

Assessing Household Resilience to Climate Change Impacts in Ha Tinh, Vietnam

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Abstract: *This study investigates the adaptability of households in Ha Tinh, Vietnam, a region heavily impacted by climate change and natural disasters. The research employs in-depth interviews and questionnaires to collect data on the socio-economic status of households, their access to social services, and the role of local government in enhancing resilience. The findings reveal that while the frequency and intensity of natural disasters are increasing, the response level of households is relatively high in certain areas such as access to social services and support from local government. However, challenges remain in areas like livelihood diversity and housing stability. The study concludes with recommendations for enhancing resilience and reducing vulnerability to climate change and natural disasters.*

Keywords: adaptability, climate change, natural disasters, households

1. Rationale

Vietnam, as assessed by international organizations, is one of the 10 countries that will be most affected by climate change. Natural disasters such as storms, floods, inundations, droughts, and saltwater intrusion occur more and more fiercely, seriously affecting people's life, production, livelihood, and the natural environment. Due to its geographical and topographical characteristics, Ha Tinh is often affected by natural disasters and climate change. In recent decades, Ha Tinh has been greatly affected by extreme weather phenomena such as storms, hot dry westerly winds, droughts, heavy rains causing floods, inundations and flash floods... Natural disasters have adversely affected water quality, reduced water resources of rivers, caused saltwater intrusion in some estuaries and coastal areas, and at the same time, heavy rain combined with high temperature have increased the risk of landslides and put great pressure on reservoirs. Local people often suffer heavy consequences due to natural disasters, especially hurricanes and floods with the highest frequency and intensity in Vietnam. [5]

The assessment of a community's capacity to cope with, or resilience to, natural disasters and climate change plays an important role in disaster risk management and is an important component of climate change vulnerability assessment. [4] To assess the adaptability to natural disaster risk at the household level, a survey limited to 360 households in frequently disaster-affected areas in Ha Tinh was conducted. The results of this study are the premise for proposing implementation of socio-economic development projects integrating measures to adapt to climate change in the locality.

2. Study location and methodology

Ha Tinh is a small province located along the North Central Coast, with a total area of 6026 km², bordering Nghe An to the North, Quang Binh to the South, Lao People's Democratic Republic to the West, and East Sea to the East. Various climate change scenarios and models for Ha Tinh have all shown that Ha Tinh will be severely affected with a high rate of land loss, especially in coastal districts and communes. [2]. The impact of this climate change have seriously affected and caused difficulties for many sectors and fields of Ha Tinh, especially agriculture, industry - construction and tourism, and the local community.

Based on the secondary data source, reports were collected during the period from 2010 to 2020 and the primary data were obtained through 360 sociological questionnaires on the adaptability of households in Ha Tinh. The main content of the semi-structured questionnaire is to find out how the lives of people in the households are relative to their adaptability to climate change and natural disasters. The main information includes: main information of the households, household economy, awareness of natural disasters and climate change, etc. Finally, some aspirations and suggestions of the people are understood through a number of open-ended questions.

Respondents are households located in areas at risk of natural disasters, identified through statistics of authorities. Using SPSS software [7] to process survey data, we get the following results:

3. Study results and discussion

3.1 Climate change in Ha Tinh

In recent years, the manifestation of climate change in Ha Tinh province has become more and more obvious and easy

to recognize, first of all, in the increasing temperature and the unusual increase of extreme weather phenomena. Over the past 50 years (1971 - 2020), the average temperature in Ha Tinh has increased over time and quite evenly across the province. Through calculations based on the data, the average increase of the average temperature of the areas in the province is 0.2 - 0.4°C/decade.[3]

Rainfall distribution in Ha Tinh province also has significant changes. Although the total rainfall does not change much over the years, the rain usually concentrates in a short period and mainly in the rainy season. In October 2020, the most severe flood caused inundation for Ha Tinh city and the downstream districts of Ke Go lake. During this period, the rain in Ha Tinh City has set four consecutive records that have never happened in the past 60 years: The highest rainfall in 24 hours (872mm), the highest rainfall in a continuous period (1100mm in 53 hours 25 minutes), the highest rainfall in a single rain(1384mm), and October 2020 is the month with the highest total monthly rainfall ever (In October 2020, the rainfall in Ha Tinh city is 2387mm, 339mm higher than the historical highest monthly rainfall in October 1983 - The historical rainfall in October 1983 is 2048mm). [3]

Climate change has caused natural disasters in Ha Tinh province to increase abnormally and develop complicatedly, continuously setting new records. In October 2010, historical double floods inundated 183/262 communes, killing 50 people, injuring 175 people, and causing thousands of houses to be deeply inundated and damaged. Next, in 2013, 2016, and 2020, consecutive big floods occurred, causing loss of life, and seriously affecting production and economic infrastructure.[1]

In addition to storms and floods that cause serious damage to people's lives and properties, various types of natural disasters such as extreme heat, extreme cold, harmful cold, drought, etc. have also increased, causing significant impacts on socio-economic development, which can be mentioned as heat waves lasting for days, the number of heat waves reaching the level of intense heat, and especially numerous intense and continuous heats. Typically, the intense heat wave lasted for 40 days in 2015 (from May 13 to June 21), with most areas in the province having a common absolute maximum temperature of 40.5 - 42.0°C exceeding the historical value, especially in Huong Khe district reaching 42.1°C. In 2019, the heat was unusually hot, and the intensity of the heat in Huong Khe exceeded the historical value with the highest temperature of 43.4°C. The year 2020 has a record number of hot days with almost no rain. The heat lasted for 62 days continuously (from May 31 to July 31), 51 days (from May 31 to July 20), and 43 - 48 days in Huong Khe, Ha Tinh city, and other areas, respectively. [3]

Although the number of days of extreme cold and harmful cold is less than before, the anomalies and historical values re-appear, e.g. the cold air wave dated January 23, 2016 causing a large-scale harmful cold (4 days); The lowest daily temperature in areas of the province is 5.0 - 6.0°C. In Ha Tinh city and Ky Anh, this is a record cold wave when the temperature drops to the lowest in the past 53 years.

The anomalies of the weather continuously occur irregularly with new records, causing very serious damage, not only adversely affecting people and ecosystems in the immediate period but also having long-term and increasingly serious effects.

3.2 Adaptability of households

Household information

The survey results show that respondents in each household are mainly householders, with some respondents being the eldest children in the households. The majority of respondents are male aged 44–50 years old, which is quite an ideal age for experienced people. On average, a household in Ha Tinh has 5 members, including 2 men and 2-3 women. The maximum number of dependents in each household (<=5 years old and >=75 years old) is 3 people. These are the target groups that are vulnerable to natural disasters [9], so they have low adaptability. On average, each household has 1 person with a high school education or higher. In which, the number of households having more than 2 members with a high school education or higher accounts for 25.2%.

Among the total number of the surveyed households, the percentage of poor and near-poor households (according to the State's classification standards) accounts for 1/5. The higher the number of poor households, the lower the adaptability.

The majority of households confirmed that their family had only one livelihood activity generating income for the family (66.6% of households). 27.7% of respondents said that their family had 02 income-generating activities. The number of opinions identifying that there are 3-4 income-generating economic activities accounts for a small proportion (5.7%). Adaptable households are those that have diversified livelihoods thanks to the role of livelihoods in income generation, living improvement, disaster prevention and climate change adaptation.

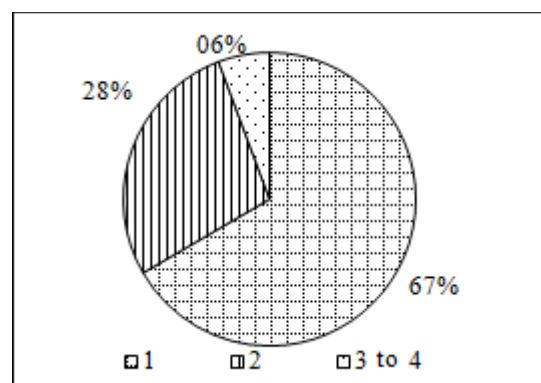


Figure 1: Livelihood diversity of households (number of livelihoods of households)

The survey results show that more than 72.73% of households consider livelihoods to play a very important role in improving adaptability to climate change. This is consistent with the fact that livelihoods play an important role in generating income and improving living standards for the households.

The survey of the swimming ability of the household members (who can swim at least 8-10 meters by themselves) shows that most husbands and elder children can swim. The wives and young children are less able to swim.

People's awareness about natural disasters and climate change

+ Common types of natural disasters in the study area: according to the survey results: Because the respondents have 1-2 options, the results include: Floods (70%), Storms (50%), and Droughts (50%).

+ Type of natural disaster that causes the most damage to the households in the past 5 years: 80%, 13%, and 7% of the respondents said that floods, storms, and droughts were the types of natural disaster causing the most damage to their families and localities, respectively.

+ Degree of change of natural disasters: 80% of households said that natural disasters have increased in the past 10 years, 15% said that natural disasters have not changed, and 5% answered that they did not know.

The majority of households believe that the number and intensity of natural disasters (storms, floods, and droughts) are increasing. Therefore, the technical solutions that the households are taking to prevent natural disasters are very diverse, of which the main solutions including bracing the houses during storms and floods, and preparing food and potable water are implemented by many households.

+ Organization of training and propaganda on natural disaster prevention:

The survey results show that 100% of the surveyed households said that every year the local government propagated to the people about natural disaster prevention. However, training on natural disaster prevention is limited, and only a part of the population has been trained (20% of the surveyed households).

The study results show that less than 7% of households do not participate in any social organizations. The Women's Union has the largest number of participating households, followed by other associations such as Farmers' Union, Youth Union, Elderly Association, etc. The households' high participation in social organizations shows good social communication, quick access to information on climate change and natural disasters, corresponding to higher adaptability to climate change and disaster reduction. In addition, through the communes' loudspeaker systems and the households' radios and televisions, 100% of the surveyed households said that they regularly receive information about weather forecasts and dangerous weather warnings from local government and other authorities. This proves that the sharing of information on disaster prevention and climate change adaptation in the locality is quite well done.

Information on household preparation

The items prepared for natural disaster response ranked high as phone, boat, flashlight, water storage item, (Table 1). This

is consistent with the local practice of flooding in the rainy season. Life jacket and first aid cabinet located at the bottom of the table are also commensurate with local people's ability to swim or because they do not have enough conditions to procure. Surprisingly, all households confirmed that there was no storm shelter at home, even though the average frequency of storms hitting Ha Tinh is 3-4 times/year.

Table 1: Items prepared by households for natural disaster response

Items	Households (%)	Ranked from highest to lowest
Boat	24	(1) Phone
Storm shelter	0	(2) Flashlight
Ladder	20	(3) Water storage item
Rope	16	(4) Boat
Phone	96	(5) Ladder
Flashlight	70	(6) Other items
Life jacket	5	(7) Rope
Water storage item	54	(8) First aid cabinet
First aid cabinet	14	(9) Life jacket
Other items	22	(10) Storm shelter

+ Food preparation:

When receiving a disaster warning, about 60% of households fully prepare food and necessities for daily living. 30% of households prepare 80%, and 10% of households prepare poorly or do not prepare. 10% of these households often fall into the poor, disadvantaged, lonely families and also the households with low adaptability and vulnerability to natural disasters.

+ Housing: The number of households with level 4 houses accounts for a large number (60.4%), the number of temporary houses accounts for a relatively high proportion (19.5%). The number of permanent and semi-permanent houses accounts for 1/4 of the total surveyed households.

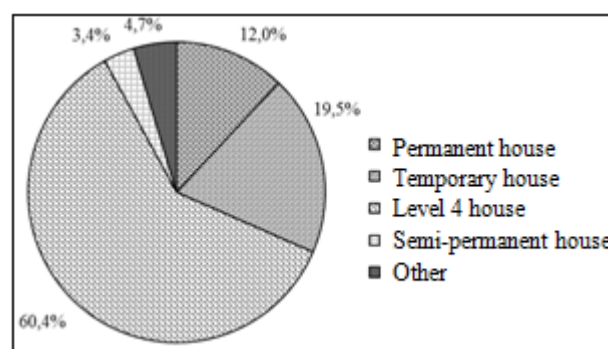


Figure 2: Structure of households' houses

The number of level 4 houses is quite large because most of the people live in rural areas, with difficult economic conditions. Only a few households can afford to repair and build permanent houses. Households' susceptibility to natural disasters and climate change is directly dependent on the structure, number of floors, and the degree of stability of the houses [8]. Households living in temporary and semi-permanent houses will have low resilience and thus be vulnerable to natural disasters.

+ Regarding arable land: Most of the surveyed households in Ha Tinh (95%) answered that they do not lack arable land. A

few, due to the need to expand production or change the agricultural economic model, have a higher demand for arable land.

Information about accessibility to social services

All households (100%) have access to local agricultural, forestry and fishery extension services (guidance on production development, veterinary services, supply of plant varieties, livestock breeds, etc.).

In particular, the level of meeting the water demand, the level of satisfaction with the quality of the water source, the stability of the power source, and the convenience of going to school were all rated at or above by the majority of the surveyed households.

In addition, good medical facilities and services have greatly increased the households' accessibility to social services. 95% of the respondents said that when there was a natural disaster, the local public health service provided good support to the people. Only 5% said that they were not supported or received little support, which may be resulted from difficult travel conditions due to natural disasters.

However, according to the survey results, the number of households which do not participate in any type of insurance accounts for 36%, that increasing the risk when encountering natural disasters. These are also the households with difficult economic conditions and limited adaptability.

+ Access to production capital

All the surveyed households in Ha Tinh said they had at least one source of investment capital for production. In addition to their own capital, the households borrow from relatives, banks for social policies (12-13% each) and other sources. Only very few households (2.6% of total households) said that they were using loans from commercial banks. 6.9% of households do not have loans. In general, the households use quite diverse sources of capital, but still mainly rely on their own capital.

Information about local government infrastructure and support

+ Current status of the natural disaster prevention and control system (dykes, dams, community houses...) in the locality: 88% of the households believe that the natural disaster prevention and control system (dykes, dams, community houses...) in the locality is operating normally and even well when a disaster occurs. Only 7% think that the system is operating relatively well and 5% think that the system is not secure or does not work.

+ Communication system when natural disasters occur in the locality:

For the question How does the local communication system work when natural disasters occur?, 95% of the households answered that the communication system worked very well or normally. Only 5% said that the measuring system was paralyzed or malfunctioning due to the effects of weather conditions.

+ Traffic system when natural disasters occur in the locality:

40% of the households said that traffic system was still operating well during the rainy season. This is the number of households in the highlands, with little or no inundation. 40% of the households said that natural disasters have made travel difficult, and 20% said that traffic has been completely paralyzed (due to inundation).

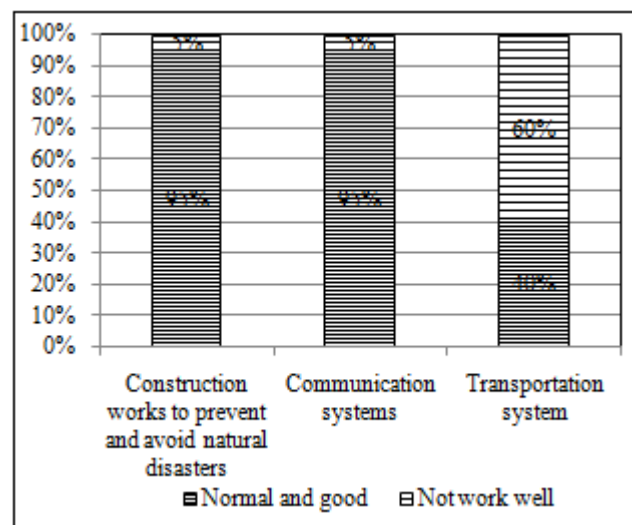


Figure 3: Assessment of the current state of some local infrastructure

+ Support from local government

With the question about the support of the local government before and during the natural disaster, the survey results show that nearly 14.7% of the respondents said that their family was relocated to a safer place. The number of households having their houses and structures reinforced is 16.4%. 37.9% of the households said that they received food support, and 31% did not need any support (due to better resilience).

After the natural disasters, the measures taken by the local government to overcome the consequences are food relief (38.8% of the total votes), traffic and communication remediation (19.8%), and environmental sanitation and other support (14.7% of the total votes).

+ Roles of the local people and the local government in reducing vulnerability due to natural disasters and climate change

Regarding the roles of the local people and the local government in disaster risk reduction, who plays the most important role: 65% of the respondents affirmed the important role of the government, only 35% said that the people played an important role in the local disaster risk reduction. This shows the need for interaction and coordination between the local people and the local government in disaster response.

+ Priorities to reduce vulnerability to natural disasters: 55% chose to prioritize raising awareness and experience in responding to natural disasters, and 45% chose to prioritize family economic development.

+ Priorities to overcome the damage caused by natural disasters in the locality:

40% of the respondents said that improving people's disaster prevention capacity was the top priority. 30% of the respondents said that the Construction of many disaster prevention works (reservoirs, embankments, pumping stations, community houses...) should be given priority. 20% of the opinions chose the relocation of people out of disaster areas, land use planning, etc. The remaining 10% said that priority should be given to changing production methods (plant varieties, livestock breeds, etc.) to adapt to natural disasters.

4. Conclusions

The results of the survey and analysis show that natural disasters and climate change in Ha Tinh tend to grow and increasingly affect people's lives and production. The majority of the local community is updated and informed about natural disasters and climate change. This helps them to be more proactive in preparing items, supplies and food to respond to natural disasters. In particular, the adaptability of the local community is also enhanced thanks to the support of the local government as well as the relatively good local infrastructure conditions. However, a number of indicators on housing, livelihood diversity, and insurance coverage are still low.

Based on the socio-economic characteristics, the situation of natural disasters, climate change, and the adaptability of the households, managers and policy makers should come up with long-term sustainable and adaptive measures to improve the adaptability to climate change such as: Orient the diversification and sustainable development of livelihoods to increase people's incomes; Promote the support of local people to participate in various types of insurance to improve their health and respond to climate change and natural disasters; Complete and consolidate infrastructure and equipment for disaster prevention and control (construction of dikes, drainage systems, water reservoirs, and storm and flood protection works).

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