river training is promoted together with relocation of inappropriate settlement along river banks.

(5) Priority Program 5:
Implement measures against landslide and flashflood

Regarding countermeasures against landslide and flash floods in the northern mountainous region, a comprehensive approach will be taken, covering 3 pillars of 1) structural measures, 2) warning and evacuation, and3) land use regulation and relocation as shown in Figure 8.7. From the viewpoint of cost-effectiveness, non-structural measures will be main countermeasures except in area adjacent to major infrastructures.

Combination of structural and non-structural measures

Warning /evacuation, land use regulation and relocation will be implemented to protect

human lives. Structural measures will be implemented to mainly protect major infrastructures.

Assessment and publication of risk of landslide and flash floods should be promoted with improved accuracy.

Regarding early warning system, pilot projects will be conducted to explore full-scale implementation. Collection and accumulation of information on disaster occurrence and hydro-met data should be promoted, since they are indispensable for improving accuracy of early warning for landslides and flash floods. Local communities should be involved in designing early warning systems to secure effectiveness.

As a long-term solution, reforestation and conservation will be promoted.

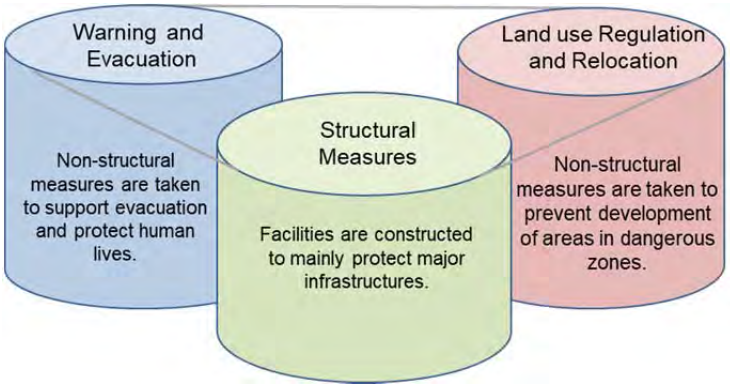


Figure 8.7 Three pillars of measures against sediment-related disasters

Source: Prepared by JICA Expert

(6) Priority Program 6: Transform production and livelihood for sustainable Mekong Delta development to adapt to climate change

Mekong Delta is one of the most vulnerable regions severely affected by climate change. It is under the risks of not only floods, storms and storm surges, but also other disasters such as droughts, salinity intrusion, ground subsidence, river and coastal erosions. It is strongly required to implement countermeasures based on guidance of the Government Resolution No.120 “Sustainable and Climate-resilient Development of Mekong Delta”.

Actively living with disasters

The traditional idea of “Living with floods” should be shifted to “Actively Living with floods, inundation, brackish water and salty water”. All of the investment should be made in line with the transformation of ways of living to adapt to different environmental conditions caused by climate change.

Solutions proposed from the view of water resources management

All measures should be consistently planned and implemented in view of Integrated Water Resources Management of the river basin, including the upstream areas managed by other countries.

Effective investment based on master plan

The “Master Plan for Sustainable and Climate-resilient Development of the Mekong Delta

until 2030" will be prepared with a vision towards 2050 using the method of multi-sectoral integration.

Monitoring system of climate change and sea level rise will be upgraded, and climate change scenarios will be updated. Effective investment will be strengthened in flood drainage, salinity control, erosion control and mangrove forest protection. All measures will be implemented through integration of works by different sectors such as flood control, transportation and irrigation. Residents and infrastructures will be rearranged along rivers and canals to avoid risk of disasters and space for water will be preserved.

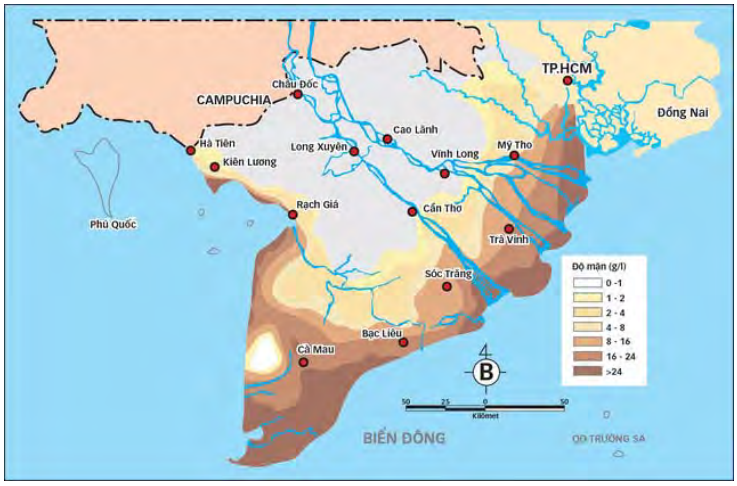


Figure 8.8 Situation of salinity intrusions in Mekong Delta

Source: Southern Institute of Water Resources Research, MARD

8.2.3. Roadmap for Priority Programs toward 2030

The Priority Programs were categorized and organized in time-lines of short-term (target years is 2020), mid-term (target year is 2025) and long-term (target years is 2030) as a roadmap for DRR sector in Vietnam (Figure 8.9)[23].

The roadmap was prepared considering 7 global targets and 4 priorities for action of the Sendai Framework 2015-2030 as well as Sustainable Development Goals (SDGs). It shows that target years of the Sendai Framework 2015-2030 and chronologic implementation of the related laws, strategies and plans in Vietnam at the top.

It is important to establish monitoring mechanism under the initiative of VNDMA to secure the implementation of the roadmap. The Priority Programs and the roadmap will be reviewed and modified according to the amendments of the laws and regulations in the future and progresses of the activities. The government of Japan will continuously support the government of Vietnam for the implementation of the roadmap through technical assistances.

23 The roadmap has not been discussed with VNDMA. It is a proposal by JICA survey team

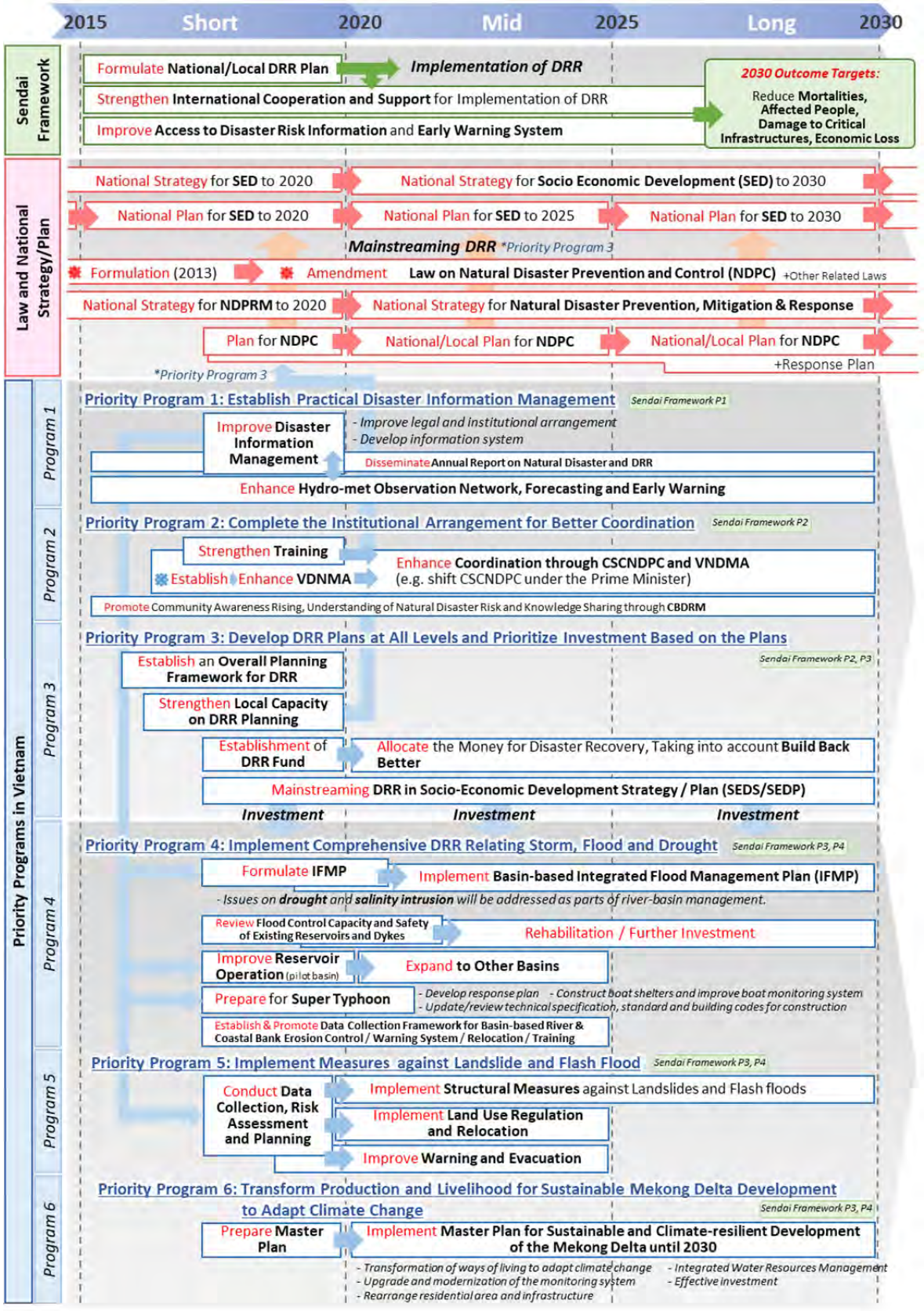


Figure 8.9 Roadmap for Priority Programs toward 2030

Annex

Annex 1	Summary and effort of CCNDPC/SR at each province
Annex 2	Major support projects on the disaster prevention by overseas donors
Annex 3	Priority Program for Disaster Risk Reduction in Vietnam -To sustain socio-economic development-
Annex 4	Minutes of meeting of 1st consultation meeting and 2nd consultation meeting

Annex 1

Summary and effort of CCNDPC/SR at each province

Summary and effort of CCNDPC/SR at each province（1）

	Northern Mountainous Province	
	Yen Bai Province	Hoa Binh Province
Number of Staff at CCNDPC/SR （Sub-Department of Irrigation）	4 people (22 people)	16 people (16 people)
Budget （CCNDPC/DWR）	0.4 billion VND／Year	0.7 billion VND/Year
Disaster Prevention Plan（Province）	Formulated（April 2017） Only Annual Plan	Formulated（July 2015） Refer to Plan of Binh Dinh Province
Disaster Prevention Plan（District）	Formulated in all districts	Formulated in all 11 districts
Disaster Prevention Plan（Commune）	Formulated in all communes	Formulated
Disaster Response Plan	Formulated	Formulated
Provincial Natural Disaster Prevention and Control Fund	Established （Collection has not been initiated）	Established （6-7 billion VND／Year）
Major Disaster Type	Landslide／Flash Flood	Landslide／Flash Flood
Damage in Recent Years	・Heavy Rain in October 2017 Damage Cost:1,855 billion VND Death: 36 people, Missing:17 people Damaged Housing: 168 houses Cropped Area: 5,561ha Irrigation Facility: 417ha Water Supply Facility: 6 Dike: 15,391m National Road: 2 routs Hydrological Power Plant: 4 ・5 Tornados in 2017 ・4 Storms in 2017 ・10 heavy rain, floods, flash flood in 2017 ・2 Sediment disasters in 2017 ・Total dike erosion in 2017: 15.3km	・Heavy Rain in October 2017 Damage Cost:2,473billion VND Death:29 people, Missing:5 people Damaged Housing: 5,346 houses Cropped Area: 8,299ha Livestock: 184,631 Fishery 757ha Road（Upper slope: 750 parts, 550,000m^3、Lower slope: 72 parts, 1720m, road surface 7,000m） ・Flood in Sep – Dec. 2017
Hazard Map	Landslide（1/50,000） Flash Flood	Landslide（1/50,000）
Early Warning・Observational System	20 HMS hyetometer in province	Installed 21 Hyetometers through Natural Disaster Prevention and Control Fund （WARTEC Company）
CBDRM Implementation	Implement a project implementation plan on raising community awareness and CBDRM from 2011 to 2015.	Implemented by Natural Disaster Prevention and Control Fund
Others	▪ In recent years, landslides and flash floods occur frequently; therefore, requiring focused efforts. ▪ Disaster Prevention Plan at Commune level does not contain appropriate context. ▪ Since the quality of landslide hazard map is not sufficient, difficult to utilize in community activities. ▪ MARD requested to conduct sites selection for installing flash flood early warning system.	▪ Due to heavy rainfall in October 2017, landslide occurred at some parts of province. The most urgent and important task is to relocate residents in dangerous area. ▪ Natural Disaster Prevention and Control Fund is utilized not only for rehabilitation projects but also for small scale projects for dike recovery and purchase of hydrometeorology data. ▪ Hoa Bihn province referred to Disaster Prevention Plan in Binh Dinh province since it is offered by Red Cross.

Summary and effort of CCNDPC/SR at each province（2）

	Central Province	
	Quang Binh Province	Thua Tien Hue Province
Number of Staff at CCNDPC/SR （Sub-Department of Irrigation）	14people (14people)	16people (No info.)
Budget （CCNDPC/DWR）	1.5 billion VND/Year	1.4 billion VND/Year
Disaster Prevention Plan（Province）	Formulated（2015）	Formulated In process of approval
Disaster Prevention Plan（District）	Formulated in all 8 districts	Formulated in all 9 districts
Disaster Prevention Plan（Commune）	Formulated in all 159 Communes	（No info）
Disaster Response Plan	（No info）	（No info）
Provincial Natural Disaster Prevention and Control Fund	Not established （Financial difficulties due to compensation for fishermen）	（No info）
Major Disaster Type	Flood／Strong Wind／Coastal Erosion	Flood／Strong Wind／Coastal Erosion
Damage in Recent Years	・3 typhoons in 2017 ・Typhoon No.3 in 2017 Damage Cost:62 billion VND ・Typhoon No.10 in September 2017 Damage Cost:8,000 billion VND Death:2 people, Injured: 48 people, Total damaged housing: 242, Partially damaged housing: 43,776, Inundated housing: 4,495, Educational Facilities: 569 Medical Facility101, Cropped Area:56,832ha Livestock: 25,977, Fishery 970ha、 National Road: 16km, Provincial Road: 12.5km, Bridge:1, Culvert: 51, Dike: 3,230m, Embankment: 22,900m, Canal: 33km Irrigation Dam: 7, Pump station: 12,Coastal/Riverbank erosion: 4070m, Transformer station: 7, Industrial plants: 92	・Flood in November 3 – 9th, 2017 Damage Cost:830,525 billion VND Death:12 people、Missing: 8 people、 Completely damaged housing: 2, Inundated housing: 71,769, Cropped Area:1380ha Livestock: 84,613, Fishery: 455.48ha, National Road: 122km, Provincial Road: 715km、 Bridge: 145, Culvert: 620, Dike: 100km、Channel: 200km、 Pumping station: 129, Educational Facility: 591, Coastal Erosion: 9.7km 、 Riverbank Erosion:150m
Hazard Map	Flood（Created by JICA）	Flood（Created by JICA）
Early Warning・Observational System		
CBDRM Implementation		

	Central Province	
	Quang Binh Province	Thua Tien Hue Province
Others	▪ Content of Disaster Prevention Plan at commune level is not appropriate. ▪ Leak of contamination from industrial complex in Ha Tinh province in 2016 drastically damaged Fishermen. Compensation of this accident has pressured the financial situation of the province. ▪ There are no measures towards industrial areas. ▪ There is no progress on IFMP due to financial difficulties.	▪ Under Law of Natural Disaster Prevention and Control, authority of Standing Office has been strengthened. Previously all Decisions had been issued by PPC; however, currently many parts can be approved after the incidents. ▪ Upgrade of hazard map is necessary. ▪ Hazard maps of Landslide and flash flood are necessary. ▪ Projects by each sector within IFMP has been making progress and conducting constant review. ▪ CC at district level must be strengthened.

Summary and effort of CCNDPC/SR at each province（3）

	Central Province	
	Quan Nam Province	Quang Ngai Province
Number of Staff at CCNDPC/SR （Sub-Department of Irrigation）	15 people （No info）	17 people （No info）
Budget （CCNDPC/DWR）	0.5 billion VND/Year	1.1 billion VND/Year
Disaster Prevention Plan（Province）	Formulated In process of approval	Formulated（2017/05） Refer to a plan created by WB4
Disaster Prevention Plan（District）	Not Formulated	Formulated in all 14 districts
Disaster Prevention Plan（Commune）	Not formulated	Formulated in 60% of communes
Disaster Response Plan	Formulated	Formulated
Provincial Natural Disaster Prevention and Control Fund	Established （8 billion VND）	Established （Collection has not been started）
Major Disaster Type	Flood・Strong Wind・Coastal Erosion・Landslide	Flood・Strong Wind・Coastal Erosion
Damage in Recent Years	・Summary of Disaster in 2017 Thunder storm: 4, Earthquake 5, Death: 39 people, Missing: 113 people Injured: 113 people Cropped Area: 5,156ha Livestock: 26,700 Riverbank: 204ha Coastal Erosion: 6,630m Coastal Erosion500m National Road/Provincial Road: 2.5million m^3 ・Typhoon No.12 in November 2017 Death and Missing: 40 people Damage Cost:1,600 billion VND	・Typhoon No.12 in November 2017 Death and Missing: 7 people Injured: 44 people, Damage Cost:963 billion VND Completely damaged housing: 40, Partially damaged housing: 394, Inundated housing50,542, Educational Facility: 187 Medical Facility: 19 Cropped Area:4110ha Livestock: 97,649 National Road35km, Provincial Road93km, Bridge:30, Aquaculture: 287ha
Hazard Map	Flood（Created by WB4）	Flood（Created by AusAID） Landslide・Flash flood
Early Warning・Observational System		Installed 14 hyetometers by province （WARTEC Company）
CBDRM Implementation	Implemented in 25% of 244 communes	Implemented in 30% of 184 communes
Others	▪ Through disaster and rehabilitation projects after the establishment of Natural Disaster Prevention and Control Fund, collection of the fund has been increased since residents understood the purpose of the fund. ▪ Integrated dam operation of Vu Gia - Tu Bon has been going well. At the flood on November 2017, it controlled more than 20 % of water flow. Regarding dam operation, coordination with Danang city has not been undertaken. ▪ There is no inconvenience regarding Information on hydrometeorology; it is desired to obtain weather forecast in a longer span. ▪ Many of victims from Typhoon No.12 were due to landslide.	▪ Latest update of the Flood Hazard Map is old as 2006; renewal is required to incorporate the change in land use and river. ▪ Tra Khuc River is a subject of integrated operation; however, inflow monitoring is not implemented since hydrometers are not installed in the river basin. The province expects the expansion of T.T Hue Project. ▪ The province delivers disaster information via SNS.

Summary and effort of CCNDPC/SR at each province（4）

	Central Southern Province	
	Phu Yen Province	Ninh Thuan Province
Number of Staff at CCNDPC/SR （Sub-Department of Irrigation）	4 people (? people)	2 people (14 people)
Budget （CCNDPC/DWR）	0.7 billion VND/Year	0.8 billion VND/Year
Disaster Prevention Plan（Province）	Formulated（2016） Supported by GIZ	Formulated（2017） Revised in September 2017
Disaster Prevention Plan（District）	Formulated in all districts	Formulated in all districts
Disaster Prevention Plan（Commune）	Formulated in all communes	Formulated in all communes
Disaster Response Plan	Formulated	
Provincial Natural Disaster Prevention and Control Fund	Established （Collection has not been started）	Established （Collection has not been started）
Major Disaster Type	Flood・Strong Wind・Flash Flood	Drought・Flood・Riverbank/Coastal Erosion
Damage in Recent Years	・Typhoon No.12 in November 2017 Death and Missing: 4 people Damage Cost:9,561 billion VND	・Flood in 2016 Damage Cost:387 billion VND Death:1 person Completely damaged housing: 290, Inundated housing: 2,346 Cropped Area:12,372ha Livestock: 18,045, Fishery: 110ha ・Typhoon No.12 in December 2017 Completely damaged housing: 148 Cropped Area: 443ha、Livestock: 23 Educational Facility: 2 ・Drought in 2016 Damage Cost:125 billion VDN Cropped Area:539ha Area in which Production has stopped due to the drought: 15,000ha Livestock: 5,372ha
Hazard Map	Flood (created by dam owner) Landslide	No hazard map for Flood Flash flood
Early Warning・Observational System	▪ Forecasters are sent out from RHMS during rainy season ▪ 10 hydrometers are installed by the province	
CBDRM Implementation	Red Cross etc.（limited）	Red Cross etc. (limited）
Others	▪ Ba River is a subject of integrated. The river is controlled under appropriate operation. There are no major problems. ▪ Hazard Map of Ba River is prepared but not for Ky Lo River and Banh Lai River. ▪ Since riverbank erosion is serious, the province is interested in small-scale and low-cost measures.	▪ Ninh Thuan Province is added after the flood damage as requested by MARD; however, according to CCNDPC/SR, flood is not serious issue ▪ There is no hydropower plant in province. Information from other electrical power plants in neighboring province is delivered appropriately.

Summary and effort of CCNDPC/SR at each province（5）

	Central Highland Province Gia Lai Province	Southern Province Ba Ria-Vung Tau Province
Number of Staff at CCNDPC/SR （Sub-Department of Irrigation）	4 people （No info）	4 people （No info）
Budget （CCNDPC/DWR）	（No info）	1.1 billion VND/Year
Disaster Prevention Plan（Province）	Formulated（2017）	Formulated
Disaster Prevention Plan（District）	Formulated in all 17 districts	Formulated in all districts
Disaster Prevention Plan（Commune）	Formulated in all communes	Formulated in all communes
Disaster Response Plan	Formulated	Formulated
Provincial Natural Disaster Prevention and Control Fund	Established （Collection of 2017 has been stopped temporarily）	Established （Total amount for 5 years by 2016 is 15 billion VND）
Major Disaster Type	Drought・Flood・Landslide	Typhoon・Tropical low pressure・River bank Erosion・Coastal Erosion
Damage in Recent Years	・Flood in December 2016 Damage Cost:50billion VND ・Hail、Tornado、Thunder in 2016 Damage Cost:14billion VND, Death:3, Injured 16, Completely damaged housing: 45, Partially damaged housing: 1,057, Educational and Social facilities: 17 ・Drought in 2015-2016 Damage Cost: more than 2,000 billion VND Cropped Area: 30,556.1ha, Food Shortage: 13,778 households, Water Shortage: more than 9,164 households	―
Hazard Map	Flash flood	Inundation map
Early Warning・Observational System	Observational facilities owned by dam owner such as HMS and others	Coordinate with PHMS closely
CBDRM Implementation	Make a use of limited Natural Disaster Prevention and Control Fund	In last 5 years, implemented in each level with budget of 2.4 billion
Others	▪ CCNDPC/SR Standing Office has not established. DARD has temporarily assigned other sub-departments. ▪ Disaster Prevention Plan is formulated with bottom-up approach (other provinces as well) ▪ Ground water development is required since ground water resource is limited. ▪ Due to heavy rain in 2017, several parts of National Road collapsed, which caused traffic blocking. ▪ Regarding integrated operation, effluent in 2013 caused damaged. After the formulation of regulation on integrated operation, damaged has decreased.	▪ Flood damage is not serious. Rather typhoons and tropical low pressures have brought serious damage. ▪ There is a southern district center of CCNDPC/SR under MOT. This center manages 8 nearby provinces. ▪ When there is a development of industrial complex and company, DOIT development committee provides altitude data and inundation area map. ▪ Industrial complex is developed by avoiding inundation damage. At present, training for response is implemented in human-caused accidents such as fire and oil spill.

Summary and effort of CCNDPC/SR at each province（6）

	Southern Province	
	Ben Tre Province	An Giang Province
Number of Staff at CCNDPC/SR （Sub-Department of Irrigation）	3 people （No info）	3 people （No info）
Budget （CCNDPC/DWR）	0.2 billion VND/Year	2.5 billion VND/Year
Disaster Prevention Plan（Province）	Formulated	Formulated
Disaster Prevention Plan（District）	Formulated in all districts	Formulated in all districts
Disaster Prevention Plan（Commune）	Formulated in all communes	Formulated in all communes
Disaster Response Plan	Formulated （Some parts has not formulated）	Formulated
Provincial Natural Disaster Prevention and Control Fund	Established Collection will begin from 2nd period in 2018	Established Since 2016, total annual amount is 14.6 billion VND
Major Disaster Type	High tide, Salt water intrusion, Typhoon, Riverbank Erosion, Coastal Erosion	Flood・Riverbank Erosion・Heavy Rainfall, Thunder・Storm
Damage in Recent Years	・Durian Typhoon（2006） Damage Cost:3,128 billion VND ・Haiyan Typhoon（2013） Damage Cost:3,224 billion VND、 Death:19, Injured 671, Completely damaged housing: 26,679, Partially damaged housing: 93.589 ・（No record of year）High tide Damage Cost:84 billion VND。 Damaged Housing7,806, Cropped Area:6,439ha, Fishery238ha, Dike60km ・Drought in 2016 Damage Cost:1,695 billion VND, Cropped Area:122,940ha, Fishery7,853ha ・Riverbank erosion（No record of year）: 114.5km ・（No record of year）Riverbank erosion : 19km	・Damage by disaster in 2000~2016 Damage Cost: more than 2,190 billion VND, Death:481, Completely damaged housing: 1,864, Partially damaged housing:18,841, Cropped Area:14,466ha, 185,000 ha Livestock: 25,000, Fishery: 3,400 Tons Bridge・Culvert・Pump station: 2,100 ・Thunder and storm in June 18, 2016 Partially damaged housing: 835, Cropped area: 4,233.2ha、 ・Flood The most serious damage of year was 2000, 2001, 2002, and 2011. ・Drought The most serious damage of year on sea water intrusion were dry season of 2008, 2010, 2015-2016. ・Riverbank erosion from 2010 to 2017 62.5km Damage cost: 289,44 billion VND
Hazard Map	Sea water intrusion simulation map（DONRE）, High tide inundation hazard map（DONRE）	Coastal Erosion Risk Hazard Map (DONRE)
Early Warning・Observational System	Close coordination with PHMS	Close coordination with PHMS
CBDRM Implementation	Implemented with support by international organization	Implemented mainly by donor's aid, including child swimming training
Others	▪ Fruit cultivation gets serious impact from seawater intrusion caused by combination	▪ Riverbank erosion occurs at 30 points every year. ▪ Disaster Response Plan added measures of

	Southern Province	
	Ben Tre Province	An Giang Province
	of rainfall and high tide. Area damaged by sea water is shifting to upper stream. ▪ Agricultural method is shifting to triple cropping from double cropping. ▪ Surface water is utilized as supply water. Pipeline is established in city: rain water tanks are utilized in suburb. ▪ Ground subsidence is not serious. ▪ There is a management plan for sea water treatment.	drought, seawater intrusion, typhoon, and super typhoon. ▪ Since surface water is rich, ground water is not actively utilized. Ground subsidence rarely occurs. ▪ Since PHMS sends out drought forecasts, PCC-NDPC/SR formulates drought and sea water response plan.

Summary and effort of CCNDPC/SR at each province（7）

	Southern Province Ca Mau Province
Number of Staff at CCNDPC/SR （Sub-Department of Irrigation）	3 people (67 people)
Budget（CCNDPC/DWR）	1,260,000 VND/year
Disaster Prevention Plan（Province）	Formulated
Disaster Prevention Plan（District）	Formulated in all districts
Disaster Prevention Plan（Commune）	Formulated in all communes
Disaster Response Plan	Formulated
Provincial Natural Disaster Prevention and Control Fund	Formulated 2017 年 9 billion VND
Major Disaster Type	Typhoon, High Tide, Riverbank Erosion, Coastal Erosion, Thunder, Tornado, Droughts, Ground Subsidence
Damage in Recent Years	・16 Typhoons in 2017 (The largest damage was caused by No.12 and No.16) ・Heavy Rainfall in 2017 (February) Cropped Area:180ha、Fishery: 2,986ha, (August) Cropped Area:9,072ha, (October) Cropped Area:284ha ・Tornado in July, 2017 Completely damaged housing: 2, Partially damaged housing: 50, Educational Facility: 2. ・Tornado from 2011 to 2016 Death:2, Completely damaged housing:731, Partially damaged housing: 2,564 ・Thunder from 2011 to 2016 Death:2 ・High Tide from 2011 to 2016 Cropped Area:・Fishery 39,916ha ・Drought in 2017 Cropped Area:109,619ha Livestock633, Fishery 52,467ha Water shortage due to sea water intrusion: 15,072 ・Coastal Erosion from 2011 to 2016 134,215 m, Completely damaged housing: 197 ・Riverbank Erosion in 2017:4,147m ・Coastal Erosion in 2017:105,000m
Hazard Map	Typhoon Inundation Map Master Plan Map for Mekong Irrigation
Early Warning・Observational System	Closely working with PHMS Utilize Zalo (SNS) for sending out information
CBDRM Implementation	14 people are trained as CBDRM trainers. Each province and commune implement several activities.
	▪ GIZ is implementing Ca Mau city inundation prevention management project （C/P is DOT）. ▪ Speed of ground subsidence is several centimeters annually and the reason for subsidence is over extraction of ground water. ▪ Drinking water is not lacking in the province. Utilization of surface water from other provinces has been pending. Most of drinking water is from ground water. ▪ Historical damage is brought by Typhoon in 1997.

Categorization of disaster damage

※ In the Format of Disaster Damage Record, housing damage is categorized into damage more than 70%, 50－70%, 30－50%, and less than 30%. In this chart, “Completely damaged housing” indicates the category of “ damage more than 70%”, and “Partially damaged housing” indicates sum of “50－70%” and “30－50%”.

※In the Format of Disaster Damage Record, damage of cropped area is recorded by rice. vegetable, corn, fruits, bonsai, perennial crops, annual crops, and forestry. In this chart, cropped area signifies the sum of these categories.

※In the Format of Disaster Damage Record, damage of livestock is recorded by cow, buffalo, horse, goat, sheep, deer, pork, and chicken. In this chart, livestock signifies the sum of these categories.

Annex 2

Major support projects on disaster prevention by overseas donors

Major support projects on disaster prevention by overseas donors (1)

No	Field	Implementation	Title	Main Agency	Period	Target site	Type and Budget	Outline
1	Flood, Storm, Drought	WB	Natural Disaster Risk Management Project (NDRM) -WB(4)-	MARD	2005 to 2013	Central regeion Ex. Nghe An Mekong Delta regeion Ex. Ben Tre	Loan: 86.0 M.US$ Total: 102.5 M.US$	The main targets of the project are as follows. 1)Communities receive training to develop their own preparedness strategies and to integrate disaster risk management (DRM) into their communes' socio-economic development plans. 2) implementing new and better engineering standards for rural roads and irrigation infrastructure—both lifelines for rural communities, ensure their safety and livelihood. 3) enhancing livelihoods among poor households through an Agricultural Risk Management Information System (ARMIS) that assists farmers in improving productivity and enhancing resilience to droughts, floods, erosion, and heat. ARMIS also provides useful information on pest control, disease treatments, nutrient management, water conservation, planting dates and cropping patterns. 4) Implementing structural risk reduction measures for dams, reservoirs and evacuation bridges.
2	Flood, Storm	WB	Managing natural hazards project -WB(5)-	MARD, MONRE	2013 to 2019	Thanh Hoa, Nghe An, Ha Tinh, Danang, Quang Nam, Quang Ngai, Quang Binh, Quang Tri, Binh Dinh, Ninh Thuan	Loan: 150 M.US$ Total: 167 M.US$	The objective of the project is to increase the resilience of the people and economic assets to natural hazards in selected river basins of the project provinces. The main subjects are as follows. -Strengthening Disaster Risk Management Institutions 1)Information Systems and Planning Strengthening 2)Weather Forecasting and Early Warning Systems 3)Community-Based Disaster Risk Management 4)Priority Disaster Risk Mitigation Investments 5)Project Management, Monitoring and Evaluation
3	Flood, Storm	WB	River basins-wide integrated DRM plan (8 river basin 10 province) -Part of WB(5)-	(MARD)	2017 to 2019	Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri, Da Nang, Quang Nam, Quang Ngai, Binh Dinh, Ninh Thuan. 8 River basins in the Central: 1)Ma, 2)Ca, 3)Gianh, 4)Thach Han, 5)Vu Gia-Thu Bon, 6)Tra Khuc- Ve, 7)Kone-Ha Thanh, 8)Dinh	T/A 459M/M	The assignment scope covers 10 project provinces within which 8 river basins that have been identified for the purposes of developing RBDRM Plans. These RBDRM Plans will adopt an integrative approach to DRM at the river basin scale, and will be used to update the PDRM Plans which are required by Law. This approach is expected to provide a more holistic and responsive mechanism to address DRM in Vietnam's Central Region.
4	Drought	WB	Mekong delta water resources management for rural development project -WB(6)-	MARD	2011 to 2017	An Giang, Kien Giang, Soc Trang, Ca Mau, Can Tho, Bac Lieu, Hau Giang	Loan: 160.0 M.US$ Total: 206.6 M.US$	The Project consists of the following components: 1) Water Management Planning and Efficient Utilization, including measures to strengthen institutional capacities at sub-regional and provincial levels, promote effective operations and maintenance, and promote on-farm water use efficiency through pilot schemes; 2) Improvement and Rehabilitation of Water Resources Infrastructure, with emphasis on rehabilitation and minor improvement through canal dredging, and embankment reinforcement, as well as the installation of secondary control sluice gates; 3) Rural Water Supply and Sanitation, aiming to extend reliable services to about 60,000 households in the project area; 4) Project Management and Implementation Support, supporting incremental operating costs to implement the project and the monitoring and evaluation of project outcomes and impacts.
5	Drought	WB	Irrigated agriculture improvement project -WB(7)-	MARD	2014 to 2020	Thanh Hoa, Ha Tinh, Quang Tri, Quang Nam, Ha Giang, Phu Tho, Hoa Binh	Loan: 180.0 M.US$ Total: 210.0 M.US$	To improve the sustainability of irrigated agricultural production systems in selected Central coastal and Northern mountains provinces in Vietnam. Structure of components are shown in below. 1) Improved Irrigation Water Management 2) Irrigation and Drainage Scheme Level Improvements 3) Support Services for Climate-Smart Agricultural Practices 4)Project Management, and Monitoring and Evaluation
6	Flood	WB	Dam rehabilitation and safety improvement project -WB(8)-	MARD	2016 to 2022	34 Provinces (From Bắc Giang to Yên Bái)	Loan: 415.0 M.US$ Total: 443.0 M.US$	To improve the safety of targeted dams under the Government's Dam Safety Program to protect downstream communities and economic activities through priority investments and capacity enhancement. 1.Dam Safety Rehabilitation 2. Dam Safety Management and Planning 3. Project Management Support

Source: Publication from each organization, edited by JICA Survey Team

Major support projects on disaster prevention by overseas donors (2)

No	Field	Implementation	Title	Main Agency	Period	Target site	Type and Budget	Outline
7	Flood, Storm, Drought, Erosion, Salt intrusion	WB	Mekong delta integrated climate resilience and sustainable livelihoods project –WB(9)–	MARD, MONRE	2016 to 2022	An Giang, Dong Thap, Ben Tre, Tra Vinh, Soc Trang, Bac Lieu, Ca Mau, Kien Giang, Vinh Long	Loan: 310 M.US$ Total: 387 M.US$	The project development objectives (PDO) are to enhance tools for climate-smart planning and improve climate resilience of and and water management practices in selected provinces of the Mekong Delta in Vietnam. 1) Enhancing Monitoring, Analytics, and Information Systems: 2) Managing Floods in the Upper Delta 3) Adapting to Salinity Transitions in the Delta Estuary 4) Protecting Coastal Areas in the Delta Peninsula 5) Project Management and Implementation Support
8	Flood, Storm, Drought	WB	Emergency Natural Disaster Reconstruction Project –WB(10)–	Provincial Project Management Units	2017 to 2021	Binh Dinh, Phu Yen, Quang Ngai, Ninh Thuan, Ha Tinh, and Central government	Loan: 118.0 M.US$ Total: 135.8 M.US$	The main targets of the project are as follows. 1)The first component: Reconstruction and rehabilitation of damaged infrastructure, especially irrigation, flood control, and road and bridge. 2)The second component: Disaster recovery capacity enhancement, to strengthen the institutional capacity of the government at the central and provincial levels. 3)The third component: Project management support to support project management, safeguards, audits, and monitoring and evaluation.
9	Flood, Storm	JICA-WB	Strengthening the institutional capacity of the Government of Vietnam on flood risk management and recovery preparedness	MARD	2017 to 2020	Hanoi, Several Provinces in the Cnetral Region	T/A	This project will be part of the implementation of the IDA Emergency Flood Disaster Reconstruction Project (P163146). The objective of the proposed project is to strengthen the institutional capacity of the Government of the Socialist Republic of Viet Nam for flood risk management and recovery planning. 1)Component 1: Further Strengthening the Government's capacity on flood risk management (RETF). 2)Component 2: Quality assurance and overall coordination strategies for enhancing DRM policies in Vietnam.
10	Flood, Storm, Drought	ADB	Greater Mekong Subregion Flood and Drought Risk Management and Mitigation Project	MARD	2012 to 2019	Vietnam and LAO PDR	Go Cong, Tinh Dong Thap, Tinh Tien Giang	The impact of the Project will be reduced economic losses resulting from floods and droughts. The outcome will be improved capacities and preparedness to manage and mitigate the impacts of flood and drought events. The Project will have four key outputs: (i) Enhanced regional data, information, and knowledge base for the management of floods and droughts; (ii) Upgraded water management infrastructure; (iii) Enhanced capacity for community-based disaster risk management; and (iv) Effective project implementation.
11	Disaster all types, CBDRM	UNDP Oxfam, Vietnam Red Cross , Vietnam Women's Union	Strengthening Institutional Capacity For Disaster Risk Management In Viet Nam Including Climate Change Related Risks (SCDM Phase II)	MARD	2012 to 2016	MARD	Grant 4.7M.USD Total 4.95M.USD	Enhanced national and sub-national institutional capacities of Central and Provincial Committees for Flood and Storm Control members and main stakeholders to consolidate the disaster risk reduction legislative, policy and strategic framework. The main subjects of the project are as follows. 1)Improved capacity of the DMC and CFSC members to effectively and efficiently plan, implement, monitor and evaluate the CBDRM program, ensuring gender sensitivity and participation of vulnerable groups in both rural and urban areas. 2)Evidence based action research on disaster risk reduction (DORR) and climate change adaptation (COCA) utilized to improve policy and strategy, and plans developed and implemented at national, regional and international levels.
12	Disaster all types, CBDRM	UNDP	Promoting Climate Resilient Infrastructure in Northern Mountain Provinces of Viet Nam	MARD	2012 to 2016	Northern Mountain Provinces		Main structure of components is shown in below. 1) Contributing to a national level enabling environment that is conducive to adaptation in rural infrastructure projects. This will include a series of practical tools for practitioners, as well as recommendations towards improved policies and standards; 2) Developing capacity to plan, design, implement and monitor infrastructure projects at the provincial level, and developing capacity to assess climate change during provincial planning; 3) Demonstrating how to mainstream climate change adaptation into 4 infrastructure projects. The 4 demonstration projects are in the road rehabilitation, irrigation system rehabilitation and river embankment protections sub-sectors*.

Source: Publication from each organization, edited by JICA Survey Team

Major support projects on disaster prevention by overseas donors (3)

No	Field	Implementation	Title	Main Agency	Period	Target site	Type and Budget	Outline
13	Storm, Flood, Erosion	UNDP	Improving the resilience of vulnerable coastal communities to climate change related impacts in Viet Nam	MOC MARD	2016 to 2022 (Totally 20 years)	Provinces along the coast	Grant GCF 29.5M.US$ MOC 8.0 M.US$ MARD 1.4M.US$ UNDP 1.6M.US$ Grants 295.2(Total)	Strengthening storm and flood protection for coastal communities in Viet Nam through resilient housing, planting and rehabilitation of mangrove forests, and systematized climate risk assessments for the public and private sectors. Main structure of components is shown in below. 1)More resilient housing will be created through incorporating storm and flood resilient design features in new houses to benefit up to 20,000 people who are exposed to high risk from adverse weather events. 2) In order to create storm surge buffers, 4,000 hectares of mangroves will be planted and rehabilitated, which will also create sustainable ecosystem resources to support coastal livelihoods. 3)The project will also develop systematized climate and economic risk assessments for private and public sector application in all 28 coastal provinces of Viet Nam.
14	Drought, Water resources	ADB	Phuoc Hoa Water Resources	MARD	2004 to 2016	Long An, Song Be, Binh Duong, Binh Phuoc, Tay Ninh	Loan 204 M.US$	Water resources development and management are key areas required to support the current growth in Viet Nam. Expansion of irrigated area is high priority of Government, particularly in rural areas unaffected by industrial and urban expansion. Control of salinity intrusion in the rivers is essential for municipal water supply. The Project will develop the water resources of the Song Be river and transfer it to Saigon and Vam Co Dong rivers for irrigation to increase agricultural production, provide bulk water for Ho Chi Minh City (HCMC), and control saline intrusion thereby providing social, economic and environmental benefits.
15	Drought	AFD ADB	Phuoc Hoa water resource usage project – phase II –	MARD	2011 to –	Dong Nai river Basin, Be river in the Saigon, Vam Co Dong river Tay Ninh, Long An, Phuc Hoa	Loan 50 M EURO	Main structure of components is shown in below. 1)Creation of the Tan Bien irrigated area (Tay Ninh province), 6,725 ha (of which 5,2301 ha supplied by gravity and 1,495 ha supplied by pumping) 2)Construction of the main Duc Hoa canal 3)Creation of the 13,821 ha Duc Hoa irrigated area (Long An province) 4)Water supply to two existing irrigated areas, Thai My (900 ha) in the Ho Chi Minh City urban region's Cu Chi district and another irrigated area in Tay Ninh province (2,657 ha) 5)The use of this additional resource (55 m3/s) will enable consolidation and extension of irrigated agriculture in the areas of Tan Bien (Tay Ninh province) and Duc Hoa (Long An province) as well as an increase in water supply for domestic, municipal and industrial use, notably in Long An province.
16	Flood, Storm	JICA	Project for Building Disaster Resilient Societies in Central Region	MARD, DARD of Provinces	2009 to 2012	Hue, Quang Nam, Quang Ngai	T/A and Provion of Equipment 0.392 Bill JPY	Strengthen adaptation measures for water-related disaster risk which increase due to water-related disaster countermeasures and climate change in central Vietnam. 1) Government agencies at each level of the provincial, provincial, county, commune, strengthen disaster prevention capacity. Disaster prevention system for water-related disasters centering on community will be strengthened. 2) Develop a manual for promoting community disaster prevention. 3) Develop standard design and construction manual of small scale low cost countermeasure for river erosion measures. 4) Each regional ministry and central government in the Chubu region will be strengthened in capacity to support disaster prevention.
17	Flood, Storm	JICA	Project for Building Disaster Resilient Societies in Vietnam (Phase 2)	MARD, DARD of Provinces	2013 to 2016	Hue, Quang Binh, Ha Tinh, Nghe An	T/A	Main structure of components is shown in below. 1) At the central level (MARD, DWR), the integrated framework of integrated flood management will be strengthened. 2) At Quang Binh Province, strengthening the ability to formulate IFMP. 3) Enhanced ability to analyze flood risk of Dear Genian Ministry / Ha Tin Province DARD. 4) Flood control measures by structures are strengthened in the target four provinces. Five. Flood control measures by non-structural objects will be strengthened in the target four provinces.
18	Drought	JICA	The Project for the Groundwater Development in Central Highland Provinces	MARD, N-CERWASS	2007 to 2010	Kon Tum, Gia Lai, Dak Lak	Grant 2.012Bill JPY	The project aimed to supply safe and sanitary drinking water to residents, and assisted construction of water supply facilities and maintenance of well excavating equipment in order to contribute to improvement of water supply penetration rate and improvement of living environment. As a result, the public water supply network was improved in the target area.

Source: Publication from each organization, edited by JICA Survey Team

Major support projects on disaster prevention by overseas donors (4)

No	Field	Implementation	Title	Main Agency	Period	Target site	Type and Budget	Outline
19	Flood, Storm	JICA	Mitigating flood disaster risk by providing forecast/warning systems and other equipment using Japanese technology	MARD, T.T.Hue PPC	2018 to 2019	Hanoi, Thua Thien Hue Province	Grants 1.844 Bill. JPY	Main structure of components is shown in below. 1) Facilities and equipment procurement: Equipment: An X-band radar system, hydrology observation stations (10 locations), closed-circuit televisions (14 locations), real-time dam operation systems, direct communication networks (seven lines), an information management system, a multiple information display, a digital signage system for fighting floods , a direct commanding unit, a topographical survey, a river channel cross-section survey 2) Consulting services/guidance in managing the facilities Detailed design work, bidding assistance, procurement supervision, (as guidance in managing the facilities) capacity development for operation and maintenance of the provided equipment
20	Drought, Irrigation	JICA	Ben Tre water management project	Project Investment and Construction Management Board 9	2017 to 2022	Ben Tre	Loan 24.257 Bill.JPY	In this project, the Saltwater Upstream Control Facility will be upgraded in the southern Benghe province of Vietnam where agricultural crop damage caused by saltwater journey has occurred. Due to the occurrence of saltwater runoff, which is considered to be the influence of climate change etc in recent years, in the tributary of the Mekong River, in these crops with low salt tolerance damage such as decrease in yield and miniaturization of fruits has become serious. Salt damage that occurred in 2015 caused damage of about 1.5 trillion dong (about 7 billion yen). Saltwater intrusion prevention sluicegate is in the package (Sluice Gate etc.)
21	Land slide, Flash flood	JICA, KOIKA	KOICA-JICA Joint Capacity Development -Landslide and Slope Hazards Prevention-	Relevant Ministories	2012 to 2013	(All Developng Countries)	Capacity enhancement: (Lecture)	Promote the security level of the participating countries with Korea's disaster prediction and warning systems using ICT technology related to landslide and slope hazards. Structure of components are shown in below. 1) Acquire the capabilities necessary for disaster management response by building the advanced disaster management system. 2)Transfer the know-how & experience of Korea in the dslide & slope hazards prevention. 3)Expand the sight of view of participants by setting a chance to learn about the Japanese experience in the same area.
22	Land slide, Flash flood	Japan Embassy and JICA	(Provided goods)	MARD	Octber, 2017	Ca Mau, Kien Giang, Quang Nam	Provide goods	40 sets of waterproof canvas, 47 water filters and more than 5,000 blankets to representative of Việt Nam Trần Quang Hoài, director of the Flood and Typhoon Prevention and Control Administration under the Ministry of Agriculture and Rural Development (MARD).
23	Erosion	GIZ	Integrated Coastal Management Programme (ICMP)	MARD	2011 to 2018	4 Mekong Delta Provinces Sock Trang, Bac Lieu, Ca Mau, Kien Gian	Capacity enhancement, Grants	The main target is the integrated coastal protection plans of four Mekong Delta provinces, including recommendations for coastal protection investments. Structure of components are shown in below. 1)Two policy packages on forest management and irrigation management have been produced. 2)Planting of 46,000 hectares of new coastal forest by 2020. 3)Introduction of T-shaped breakwaters. -25 new livelihood models have been introduced to 10,800 households.
24	Flood	GIZ Germany Red Cross Vietnam Red Cross	Improving flood protection and drainage in medium-sized coastal towns and cities to help them adapt to climate change	MOC, Provincial PPC	2012 to 2017	Main subjects Phu Yen, Binh Dinh Other than that Khanh Hoa, Quang Ngai, Soc Trang	T/A Provide Equipment	Public institutions and communities have greater skills, resources and capacity to adapt to more frequent and severe urban flooding in the wake of climate change. The project supports the inclusion of climate change impacts in urban drainage planning and in disaster preparedness and prevention. The project provides policy advice in five provinces: Phu Yen, Binh Dinh, Khanh Hoa, Quang Ngai and Soc Trang. It works closely with the provinces of Phu Yen, Binh Dinh and Soc Trang to mainstream adaptation to climate change in urban drainage planning. Legislative loopholes are identified, benefiting activities at national level and in other provinces. The project focuses on the provinces of Phu Yen and Binh Dinh, where it works to improve disaster prevention by supporting the establishment of early-warning systems and helping to improve existing systems. The project is working in partnership with the German Red Cross and the Viet Nam Red Cross Society so as to be able to directly reach people living in especially vulnerable parts of the provincial capitals. Training is provided on disaster preparedness and disaster response to teach the population how to cope better with flooding events. The project is also working with the competent authorities to review and upgrade organisational procedures for contingency planning.

Source: Publication from each organization, edited by JICA Survey Team

Major support projects on disaster prevention by overseas donors (5)

No	Field	Implementation	Title	Main Agency	Period	Target site	Type and Budget	Outline
25	Flood, Storm, Drought	GIZ Cologne University of Applied Sciences	Land Use and Climate Change Interactions in Central Vietnam (LUCCI)	VAWR Hue University of Agriculture and Forestry (HUAF)	2010 to 2015	Quang Nam Da Nang City (Vu Gia-Thu Bon River Basin)	T/A Research and study	Providing a scientific basis to develop optimized land use and water resources management strategies. To develop such strategies, interdisciplinary research methods are applied which consider both natural and social science approaches.
26	Flood, Drought	SCE (pilot management plan) and Asconit Consultants (monitoring).	Assistance to the development of Dong Nai management plan and surface water monitoring	MONRE	2009 to 2010	Dong Nai River Basin	Finance and Employment (800,000 EURO).	N/A
27	Flood, Drought	AFD 3 French Water Agencies	Integrated Water Resources Management	MONRE	2009 to 2012	Dong Nai River Basin	T/A	The Dong Nai Pilot Project has been developed first right after the signature of a cooperation agreement in June 2007 between Mr Alain Juppé, at the time Ministry of Sustainable Development, and Mr Mai Ai Truc, former Ministry of Natural Resources and Environment in Vietnam. It aimed at providing technical assistance to the Vietnamese authorities for the implementation of an Integrated Water Resources Management approach (IWRM) through an application on the Dong Nai pilot basin.
28	Flood, Drought	AFD	Second phase of the Dong Nai Basin pilot project	MONRE	2014 to –	Dong Nai River Basin	T/A	Establishment of an operational Basin Committee. Main structure of components is shown in below. 1) Preparation of the Dong Nai Management Plan; 2)Training in France for the technical team in charge of supporting the Dong Nai Basin Committee
29	Erosion	AFD Southern Institute for Water Resources Research and the Central Region College of Technology, Economics and Water Resources	Study on the coastal erosion process hoi an and the measures	MARD DARD Provincial PPC	2016 to 2017	Quang Nam	T/A Research and study	Field survey and analysis by simulation models for the coastal erosion process and protection measures. · Planning of countermeasures and evaluation of its effectiveness
30	Erosion	AFD	LMDCZ-AFD PROJECT Study of erosion processes and protection measures for the Lower Me Kong Delta coastal zone	MARD DARD Provincial PPC	2016 to 2017	Ca Mau, Tien Giang, Quang Nam	T/A Research and study	Main structure of components is shown below. 1)Understand the mechanism responsible for the erosion process in these two zones; 2)Establishing a solid scientific basis for integrated managements of the Vietnamese coastal zones; 3)Propose soft and hard measures for sustainably protecting these coastal zones from erosion
31	Erosion	AFD	Erosion Process and Measures for Protecting Hoi An Beach and the Lower Mekong Delta Coastal Zones (Tentative name)	MARD DARD Provincial PPC (Assumed)	(Planned)	Hoi An, Lower Mekong Delta	Loan(AFD) $98 million Grant(EU) –	N/A
32	Flood, Salt intrusion, Water resources	AFD	Supporting regions threatened by rising water levels	MARD and Ninh Ninh Ha Tinh Can Tho PPC	2015 to –	Ninh Ninh, Ha Tinh, Can Tho	Loan 53 M EURO	In change of rainfall pattern, against the increase in the frequency and violence of extreame climate events and the sea level rise, AFD is supporting these provinces by constructing engineering sturucture (locks, dams, banks and irrigation systems), aims to secure the economy of these provinces, particularly their agricultural economy, ensure the safety to people and goods, and improving sanitary conditions for people.
33	Flood, Storm, Drought	IADC	Integrated and Sustainable Water Management of Red-Thai Binh River System in a Changing Climate	MARD, Institute of Water Resources Planning(IWRP)	2012 to 2014	Red-Thai Binh river basin	€1,114,575 (Italy's grant) €309,002 (POLIMI) €168,673 (IWRP)	The project aims at minimising economic losses (in agriculture and hydropower sectors), decreas-ing the risk of flooding and enhancing environ-mental quality in the multi-purpose multi-reservoir Red-Thai Binh river basin system. 1)Assessment of the current conditions of man-agement of the multi-purpose multi-reservoir Red-Thai Binh river basin system; 2)Designing of optimal operating rules for the multi-purpose multi-reservoir system for domestic, industrial, agricultural water sup-ply, navigation, power generation, flood con-trol, and environment conservation of the Red river delta in a changing climate.

Source: Publication from each organization, edited by JICA Survey Team

Major support projects on disaster prevention by overseas donors (6)

No	Field	Implementation	Title	Main Agency	Period	Target site	Type and Budget	Outline
34	Flood, Storm	IADC (Italian Agency for Development Cooperation)	Improving the flood forecasting and warning system in Viet Nam – Phase-2	NHMS of MONRE	2016 to 2020	SE Binh Dinh, Phu Yen, Khanh Hoa, Ninh Thuan, Binh Thuan	Total: € 6,494,000 €4,000,000 Italy's soft loan + €36,000 Italy's grant for TA + €2,458,000 Vietnam's local fund	Improvement of the flood forecasting and warning system through supply and installation of equipment for 114 automatic stations capable to measure remotely hydrological, meteorological, oceanographic and rainfall data. Provision of equipment to 4 centres for management of data, forecast and warnings at the provincial, regional and national level. Provision of training for specialised staff to properly manage the new hydro-meteorological network.
35	Flood, Storm, Drought	IADC	Real Time Monitoring, Modeling and Management of Water Resources in the Ba River Basin	MONRE	2016 to 2018 (Planned)	Kon Tum, Gia Lai, Dak Lak, Phu Yen	€3,000,000 (Italy's soft loan) €42,000 (Italy's grant for TA)	The project—currently under formulation—aims at developing a decision support system based on a real time monitoring network. The project is twofold: on the one hand, a real time monitoring network will be created by in-stalling automatic hydrological and meteorologi-cal stations and upgrading dedicated centres in processing data on rainfalls and water level in rivers; on the other hand, advanced models and tools will be applied to facilitate dialogue and coordination among different stakeholders in order to ensure the sustainable and efficient use of water resources in the basin.
36	Drought, Ground water	ADPC(Asian Disaster Preparedness Center) and the Geographic institute of Norway	(Land subsidence monitoring project)	MARD	2012 to 2018	Ca Mau	T/A Research and study	The sedimentary layer of Ca Mau is about 400 m. On the surface layer 3 to 41 m (average 20 m) of soft clay, under it the layers of sand including silt including clay / silt alternate. 1)Ca Mau has 137,988 wells (99.7% for household use), pumping up 373,232 m 3 / day (62% for domestic use) 2)In the monitoring project, from February 2017, Benchmark of about 100 m is driven into 3 places, and measurement of the displacement (settlement amount) is started. 3)Observation of the lowering of the groundwater level at observation wells. In estimation, ground subsidence amount is 15 – 45 mm / year, and the cumulative settlement amount so far is 20 – 50 cm. Possibility of 1 m subsidence in the coming decades. 4)In addition to monitoring and modeling ground subsidence, measures for regulating underground water pumping should be implemented at an early stage. For this reason, securing alternative water sources is indispensable.
	CBDRM	Norway R. C	Risk mitigation and preparedness		2010 to 2013	Phu Yen	100.000 US$	Improving capacity for management and implementation of projects for Red Cross staff at all levels, staff of departments, and communities in the region often affected by natural disasters and disasters; Training a key team on disaster preparedness, community first aid, community health care; Strengthening disaster resilience of people in the community; Constructing community-based disaster prevention facilities.
	CBDRM	Norway R. C	Community-based disaster risk reduction		2010 to 2015	Phu Yen	350.000 US$	Strengthening the knowledge and capacity of local governmental staff, Red Cross in project area; Raising awareness on the risk and risk reduction measures targeting local people who shall be trained and be capable of response so as to protect themselves and their assets; Supporting the formulation of policy, plan on DRR in project area through the cooperation between Red Cross and local governments, departments
	Drought, Irrigation	JICA	North Nghe An irrigation system upgrading		2014 to 2023	Nghe An	Loan: 213 M US$	Upgrading, rehabilitating Northern Nghe An irrigation system, securing the irrigating for 27.565ha in 04 districts of Do Luong, Dien Chau, Yen Thanh and Quynh Luu; dredging main drainage channels in Yen Thanh district and Dien Chau district; Building Irrigation Training Center (that shall be belonging to VAWR)
	Drought, Irrigation	JICA	North Ben Tre irrigation system upgrading		2017 to 2023	Ben Tre	Loan: 246 M US$	Constructing 11 culverts in 03 provinces: Ben Tre, Tra Vinh and Vinh Long Improving the flow management, seasonal crop system
	CBDRM	World Vsion	Strengthening the capacity of disaster risk preparedness and mitigation in coastal areas		2011 to 2014	Thanh Hoa	1,1 M US$	03 communes in Hoang Hoa district and 03 communes in Quang Xuong district. Enhancing local people awareness on CBDRM and Climate Change; Promoting the mainstreaming of DRR into district, commune development planning; Improving early warning system at local area; Strengthening the awareness on CBDRM and Climate Change at school level and the capacity of staff working for provincial commanding committee for NDPC/SR

Source: Publication from each organization, edited by JICA Survey Team

Major support projects on disaster prevention by overseas donors (7)

No	Field	Implementation	Title	Main Agency	Period	Target site	Type and Budget	Outline
	CBDRM	World Vision	Mitigating the vulnerability caused by disaster		2003 to 2009	Quang Ngai	2,9 M US$	Conduct disaster risk assessment at commune level; Formulate disaster prevention plan; Organize loan for production development
	CBDRM	Australia	Community-based climage change adaptation in Mekong delta		2011 to 2013	Soc Trang		03 poor communes of An Phu district (An Giang province) and 02 communes of Vinh Chau Town (Soc Trang province) The Project has supported most vulnerable people in the 02 provinces on DRR, livelihood improvement and capacity building… (target group: woman, disability, ethnic minority people...)
	CBDRM	The Government of Denmark	Risk assessment at community level		2011	Son La	25.000 US$	Training and raising awareness of local community, conducting risk assessment at local level Providing necessary equipment
	CBDRM	Oxfam	Strengthening climate change resilience for the coastal communities of Vietnam		2012 to 2014	Hai Phong, Nam Dinh, Thai Binh, Tien Giang, Tra Vinh	15 M AuD$	Strengthening the capability of response, recovery and resilience targeting vulnerable woman living along the coast
	CBDRM	Oxfam	Building the capability of responding, recovering and adapting the hazards and climage change targeting man and woman		2012 to 2017	Ben Tre	4 M US$	13 coastal communes of 03 districts: Binh Dai, Thanh Phu and Ba Tri Strengthening effective and participatory disaster risk management; Supporting livelihood development to increase income of local people; Improving water supply system to reduce the infection diseases through water sources.
	CBDRM	Ausaid	Strengthening climate change resilience for the coastal communities in Tra Vinh		2012 to 2014	Tra Vinh		N/A
	CBDRM	Ausaid	Community-based climate change in Mekong delta		2012 to 2014	An Giang, Soc Trang	3 M US$	CVCA; Participatory climate change adaptation planning; gender action planning; action change awareness raising. Action research on climate change resilient livelihood, conduct climate change resilient livelihood models; micro insurance for women's livelihoods; disaster risk reduction activitites; Build small scaled infrastructure to build resilience. Several documentation on good practices eg. community digital story; CBA E74planning process; documentation on climate smart social economic development planning etc.. Support the foundation and performance of Southern NGO climate change working group.
	CBDRM	Ausaid	Natural disaster and climate change program		2011 to 2013	Thanh Hoa, Bac Kan, An Giang	225.000 US$	Develop IEC/BCC materials, printing for use Conduct IEC activities in the communities and schools in target communes. Provide training on CC, CBA and DRR for district and commune officers. Provide training on soft skills(team/group operation,planning,communication,presentation…) Continue current livelihood models in target communes in Bac Can and Thanh Hoa. Implement DRR activities in An Giang. Documentation / lessons learned. Support for CSOs and partners to advocate and lobby for integrating CCA and DRR in commune and district SEDP; support adaptive capacity and advocate for change of policies related to CCA, Bac Can.
	CBDRM	Save the Children	Installation and operation of disaster early warning system		2014 to 2015	Quang Nam	25.000 US$	N/A
	CBDRM	Save the Children	Disaster risk mitigation		2014 to 2017	Tien Giang	350.000 US$	Building capacity of teacher for safe school, improving first-aid skill of teacher; Organizing training courses for swimming; organizing DRR activities at school; Establishing community relief team; Implementing disaster fighting drill; Providing equipment and tools such as life jacket, loudspeaker… Providing early forecasting tool such as rain gauging device... Formulating local socio-economic development plan in consideration of DRR mainstreaming...
	CBDRM	UNDP	Strengthening institutional capacity for disaster risk reduction in Vietnam		2009 to 2011	Can Tho, Binh Thuan, Cao Bang	4 M US$	Supporting legal documentation on DRM; Strengthening the coordination to elaborate policy on early warning and response; Designing and establishing DMC for 03 provinces; Building capacity for key staff of 03 DMC at 03 provinces…

Source: Publication from each organization, edited by JICA Survey Team

Major support projects on disaster prevention by overseas donors (8)

No	Field	Implementation	Title	Main Agency	Period	Target site	Type and Budget	Outline
	CBDRM	Rockefeller Foundation	Climate change-caused risk communication model		2012 to 2015	Can Tho	30.000 US$	Strengthening forecasting and warning capacity Raising awareness of local community
	CBDRM	Rockefeller Foundation	Strengthening the resilience for climate change-caused salinity intrusion response		2012 to 2014	Can Tho	521.414 US$	Installing 08 automatic salinity measuring stations in the city and neighbouring area
	CBDRM	Rockefeller Foundation	Flood risk reduction for the downstream of Kon river		2013 to 2015	Binh Dinh	476.268 US$	Providing information of inundation status in Kon and Ha Thanh rivers; developing the system and procedure to send flooding information promptly to local people in low-land area; Developing inundation map for wards: Nhon Binh and Nhon Phu; Constructing safe houses, improving the response and raising awareness of community on CBDRM
	CBDRM	Rockefeller Foundation	Pilot study on forecasting and early warning on flooding level in riverain areas		2014 to 2015	Da Nang		N/A
	CBDRM	World Bank	CBDRM		2008 to 2010	Dong Thap	551.000 US$	Training on CBDRM targeting local staff and vulnerable people Help children practice swimming Providing equipment to support disaster early warning Investing the facility to serve evacuation of local people Conducting flood fighting drill and emergency storm response drill at communal level Training on rescue
	CBDRM	World Bank	Disaster risk management		2008 to 2011	Nghe An		Quynh Luu district Mitigate the damages caused by disaster
	CBDRM	World Bank	CBDRM		2013 to 2015	Thanh Hoa	1,4 M US$	Training on strengthening capacity of local staff (district and commune) in preparing disaster prevention and control plan; Preparing communication documents for awareness raising; Instructing the way to build safe houses; Procuring equipment and tools for communal level activities; Procuring devices for rescue activities at commune Constructing small scale works
	CBDRM	Germany	Building the capacity for participatory disaster prevention targeting 13 poor coastal communes in Danang		2009 to 2011	Danang	211.000 US$	1- Select 20 volunteers who will replicate the local disaster risk management. - Open 6 TOT training courses for 20 volunteers in the field of natural disaster risk management, each lasting 4 days. - TOT training for 26 members of the rescue team. - TOT training for 26 first aid team members. - Organize six work coordination meetings for 26 people (every three months per one-day meeting). - Organize two workshops to initiate and finalize the project for 120 delegates at city and district levels; 2 - Training on disaster risk management for 2000 families in the project area (participatory risk assessment, capacity identification, disaster preparedness and response planning on an individual basis and community, etc., each lasting two days. - First aid training for 2,000 families, one day each. - Training in emergency water and sanitation in shelters for 2,000 families. - Carry out 10 awareness-raising campaigns in schools and communities. - Check the knowledge of 2000 people / families about clean water and sanitation, first aid, evacuation strategies and fully inform them about the plan. emergency. - Printing and distributing educational communication materials in the project area; 3 - Purchase and distribute equipment for early warning and emergencies. - Disaster preparedness and evacuation exercises with the participation of the public and agencies.

Source: Publication from each organization, edited by JICA Survey Team

Major support projects on disaster prevention by overseas donors (9)

No	Field	Implementation	Title	Main Agency	Period	Target site	Type and Budget	Outline
	CBDRM	Germany	CBDRM targeting the disability		2012 to 2014	Quang Nam		· Awareness raising workshop for provincial, district and commune stakeholders · Coordination meetings with stakeholders · Training of trainers on community-based disaster risk management targeting people with disabilities · Training for project promoters on community-based disaster risk management for people with disabilities · Establishment of Village Disaster Risk Management Team · Establishment of village rescue team · Training on Community Based Disaster Risk Disaster Management · Disaster Risk Management Training for the Village Disaster Risk Management Team · Draw a hazard map and draw up a list of priority evacuated persons. · Provide training for rescue teams and evacuation drills for priority evacuated persons. · Prepare and review the draft early warning and evacuation plan · Submit the early warning and evacuation plan to the Commune People's Committee for approval
	Drought, Irrigation	ADB	Flood and drought mitigation in Greater Mekong Sub-regions		2012 to 2019	Greater Mekong		N/A
	CBDRM	CARE	Disaster risk management and climate change resilience		2011 to 2013	Thanh Hoa	200.000 US$	1. Strengthening capacities for the Red Cross at provincial and district levels in preparation for the implementation of national programs (refer to the national program guidelines). 2. CBDRM Core Group understands the roles / responsibilities of national programs (goals, timeframes) 3. Capacity building for DOET and schools in the 10 districts where WV and CARE are operating 4. Orientation and training of provincial and district / commune staff to integrate DRR with the CCA into the SEDP using the CCWG / DMWG. 5. Support the design and implementation of two (2) CBDRM plans in two (2) communes 6. Improve awareness through development communication strategies and implementation in two (2) target communes. 7. Support for Thanh Hoa TV on national CBDRM programs, ADH projects, awareness raising on important DRR / CC knowledge and key trends, causes and impacts of DRR / CCA.
	CBDRM	ECHO	Community based disaster preparedness		2007 to 2008	Binh Thuan, Hue, Ninh Thuan, Quang Tri		Community awareness about natural disasters and disaster preparedness; Community training on Disaster Preparedness and Hazard, Vulnerability, Capacity Assessment; Training of 240 school teachers in 16 communes, who then disseminate on Disaster Preparedness to in total 5,040 primary school children of class 4 and 5, focussing on how to reduce risks in their own situation; Dissemination of Disaster Preparedness information (via local mass media and distribution of IEC materials). Community identification of disaster risks and risk reduction measures; Conducting community assessments on specific hazards, vulnerability and capacity; Discuss and advocate the results of the assessments with local authorities. Implementation of disaster risk reduction measures・Selection, preparation and implementation of small-scale mitigation works based on the results of the community hazard, vulnerability and capacity assessment; Training and equipping local Emergency Response Teams in each commune; Conducting demonstration/simulation activities in order to practice and test the response capacity of the Emergency Response Teams and the commune. Strengthening disaster preparedness capacity for Red Cross; Updating training materials (on community Hazard, Vulnerability, Capacity assessments and on the impact of climate change on the occurrence of disasters); Training trainers in Community Based Disaster Preparedness and community Hazard, Vulnerability, Capacity assessments; Organizing a workshop to exchange experiences on addressing drought at commune. Exchange experiences with DIPECHO partners and other stakeholders in Disaster Preparedness in Vietnam.
	CBDRM	UN Women	Strengthening women's capacity in disaster risk reduction to cope with climate change		2011 to 2016	–	1,3 M US$	Training and raising awareness and capacity of women union, training of trainers Conduct propaganda, communication..

Source: Publication from each organization, edited by JICA Survey Team

Major support projects on disaster prevention by overseas donors (10)

No	Field	Implementation	Title	Main Agency	Period	Target site	Type and Budget	Outline
	CBDRM	AECID	Strengthening resilience to face up climate change effects and disaster risks in four provinces of Vietnam.		2012 to 2013	Phu Tho, Quang Binh, Quang Tri, Quang Ngai		1.1 Design, develop and produce educational material package on climate change education 1.2 Formation of 126 communication groups at community level; and 40 communication groups the school level 1.3 Training and equipping communication teams at community level 1.4 Organize discussion and focus groups vulnerable households to raise awareness of disaster preparedness and mitigation measures 1.5 Organize school lesson on climate change education to raise awareness of disaster risk reduction and climate change 2.1 Establish/identify community based disaster management groups 2.2 Training community based disaster management groups on VCA/CCA (assessment and planning; child centred approaches) 2.3 Conduct VCA/CCA assessment and develop community level preparedness and mitigation plans at the commune level and in participating schools 2.4 Implement small-scale mitigation work based on plans 3.1 Provincial and district workshops to introduce DRR/CCA integration into Socio-economic Development Plans (SEDPs) to key provincial and district level stakeholders as well as provincial stakeholders from neighbouring central provinces 3.2 Support to CFSC (under Department of Agriculture and Rural Development (DARD) conduct of bi-annual Provincial level coordination meetings 3.3 Refresher training/Master ToT on DRR/CCA for resource trainers 3.4 Inter-Provincial exchange visit to identified DRR/CCA good practice sites 4.1 Conduct Baseline survey and end-life survey and 4.2 Establish monitoring plan to collect lessons learnt and best practice 4.3 Conduct final evaluation to identify best practice in disaster preparedness 4.4 Document a research on children perspective and participation in climate change and disaster management in targeted communities
	CBDRM	Switzerland	Community-based Disaster Risk Management in exposed localities in the Mekong Delta of Vietnam.		2012 to 2014	Ca Mau	350.000 US$	1. Seven targeted communes are able to analyze their vulnerability to disasters, assess their own capacities and to take appropriate measures. 2. Seven communes have improved disaster response mechanisms. 3. Fourteen primary and secondary schools in the project area are better prepared for disaster. 4. Disaster Response mechanisms of VNRC at Province, District, and Communes levels are strengthened.
	CBDRM	USAID	CBDRM		2010 to 2013	Quang Nam, Ha Tinh	1,6 M US$	Output 1: All residents in target communes are aware of the disaster and the importance of disaster preparedness. Output 2: "Preparedness" ability in all communes is improved and sustainable Output 3: In all targeted communes, local authorities and villagers participated in the vulnerability and capacity assessment (VCA), designing and drafting action plans. Commune Output 4: Improved coordination and advocacy will lead to a more standardized CBDRM approach in Vietnam.
	CBDRM	USAID	Building the climate change response capacity		2012 to 2014	Lao Cai	133.000 US$	Evaluating the vulnerability Formulating response plan Installing water level gauge Raising awareness of local people
	CBDRM	USAID	CBDRM in Highlands		2012 to 2015	Kon Tum	552.529 US$	Support a lot of communes and schools in formulating DRR Plan to better response other disaster events in the future; Help local people and children understand more about disaster risks and prepare well for reducing disaster damages in the future; Provide emergency response teams in communes with necessary equipment and devices to fight with disaster; Train local staff, members of public associations and community volunteers in disaster preparedness and risk reduction

Source: Publication from each organization, edited by JICA Survey Team

Major support projects on disaster prevention by overseas donors (11)

No	Field	Implementation	Title	Main Agency	Period	Target site	Type and Budget	Outline
	CBDRM	SEED – Japan	Enhancing the capacity of disaster risk reduction for coastal schools and communities		2014 to 2015	Quang Nam	219.927 US$	Raising awareness and capacity of coastal 06 districts (Hoi An, Dien Ban, Duy Xuyen, Thang Binh, Tam Ky and Nui Thanh) and schools in field of disaster risk reduction; Training on DRR (disaster risk reduction measures and preparedness, evacuation drill, DRR games, hazard mapping, first-aid...)
	CBDRM	PLAN	Safe school in response for the disaster		2013 to 2015	Quang Binh	66.000 US$	Evaluating safe schools Helping students understand types of disaster and know how to prevent disaster risk
	Erosion, Reforest of Mangrove	Japan R. C	Mangrove forestation and disaster risk reduction		1997 to 2010	Quảng Ninh, Hải Phòng, Thái Bình, Ninh Bình, Nam Định, Thanh Hóa, Nghệ An, Hà Tĩnh	7,2 M US$	24,000 ha mangrove forests has been planted and the mangrove forests have been protecting 100km of sea dike. The project also carried out the planting of 103 ha of bamboo to protect riverbank area and 398ha of casuarina to protect coastal area Support to develop safe communities that are resilient to disaster risk at 392 communes thourgh awareness raising activities, strengthening capacity for local staff and key people on disaster risk reduction
	CBDRM	Japan R. C	CBDRM		2011 to 2015	Vinh Phuc, Hoa Binh	100.000 US$	N/A

Source: Publication from each organization, edited by JICA Survey Team

Annex 3

Priority Program for Disaster Risk Reduction in Vietnam
-To sustain socio-economic development-

Priority Programs for Disaster Risk Reduction in Vietnam

~ To sustain socio-economic development ~

Ministry of Agriculture and Rural Development (Vietnam Disaster Management Authority), in cooperation with Japan International Cooperation Agency (JICA)

As of June 27, 2018

Disaster Risks in Vietnam

1. Natural disaster in Vietnam

REGION 1

NORTHERN MOUNTAINOUS REGION (15 PROVINCES)

Typical types of natural disasters: Floods, landslide, cold weather, ice, frost, heavy rain.

REGION 2

NORTHERN DELTA (9 PROVINCES), **NORTHERN CENTRAL REGION** (3 PROVINCES)

Typical types of natural disasters: Flood, tropical depression, storm, drought, saltwater intrusion, cold weather, heavy rain.

REGION 3

NORTHERN CENTRAL MOUNTAINOUS REGION (3 PROVINCES)
MIDDLE CENTRAL REGION (4 PROVINCES)

Typical types of natural disasters: Extreme heat, flash flood, landslide.

REGION 4

CENTRAL COAST (10 PROVINCES)

Typical types of natural disasters: Heavy flood, flood, tropical depression, storm, powerful and super storms, storm surge, drought, saltwater intrusion, river/coastal bank erosion, heavy rain.

REGION 6

HIGHLAND (5 PROVINCES)
SOUTH CENTRAL MOUNTAINOUS REGION (6 PROVINCES)
SOUTH EAST (6 PROVINCES)

Typical types of natural disasters: Extreme heat, drought, flash flood, landslide, flood

REGION 5

CENTRALIZED LARGE URBAN ZONES
(05 CITIES UNDER THE CENTRAL GOVERNMENT + 14 TYPE-1 URBAN CITIES IN THE PROVINCES)

Typical types of natural disasters: Flood caused by heavy rain and high tides, powerful storm and thunderstorm

REGION 7

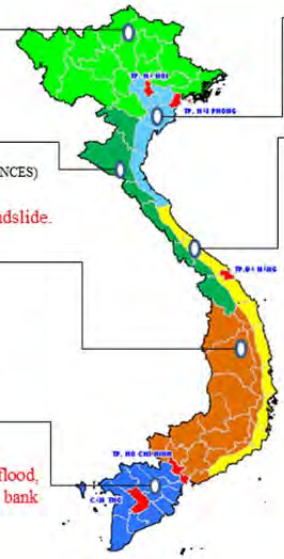
MEKONG RIVER DELTA (12 PROVINCES)

Typical types of natural disasters: Tropical depression, storm, flood, high tide, storm surge, droughts, saltwater intrusion, river/coastal bank erosion, thunderstorm.

REGION 8

SEA AND OFFSHORE ISLANDS
(OFFSHORE REGION CONSISTS OF 28 PROVINCES FROM QUANG NINH TO KIEN GIANG AND 02 ARCHIPELAGOS: PARACEL ISLANDS AND SPRATLY ISLANDS)

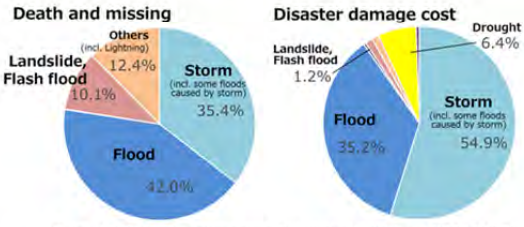
Typical types of natural disasters: Storm, tropical depression and storm surge



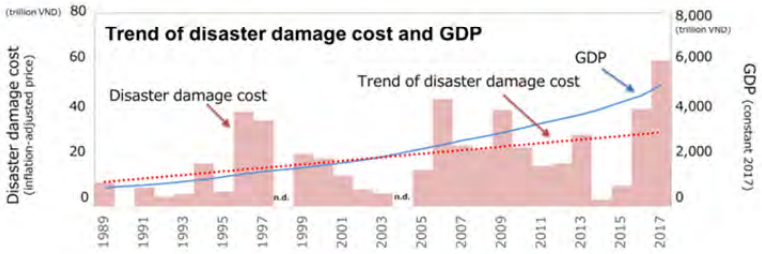
Source: MARD

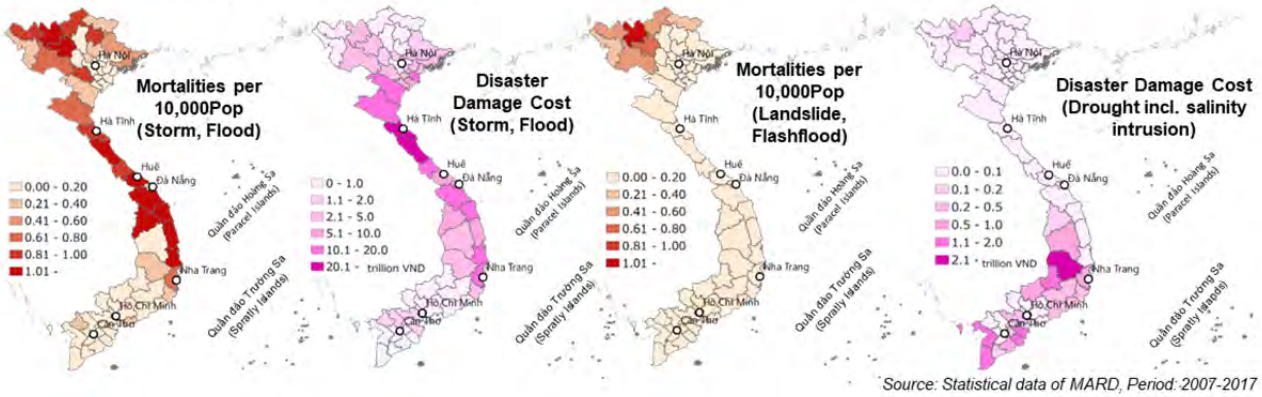
2. Storms and floods, landslides and flashfloods, and drought are the major disasters in Vietnam

- **Storms (including tropical depressions and typhoons) and floods** occur in all over the country and dominate almost all of the disaster damage, both in motilities and economic loss. These are seriously severe in the central region.
- **Landslides and flashfloods** also account for high percentage in mortalities, next to storms and floods. These are typically concentrated in the northern mountainous region.
- **Drought (including salinity intrusion)** is a typical disaster from the viewpoint of economic loss. These concentrate in the Central Highland and Mekong Delta. Especially drought in 2015-2016 caused severe economic loss in the Central Highland and Mekong Delta. The damage cost accounts for 38% of the total natural disaster damages for these two years.
- **Economic loss caused by natural disasters has increased along with the recent economic growth in Vietnam.** Climate change and human activities such as inappropriate development will increase risks of natural disaster and aggravate economic loss.



Total: 3591 death and missing, 288 trillion VND loss (2007-2017)





Source: Statistical data of MARD, Period: 2007-2017

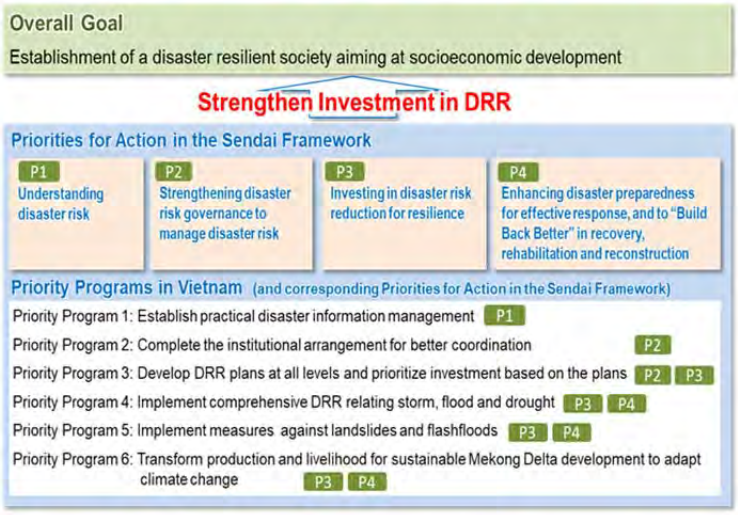
Priority Programs in light of Damage Features of Vietnam and the Sendai Framework

In light of the disaster characteristics and the Global Targets in the Sendai Framework, the Government of Vietnam (GoV) aims at reducing economic loss caused by dominant disaster types, especially storms, floods and drought, by focusing on preventive DRR investments including structural measures.

It is also needed to pay attention to non-structural measures with high priority to those who are at high risks, such as people working at sea or coastal areas and mountainous areas.

Accordingly, **GoV will implement various activities related to DRR under 6 Priority Programs, which cover 4 Priorities for Action in the Sendai Framework.**

A process to monitor and evaluate the achievement of the targets in the Sendai Framework should be improved to enhance actions.



Priority Program 1: Establish practical disaster information management P1

Disaster data and information provide basis for all evidence-based DRR activities, including future investment planning. **It is crucial to establish appropriate data and information management, including hydro-met data, disaster damage data and disaster risk information.**

Disaster Information Management

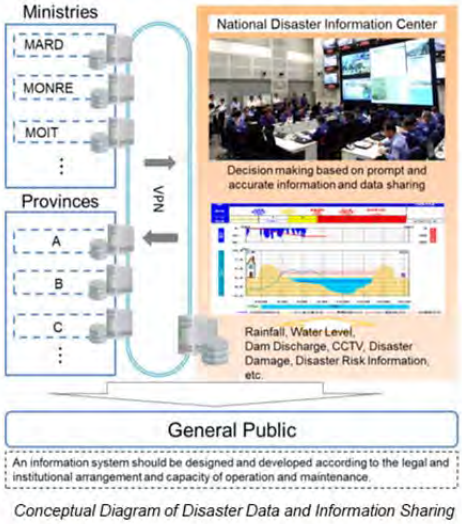
- Legal and institutional arrangement and information system will be developed to share data and information, which are presently collected and managed by different entities. It is important to improve operation in both emergency situation and normal time.

Utilization of Hydro-met Information

- Through enhancement of hydro-met observation, disaster management including forecasting and early warning will be improved.
- Forecasting and early waring information will be transmitted in forms that can be utilized for appropriate responses by disaster management authorities and local residents.

Dissemination of Annual Report on Natural Disaster and DRR

- Annual report on natural disaster and DRR will be prepared and disseminated, utilizing collected information on disaster. It is also useful to educate and disseminate knowledge on DRR.



Conceptual Diagram of Disaster Data and Information Sharing

Priority Program 2: Complete the institutional arrangement for better coordination P2

In Vietnam, Law on Natural Disaster Prevention and Control (NDPC) was legislated in 2013 and Vietnam Disaster Management Authority (VNDMA) was established in 2017. The legal and institutional arrangement should be enhanced. Besides, the actions taken at the central and local levels should be coordinated in a better way.

It is necessary to complete the institutional arrangement on DRR, with improved coordination mechanisms. Roles and responsibilities of relevant sectors and stakeholders should be clearly defined for effective implementation.

Implementation of DRR policies based on existing laws

- All of the DRR activities and policies should be implemented based on existing DRR-related laws such as Law on Water Resources, Law on Hydraulic Works, Law on Hydro Meteorology, Law on Forestry, Agricultural Restructuring Program and the Government Resolution 120, in addition to Law on NDPC.

Enhancement of coordination through CSCNDPC and VNDMA at the central level

- Through the Central Steering Committee on Natural Disaster Prevention and Control (CSCNDPC) and VNDMA (Standing office of CSCNDPC), coordination among all relevant stakeholders should be strengthened to mainstream DRR in all sectors.
- For this purpose, it should be considered that the Prime Minister will lead CSCNDPC as chairperson, because natural disaster has impacts on all sectors and provinces.

Capacity development for DRR at local levels

- Training mechanism on DRR for different levels should be reviewed and improved to be more practical and effective on the ground.
- Community awareness raising, understanding of the risk and knowledge sharing should be improved through the activities of CBDRM and communication.
- Capacity of officials should be enhanced to coordinate with relevant stakeholders as well as to implement activities on the ground.

Priority Program 3: Develop DRR plans at all levels and prioritize investment based on the plans

P2 P3

To develop a plan for DRR at central and local levels is stipulated in Law on Natural Disaster Prevention and Control (2013). It is also encouraged in the Sendai Framework for DRR as an urgent target by 2020. **To prioritize investment in DRR, it is important for Provincial People's Committees (PPCs) to develop their DRR plans including concrete countermeasures.**

Development of Risk-based DRR Plans

- It is necessary to strengthen local capacity on DRR planning with quantitative risk assessment. By doing quantitative risk assessments and setting concrete targets to reduce risks in the plan, appropriate countermeasures including structural and non-structural measures can be identified.
- It is important to establish an overall planning framework for DRR, which covers relevant sectors at the local level. The DRR plans should clearly define roles and responsibilities of all stakeholders. Involving local people is essential in developing a plan for DRR at commune level. It is also necessary to strengthen the capacity of formulating disaster response plans at central and local levels considering damage scenarios.

Mainstreaming DRR in Socio-Economic Development Strategy / Plan (SEDS/SEDP)

- It is important to mainstream DRR in SEDS/SEDP, and to allocate a certain percentage of budget as investment in DRR at central and provincial levels. It is also meaningful to develop a database for the investment in DRR to clarify the current scale of DRR-related budget and other relevant investment.

Establishment of DRR Fund

- It is necessary for the central government to establish a natural DRR Fund to manage disaster recovery and preventive measures. At the provincial level, almost all of the provinces have established local DRR Fund at local level.

Priority Program 4: Implement comprehensive DRR relating storm, flood and drought

P3 P4

Structural measures will be strengthened as a main pillar to address flood disaster risks. Non-structural measures will be applied to address residual risks, which cannot be covered by the capacity of structures.

Disaster risk tends to increase due to rapid urbanization and economic development. Appropriate development control and DRR investment should be promoted to reduce risks.

Implementation of Integrated Flood Management Plan

- Basin-based Integrated Flood Management Plan (IFMP) formulation / implementation will be promoted involving relevant sectors. Issues of drought and salinity intrusion will be addressed as parts of river-basin management.
- Flood control capacity and safety of existing reservoirs and dykes will be reviewed for further improvement and rehabilitations. In particular, the review of flood control system in deltas (including Red River system) is important, since huge disaster risks exist in the region.
- Real-time operation of reservoirs in emergency situation will be improved by introducing disaster information system. The project will be extended to all basins having the same problem.

Concept image of Integrated flood management

- Hydro-met observation will be improved, including river survey and discharge measurement.
- Sustainable exploitation of resources such as forest and river sand will be promoted from the viewpoint of river-basin management.

Preparedness to Strong and super typhoons

- In order to reduce damages caused by strong and super typhoons, response plans will be developed based on damage scenarios.
- For safety of fishing boats during storm, construction of boat shelters and development of boat monitoring system will be promoted.
- Technical specification, standard and building codes for construction will be revised and updated to withstand strong and super typhoons.

Erosion control

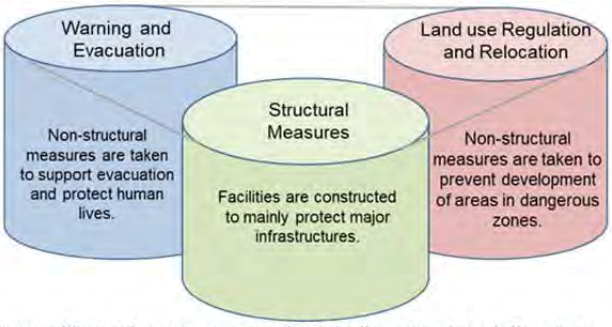
- Basin-based approaches are essential to address coastal and river-bank erosion. A framework will be established for data and information management on sediment movement in river basins, including deposition in dam reservoirs and sand mining.
- Warning system for coastal and river bank erosion will be developed based on erosion risk maps.
- River training is promoted together with relocation of inappropriate settlement along river banks to secure more room for rivers.

Priority Program 5: Implement measures against landslide and flashflood P3 P4

Regarding countermeasures against landslide and flashfloods in the northern mountainous region, a comprehensive approach will be taken, covering 3 pillars of measures. **From the viewpoint of cost-effectiveness, non-structural measures will be main countermeasures except in area adjacent to major infrastructures.**

Combination of Structural and Non-structural Measures

- Warning /evacuation, land use regulation and relocation will be implemented to protect human lives. Structural measures will be implemented to mainly protect major infrastructures.
- Assessment and publication of risk of landslide and flashfloods should be promoted with improved accuracy.
- Pilot projects for early warning systems will be conducted to explore full-scale implementation. Collection and accumulation of information on disaster occurrence and hydro-met data should be promoted, since they are indispensable for improving accuracy of early warning for landslides and flashfloods. Local communities should be involved in designing early warning systems to secure effectiveness.
- Forests will be restored and protected as a fundamental and long-term solution to reduce the risk of disasters in mountainous areas.



Three pillars of measures against sediment-related disasters

Priority Program 6: Transform production and livelihood for sustainable Mekong Delta development to adapt climate change P3 P4

Mekong Delta is one of the most vulnerable regions severely affected by climate change. It is under the risks of not only floods, storms and storm surges, but also other disasters such as droughts, salinity intrusion, ground subsidence, river and coastal erosions.

It is strongly required to implement countermeasures based on guidance of the Government Resolution No.120 (Sustainable and Climate-Resilient Development of Mekong Delta).

Actively Living with Disasters

- A traditional idea of "Living with floods" should be shifted to "Actively Living with floods, inundation, brackish water and salty water". All of the investment should be made in line with the transformation of ways of living to adapt to different environmental conditions caused by climate change.

Solutions proposed from the view of Water Resources Management

- All measures should be consistently planned and implemented in view of Integrated Water Resources Management of the river basin, including the upstream areas managed by other countries.

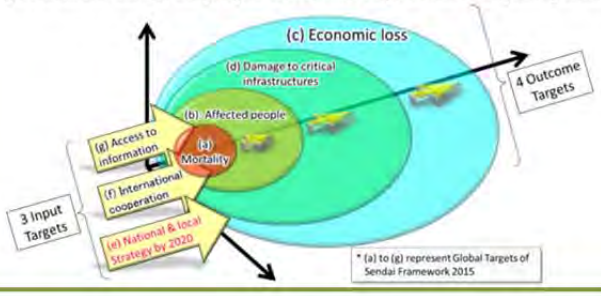
Effective Investment based on Master Plan

- The "Master Plan for Sustainable and Climate-resilient Development of the Mekong Delta until 2030" will be prepared with a vision towards 2050 using the method of multi-sectoral integration.
- Monitoring system of climate change and sea level rise will be upgraded, and climate change scenarios will be updated.
- Effective investment will be strengthened in flood drainage, salinity control, erosion control and mangrove forest protection. All measures will be implemented through integration of works by different sectors such as flood control, transportation and irrigation.
- Residents and infrastructures will be rearranged along rivers and canals to avoid risk of disasters and space for water will be preserved.

Sendai Framework for DRR 2015-2030

Sendai Framework sets 7 Global Targets which will be achieved by each state. These Targets are categorized into 3 "Input Targets" and 4 "Outcome Targets". Among 4 outcome targets, reduction of (c) economic loss is one of the most important from the viewpoint of sustainable development. By aiming at reducing economic loss, reduction of disaster mortality and affected people can be simultaneously achieved.

Sendai Framework also sets 4 Priorities for Action. Disaster management cycle can be implemented under strong leadership and governance based on proper understanding of the risk perception.



Contact information: ***Vietnam Disaster Management Authority****, Ministry of Agriculture and Rural Development*
Office: No.2 Ngoc Ha Str., Ba Dinh Dist., Hanoi, Vietnam Tel: (84-24) 37335697 / Fax: (84-24) 37335701 / Email: phongchongthientai@mard.gov.vn

Annex 4

Minutes of meeting of 1st consultation meeting and 2nd consultation meeting

Minutes of 1st Consultation Meeting

Date and Time	May 11, 2018 8:30－12:00	**Venue**	Meeting Room in MARD
Theme	1st Consultation meeting ➢ Analyze natural disaster situation and disaster risk reduction in Vietnam in the context of Sendai disaster reduction framework 2015-2030. ➢ Recommend Mid- and Long-Term Vietnamese Disaster Risk Reduction and Management Strategy		
	【Vietnam】 Ministry of Agriculture and Rural Development Members of Central Steering Committee for Natural Disaster Prevention and Control Provincial People's Committee 【Japan】 Japanese Embassy JICA Head Quarters JICA Vietnam Office JICA Long-Term Expert JICA Consultant Team (Refer to attached list of participants)		
Contents of Discussion	**Mr. Le Truong Son – Deputy General Director of VDMA** ▪ Highly appreciate the presentation by Mr Takeya. In Vietnam, development has changed impact of disasters. For example: concreted and reinforced houses along river in Mekong Delta are one of the causes of riverbank erosion, transport facilities or high buildings/residential areas obstruct the flood drainage… Additionally, In Vietnam, sometimes economic loss is not high but human loss is high. ▪ Specific objectives in Draft Resolution after National Conference on March 29, 2018 shall be integrated into the Draft of National Strategy for NDPC. One of objectives is early warning system for landslide, flashflood in mountainous area which has not been installed systematically in Vietnam. International support including JICA and other donors on this matter is appreciated. ▪ For legal system, it is concerned about strengthening the Central Steering Committee for NDPC. At present, Minister of MARD is Head of CSCNDPC who may or may not have enough power to command and mobilize the forces from other line-ministries. Strong leadership from central government for DRM/DRR in Vietnam is required. **Commanding Committee for NDPC/SR under Ministry of Public Security** ▪ It is very important to unify legal system and centralized direction and command on DRR/DRM because CSCNDPC activities are ineffective and awareness and collaboration of line-ministries on DRR/DRM is still not high. ▪ In Vietnam, there are a lot of overlaps in direction and command on NDPC/SR ▪ Agree with JICA suggestion on adjusting legal system. Chief of CSCNDPC should be Prime Minister. At local level, there is only one committee in charge of both NDPC and SR namely PSCNDPC/SR led by Chairman of PPC. So why are there two (2) committees at central level namely Central Steering Committee for NDPC and National Committee for Incidents, Disaster Response and Search and Rescue. There must be a unified powerful committee for DRM/DRR at central level to mobilize the human resources from related line ministries, departments and localities in case of emergency disasters		

	▪ It is suggested that: CSCNDPC should be led by Prime Minister, Vice Standing Head of CSCNDPC is Deputy Prime Minister, MARD & Ministry of National Defense Are Vice Head and the other ministries are members. **Mr Tran Dinh Hoa – Vice Director of VAWR** ▪ To reduce the disaster risks, it is required that efforts should be given by not only central government, related organizations (including VDMA and line ministries…) but also by local residents (community) and appropriate collaboration of such efforts is needed ▪ To take action under Sendai Framework, it is a must to ensure that 1) implementation organization, 2) implementation method, 3) implementation tool are in place, ▪ Implementation organization: Basically, agree with JICA suggestion that Prime Minister should be head of CSCNDPC. VDMA has been newly established and does not have enough capacity and experience to cope with 21+ types of natural disaster. However, it is a must to experience NDPC activities and smoothly carry out all tasks. VDMA needs the time to increase their capacity, learn lessons during their practical exercises so that they can effectively advise and coordinate when Prime Minister becomes head of CSCNDPC. ▪ Implementation Method: In addition to legal system, institution, related measures including four (4) on-the-spot-mottos, the cooperation between VAWR and VDMA is required. Scientific, technical and training support from VAWR shall contribute to improve VDMA's capacity in process of NDPC ▪ Implementation Tool: It is very necessary to apply advanced science, technology on DRR/DRM in Vietnam, especially the technology for early warning, forecasting… In addition to application of science and technology, training, knowhow and knowledge on such equipment are required as well **Hanoi City Department of Dike and Flood and Storm Control** ▪ Has JICA Team referred to the Decision 1002 on CBDRM and community awareness raising? ▪ Legal system, policy, strategy, plan and legal regulations have been issued from central to local level. On process of natural disaster prevention and control, local governments should improve their skills and take actions depending on legal regulations promulgated. Organization structure must be from bottom to top (bottom-up method) **Yen Bai PSCNDPC/SR** ▪ The disaster in 2017 seriously affected Yen Bai province, especially the disaster events in August 2017 and October 2017. Major disasters in Yen Bai include landslide and flashflood ▪ There is no full-time specialized agency on NDPC (DRR/DRM) in Yen Bai province. Head of PSCNDPC is the Chairman of PPC, Vice Head is Vice Standing Chairman of PPC and Director of DARD, members are from related departments. Standing Office of PSCNDPC/SR is the Sub-Department of Irrigation, which includes three (3) staff working as side-work (part-time) but who are not professionally trained. The Standing Office still lacks human resources, budget and equipment. ▪ It is requested that Guideline given by VDMA shall be formulated and delivered to local Standing Office to meet the requirements of practical natural disaster prevention and control in province. **Mr Le Truong Son, VDMA** ▪ According to Law on NDPC, national, provincial, district and communal NDPC Plan should be formulated. At present, VDMA has just started the formulation of national NDPC Plan and the guideline on NDPC planning. ▪ Some localities have formulated their plan with detailed content, but some provincial plans are still very general because there is no uniformed guideline on NDPC planning at all levels. ▪ VDMA shall learn lessons from the past disaster prevention and control activities to formulate more effective NDPC planning guideline which is suitable to each region. ▪ Preparedness is one of the priorities on DRR/DRM including structural and non-structural measures.

	Guideline on NDPC planning for local level is required as soon as possible. ▪ Recommendations by JICA team are highly appreciated, shall be a fundamental basis for VDMA to advise the amendment of Decree, Circular, National Strategy for NDPC, national NDPC Plan and related legal regulations for better implementation of DRR in Vietnam.

List of Participants

No	Name	Organization	Position
1	Mr Le Truong Son	VNDMA	Deputy DG
2	Mr Nguyen Van Hai	Department of Disaster Response and Recovery, VNDMA	Vice Director
3	Ms Le Thi Thanh Ha	Department of Dike Management, VNDMA	Staff
4	Ms Nguyen Thuy Lieu	Department of Planning, Financing, VNDMA	Vice Director
5	Mr Nguyen Huynh Quang	VNDMA	Staff
6	Mr Le Hoai Nam	Department of Financing, MARD	Staff
7	Mr Tran Minh Tuyen	Department of Irrigation Works Management, DWR	Vice Head of Division
8	Ms Nguyen Ngoc Quynh	Key Laboratory of River and Coastal Engineering	Director
9	Mr Pham Thanh Tu	Vietnam Institute of Water Resources Planning	Staff
10	Ms Nguyen Thi Bich Thuy		Head of Division
11	Mr Tran Dinh Hoa	Vietnam Academy of Water Resources	Vice Director
12	Mr Nguyen Thanh Bang		Head of Department
13	Ms Le Hanh Chi		Staff
14	Mr Nguyen Trung Viet	University of Water Resources	Vice Director
15	Mr Ngo Le Long		Vice Head of Department
16	Mr Nguyen Quoc Hiep	Water Resources Software Technology Center	Director
17	Mr Lam Tuan	Ninh Binh Sub-department of Irrigation Standing Office of Ninh Binh PSCNDPC/SR	Vice Director
18	Mr Doan Khac Trung		Vice Head of Division
19	Mr Nguyen Bao Khuong	Thai Binh Sub-department of Irrigation	Vice Director
20	Mr Dao Van Hai		Vice Head of Division
21	Mr Nguyen Xuan Hai	Hanoi Sub-department of Dike	Vice Director
22	Mr Vu Xuan Thuy	Nam Dinh Sub-department of Irrigation (Nam Dinh PSCNDPC/SR)	Vice Director
23	Mr Nguyen Manh Trung		Staff
24	Ms Nguyen Van Huong	Ha Nam Sub-department of Irrigation	Vice Director
25	Mr Pham Tien Dung		Staff
26	Mr Hoang Gia Binh	Hai Duong PSCNDPC/SR	Staff
27	Mr Nguyen Van Thuong	Hung Yen Sub-department of Irrigation	Head of Division
28	Mr Do Manh Dang		Vice Head of Division
29	Ms Nguyen Thi Hoang Yen		Staff
30	Mr Nguyen Huu Dung	Bac Ninh Standing Office of PSCNDPC/SR	Vice Chief of Office
31	Mr Bui Lien Son	Bac Giang Sub-department of Irrigation	Vice Director
32	Mr Than The Hung		Head of Division
33	Mr Nguyen Ba Tien	Hai Phong Sub-department of Irrigation	Director
34	Mr Dang Trung Thanh	Standing Office of Hoa Binh PSCNDPC/SR	Vice Chief of Office
35	Mr Nguyen Ngoc Hoang		Staff
36	Mr Tran Anh Van	Yen Bai PSCNDPC/SR	
37	Mr Nguyen Hoang Son	Phu Tho Sub-department of Irrigation	Director
38	Mr Nguyen Duc Sinh	Standing office of Vinh Phuc PSCNDPC/SR	Chief of Office
39	Ms Mai	National Center for Hydro-Met Forecasting	Vice Director
40	Ms Trinh Thu Phuong		Head of Division
41	Mr Le Viet Phai	Ministry of Labor, Invalids and Social Affairs	
42	Mr Doan Hien	Public Security Ministry's SCNDPC/SR Standing Office	Chief of Office

No	Name	Organization	Position
43	Mr Tran Kien	Border Defense Command	Head of Division
44	Mr Nguyen Hai Nam	Ministry of Science and Technology	Staff
45	Ms Nguyen Kieu Trang	Vietnam Red Cross	
46	Mr Pham Quang Huy	Ministry of Health	Staff
47	Mr Nguyen Ton Nam	VTV	Reporter
48	Mr Nguyen Van Hau		
49	Mr Nguyen Van Dung		
50	Mr Kimio Takeya	JICA HQ	Distinguished TA to President
51	Mr Itaru Chiba		Department of Southeast Asia - Pacific
52	Ms Kumiko Kato		DRR Section, Global Environment Department
53	Mr Ryutaro Kobayashi	JICA Vietnam	Deputy Chief of Representative
54	Ms Akiko Urakami		Project Formation Advisor
55	Ms Nguyễn Thị Thu Lê		Program officer
56	Mr. Kenichiro Tachi	JICA Expert	
58	Mr Yukishi Tomida	JICA Survey Team	Team Leader
59	Mr Toru Koike		Deputy Team Leader
60	Mr Hodaka Igo		Member
61	Mr Yasuhiko Kato		Member
62	Mr Tomoyuki Wada		Member
63	Mr Phan Vu Thanh Nhan		Supporting Staff

Minutes of 2nd Consultation Meeting

Date and Time	June 27, 2018 8:30－12:00	**Venue**	Conference Room in MARD
Theme	2nd Consultation meeting Mainstreaming the contents of Sendai Framework for DRR in modification of National Strategy for Natural Disaster Prevention and Control till 2030, with vision to 2050		
	【Vietnam】 Ministry of Agriculture and Rural Development (MARD) Vietnam Water Resources Academy (VWRA) Ministry of Natural Resources and Environment (MONRE) Provincial sub-Department of Irrigation International Organization Etc. 【Japan】 JICA Head Quarters JICA Vietnam Office JICA Long Term Expert JICA Consultant Team (Refer to attached list of participants)		
Contents of Discussion	**Mr. Hoang Van Thang – Deputy Minister of MARD** ▪ Sendai framework is similar to our typical framework which addresses 1) Understanding of DRR 2) Governance 3) International Cooperation, etc. However, our framework goes directly into details. Therefore, compared to the Strategy, we can consider the framework as a scenario ▪ Vietnam is a country with unstable development. Vietnam should develop stable economy and DRR. Many infrastructure developments have not considered DRR. Likewise, many structures like sewerage and houses increase risks of natural disaster. Many roads increase the flood level. Many even block flood flows. We have tried to improve the coverage of the forest to help prevent flood. We should consider development targets in line with DRR ▪ The population growth also increases disaster risks. Many houses are constructed along dangerous areas → increase disaster risk. ▪ We should clearly identify the roles and responsibilities of various levels and sectors in DRR **Mr. Kimio Takeya – JICA Head Quarter** ▪ Each country has different institutional structures. However, all share the history of DRR. In Japan, the roles of the ministries are clear. The cabinet office controls all DRR decisions. In short, the institution in Japan is mature. In Indonesia, after a disaster strikes, they change the law then change the institution. In Vietnam, the structure is different. MARD implements the prevention & investment under the leadership of the Vice Minister of MARD. This has both advantage and disadvantage. Disadvantage: MONRE cannot join the leadership, advantage: MARD can control their work. **Mr. Hoang Van Thang – Deputy Minister of MARD** ▪ As for priorities, I think 1st should be Organizational structure, 2nd should be Institution, and 3rd should be Enhancement of investment, strengthening the capacity of early warning and understanding of DRR. We should not blame climate change.		

Mr. Le Thanh Hai - MONRE

- In October 2017, VDMA was established. In March 2018, the Hydro-met Agency was established. Among 20 disaster types, Vietnam has 18 types; many of them have the tendency to become extreme. For example, in 2015, Quang Ninh province received 1500mm rainfall/10 days, which is equal to ¾ of the annual rainfall. In 2016, history recorded drought in the Mekong delta, etc.
- As for investment, if we spend USD 1 in monitoring and early warning, we benefit USD 20. In the hydro-met sector, we are formulating a development plan of the sector until 2020, orientation till 2030.
- JICA has supported 2 projects: 1) installation of 2 radars in Hai Phong and Vinh, which are running well and 2) enhancement of early warning capacity
- We are aware that sometimes our warning is not accurate, but the information transmission system is not good enough to deliver the warnings to the local level. At the moment, we have monitoring systems only until the district level (700 stations). In the future, we hope to establish the systems to the commune level.

Mr. Pham Van Dien – Directorate of Forestry

- The formulation of National strategy together with action plans is necessary. We understand that based on the existing National plan in 2007, we will formulate the new Strategy. In 2006 we lost 60,000 billion VND in damage. We agree with the 4 priorities and 6 programs for Vietnam. We invest the money into economic development but it should also cover DRR. DRR should occur everywhere, every place, every time. Of course, we should have an overall national strategy, which we can base on to create plans by regions and define the roles of different sectors and agencies. The most important thing is the socialization of the DRR. It should involve the local level in DRR.
- As for the forestry sector, the forest is a very important structural measure. We have 12 million ha of natural forest, which we have to protect. We hope to have forestry development, which means to create values from the forest. We protect the forest but still have economic gain through it. Along the coast, we have 150,000 ha of forest. In the future, we hope to have cooperation with JICA to develop forestry structures.

Ms. Nguyen Quynh Trang – UNICEF

- Sendai framework is very useful and comprehensive. The National strategy of Vietnam should follow and be guided by the targets here. In Vietnam, we should specify the targets, set the targets till 2020 and 2030, for example. Based on analysis of the technical report, we should work out appropriate measures.
- In the priority of Governance: it lacks the interagency coordination. We have Central Steering committee and Commanding committee, which are well structured but how should they coordinate and mobilize resources from the society. It should be mentioned in the Strategy.

Ms. Nguyen Le Hoa – Deputy Country Director of Oxfam Vietnam

- We welcome the integration of Sendai framework in the National strategy. In the National strategy, besides setting the target, we need to specify priority level because our resources are limited. We should define where we should invest first.

Mr. Nguyen Tung Phong – Deputy Director of VAWR

- Agree with the priorities and solutions
- The title: “sustainable economic development through investment in DRR” gives the impression that the investment is for construction and should be reconsidered
- The Strategy should be structured following the Sendai framework to highlight the mainstreaming
- We should point out the basis to formulate the National Strategy i.e considerations on institution, pressure of social – economic development
- As for governance, we should formulate the system of monitoring and observation to evaluate the efforts as well as necessary adjustments.
- We should socialize the investment in DRR

Directorate of Water Resources

- Regarding the priorities, we have done a good job to identify flood risk areas, potential flooding in the downstream to create flood maps. In WB8 we plan to upgrade 400 reservoirs to strengthen dam capacity and safety.
- Regarding non-structural measures: we have enhanced international cooperation.

Fishery Directorate

	▪ We agree with the formation of the Strategy with links with Sendai framework. ▪ For the fishery sector, we are interested in upgrading fishing boats, monitoring offshore boats and ports which are related to DRR **Mr. Tang Quoc Chinh – VDMA** ▪ The National strategy was established in 2007 with the Hyogo framework. At that time the strategy has many limitations, thus the Government requested us to review the strategy based on the Sendai framework. We think we should review the approach and priorities. ▪ Vietnam has poor experience in insurance in the area of DRR. **Mr. Satoshi Ishii – ADB** ▪ It is a meaningful step for MARD and JICA to formulate the Strategy. We hope to contribute our roles in DRR. ADB has been working in transportation, construction, natural resources, and finance. ▪ As for the last priority in the Mekong region, the region has a GIS map to show the fatality in the region. We should show the basis, the foundation to choose the Mekong region as a priority. **Mr. Kimio Takeya – JICA Head Quarter** ▪ In DRR, there are 3 related groups: individual, public support and mutual support. In Sendai, the roles of the Government are emphasized. The Government invests so the insurance company can provide the service. If the Government makes no investment on DRR, the insurance cannot be applied. For example, after the flood in Thailand 2007, insurance company withdraws because there is no investment from the government in DRR. ▪ The handout is an evidence to show the efforts of Vietnam in DRR. It is a chance to show the document in the international meeting with other countries in July to attract the attention and companies to Vietnam. **Mr. Hoang Van Thang – Deputy Minister of MARD (Conclusion)** ▪ We acknowledge all the comments and will put in the comment. We should reconsider the title which is now emphasizing on “investment” in structural measure, how to support the local to change their livelihoods, how to identify priorities in the Strategy ▪ One of the Priorities is institution. At strategic level, we have the Resolution no. 24 on resilience to climate change and management of natural resources, Resolution 120 on the Mekong delta. How to bring the laws and strategies into life, we have to scrutinize our legislation as they still contain limitations. We will define the roles and responsibilities of relevant agencies in the plans on natural disaster prevention and control ▪ We thank the Professor and JICA to support us in big issues of Sendai framework. We will have to materialize the implementation of Sendai framework in Vietnam, especially the institution part. I would like to point out the following: 1. Vietnam often suffers from disasters 2. Sustainable development and disasters are important. If the development is not sustainable, it will worsen the disaster. 3. Climate change and disasters have close relation. Climate change increases frequency of disaster. Local people have to change their livelihood in order to survive under extreme conditions. We still have many issues to deal with.

List of Participants

No	Name	Organization	Position
1	Mr. Hoang Van Thang	MARD	Vice minister
2	Mr Vu Huynh Quang	VNDMA's Department of Community-based Disaster	
3	Ms Phan Thi Viet Ha		Staff
4	Mr Nguyen Thanh Tung	VNDMA's Department of Dike Management	Vice Director
5	Mr Vu Ngoc Chau	VNDMA's Department of Disaster Response and Recovery	
6	Mr Tang Quoc Chinh	VNDMA's Department of Disaster Safety Control	
7	Ms Dang Thanh Huong		Staff
8	Mr Nguyen Viet Tien	VNDMA's Department of Inspection and Legislation	Vice Director

No	Name	Organization	Position
9	Mr Vu Duc Hung	VNDMA's Department of Planning and Financing	
10	Ms Nguyen Xuan Hong	VNDMA's ICD	Staff
11	Mr Nguyen Minh Duc		
12	Mr Tran Q.Dai		
13	Mr Nguyen Duc Viet	Directorate of Water Resources (DWR)	
14	Mr Le Hung Nam		
15	Mr Nguyen Anh Tu		
16	Mr Le Hung Nam		
17	Mr Nguyen Duc Tuan	Key Lab for River and Coastal Engineering	
18	Mr Nguyen Tung Phong	VAWR	Vice Director
19	Mr Tran Manh Thang		
20	Mr Le Van Dong	Department of Dam Safety (WRD)	Vice Director
21	Mr Luu Van Huy	Department of Fisheries Resources Surveillance	Director
22	Mr Doan Manh Hieu		Vice Director
23	Mr Pham Van Dien	Department of Forestry	Vice Director
24	Mr Tran Hieu Minh		
25	Ms Vu Thi Phuong	Department of International Cooperation	
26	Mr Lu Ngoc Lan	Department of Legislation	
27	Mr Le Hoai Nam	Department of Personnel Organization	
28	Mr Nguyen Van Hung	Department of Planning and Financing	Vice Director
29	Mr Nguyen Manh Trung	Division of Disaster Management	Head
30	Ms Nguyen Thi Hong Nhung		
31	Mr Dang Trung Thanh	Hoa Binh Provincial Sub-Department of Irrigation	Vice Director
32	Mr Nguyen Van Hung	Thai Nguyen Provincial Sub-Department of Irrigation	Vice Director
33	Mr Dang Ngoc Thang	Sub-department of Irrigation	Director
34	Mr Do Van Nhan	Thanh Hoa DARD's Sud-Dept. of Dike	Vice Director
35	Mr Nguyen Xuan Hung		Senior Representative
36	Mr Hoang Duc Cuong	MONRE	
37	Mr Le Thanh Hai		
38	Mr Vu Duc Long		
39	Ms Nguyen Thi Thu Loan	Vietnam Meteorological and Hydrological Administration	
40	Mr Satoshi Ishii	ADB	
41	Ms Giang My Huong		
42	Ms Huong	UNESCO	
43	Ms Nguyen Quynh Trang	UNICEF	
44	Ms Nguyen Le Hoa	Oxfam	
45	Mr Le Minh Dung	GIZ	Program Manager
46	Ms Bui Thuy	Vietnam Communist Party Newspaper	Correspondent
47	Ms Bich Hong	Vietnam News Agency	
48	Ms Dao Thi Nhan	VTC16	Correspondent
49	Mr Kimio Takeya	JICA HQ	Distinguished Technical Advisor
50	Mr Itaru Chiba		Southeast Asia Division 3
51	Mr Kenichiro Tachi	JICA Expert	Expert
52	Mr Ryutao Kobayashi	JICA Vientam	Senior Representative
53	Ms Nguyen Thi Thu Le		
54	Ms Akiko Urakami		Lead Advisor
55	Ms Pham Thi Minh Duc		Assistant/Interpreter
56	Mr Hodaka Igo	JICA Project team	Member
57	Ms Mai Thu Trang		Clerk