BAN CHỈ ĐẠO TRUNG ƯƠNG VỀ PHÒNG CHỐNG THIÊN TAI
22 - 5 - 1946

NATURAL DISASTER ANNUAL REPORT 2015

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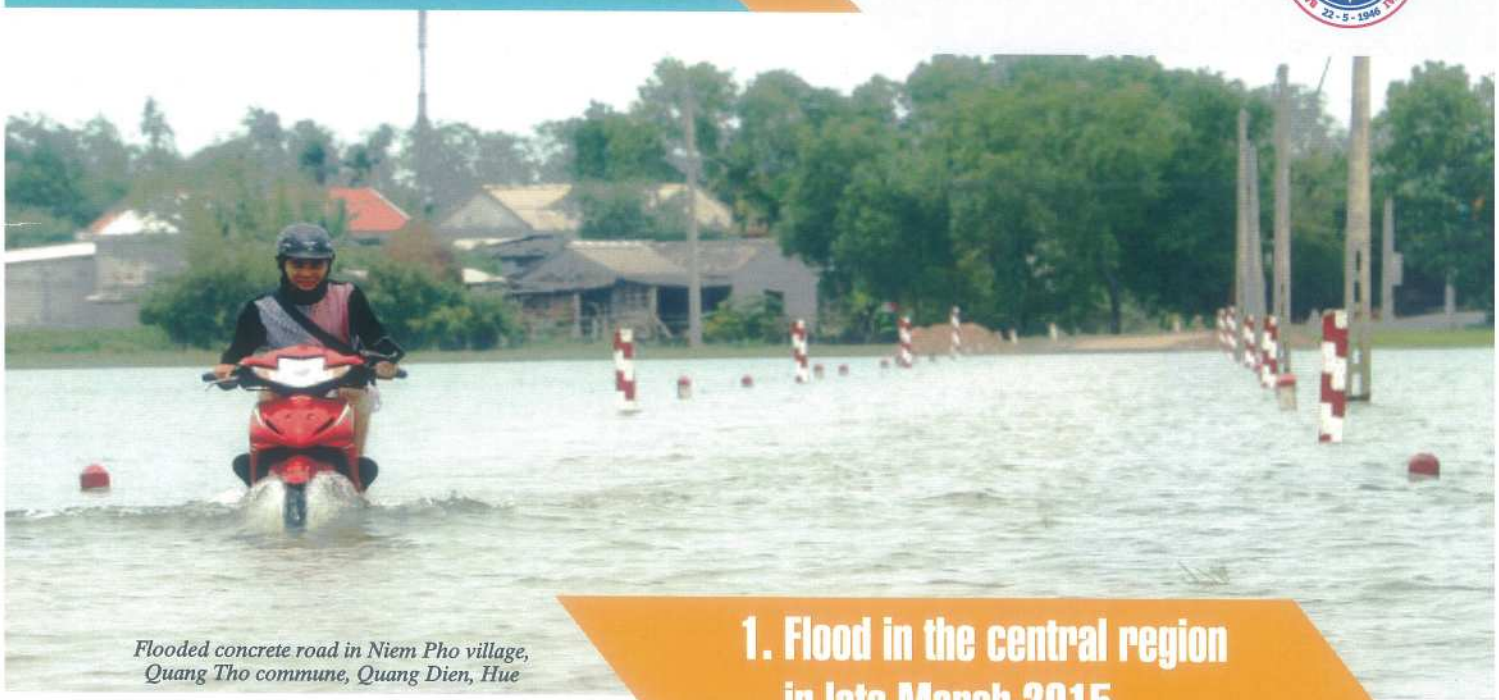
I. GENERAL OVERVIEW

In 2015, natural disasters happened in Vietnam with lower frequency, but higher magnitude in terms of impact, i.e.: five storms and two tropical depressions in the East Sea (with the first and the third storms hitting Vietnam directly). From January to March, unseasonal heavyrains and floods occuredin three central provinces, with flood peaks in some rivers reaching alarm level 3. On the other hand, extreme heat waves also occurred for record durations (for the first time in 60 years). Drought spread from northern region to south of central region. In many areas, a serious lack of rainfall occurred even during the rainy season. Especially heavy rained also occurred in Quang Ninh for as long as 10 days (from 24 July to 4 August) with total rainfall reaching over 1,557mm in Cua Ong (the highest in over 50 years). Land, riverbank and coastal erosion occure din many places, and saltwater intrusion was earlier and reached deeper inland. Depletion of water in rivers is increasingly common sight posing negative influences people's lives (with Mekong river water level decreasing to it lowest level in 100 years).

I. EXEMPLARY NATURAL DISASTER EVENTS

2015 saw a numbler of unusual natural disaster events in Vietnam, some with the highest magnitude of impacts.



Flooded concrete road in Niem Pho village, Quang Tho commune, Quang Dien, Hue

1. Flood in the central region in late March 2015

Due to the influence of the easterly wind belts combined with cold from 24-28 March, heavy rains occured across Thua Thien Hue, Quang Nam and Quang Ngai, mainly concentrated in mountainous regions with average rainfall of 200-400mm and peaks of 684mm in Bach Ma (Thua Thien Hue), 684mm in Hiep Duc (Quang An), and 521mm in Ba To (Quang Ngai). Heavy rains caused unseasonal floods to happen with flood water level around alarm level 1. Extreme rainfall in Song Ve station in Quang Ngai's Ve River caused water level to reach alarm level 3 (making it the biggest flood ever over the last 40 years compared to seasonal averages).

Rains and floods killed three people, blew three houses down, damaged another 281 houses, 8,458 ha of rice, 4,834 ha of crops; and swept away 4.927 cattles and livestocks and 118,642 m3 soil and rocks from transportation and irrigation works. Total material damages were estimated at VND 275 billion.

Rain and flood caused damages in Quang Ngai province

Rain and flood caused rice and crops to be extensively inundated in Quang Ngai province

Historic flood in Quang Ninh Province

2. Rain & flood in the central region and Thanh Hoa from 24/7-06/8

President of State Truong Tan Sang gave directions to overcome the consequences of rain and flood in Quang Ninh province

Minister Cao Duc Phat checked the area of Dyke 790 (Cam Pha City) and steered efforts to overcome consequences of rain and flood in Quang Ninh provinces

Due to the impacts of a depression whose axis surpassed the northern region, from 24 July to 4 August, the northern region witnessed moderate to heavy and even extremely heavy rains in some places, with a historic rain in both intensity and total volume. Total rainfalls from 24 July to 4 August were measured at 1,557mm in Cua Ong, 1,256mm in Co To, and 1,247mm in Quang Ha. Heavy rains caused flooding upstream in Thai Binh, Ky Cung and Thao rivers. Flood peaks reached alarm level 3 in the upstream of Thai Binh river systems, and level 2 in Ky Cung and Thao rivers.

Heavy rains also caused flash flood, land erosion and floods to happen in Northern provinces and Thanh Hoa. 42 people were killed or reported missing (17 of whom were in Quang Ninh province), 23 others injured, 340 houses down and/or swept away, 16,159 others flooded and damaged, 16,992ha of rice and 6,552ha of crops lost, 33,652cattles and livestocks and over 3.6 million m3 of soil and rocks washed away. Total material damages were estimated at over VND 4,614 billion.

Flood in Thanh Hoa

3. Rain & flood in the central region, Thanh Hoa and Nghe An from 17-22/9

Due to the impacts of intertropical convergence zone in the central region combined with active easterly wind belts, from 17 22 September, some places in the northern region, Thanh Hoa and Nghe An witnessed heavy rains with common rainfalls in the range of 150-250mm, including 367 mm in Lam Son (Hoa Binh), 256 mm in Thanh Son (PhuTho); 368 mm in Nhu Xuan (Thanh Hoa); 304 mm in Vinh (Nghe An), and 297 mm Nam Dan (Nghe An). Heavy rains caused floods to happen in rivers in Ninh Binh and Thanh Hoa, with flood peaks reaching alarm level 3 and above, i.e. 3.92m or 0.08m below alarm level 3 in Hoang Long river in De Terminal (Ninh Binh), or 12.09m or 0.09m above alarm level 3 in Buoi river in Kim Tan (Thanh Hoa).

Rains and floods caused severe damages in northern provinces, Thanh Hoa and Nghe An, with 8 people killed and 3 others injured, 11 houses down and 3,554 others down and damaged, 15,099ha of rice and crops lost, and 116,000m3 of soil and rocks from irrigation and transportation works swept away. Total material damages were estimated at over VND 287 billion.

Flood in Hoang Long river, Ninh Binh province

People evacuated to safe area outside of the dykes of Ma River in Thieu Duong commune, Thieu Hoa district

4. Thunderstorms and tornados

Thunderstorm and tornado in Hanoi

In 2015, over 190 thunderstorms, thunderbolts and hails killed 60 people and injured 80 others, with 705 houses down and 11,510 others unroofed. A severe thunderstorm with wind power of 8/9 level appeared in Hanoi in the afternoon of 13 June, killing 2 people and injuring 5 others, with many trees down, houses unroofed, many roads flooded and blackouts in various places.

Erosions in Hoi An, Quang Nam

5. Riverbank and coastal erosion

In 2015, serious riverbank and coastal erosions occured in many parts of the country, e.g. 171,000m from Quang Tri to Phu Yen and 11,710m in the southern region. In Hoi An, Quang Ninh, due to the impacts of storm #3 and rising sea waves, over 1,800m of coastline were eroded. In many other provinces e.g. Ca Mau, Ben Tre and Binh Thuan, serious erosions also happened, threatening lives and production.

Suoi Lon River, Thuan Nam district, Ninh Thuan province

6. Heat waves, droughts and saltwater intrusion

Prime Minister Nguyen Tan Dung steered efforts to prevent droughts in Ninh Thuan province

Due to the impacts of a record strong and long El Nino ever over the last 60 years temperatures were higher in general, and 17 heat waves happened extensively nationwide, which were equivalent to 2014. An all-time high heat wave happened from 1-11 May in Northern provinces and from 25-26 June in the central regions with highest monitored temperatures ever during the same period in the previous years, with common highest temperatures reaching 39 - 42°C and even over 42°C in some places.

Extended heat waves happened in the central region, central highlands and southern region (especially in Ninh Thuan, Khanh Hoa and Binh Thuan) caused water resources to deplete and drought to happen extensively. Saltwater intruded deeply in some coastal provinces, causing challenges in securing water for agricultural production and daily life.

In addition, as soon as the dry season began in the Mekong Delta (in January 2015), saltwater intrusion appeared, earlier and more intensive compared to the same period in the previous years, with 4g/l salinity, affecting 35-55 km inlands from the water mouth (i.e. 15-25 km further into inlands vs. the same period in 2014). Saltwater intrusion often peaked around late February and early March, which was 1 month earlier than previously. By mid-March 2015, upstream discharge tended to increase, lowering saltwater intrusion at river mouths. By end of April 2015, saltwater intrusion returned to normal levels with no impact on water supply for agriculture and daily life utility.

However, in early July 2015, an usual saltwater intrusion happened in the Mekong Delta as a result of depleting upstream discharge, affecting agricultural production and daily life in 9 Mekong delta provinces (i.e. Long An, Tien Giang, Ben Tre, Tra Vinh, Soc Trang, Bac Lieu, Ca Mau, Kien Giang and Hau Giang) with salinity of 4g/lgoing 35-65km deep inlands in some river mouths e.g. Vam Co, Hau and Cai Lon rivers.

Droughts and saltwater intrusion caused water shortage to happen in almost of the southern part of the central region and central highlands, seriously affecting agricultural production and daily life, causing 40,000 ha agricultural land to be suspended from cultivation due to water shortage. As many as 400,000 ha of crops suffered from droughts, over 44,000 cattles and livestocks were killed and tens of thousands of people were short of water for their daily use. Some 88,000 ha of agricultural land was affected by droughts and saltwater intrusion in various Mekong delta provinces.

To date, droughts and saltwater intrusion are still happening seriously in the southern part of the central region and the Mekong delta, and are expected to last until June 2016 if the rainy season is late to arrive.

President of State Truong Tan Sang steered efforts to prevent droughts in Ninh Thuan Province

Video conference in response to droughts and saltwater intrusion in 2015-2016 and impacts on El Nino

Saltwater intrusion in Ca Mau

Saltwater intrusion in Ben Tre

7. Other types of natural disasters

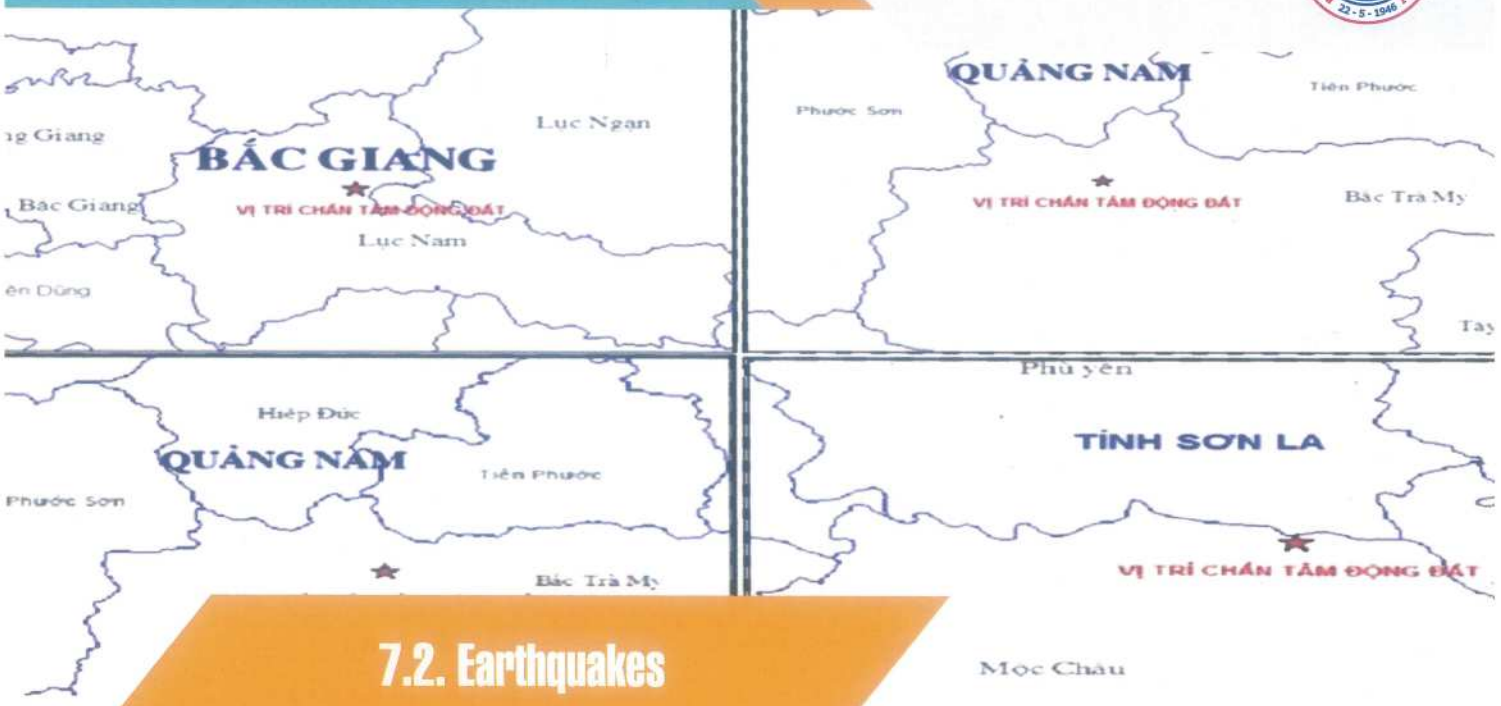
7.1. Extremecold days

Snow fell in Sapa, Lao Cai

In 2015, Vietnam was hit by 22 cold waves, which was lower than multi-year average over the same period in previous years. Cold waves caused four extremely and damaging cold events to happen with a total of 16 days across a broad area. The mountainous area of Sapa in Lao Cai saw snow rain, freeze, and hails in Muong Khuong, Bat Xat (Lao Cai) in mid-March.

Statistics of some extremely cold and damaging cold waves hitting Vietnam in 2015

No	Date/month	Affect scale and common daily average temperatures	Lowest daily average temperature in some areas
1	09 -15/1/2015	Bắc Bộ và Bắc Trung Bộ 12^0C - 14^0C	Sapa: $3,0^0C$; Mẫu Sơn: $3,6^0C$; Đồng Văn $5,3^0C$;....
2	31/1-2/2/2015	Phía Đông Bắc Bộ 12^0C - 13^0C	Sapa: 6.3 ^0C; Đồng Văn $8,8^0C$; Trùng Khánh: $7,4^0C$;...
3	05-07/2/2015	Bắc Bộ và Bắc Trung Bộ	Sìn Hồ: 6.2 ^0C, Sa Pa: $3,2^0C$, Tam Đảo: $6,0^0C$
4	16-18/12/2015	Bắc Bộ và Bắc Trung Bộ	Sa Pa: 1.2 ^0C; Mẫu Sơn: $2,0^0C$, Hà Đông: $13,0^0C$



7.2. Earthquakes

In 2015, 42 earthquakes happened in Vietnam with magnitude from M = 2.4 to 4.1 in Quang Nam, Quang Ngai, offshore Tonkin Gulf, Son La, Dien Bien, Lai Chau, Bac Giang, Thua Thien Hue and Nghe An.

Six of these had M of over 3.5, and were duly covered in mass media, including:

1) An earthquake of M=3.6 happening on 16/01/2015 in Thuan Chau, Son La.

2) An earthquake of M=4.1 happening on 17/02/2015 in Moc Chau, Son La.

3) An earthquake of M=3.5 on 08/4/2015 in A Luoi, Thua Thien Hue.

4) An earthquake of M=3.9 on 12/6/2015 in Quy Chau, Nghe An.

5) An earthquake of M=3.6 on 04/ 9/2015 in Dien Chau, Nghe An.

6) An earthquake of M=3.6 on 21/ 9/2015 in Tuan Giao, Dien Bien.

Of these, the biggest one happened in Moc Chau, Son La at 18.53 hours on 17/02/2015 with M = 4.1 Richter at the coordinates of 21,026 North latitude, 104,806 east longitude, with a focal depth of approximately 6.3km.

8. Total damages and losses in 2015

Natural disasters in 2015 caused serious human and assets losses, including:

- Human losses: 154 were killed and/orreported missing (94 by floods, flash floods, land erosion and post-storm rains and floods, 60 by tornados and thunderbolts, none by storm); 127 were injured.

- Houses: 1,242 were down and/or swept away; 35,233 were flooded, damaged, and/or unroofed.

- Agriculture: 443,292ha of rice and crops and 51,230 ha of industrial and fruit crops were damaged, 2,642cattles and 63,448livestocks were killed.

- Irrigation: 3,026m dykes of grade 3 and special grades and 5,313m dykes below grade 4, 9,514m of embankments, 115,287m of canals, and 179 small lakes and dams were damaged.

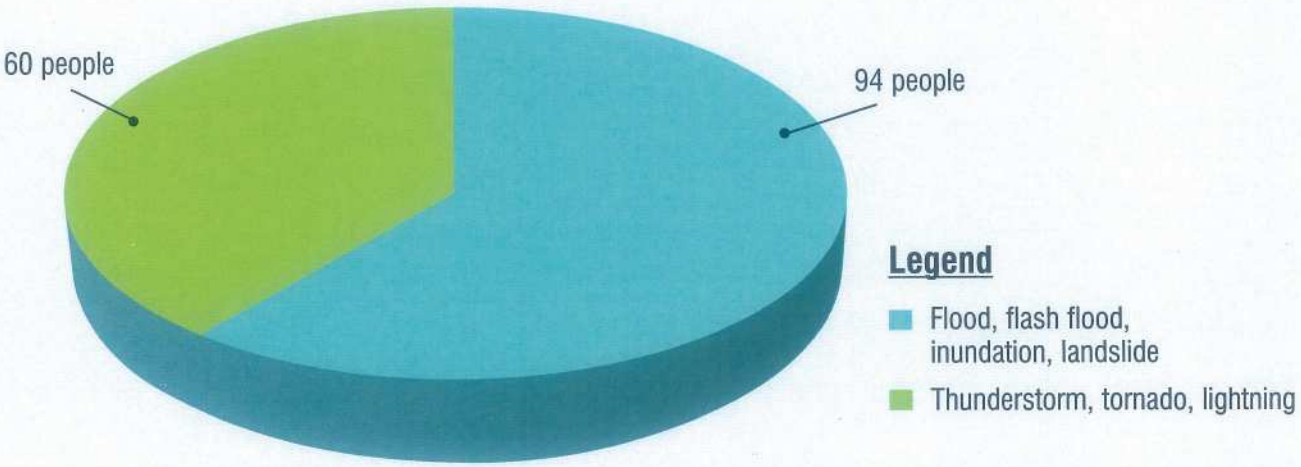
- Transportation: 2,107,247m3 of soil and rocks were caused to erode from national, provincial and rural transport roads, 136 bridges and drains were damaged.

- Agriculture: 5,488 ha of aquaculture area and 2,583 cages of fish culture were damaged

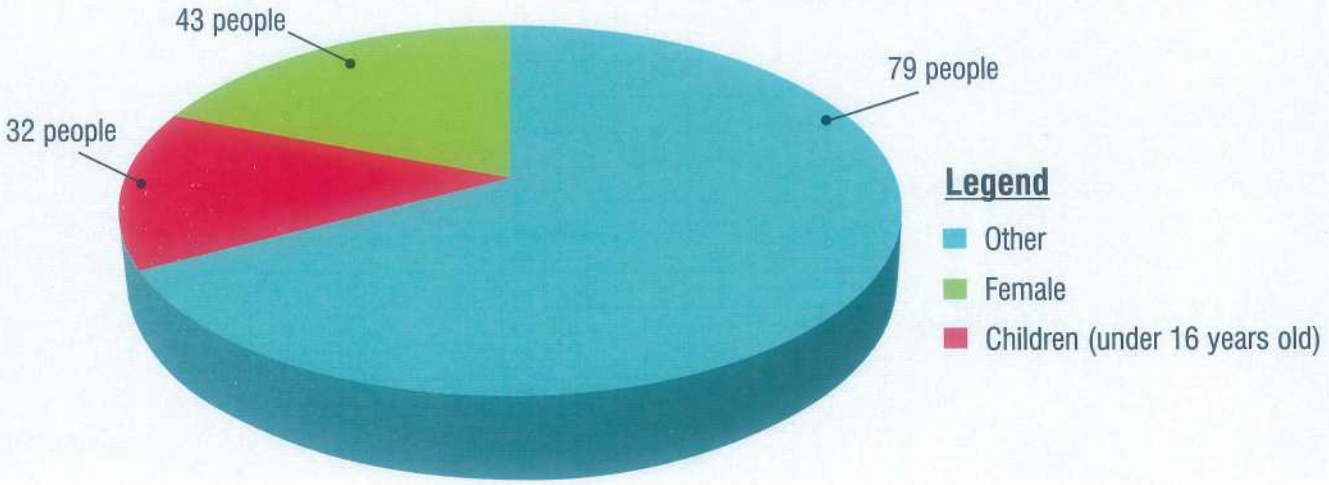
- Industry: 300,000 tons of coal were lost, various mines of Mong Duong and Quang Hanh Coal Mining Companies were flooded, and a dam accident happened in Mong Duong Coal Mining Company (Dam 790).

Total asset damages were estimated at ca. VND 8,167 billion.

Total human damages



By gender and age (killed and reported missing)



TOTAL DAMAGES CAUSED BY NATURAL DISASTERS IN 2015

Items		Unit	Other disasters	Drought, Slat water intrusion	Thunderstorms tornadoes, lightnings
PEOPLE	Number of dead people	no	-	-	60
	Number of missing people	no	-	-	-
	Number of injured people	no	-	-	80
HOUSING	Number ofhouses destroyed/swept away	no	11	-	705
	Number ofhouses damaged	no	704	-	11.510
	Number of houses submerged	no	383	-	343
AGRICULTURE and FORESTRY	Rice areadamaged	ha	5.968	198.549	7.088
	Lost completely (more than 70%)	ha	690	50	1.409
	Rice seed areasdamaged	ha	245	-	-
	Lost completely (more than 70%)	ha	-	-	-
	Vegetable areasdamaged	ha	1.212	161.110	3.232
	Lost completely (more than 70%)	ha	-	17.000	1.410
	Long-growing industrial tree areasdamaged	ha	-	42.578	662
	Short-growing industrial tree areasdamaged	ha	542	-	748
	Fruit tree areas damaged	ha	-	-	7
	Forest areas damaged	ha	-	-	156
	Number of large livestock dead	no	-	-	22
	Number of small livestockdead	no	68	-	520
	Number of poultries dead	no	550	-	1.677

Flash floods, landslides	Central region flood 3/2015 and other small flood	Flood in North region and Thanh Hoa 24/7 - 06/8	≠ 1 storm and raining flood after storm	≠ 3 storm and raining flood after storm	Flood in North region, Thanh Hoa Nghe An 17 - 22/9	Total
1	18	34	14	4	8	**139**
1	4	8	1	1	-	**15**
-	5	23	15	1	3	**127**
2	26	340	147	-	11	**1.242**
3	223	1.668	1.239	91	108	**15.546**
-	297	14.491	152	575	3.446	**19.687**
1.237	12.615	16.992	5.078	547	12.433	**260.506**
-	3.185	6.991	79	-	-	**12.403**
-	4	-	1.569	-	-	**1.818**
-	3	-	6	-	-	**9**
-	5.020	6.552	3.673	767	5.258	**186.823**
-	1.510	2.581	33	-	-	**22.534**
-	-	256	-	-	2.306	**45.802**
-	182	217	62	21	1.619	**3.391**
-	-	1.087	179	190	-	**1.463**
-	-	-	-	-	-	**156**
-	16	170	59	-	12	**279**
-	8	1.040	149	-	585	**2.370**
618	4.240	32.442	4.831	-	19.030	**63.388**

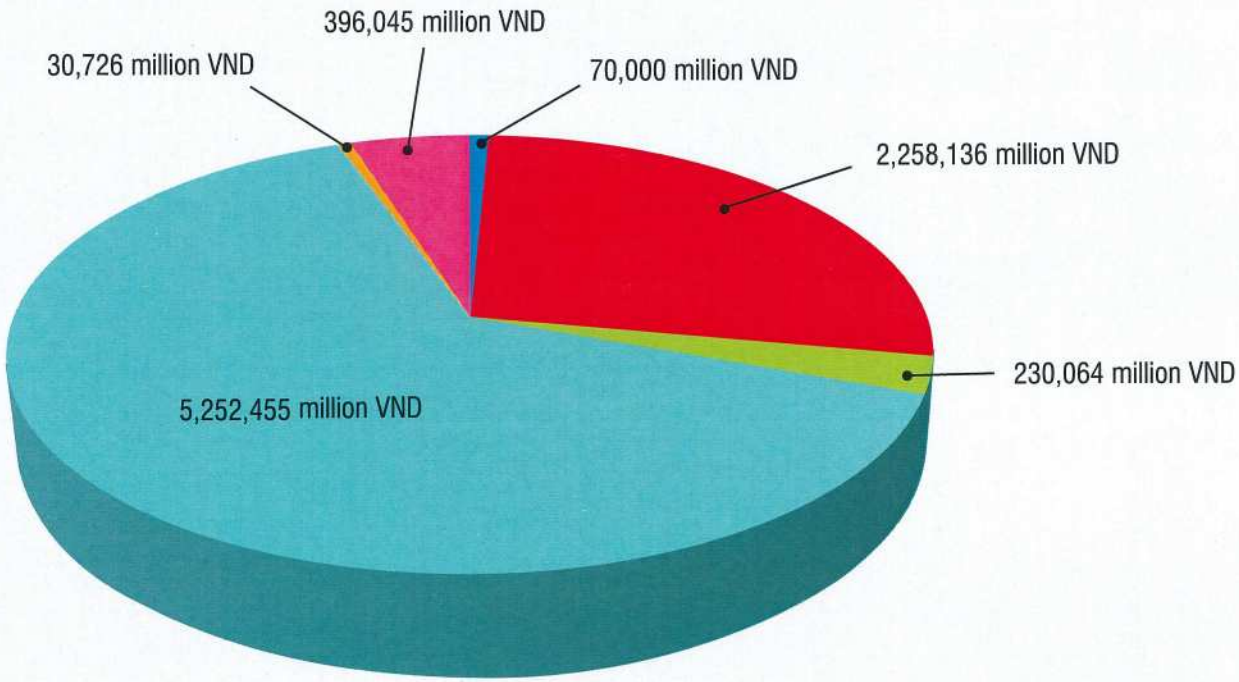
Items		Unit	Other disasters	Drought, Slat water intrusion
HYDRAULIC STRUCTURES	Length of damaged dike from level III to special level	m	-	-
	Amount ofsoil eroded or washed from dike of level III to special level dike	m^3	-	-
	Amount of stone and concrete eroded or washedfromdike of level III to special level	m^3	-	-
	Length of damaged dikeof the 4th level downward	m	544	-
	Amount of soil eroded or washed from dike of the 4th level downward	m^3	-	-
	Embankments damaged		-	-
	Length of embankmentseroded andwashed away	m	2	-
	Amount of soil eroded or washed away from embankments	m^3	-	-
	Length of irrigation channels eroded or washed away	m	974	-
	Amount of soil eroded or washed away from irrigation channels	m^3	-	-
	Amount of stone and concrete eroded or washedfrom irrigation channels	m^3	-	-
	Length of coastal line, river and stream bank eroded or washed away	m	39.325	-
	Amount of soil eroded or washed away from coastal line, river bank and stream bank	m^3	800	-
	Number of reservoirs and dams eroded or washed away	no	-	-

Thunderstorms, tornadoes, lightnings	Flash floods, landslides	Central region flood 3/2015 and other small flood	Flood in North region and Thanh Hoa 24/7 - 06/8	≠ 1 storm and raining flood after storm	≠ 3 storm and raining flood after storm	Flood in North region, Thanh Hoa Nghe An 17 - 22/9	Total
-	-	-	2.232	70	-	724	**3.026**
-	-	-	16.550	-	-	-	**16.550**
-	-	-	34	-	-	-	**34**
20	-	15	1.334	-	-	3.400	**5.313**
-	-	-	5.000	-	-	-	**5.000**
-	-	-	3	-	-	-	**3**
-	-	-	5.422	3.390	-	700	**9.514**
-	-	-	6.200	-	-	-	**6.200**
229	974	19.528	67.388	4.926	-	22.008	**116.027**
-	-	7.228	245.660	-	-	-	**252.888**
-	-	769	105	250	-	-	**1.125**
-	-	1.826	500	2.100	800	3.000	**47.551**
-	-	-	-	-	-	-	**800**
2	-	95	69	1	1	48	**216**

	Items	Unit	Other disasters
TRANSPORTATION	National and provincial roads damaged	line	-
	Length of national and provincial roads erodedor washed away	m	-
	Length of national and provincial roads submerged	m	-
	Amount of soil eroded or washed away from the national and provincial roads	m^3	-
	Amount of stone and concrete eroded or washed awayfrom the national and provincial roads	m^3	-
	Rural roads damaged	line	-
	Length of rural roads eroded or washed away	m	6.885
	Length of rural roads submerged	m	-
	Amount of soil washed away from the rural roads	m^3	-
	Amount of stone and concrete lost from the rural roads	m^3	-
	Bridges, sluices eroded or washed away	no	12
FISHERIES	Aquaculture areas eroded or washed away	ha	37
	Lost more than 70%	ha	-
	Areas of shrimp ponds damaged	ha	-
	Lost more than 70%	ha	-
	Amount of fish and shrimp lost	ton	-
	Quantity of fish and shrimp seeds lost	No of thousand	-
	Number of fishing nets lost	no	-
TELECOMMUNICATION	Television towers, communication stations damaged	no	-
	Communication poles destroyed	no	-
	Communication lines broken	m	-
INDUSTRY	Electricity poles collapsed, broken	no	2
	Electricity cables broken	m	-
	Transformer stations damaged	no	-
	Amount of coal mine washed away	ton	-
TOTAL COST OF DAMAGES	Estimated total damages	Mil. Dong	30.726

Drought, Slat water intrusion	Thunderstorms, tornadoes, lightnings	Flash floods, landslides	Central region flood 3/2015 and other small flood	Flood in North region and Thanh Hoa 24/7 - 06/8	≠ 1 storm and raining flood after storm	≠ 3 storm and raining flood after storm	Flood in North region, Thanh Hoa Nghe An 17 - 22/9	Total
-	-	2	23	44	7	1	15	**92**
-	-	-	-	439	-	-	-	**439**
-	-	-	-	-	-	-	4.200	**4.200**
-	-	1.780	43.440	916.241	100.000	3.000	83.192	**1.147.653**
-	-	-	-	-	50.890	-	-	**50.890**
-	1	-	7	80	6	8	9	**111**
-	2.100	7.343	22.119	18.868	17.840	35	785	**75.975**
-	-	-	2	10.793	-	-	100	**10.895**
-	10	2.100	8.575	751.907	8.937	2.747	33.268	**807.544**
-	-	-	101.160	-	-	-	-	**101.160**
-	9	10	6	44	30	1	24	**136**
-	-	33	103	3.441	920	10	996	**5.539**
-	-	-	29	2.158	-	-	-	**2.187**
-	-	-	-	226	-	-	-	**226**
-	-	-	-	226	-	-	-	**226**
-	-	-	0	1	4	-	100	**104**
-	-	-	8	-	-	1	-	**9**
-	-	-	-	2.380	-	201	2	**2.583**
-	2	-	-	-	-	-	1	**3**
-	1	-	-	1	-	1	-	**3**
-	28.000	-	-	-	-	-	-	**28.000**
-	351	-	-	230	13	42	23	**661**
-	2.620	-	-	200	-	-	-	**2.820**
-	-	-	-	253	-	-	7	**260**
-	-	-	-	300.000	-	-	-	**300.000**
2.258.136	**230.064**	**70**	**351.059**	**4.614.396**	**385.045**	**11.000**	**287.000**	**8.167.495**

Total asset damages

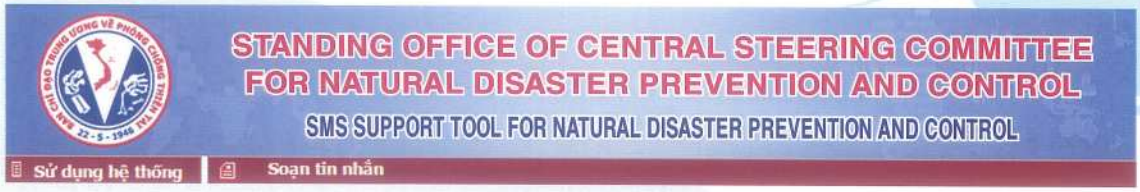


Legend

- Flash floods, landslides
- Drought
- Thunderstorms, tornadoes, lightnings
- Other disasters
- Storm and floodings after storms
- Floodings in the North, Thanh Hoa, Nghe An and the Centre

Support Tools for Decision Making

SMS support tool for Natural Disaster Prevention and Control: http://smsdieuhanh.com



Recommend websites for Natural Disaster Management

No	Agency/Description	Website address	Note
1	Standing office of Central Steering Committee for Natural Disaster Prevention and Control	http://phongchongthientai.vn http://hochuavietnam.vn/	
2	National Center for Hydro-Meteorological Forecasting	http://www.nchmf.gov.vn	
3	Vietnam Information System on Hydraulic Work Management	http://hochuavietnam.vn	
4	Vietnam Red Cross Society	http://www.redcross.org.vn	
5	Vietnam National Mekong Committee	http://ffw.mrcmekong.org	
6	Information on Flood and Storm Prevention & Control	http://www.vnbaolut.com	
7	Vietnam All-Hazard Warning, Analysis and Risk Evaluation (VinAWARE)	http://www.vinaware.mard.gov.vn	
8	United State Naval Research Laboratory	http://www.nrlmry.navy.mil	
9	Philippines Atmospheric Geophysical and Astronomical Services Administration	http://www.pagasa.dost.gov.ph	
10	The Philippines website on Tropical Cyclones	http://www.typhoon2000.ph	
11	Japan Meteorology Agency	http://www.jma.go.jp	
12	Hongkong Observatory	http://www.hko.gov.hk	
13	NOAA Geostationary Satellite Server	http://www.goes.noaa.gov	
14	Weather Forecast and Reports	http://www.wunderground.com	

CENTRAL STEERING COMMITTEE FOR NATURAL DISASTER PREVENTION AND CONTROL

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