



*Strengthening local capacity
in the economic analysis
of environmental issues*

The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries (i.e., Cambodia, China, Indonesia, Lao PDR, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, and Vietnam.) It aims to strengthen local capacity for the economic analysis of environmental issues so that researchers can provide sound advice to policy makers.

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How Much is Storm-Warning Information Worth? A Choice Modelling Study from Vietnam

Vietnam is a country that is badly affected by storms, which kill and injure many hundreds of people each year. This problem is very likely to get worse due to the impact of climate change.

As a result, the Vietnamese government is currently taking steps to improve the country's storm defenses. However, this work will cost a lot of money and will require funding from international donors. To provide a justification for this investment, a new EEPSEA study has assessed the value of improvements in Vietnam's storm warning systems.

The study is the work of a team led by Nguyen Cong Thanh from the National Economics University, Hanoi, Vietnam. It finds that Vietnamese households are willing to pay 0.024% of their income for the improvement of the early warning services they receive. It also finds that the maximum benefit of improving these services is worth up to VND 3,771 billion (~USD 181 million). The study recommends using these findings in the cost-benefit analysis of the government's storm warning improvement programs, and suggests that this will assist in international negotiations for storm-preparedness funding.



A summary of EEPSEA Research Report No. 2016-RR9:
"Estimating the Benefits of an Improved Storm Early Warning Service in Vietnam:
An Application of Choice Modelling," by Nguyen Cong Thanh.
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Vietnam’s storm challenge

Vietnam’s coastal areas are affected by an average of seven storms each year, with about 30% of these storms classified as either strong or very strong. Each year, over 820 people in the country are killed, injured, or declared missing due to storms; this makes Vietnam one of the top 20 countries in the world in terms of the storm risk its residents face. In recent years, due to the impact of global warming, stronger storms have hit Vietnam more frequently, and the fatalities caused by storms have accordingly increased. The pattern of storms affecting the country has also changed.

In Vietnam, the major source of meteorological services is the National Hydro-Meteorological Service (NHMS). Storm warnings are provided for free and are the primary sources of storm information for the public, particularly in rural coastal areas. Storm warnings are often given 24–48 hours ahead of the expected occurrence of a storm. There are several ways by which the public can access the storm warnings, with television and radio being the primary channels. Sirens, fixed and portable loudspeakers, and door-to-door visits are also used.

However, it is acknowledged that Vietnam’s storm monitoring network is not capable of dealing with the increased storm threat that the country will face in the coming years. The network only has a small number of stations, most of which are not fully automated. It also provides meteorological data that has low geographic and temporal coverage.

The need for benefit information

Recognizing the challenges that the country faces, the Government of Vietnam plans to improve its forecasting capacity. Under the

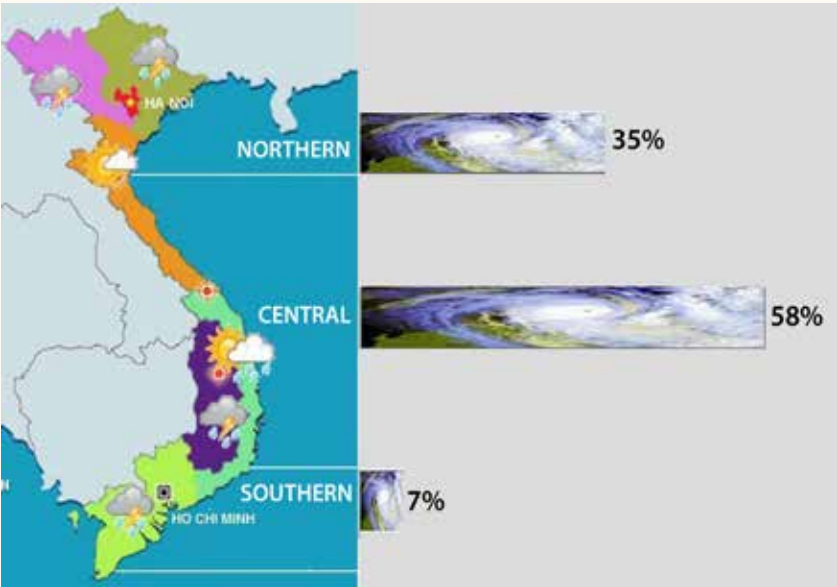


Figure 1. Frequency of storms affecting three mains regions of Vietnam, 1961–2009

Source: MONRE

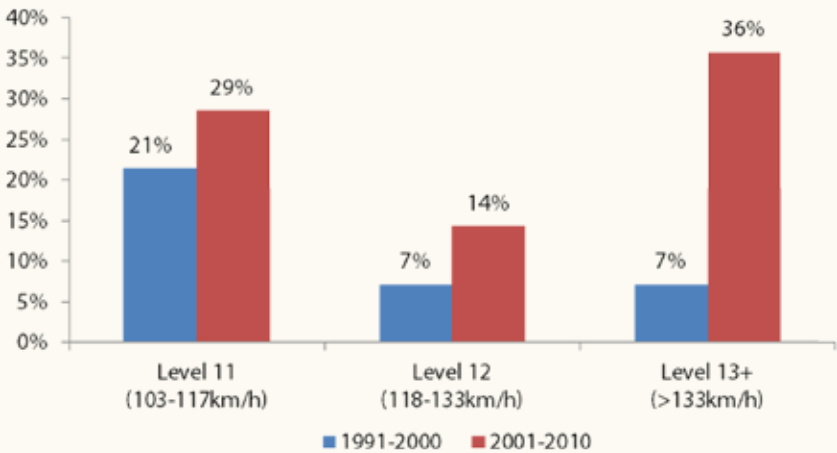


Figure 2. Increases in the frequency of intense storms in Vietnam

Source: MONRE

Strategy for Development of Hydro-meteorological Service, which was ratified in June 2010, several important programs to improve the capacity of NHMS have been developed. These programs aim to modernize forecasting technologies and hydro-meteorological services, improve training, and develop market-oriented hydro-meteorology information services.

However, these improvement programs require a substantial

investment, with total costs likely to exceed VND 3,456 billion (~USD 167 million). This is 17 times higher than the annual government budget currently allocated to NHMS. This means that the Government of Vietnam will have to find additional sources of financing, such as international funding, for the planned improvements. Thus, it is vital to provide formal economic justification for the necessary expenditure to potential donors.

Valuing improvements in storm warnings

To help provide this much needed information, the research team set out to provide information on the value of improvements to the country’s storm warning systems. Based on a literature review and several focus studies, the Choice Modelling (CM) approach was chosen as the best way to carry out this assessment. This is the first time that this approach has been used for meteorological valuation in a developing country.

In the CM survey, individuals were asked to consider a series of choice sets. These choice sets described key attributes of storm warning information: (1) the accuracy of storm forecasts (in terms of the time and location at which a storm would hit land), (2) the number of storm updates provided each day, and (3) the availability of a mobile phone short message warning (this service is currently not available).

Each choice set described a certain level of improvement (over the current situation) for each of these attributes (different improvement levels were randomly combined to give a wide variety of choice-set combinations). Each respondent was given a block of six randomly chosen choice sets to look at. In each these choice sets, the respondents were asked to indicate their preference between two alternatives: the potential improvement program and the status quo.

The design of the choice sets

The choice of attributes presented in this study was based on previous CM studies, discussions with Vietnamese policy makers, a focus group study, and an internet survey (which was used to collect the people’s opinions about what attributes of a storm warning system they are most interested in).

With respect to attribute levels, one of three improvement levels (Levels 1, 2, and 3) was offered for the attribute relating to the accuracy of storm forecasts (full details were given to explain what the different levels of improvements would mean in practice). For the number of updates per day, three performance levels were offered: 8, 12, or 16 updates per day (eight updates a day are currently provided). Mobile phone short message warnings were either available or not available.

To estimate people’s willingness to pay (WTP) for improvements in Vietnam’s storm warning system, a cost was attached to each choice set. The cost levels were VND 50,000, 150,000, or 250,000. A one-off coercive payment through a household’s electricity bill was selected as the way in which this cost would be paid.

The survey process and location

Before the main survey, a pilot survey with 170 respondents was implemented in July 2011. The primary objective of the pilot study was to test the contents and logistics of the survey process. In August and September 2011, face-to-face surveys were conducted in four sites: Do Son district (Hai Phong province), Vinh Quang commune (Hai Phong province), Son Tra district (Da Nang City), and Tam Tien commune (Quang Nam province). A total of 1,014 respondents took part in the main survey.

The survey sites included both urban and rural coastal areas in the Northern Region (Hai Phong province) and Central Region (Quang Nam, Da Nang provinces) of Vietnam. All of these sites had been recently affected by storms. In July 2010, Hai Phong was affected by Storm Conson. In September 2009, Quang Nam and Da Nang were devastated by Storm Ketsana.

The respondents who took part in the survey therefore had recent memories of storms and of the use of storm early warning services.

The main part of the survey involved the choice-set experiment. A questionnaire was also used to collect information on how the respondents had received storm warnings and the use they had made of this information. People were also asked about their perceptions of current storm warning services and about the storm risk they felt they faced.

Respondents were also provided with information about the importance of the storm early warning service in helping the country adapt to climate change. Using show cards, interviewers introduced the respondents to scenarios for improving early warning services and to information about budget constraints. Before they took part in the choice set experiment, the respondents were presented with three examples of choice sets. This was done to familiarize them with the experiment process.

WTP for storm warning improvements

Three types of econometric models (i.e., conditinal logit models, mixed logit models, and latent class models) were used to estimate respondents’ total WTP for improvement programs in the early warning service for storm in Vietnam. The total WTP estimates for the two improvement programs were as follows:

- + Medium improvement: accuracy improvement Level 2, update frequency of 12 times and mobile phone short message warning
- + Maximum improvement: accuracy improvement Level 3, update frequency of 16 times and mobile phone short message warning

Table. Total WTP estimates (in '000 VND)

Program	Full Sample	Certainty Sample
Medium improvement	113.5700*** (5.6990)	99.7038*** (6.7196)
Maximum improvement	165.1610*** (6.9513)	147.7590*** (8.0823)

Notes: (1) Certainty sample includes respondents who were very certain about their willingness to pay. (2) Standard errors (based on the Krinsky-Robb simulation using 1,000 draws) are in parentheses. (3) *** refers to values that are significant at 1% level.

The total WTP for a medium-improvement program was estimated at about VND 100,000–110,000 (~USD 4.8–5.3) per household. The results showed that a Vietnamese household is willing to pay 0.024% of their income for improvements in the storm early warning service.

According to the 2009 Vietnam Population and Housing Census, Vietnam has 22,444,322 households. The total WTP of all of the people in Vietnam was therefore estimated at approximately VND 2,350 billion. The maximum benefit of improving early warning service for storm in Vietnam was estimated to be about VND 3,322–3,771 billion (~USD 160–181 million).

On June 25, 2010, the Prime Minister of Vietnam approved a program called *Modernize Forecasting Technologies and Monitoring Systems for Hydro-Meteorological Services in 2010–2012*. This has a total cost of VND 1,391 billion.

It can therefore be argued that people in Vietnam think that this level of expenditure for the improvement of storm-warning systems is justified.

How should warning systems be improved?

Not surprisingly, respondents preferred more accurate storm warning information. They also wanted to have more frequent updates on storm information and to have access to a mobile phone short message warning. They also asked for all these improvements to be provided at as cheap a cost as possible.

The respondents' WTP for storm warnings of Accuracy Level 3 were generally higher than their WTP for warnings of Accuracy Level 2 and mobile phone short message warning. This means that people would prefer an improvement of warnings to Accuracy Level 3, rather than the improvement of warnings to Accuracy Level 2 and the provision of mobile phone short message warning.

Helping to secure foreign funding

Improving storm early warning service will be one of the key measures to help Vietnamese people, especially the poor, to adapt to the more severe environmental risks that climate change will bring.

However, as stated above, if all the country's planned improvement programs for storm forecasting and warning services are to be implemented, then the Government of Vietnam will have to source additional financial investment, such as international funding. This is a challenge as the funds available are limited, particularly given the size and scope of the challenge.

The study therefore recommends using the findings of the research about the value of improved warning services for storms in the cost-benefit analysis of the government's programs. This will help in international negotiations for the funding of the proposed measures, and should speed the delivery of these much needed improvements.

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