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STATUS OF FOREST FIRE MANAGEMENT AND CONTROL IN VIETNAM

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STATUS OF FOREST FIRE MANAGEMENT AND CONTROL IN VIETNAM

Situation of Forest Fire

+ Total Forest area: about **12,094,518ha**
+ Natural Forest area: about **10,004,709ha (82.7%)**
+ Plantation Forest area: about **2,089,809ha (17.3%)**

In dry season there are about **6 millions ha** of forest and plant vegetable (about **50%** of total forest area) with high potential of forest fire risk, located in 48 different provinces and cities.

Forest types, which easy to catch fire including: ***pine, dipterocarpaceac, indigo, casuarinas, eucalyptus, bamboo forest, grassland and brush trees***. However, when severe weather and climate coming, all the forest types could easy cast fire and forest fire happen in high frequency.

Weather and climate condition are differ from zone to other zone in Vietnam. The forest fire could happen at any time around the year in different locations.

- In average, from December of previous year to April of the next year is a forest fire season with high risk in different eco-regions: North-East, North-West, Plateau, East of Southern Vietnam and Mekong Delta River;

- From June to August with dry and hot western wind is a season of forest fire in Northern part of Middle Vietnam;

- From April to June is a season of forest fire in Coastal Provinces of Central Middle Vietnam.

There is quite strong relationship between the total number of forest fires and ENSO activities. General speaking, in El Nino period, the average number of forest fires in Vietnam is much more than in La Nina period.

Places and month of forest fire in different eco-regions in Vietnam

Note: **(+) Drought month, danger of forest fire (-) Dry month, risk of forest fire**

Forest Area	.Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
East North	+	+	+	+	-						-	+
West North	+	+	+	+	-						-	+
Hong river Delta	+	+	+	+	-						-	+
West Plateau	+	+	+	+	-						-	+
East Southern	+	+	+	+	-						-	+
Cuu Long Delta	+	+	+	+	-						-	+
North Centre					-	+	+	+	-			
Central Coastline			-	+	+	+	-					

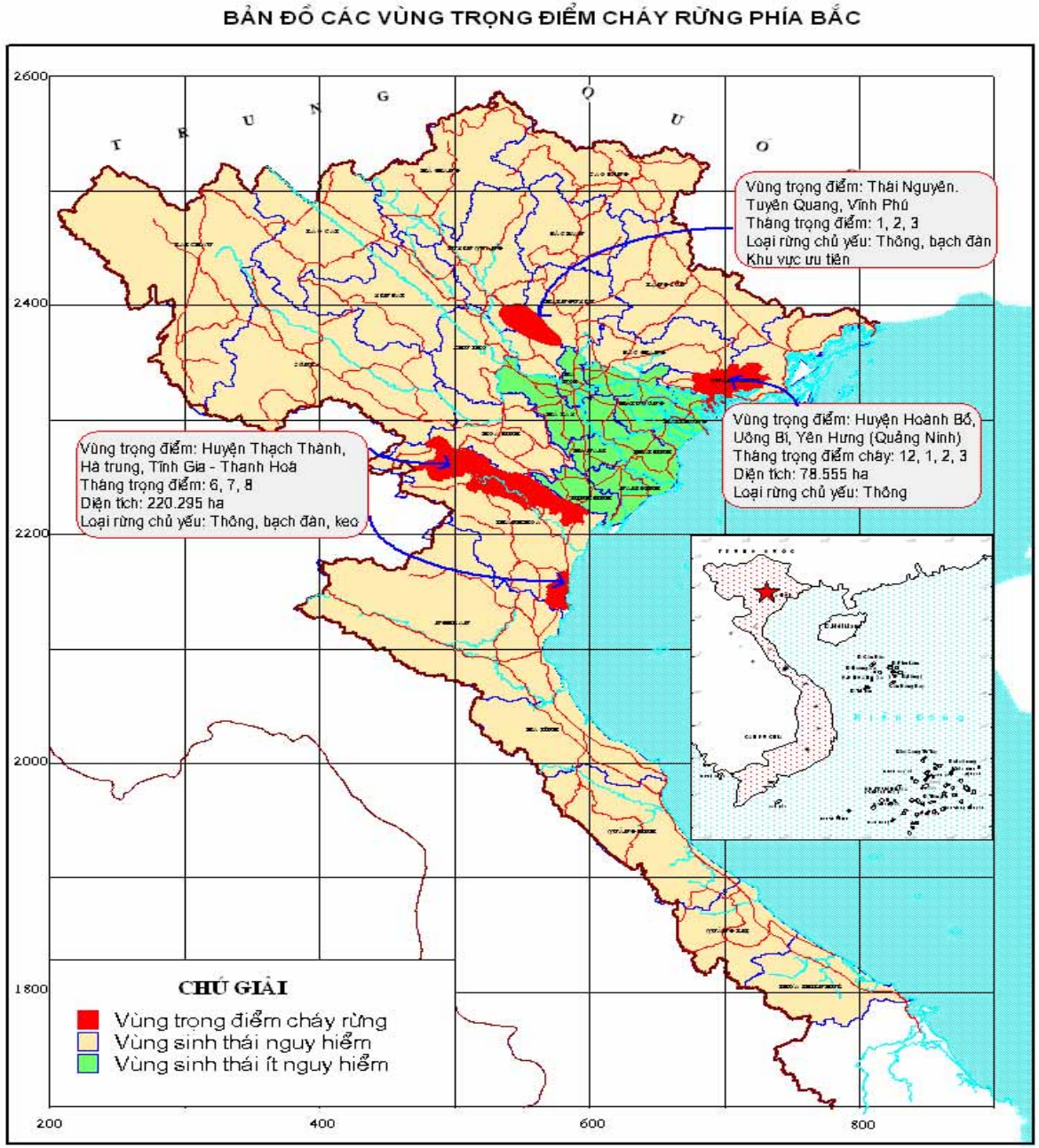
The Main Disaster Phenomenon in Vietnam

The main disaster risks in Vietnam, including forest fire, are showed as bellow:

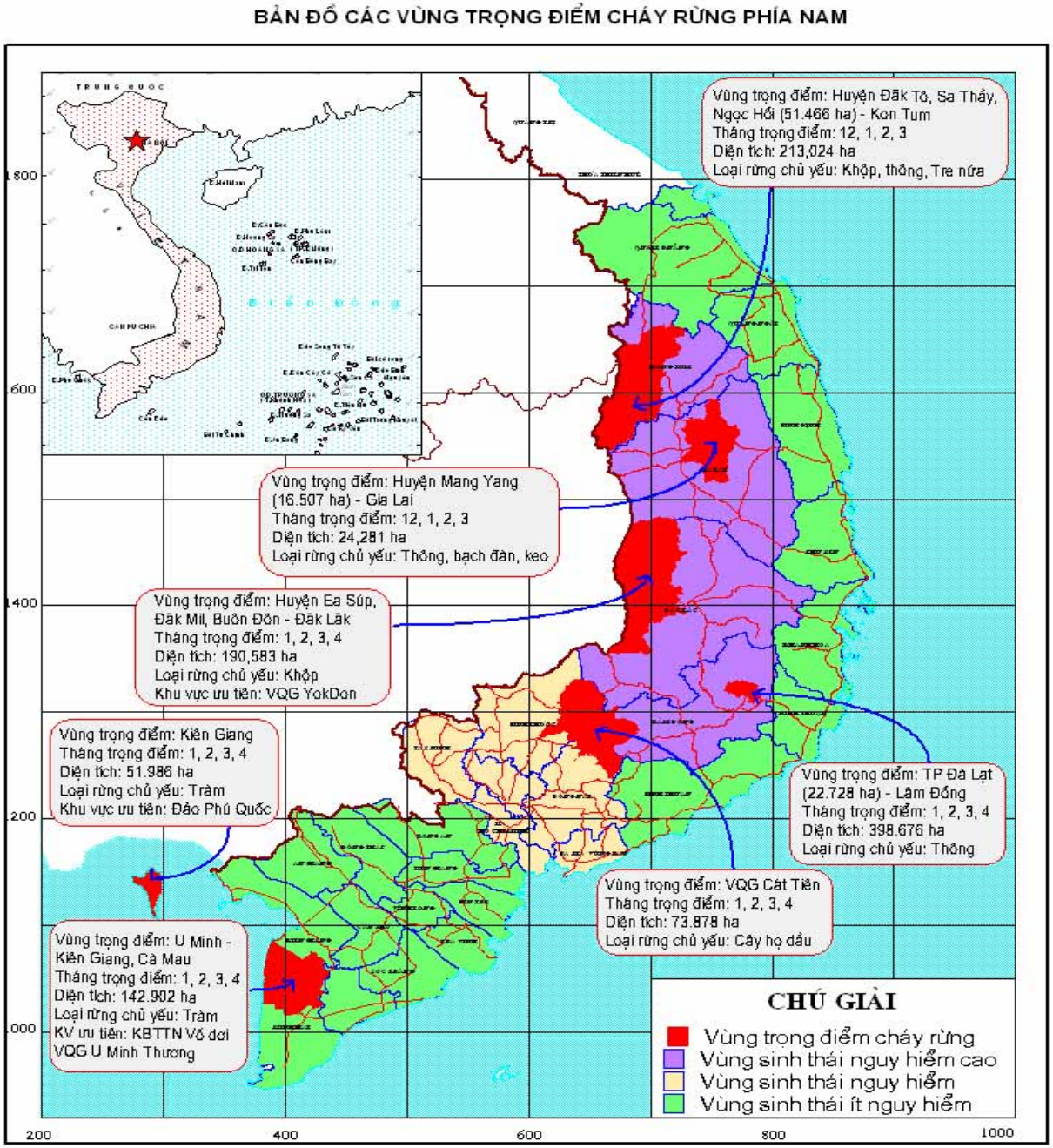
1. ***Storm & Storm Surge***
2. ***Flood***
3. ***Inundation***
4. ***Drought***
5. ***Salt Invasion***
6. ***Whirlwind***
7. ***Shoreline Erosion***
8. ***River bank erosion***
9. ***Flash Flood***
10. ***Landslide***
11. ***Earthquake***
12. ***Tsunami***
13. ***Forest fire***
14. ***Other***

However, for Vietnam, the forest fire is not defined as a natural disaster.

Map of main forest fire areas in Northern Vietnam



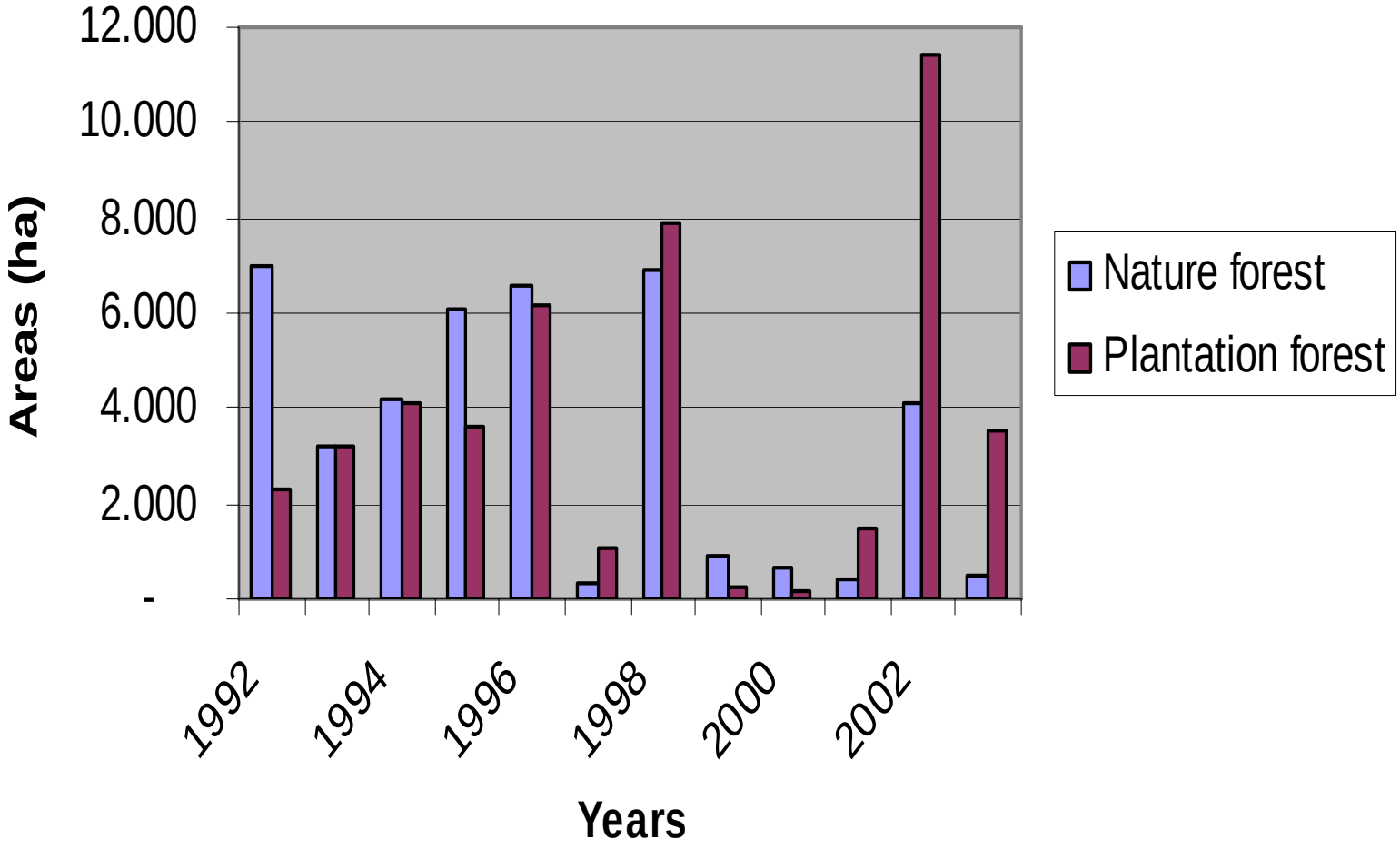
Map of main forest fire areas in Southern Vietnam



Situation of Forest Fires over last 12 year (1992-2003)

No.	Year	Total	Nature forest (ha)	Plantation forest (ha)	Total area (ha)
1	1992	1,467	6,995.5	2339.8	9,335.3
2	1993	4,248	3,165.2	3,200.0	6,365.0
3	1994	2,337	4,226.6	4,120.0	8,321.6
4	1995	850	6,084.0	3,600.0	9,684.0
5	1996	2,551	6,540.0	6,196.0	12,758.0
6	1997	309	307.0	1,054.0	1,361.0
7	1998	1,685	6,893.7	7,918.8	15,276.5
8	1999	185	902.8	236.5	1,139.5
9	2000	244	654.7	205.5	850.2
10	2001	256	391.0	1,454.4	1,845.4
11	2002	1,198	4,125.0	11,423.	15,548.0
12	2003	892	499.0	3,545.0	40,44.0
Total		**16,222**	**40,784.5**	**45,293**	**86,528.5**

Forest fire status quo in Vietnam



Causes of Forest Fire in Vietnam

1. Burning for agriculture land by ethnic minorities; straw and grass burning in rice field. The forest fires causing by this kind of reason takes about **20%** of total forest fires.

2. Local people using fire for hunting, trapping and catching wild animals in forest, especially use of smoke to harvest bee's honey (about **55%**).

3. Illegal activities of timber, wood and other forest products exploitation, they using fire without take consideration when cooking, smoking etc. (about **15%**).

4. The trading conflict from forest resource exploitation of stakeholders with burning forest to harm other competitors (about **10%**).

General speaking, the human activities are the major causes of forest and grassland fires in Vietnam.

Solution and Direction on Prevention and Fighting again Forest Fire

1. The mode of Forest Fire Preventing and Fighting

- Concentrate in fire prevention; strengthening of forest fire forecast and warning;
- Regular checking and control of forest fire in dry season.
- Implement of method of ***"4 Spots at Site"***: *use of local force, local equipment, local logistics and command at local site.*
- Detection of forest fire at the beginning stage.
- Improve the role and duty of forest fire prevention and fighting to forest owner of area allocated by government.
- Improve the cooperation between different forces, especially forest ranger, army and police… under direct guideline and comprehensive of local government in forest fire fighting.

2. Main Solutions

To implement the above-mentioned guideline, the Local Government and related forest protection units from different levels have to carry out activities as bellow:

- *Improve the quality of setup and implement the planning, aspects and project of forest fire preventing and fighting*
- *Improve the knowledge and awareness of local people and agencies, schools... about the forest fire preventing and fighting*
- *Strictly direction on forest fire preventing & fighting to forest owners.*
- *Strictly inspection of the forest fire preventing and fighting of forest at localities.*

Some Activities and New Applications for Forest Fire Management & Control in Vietnam

1. Forest Fire Risk Warning

The Forest Protection Department (FPD) belonging to the Ministry of Agriculture and Rural Development (MARD) has developed a National Fire Danger Rating.

- Fire-related weather data is collected for analysis of a forest fire danger rates for distribution across the country.
- The fire danger rating that is made available in rural areas via different media including facsimile, radio, television and roadside signboards.
- FPD then have created special software which using the Nesterop algorithm to calculate the levels of forest fire risk of all provinces. The result of calculated the immediately transfer to Vietnam Radio Voice and Vietnam Television for broadcast.
- The forest fire forecast also find in the web of FPD and MARD: *http://www.kiemlam.org.vn*
  http://kiemlam.mard.gov.vn

Software for calculation Levels of Forest Fire Risk

Use of meteorological data for estimate the levels of forest fire risk

Station Name	T^{0}_{13}	Humidity (%)	Rainfall (mm)

Designating of forest fire forecast, following the Nesterrop's Formula to calculate the P indicator

$$P = k * \sum_{i=1}^{n} T13i * D13i$$

in which:

k = 0 when rainfall >= 5mm or 3 continuous days of raining,

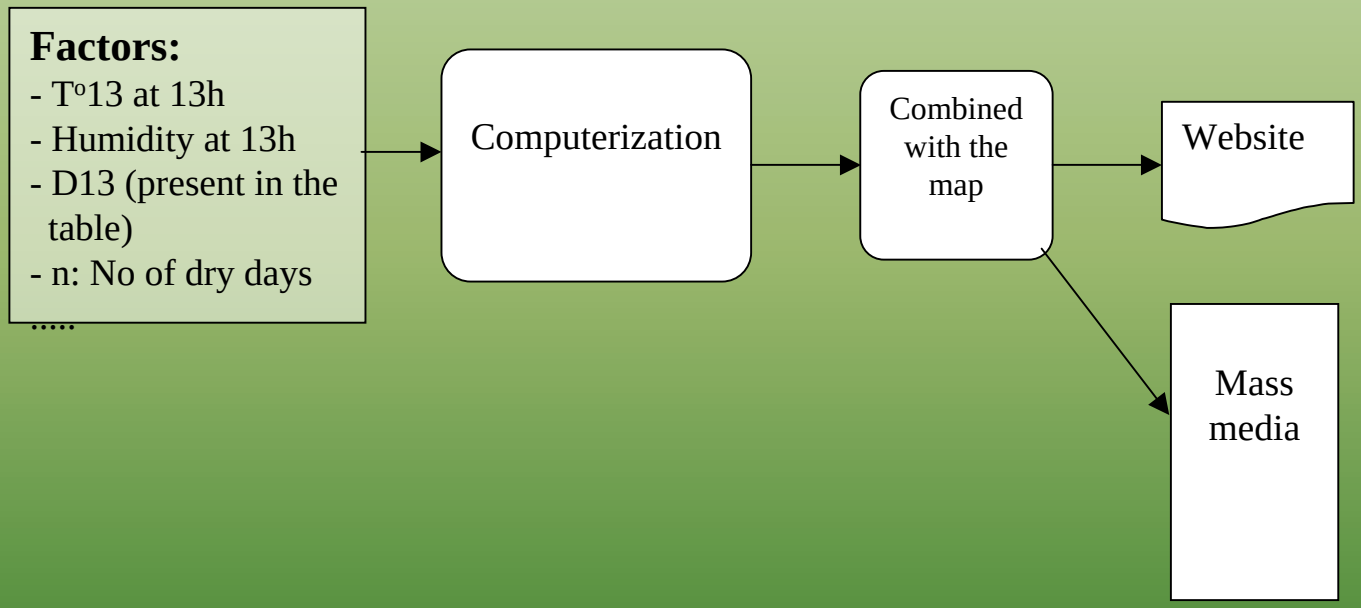
k = 1 if the rain fall < 5mm

N is a number of days without raining

T13*i* is the temperature at 13 o'clock in *i* day

D13*i* is the differential saturated between dry graph and wet graph of day *i* (calculated from T13*i* and humidity of day *i*)

The chart of forest fire forecast



The value of P co-efficient is use to identify the levels of forest fire risk, which depend on the decision of provincial people committee, for example:

Province	Level 1	Level 2	Level 3	Level 4
Quang Ninh	2.500	5.000	7.500	10.000
Tay nguyen	5.000	10.000	15.000	20.000
.....	.....	....	.....	....

Level 3, 4 and 5: are for automatically filled color on map at the district level.

- **Level 3**: It is danger for forest fire, which is presented in yellow color. In this case is needed to consider on forest fire prevention for pine, eucalyptus, bamboo, rubber and indigo forest etc.
- **Level 4**: It is very danger of forest fire, which is presented in orange color. It is a high risk of forest fire in large scale.
- **Level 5**: Dramatically danger of strong forest fire in large scale with quick spreading. It is presented in red color, which mostly happen in drought season.

3 4 5

Some effective results on use of TV and Radio for show of places and levels of forest fire risk

- *Improve the awareness and knowledge for people, especially the local communities who living near the forest understand of forest fire prevention and fighting.*
- *To warn the forest owners, local government strengthening all the measures to prevent and fight again the forest fire.*

Although there are some advantage but also still some disadvantage of new method in using information technology and remote sensing:

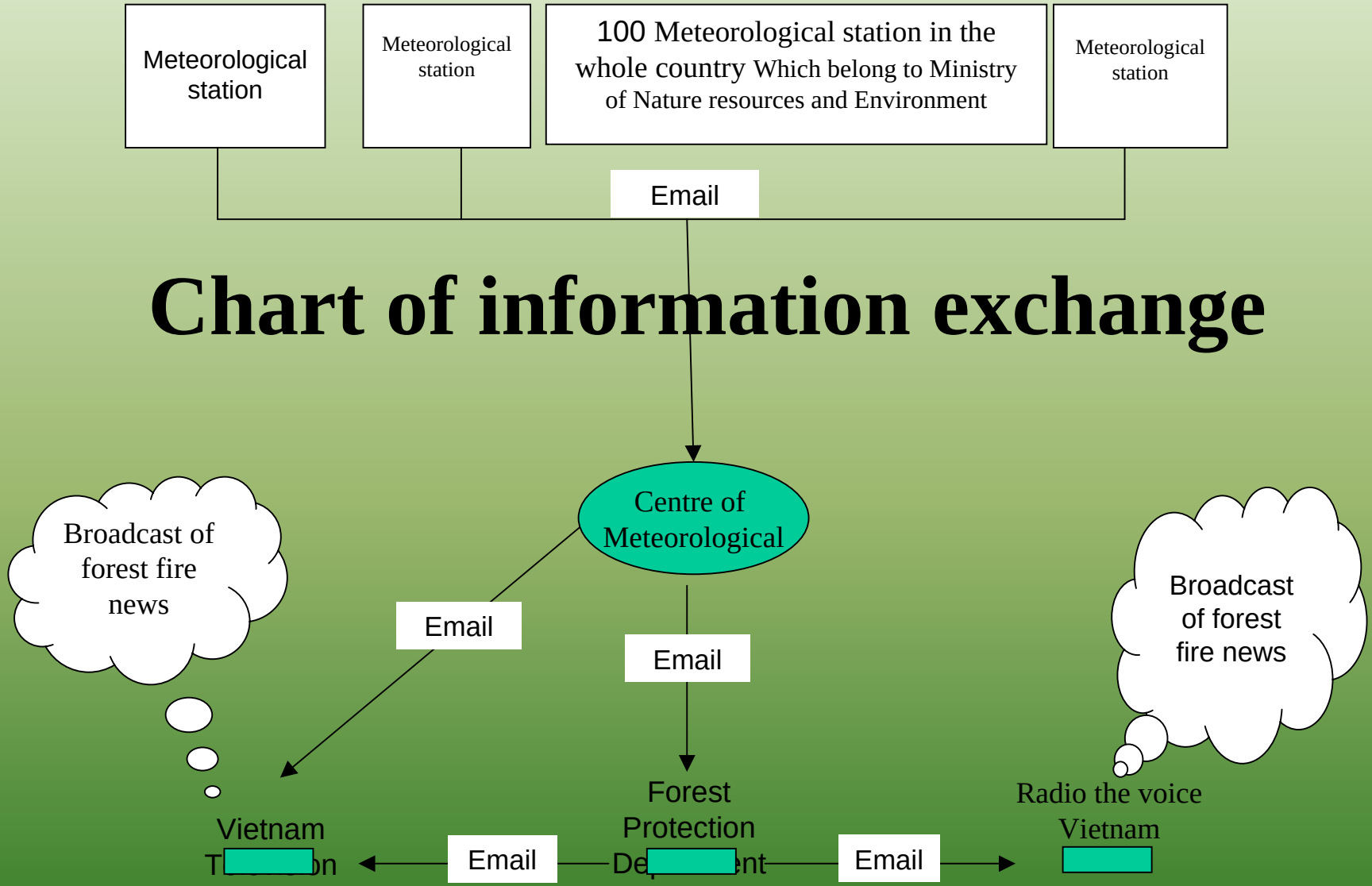
- *The forest fire index limited is too old (index p in Nesterop algorithm), this index from provinces was established since 1992, and not suitable with the changing of climate in recently years.*
- *The daily Forest fire forecast just only show the weather conditions with high risk of fire (warming) at certain day but not able to predict the situation of forest risk in the next few day, or few week.*

2. Early Detection of Forest Fire Spots

FPD in cooperation with Centre of Remote Sensing and GIS in order to apply of technology to early detecting of forest fire. After NOAA data processing, the result of hot spots will be sent to FPD at 6 pm each day. In turn, FPD will continue to analyze the data in specific method:

- *Overlapping the fire map into forest map to separate the fire spots outside forest and fire spots with reliability smaller than 75%.*
- *Identify the name of province, district and village have forest fire spots*
- *Post the forest fire information onto website.*
- *Make warning message to Provincial FPD to urgent they to implement the suitable measure again forest fire.*

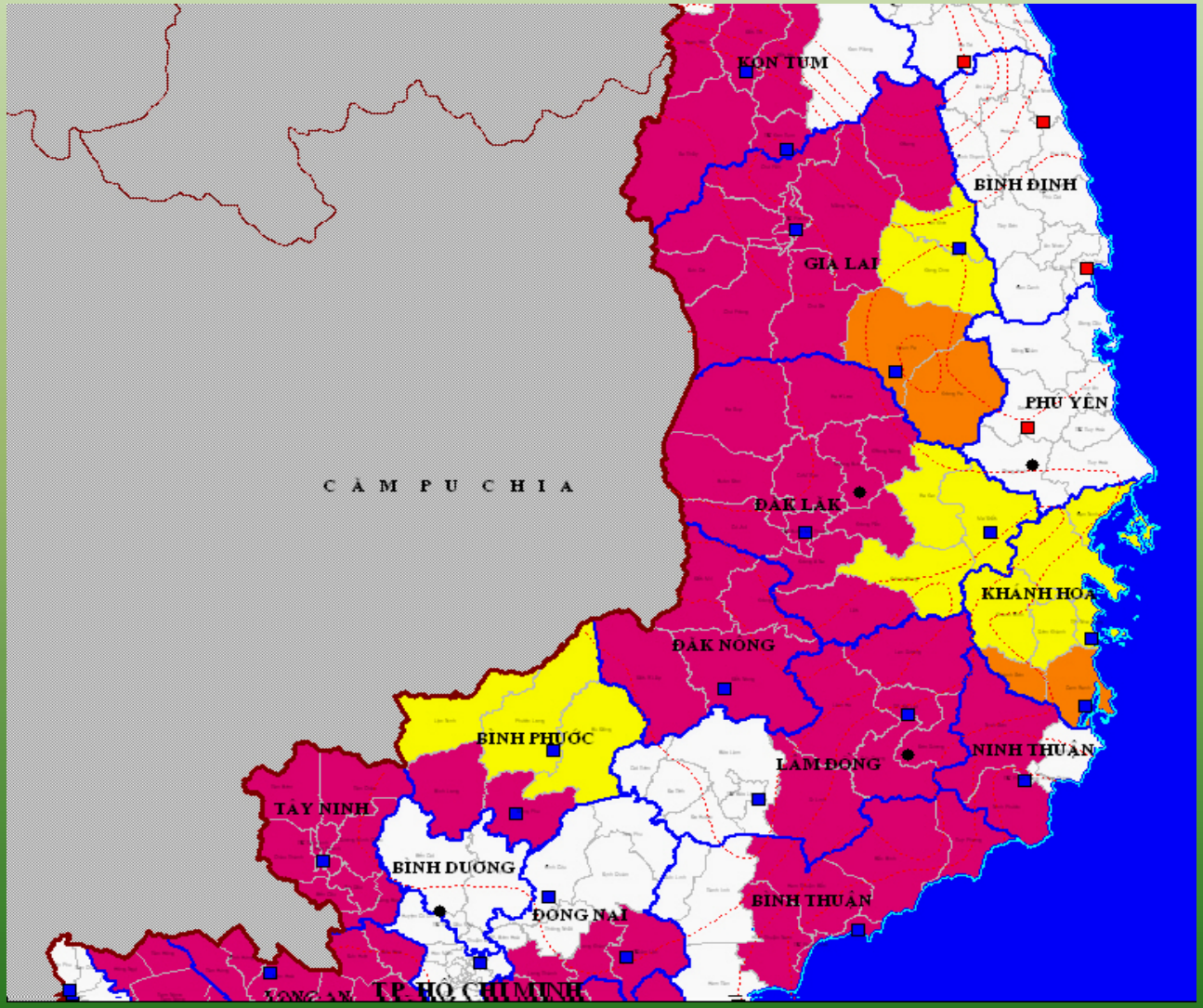
However, due to the resolution of NOAA satellite picture are low (1km x 1km) and weather condition reasons, the result of picture processing not really good.


Meteorological station
Meteorological station
100 Meteorological station in the whole country Which belong to Ministry of Nature resources and Environment
Meteorological station
Email
Chart of information exchange
Broadcast of forest fire news
Centre of Meteorological
Email
Email
Broadcast of forest fire news
Vietnam
Forest Protection
Radio the voice Vietnam
Email
Email

Example of hot spot detection in Vietnam on 25th Dec. 2006 *(Provided by FPD, MARD)*

HOTSPOTS IN VIETNAM 0N 25 DEC. 2006						
Province	**District**	**Longitude**	**Latitude**	**Date**	**Time**	**Level of Accuracy(%)**
Quang Ninh	TX C.Pha	107.289	21.110	25-12-2006	10:25am	84
Quang Ninh	TX C.Pha	107.277	21.102	25-12-2006	10:25am	90
Quang Ninh	TX C.Pha	107.287	21.101	25-12-2006	10:25am	91
Binh Phuoc	Loc Ninh	106.581	11.964	25-12-2006	13:30pm	87
Binh Phuoc	Loc Ninh	106.570	11.962	25-12-2006	13:30pm	77
Dac Lac	Ea Sup	107.716	13.372	25-12-2006	13:30pm	59
Gia Lai	Chu Prong	107.910	13.453	25-12-2006	13:30pm	54
Phu Tho	Thanh Son	105.027	21.155	25-12-2006	13:35pm	83
Phu Tho	Thanh Son	105.015	21.153	25-12-2006	13:35pm	98

Forest Fire Warning on 8th February 2004 in Southern Vietnam



Shortcomings and suggestion

- Lack of meteorological stations in some sensitive area of forest fire
- The resolution of map for forest fire status, management and warning is not good enough
- Improvement of forest fire forecast procedure by use of meteorological data and in combination of estimation information extracted from satellite data
- Setting up the MODIS Data Receiving Station. Detection of hot spots by MODIS data receiving in real time.
- Development and identification of forest fire risk levels separately for each concrete region of country
- Provincial FPDs have to applied above-mentioned forest fire forecast procedure by themselves then notify the forest fire risk level for each district and for Provincial Television Media

Some Remarks on Use of RS Data for Hot Spots and Forest Fire Management in Vietnam

Since 90's years of last century, there were some studies on use of NOAA data for detection of hot spots. The first pilot project on use of NOAA data on hot spots detection for forest fire management conducted in FPD, MARD since 2002.

However, the accuracy and effectiveness of this pilot project has been not good enough to fit with the forest fire monitoring and management in practice.

The first MODIS satellite receiving station was established at VAST in 2001 and up to now it is only once MODIS receiving station in Vietnam.

In last few years, there are some researches on use of MODIS data for hot spots detection in Vietnam. However, up to now, there is no application of MODIS data in practice for detection of hot spots and forest fire control yet.

Some Limitations on Use of Remote Sensing Data in Practice for Forest Fires Control

- The MODIS data is not available at responsible institutions on forest fire management yet.
- Lack of experts on application of RS data for forest fire detection, forecast and warning.
- The number of hot spots detected by RS data is often over estimated. The test of hot spots at sites of forest fire is not convenience and expensive.
- Mostly the forest fires in Vietnam are at small size while the space and frequency resolution of NOAA and MODIS data are not so high.
- Hot spots detection by RS data is available at international centers. However, mostly are only for the Southern Vietnam.
- The combination of RS with climate and meteorological data is not good enough.

Plan for use of MODIS data for Monitoring of Forest Dynamic and Forest Fire Control

- MARD is planned to setup the MODIS Satellite Receiving Station in this year 2007
- Enhancement of capabilities on use of MODIS data for forest fire management;. Training on use of MODIS data for forest fire detection and management.
- Establishing of policy guidelines for use of RS data for forest fire management, including the strengthening of media warning to the community in relation to forest fires.
- Building of related database and maps for forest fire management; combination of MODIS with other remote sensing data, including with Meteorological Geostationary Satellite Data (like MTSAT-1R) for forest fire monitoring.
- Combination of Forest Fire Management and Control with the Forest Dynamic Monitoring and Management

Some Request for Forest Fire Management

- Longer record as possible for NDVI covered whole Vietnam, including from NOAA and MODIS data
- Assimilation of NDVI from MODIS data with these from NOAA while the MODIS data is new and its record is still very short
- Automatic receive of forest fire information and products from regional or international organizations in near real time via Internet communication for whole Vietnam
- Early detection of hot spot with small size
- Reduce over-estimation of hot spots by RS data

- Training on use and analysis of MODIS data. Guide for use of MODIS data for hot spots detection and forest fire management
- Estimation of forest fire smoke by MODIS data
- Receive of RS Rainfall Product at near real time
- Classification of major land cover types by MODIS and other RS data for monitoring of Forest Dynamic and Forest Fire Management
- Monitoring the land use, land cover types of target region in every 5 years using MODIS data
- Intensity
- Damage estimation
- Forevast
- Workshop for VIP
- Digital forma of product
- El nino, La Nina ENSO

REFERENCES

- Hien H. M. 2004. *Primary Study on En Nino and Forest Fires in Vietnam*. Report of Disaster Management Center, MARD.
- Hung P. N., Truong N. V. and Pho N. V. 2000. *Forest Fire Disaster Study in Vietnam*. UNDP Project VIE/97/002 DMU, Vietnam. Support to Disaster Management System in Vietnam.
- Hung, P. N. 2001. *Assessment of the Forest Fire Situation (1998-2000) and Community Based Forest Fire Management for Biodiversity Conservation in Vietnam* in Proceedings of Workshop on Minimizing the Impact of Forest Fire on Biodiversity in ASEAN, Brunei Darussalam. 22-23 March 2001. pp. 117-120.
- Quang N. H. 2005. *Forest fire prevention and fighting in Vietnam*. Report of Forest Protection Department, Ministry of Agriculture and Rural Development (by personal communication).
- Quang N. H. 2005. *Information Technology Application in Forest Fire Control in Vietnam.* Forest Protection Department, Ministry of Agriculture and Rural Development (by personal communication).
- Pham, N.G. 1999. *Community-based forest fire management for biodiversity conservation in Vietnam*. Paper presented at the Proceedings of First International Workshop on National Guidelines on the Protection of Forests against Fire, March 1999, Bogor, Indonesia.
- Shields B. J., Smith R. W. and D. Ganz D. March 2006. *"Report on fires in the ASEAN Region"*. Forest Resources, Development Service, Forest Resources Division, Forestry Department, Working Paper FM/10/E, FAO, Rome, Italy.

THANK YOU