

Impacts of climate change on the livelihood of coastal urban-dwellers in Vietnam Case study of Haiphong city*

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1. The description of the research: background, research question, conceptual framework, methodology

Climate change has been directly affecting the livelihood of millions of people around the world. Vietnam is among five countries in the world that are believed to suffer most from climate change. In Vietnam, the Red River Delta and Mekong Delta are the areas affected most by climate change (Dasgupta et al, 2007). Specifically, average sea level in Vietnam has increased from 1.75 mm to 2.56 mm per year (Hanh and Furukawa, 2007). Because of the fact that most big cities of Vietnam are located in coastal plains, rising sea level, storms and floods are the biggest threats (Vietnam Institute of Meteorology, Hydrology and Environment, 2011). However, in the climate change condition, coastal cities will be often impacted by the rising sea level. Those impacts include land use, population and traffic of city in particular and the development of whole coastal urban areas in general (Nguyen KyPhung et al, 2009 and 2011). In cities and provinces of Vietnam, the coastal city of Hai Phong which is located at the Red River Delta of the country are among urban areas affected most by climate change. Similar to other big coastal cities, the rising sea levels, tropical storms and floods are also the main challenges that this city is facing in order to maintain and develop its economic activities. Besides, The level of urbanization in Haiphong has been extremely fast not only urban area but also some out-skirt districts. Urbanization process will effect on climate change and sustainable livelihoods. That the reason why I have chosen Hai Phong as a my fieldwork in this thesis.

Available scholarly works on the climate change within Red River Delta region generally put an effort on the macro level, discussing the issues, needs, problems and challenges and measures to address climate change and then

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presenting them to governments, international agencies and other parties. The strength of these works is that the issues of climate change are approached from a broader perspective with various sources of statistics, surveys and documents which are useful to characterize patterns, change trends, and related policies of intra-region climate change. There is however, a big gap in understanding about the work and life of urban residents in general and specific characteristics in urban-dwellers in Hai Phong, the local response and various problems they are facing particularly.

A livelihood is a means of making a living. It encompasses people's capabilities, assets, income and activities required to secure the necessities of life. The livelihood is sustainable when it enables people to cope with and recover from shocks and stresses (such as natural disasters and economic or social upheavals) and enhances their well-being and that of future generations without undermining the natural environment or resource base (International federation of Red Cross and Red Crescent societies, 2015).

Sustainable livelihoods framework is divided into 5 resources affecting human subsistence, including Human Capital, Natural Capital, Financial Capital, Social Capital, and Physical Capital. The Haiphong city has been identified as one of the most sensitive and exposed regions to climate change and sea level rise phenomena.

Weather is more and more severe is the main reason causing the changes in ecosystems, floods and landslides during the rainy season; salinity goes deep into the land in the dry season. Salinity is an ecological factor of considerable importance, influencing the types of organisms that live in a body of water. All things are risk factors for infectious diseases, deteriorating the production of marine products, the lack of materials for processing industry, and attenuation Biodiversity leading to negative impacts on tourism development.

Based on such initial information, in this research project, I try to seek the answers for the following questions:

- What are the impacts of climate change on livelihood?
- How people are affected by environmental degradation (deteriorating environmental resources)?

In this project, I propose to approach livelihood from a grass-root level, using anthropological participant observation in order to obtain the direct information by collecting urban people's life stories, which is aimed to understand their situation from a more intensive level. The narrative inquiry will be applied in my fieldwork

with an expectation that it will help narrow down the gaps existing in macro level-approaches mentioned above. The fieldwork embraces four districts in Hai Phong those are Dai Hop commune (KienThuy district), Lap Le commune(ThuyNguyen district), Phu Long commune (Cat Hai district) and Ngoc Hai commune (Do Son district), concentrating in June and July, 2016. The process of data collection involved survey, in-depth interviews, semi-structured interviews, and focused group discussions. I will engage in participant-observation over a twelve-week period. The best way to collect primary data is through periodic personal interviews. The sample will consist of both men and women of working age those are working in agricultural sector and people who work in the fishing and aquiculture. Partly, because four districts which I choose as the my fieldwork are near the sea. Particularly, I will select these participants those have lack of the farmland because of the urbanization process or environmental degradation(the rising sea levels, tropical storms, floods or the Saltwater intrusion). These groups are the vulnerable groups and they are easily affected by climate change and urbanization. My aim is to understand the adaptability and resolving the difficulties of local residents to climate change and urbanization.

Research results

2. Overview of the research sites

Hai Phong city is located in key economic regions of the North of Vietnam, which has great potentials and advantages of marine economic development and fisheries. Sea livelihoods plays an important role in the lives of people here. However, fishing activities and other livelihood activities of inhabitants in coastal area of Hai Phong city has been facing many difficulties and challenges due to climate changes.

Hai Phong City has 7 Districts, 8 Wards, in which there are 6 districts and wards adjacent to Do Son beach, Duong Kinh, Hai An, Tien Lang, KienThuy, Thuy Nguyen and 2 island districts including Bach Long Vi and Cat Hai. Based on the extent and characteristics of impacts of climate change, there are four districts being selected as study sites, which are *Ngoc Hai Ward – Do Son District, Lap Le Commune - Thuy Nguyen District, Dai Hop Ward, KienThuy District, and Phu Long Commune - Cat Hai District.*

Do Son District is located away from center of Hai Phong City about 22 km to the southeast, which has a fleet of offshore fishing ranking third of the city. The natural area is 4237.29 hectares with 22.5 km of coast and mountainous terrain

reaching out towards the sea of 5km to northeast - southwest. Specific geographical location is that it is located on the northern of Gulf of Tonkin, which brings the District the potentials to develop tourism, services and mining, aquaculture (Do Son District People's Committee, 2013). *Ngoc Hai Ward* is the coastal ward located in the northeast of Do Son District and the easternmost city of Hai Phong. Northern side borders with Tan Thanh (Duong Kinh District). Southern side borders with Van Son Ward. Western side borders with Ward 47Ngoc Xuyen. Eastern side borders with by the Gulf of Tonkin with an area of 350 hectares with 2,160 households, 8166 people. Ngoc Hai Ward is a pure fishing ward, in which people are mainly employed in fishing, processing and logistics fisheries (Ngoc Hai Ward People's Committee, 2012).

Thuy Nguyen District is located in the north of Hai Phong city surrounded by 4 saltwater rivers (Da Bac River, Bach Dang River, Cam River and KinhThay River). The district has 35 communes and 2 towns, including 24 communes and towns that have dykes; 16 communes and towns that have fishing exploitation; In addition to a long tradition of fishing development, the district is also developing industrial and service structure which accounts for 80%, and the structure of agriculture and fisheries account for about 20% (Thuy Nguyen district People's Committee, 2013). *Lap Le Commune* is located in the southeast of Thuy Nguyen district and northern of Phuc Le Commune, Ngu Lao; Southeast side borders with Pha Le commune, Bach Dang River and Nam Trieu, western and southwestern border with Thuy Trieu Ward and Ruot Lon River. The total area is 1172.6 hectares of natural land, in which area of aquaculture is 416 ha; 3,000 households, of which over 23% of households are doing fishing exploitation. Lap Le Commune has a long tradition and the strongest development of marine fisheries with the number the number of vessels and fishermen accounted for the largest proportion (Lap Le Commune People's Committee, 2012).

KienThuy District is located in South of Hai Phong City, which has the number of fishing fleet ranked by the third of the city but in the second ranking with largest number of offshore fishing vessels. The district has 17 communes and one town. It is a pure agricultural district, with great potentials for aquaculture and fishing together with favorable conditions for fishing logistics services for the surrounding areas. The economic structure of agriculture and fisheries account for about 50% (KienThuy district People's Committee, 2013). *Dai Hop Commune* is located in the Southeastern coastal of KienThuy district, Northern to Tu Son commune, Eastern to Bang La of Do Son District, western to Doan Xa commune, and southern to Van Uc with the length of 4.2 km of coastline. Dai Hop Commune has a total of 2,644 households and 10,192 people. Dai Hop economic is mainly agriculture production and fishing exploitation. In 2008, the fishing exploitation accounted for 43.5%;

Agriculture accounted for 30.5% and the remaining is handicraft and services accounted for 26% (Dai Hop Commune People's Committee, 2012).

Cat Hai district is an island with a total of 30,700 people with an area near 345 km², including 366 islands including Cat Ba and Cat Hai. The district has the number of fishing boats ranking by the second of the city after Thuy Nguyen district, but most of them are inshore fisheries vessels. Natural conditions and advantages create opportunities for tourism development and fisheries. The livelihood of the people here are mainly based on tourism and mining, aquaculture (Cat Hai District People's Committee, 2012). *Phu Long Commune* is the commune in the area of Cat Ba Island, accounting for 15.2% of the natural area of Cat Ba Island surrounded by the sea dyke system. This is a low area compared to sea level thus it should be affected directly by the sea, especially the tide during large rainstorms. Phu Long commune has a total area of 4408.99 hectares; northern borders with QuangNinh, Eastern borders with Gia Luan and HaoHien, Southern borders with the Sea, western borders with Lach River, Cat Hai district. Farming and fishing exploitation are the main industries of the commune, which account for the largest proportion of 64.1%, agriculture accounts for 8.2% of total industrial production value, service accounts for 27.7% (Phu Long Commune People's Committee, 2012).

3. Trends of climate changes

3.1.The trend of climate change - sea level rise

The trend of climate change has been clearly shown day by day, which causes large impacts to fishing activities, marine ecosystem and fluctuations on marine resources and direct impacts to the lives of fishermen communities. Through observations at HonDau Island, in the last decade, the sea level of Hai Phong has risen more than 20cm. Some coastal areas in Hai Phong have sea water incursion, especially in the area of Phu Long, Cat Hai island, Dinh Vu, along the sea dike 1 and 2. Some estuarine areas have weak geologic, in which there is appearance of dangerous turbulence and riverbank erosion tends to increase. Some intertidal areas clearly appear the rising sea and tidal fluctuations.

3.2.Salinization

Sea level rise makes annual lowland areas suffer from heavy flooding during the rainy season and drought and salinization in the dry season. At the same time there is an increase in flooding areas, which makes it very difficult for drainage,

increase coastal erosion and salt water intrusion, as well as causes great risk for coastal constructions such as sea dykes, roads, ports, factories, cities and residential areas along the coast.

Notably, all four study sites were strongly salinized such as Thuy Nguyen District, KienThuy that has not enough water for agricultural production and in many other coastal areas such as Do Son, Cat Hai all of which have phenomenon of beach erosion. Currently the salinization was flooded to upstream of the estuary, away from the coast of Hai Phong to 45km and salinity constantly increases over the years.

In addition to increasing demand for water for agriculture and domestic use in daily life, the coastal area of the city also faces pressure of the salinity, especially for the aquifer and the coastal estuaries. According to monitoring data of water quality, the coastal areas are increasingly salty, which significantly reduces the volume of water and many places must get water from other places. The rivers in the study areas are all showing signs of infection.

3.3.Extreme weather events

The temperature rises, flow regime, salinity and rainfall changes have directly affected to the formation and development of resources, structure and quality of food for marine species. Hai Phong is also home to the high frequency of storms and tropical depressions with annual average of 2 to 3 storm with direct impacts. Defense system, warning and rescue of Haiphong are limiting, which is only the emergency notice on the storm situation for the fishing boats and establishment of some storm shelters but not have enough necessary technical means to be able to salvage and rescue quickly and timely in the seas.

According to the recent interview of people who live in the study area, most of them said that from the past 5 years to now, the extreme weather events happen more than before. Typhoon season started early and ended later than usual. Although the number of storms during the year has not changed, the intensity of storms is much bigger, including hurricanes, tornadoes causing major damages to the lives of people in the city like the tornadoes in An Lu (Thuy Nguyen), hurricane in Hai Yen (2013), hurricane in Rammasun (2014). Especially, after the storm No. 3 of 2014, in Do Son beach there was an anomalous phenomenon, in which the sea level rose after the storm and lasted for 12 hours with wave height than 1 m.

4. Possibility of vulnerability of coastal livelihoods of people living in coastal areas of Hai Phong beach due to the impact of climate change

4.1. Possibility of vulnerability of livelihoods in fisheries and aquaculture

According to the results of qualitative interviews, fisheries and aquaculture are important livelihood activities of many families in the coastal areas. Due to the high cost of investment in boats and fishing equipment, inshore fishing activities are more than offshore fishing activities. However, there is a number of household who take loan to invest offshore fishing because coastal fisheries resources are declined. Offshore exploitation is often undertaken by men while women often caught near the river, near shore and participates in procurement and seafood processing practices.

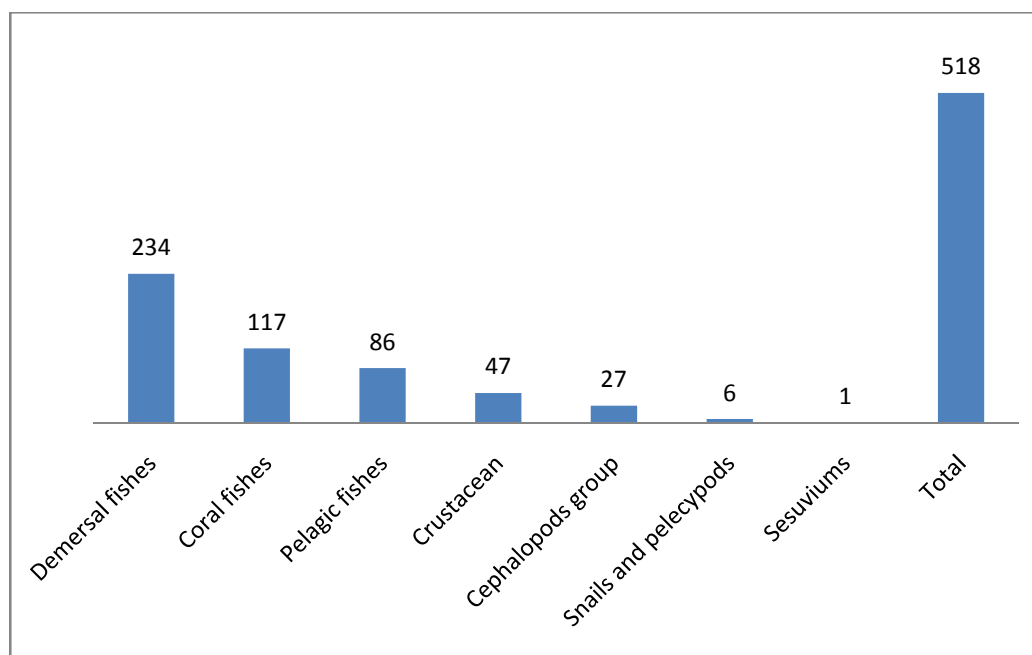
Marine resources in Hai Phong marine have characteristics of marine resource of northern regions, which is one of the areas with high biological diversity. Recent studies have listed 124 species of marine fish belonging to 89 varieties of in 56 families, all of which are distributed in around the island of Cat Ba (Bui Dinh Chung, 1999). The families that have the greatest varieties are Khe fish with 9 species; Liet fish with 8 species; they croaker were caught 7 species; Labridae fish caught with 6 species and Bong fish with 5 species. There are 15 families that have between 2 and 4 species. In 2003 and 2004, Do Van Khuong and his colleagues surveyed the marine species in the water around the island of Cat Ba and identified 215 species and marine groups belonging to 72 different families, in which there are 173 species of fish, 26 species of crustaceans, 14 species of mollusks and 2 species of sea crabs. Reef fish predominates with 79 species belonging to 58 varieties in 37 different families of fish (Do Van Khuong et al., 2005). The most popular marine fish are Giant trevally, Threadfin bream, Drums, Saurida, Goby, Snapper, Goatfish, and Sardinella. There are also high economic value s species such as prawns, cuttlefish, squid and crabs. From 2001 to 2005, the project of Vietnam living marine resources assessment has carried out 4 surveys of marine resources in the waters of the Gulf of Tonkin. The surveyed area covers most of Hai Phong sea and the bottom trawl has been used (Dang Van Thi et al., 2005). The survey has identified 518 species / species groups of major ecological groups and different species groups (Table 1).

Table 1. *Marine resources of the Gulf of Tonkin*

TT	Fish groups	Number of species
1	Demersal fish	234
2	Reef fish	117
3	Pelagic	86

4	Crustacea	47
5	Cephalopoda	27
6	Snails and bivalve	6
7	Xiphosuridae	1
	Total	518

Graph 1: Seafood sources in Gulf of Tonkin (number of species)



Source: Dang Van Thi and Colleagues (2005)

As stated by Pham Thuoc (2005), the Gulf of Tonkin has 28 species of shrimps. The Penaeidae has the greatest species a high percentage of catches. Since the fishing grounds of Hai Phong are located primarily in the Gulf of Tonkin so it could be based on the resource reserves of the Gulf of Tonkin to build and develop plans for the marine industry for Hai Phong and also strategies to support fishermen. According to a study by Nguyen Van Khang et al. (2011), the total reserve of marine resources in the Gulf of Tonkin is 586,370 tons, which is 161,280 tons on coastal, 205,756 tons on demersal and 219,334 tons offshore. The catching capabilities of the entire the Gulf of Tonkin is 249.836 tons. Thus, with the advantage of marine resources, coastal fishermen in Hai Phong has enjoyed an abundance of natural resources, which creates many attractive opportunities for their livelihoods. However, due to the negative impacts on the environment, which makes the resources, especially coastal resources, become dwindling and exhausting. Responding to increasingly depleting resources, many fishermen who have large capacity ships are forced to either lie ship on shore or return to inshore

For farming activities, since it must ensure to follow the requirements in terms of farming technical and knowledge and large investment costs, not many household can afford to perform. Only a few of wealthy households are capable of performing. The majority of households in the surveyed area that has expanded aquaculture area but recent aquaculture production tends to decrease due to disease, water pollution, freshening (by floods), salinization (due to salinity intrusion and droughts), and changes in climate conditions. In addition, aquaculture also caused serious environmental pollution when a large amount of waste water is discharged untreatedly into the public water system, thereby affecting natural resources (water resources) by which households families depend on. A number of households newly participate in aquaculture are benefiting from water resources that are still abundant and unpolluted. However, when there are more households involved in farming, benefits will decline due to the negative impact of aquaculture activities on water resources. To protect and develop mangrove ecosystems, Phu Long Commune - Cat Hai district has built a model of "management, protection and development of mangroves combining sustainable aquaculture and fisheries with the participation of the community" The model was implemented in aquaculture facilities adjacent to mangrove area inside dike and outside dike being directly managed by households and individuals.

The common feature in all four study sites is that fishermen live mainly by exploitation, shortage of productive land, difficulty to access and transition to other occupations, mainly inshore fisheries; exploitation is mainly based on experience but only a few are trained. Besides, the exploitation is implemented in small model, while at the same time people here are facing three risks of marine resources reduction.

4.2. The possibility of vulnerability of agricultural livelihood

Besides fishing and aquaculture, agricultural production, and especially rice cultivation also serves as the main livelihood of residents in order to ensure food security.

Agricultural activities, mainly arability are, always associated with the use of the land thus agricultural livelihood activities are the most vulnerable to the effects of climate change such as flooding of land loss farming, saltwater intrusion that narrows agricultural land, rising temperatures affecting the growth, yield, planting date, etc. In recent years, the population density is rising up, which means that the area of land for agricultural production is under pressure of increasing,

thereby limiting the potentials of agricultural productivity increase in the area of arable land that is increasingly limited by the impact of the salinity invasion.

5.The appropriate activities of livelihood in the effects of climate change of Hai Phong coastal urban residents

In fact, when there are shocks or natural hazards, the community often have a certain reaction to adapt to new conditions. This section summarizes some adaptation activities of Hai Phong coastal people, namely at 4 study areas in front of the risks of climate change to coastal areas affecting their livelihood.

5.1.Adaptable activities in agriculture

Since agricultural activities directly relate to land, water and other climatic changes, people here strongly focus on finding solutions to adapt and ensure production. Here are some adaptable activities that Hai Phong coastal communities have made:

Improving, maintaining and management of water resources through effective measures to offset the groundwater and rainwater use. These are said to be extremely necessary measures to deal with water shortages in the dry season, as well as to limit the negative effects of salinity.

Changes in management and farming techniques help to reduce the risk of crop failure such as changing cropping patterns to adapt to saltwater intrusion. Diversification of crops help to adapt to the change of weather extremes, replacing old plants with new varieties capable of adapting to climate change. Rice farming in coastal mainland is the main activity and a source of food. Some farmers have switched to farming two crops a year, which are the summer-autumn and winter-spring crop. This conversion helps people ensuring food security in flood season. The farming activities are sometimes combined with livestock, mostly pigs and poultry, in order to increase income. In agriculture, women are the main labor force and play very important role in ensuring food security. In four districts studied outside Phu Long Commune-Cat Hai district and Ngoc Hai Ward-Dp Son district mainly focus on exploitation and aquaculture, Dai Hop Commune - KienThuy district and Lap Le Commune - Thuy Nguyen District besides exploitation, and aquaculture, people still maintain agricultural activities because there is still land serving.

Besides, Hai Phong coastal residents also conducted diversifying livelihoods to increase income and help family livelihoods not rely on just one source of income, such as farming combined with livestock, or the development of service models, small trades

5.2. Adaptable activities in exploiting activities and aquaculture

Fishery exploitation and fishing have been for a while thus residents of Haiphong coastal areas have more local knowledge in prevention and adaptation to natural fluctuations. Those are very rich experiences transferred from previous generations such as: how to design nets, how to organize exploitation, find fishing and seasonal fishing experience, experience of storm forecast, wind, etc. The local knowledge of community has become a typical cultural feature of people daily lives. Along with scientific advances, the folk knowledge helps fishermen more active in prevention of natural disasters, ensuring the life and property of the community.

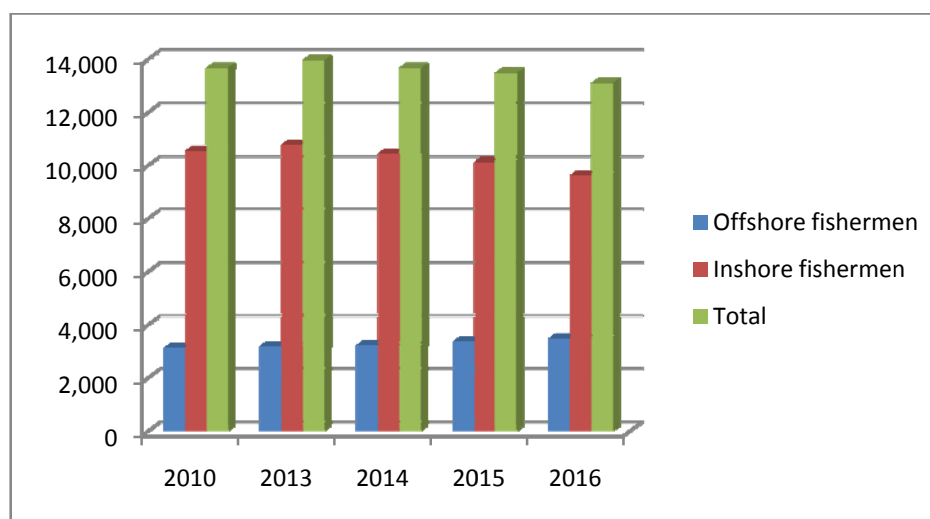
5.2.1. Selection of exploitation sea areas

The study showed that the majority of fishermen, especially in Phu Long Commune chose inshore exploitation since it's easy to join and does not require large capital investment. The exploitation time is often during the day so they can take advantage of the leisure time to incorporate other jobs. For communes with significant development of offshore fishing as Lap Le, Ngoc Hai, and Dai Co, the proportion of fishermen participating in offshore fishing still accounts for the low rate. According to the data of Hai Phong Department of Exploitation and Protection of Marine Resources (2012, 2013, 2014), in Hai Phong, the proportion of fishermen who exploit offshore reached only from 22.9 to 26.6%, while for inshore fishermen, this figure remains at over 70% (Table 2)

Table 2. Participation of exploitation of marine living resources of fishermen on coastal areas during the period of 2010 - 2016

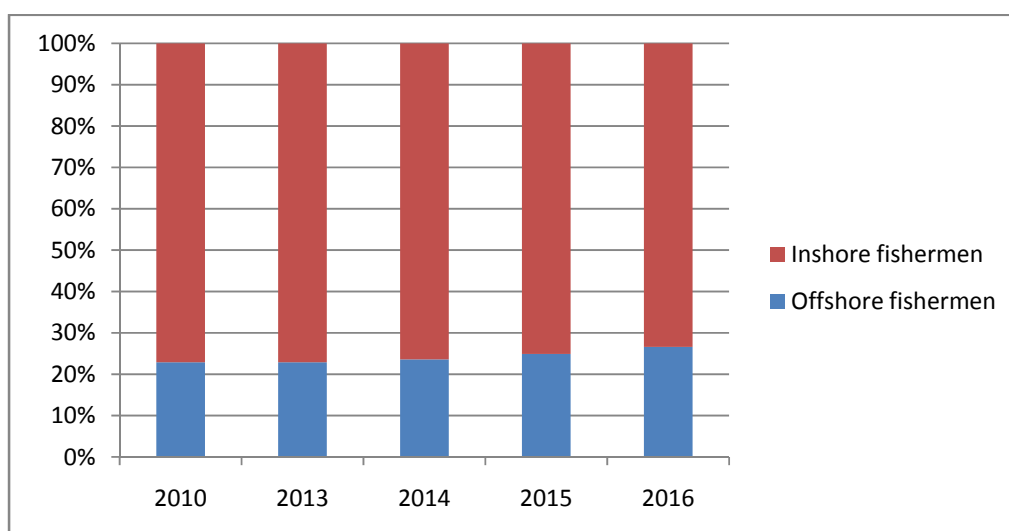
Year	Total (ppl)	Offshore fishermen		Inshore fishermen	
		Number (ppl)	Percentage (%)	Number (ppl)	Percentage (%)
2010	13,669	3,127	22.9	10,542	77.1
2013	13,959	3, 94	22.9	10,765	77.1
2014	13,669	3,227	23.6	10,442	76.4
2015	13,478	3,361	24.9	10,117	75.1
2016	13,098	3,482	26.6	9,616	73.4

Graph 2: The situation of participating in exploiting seafood resources at Hai Phong between 2010 and 2016 (unit: number of fishermen)



Source: Data reported from Agency of Exploitation and Aquatic Resources Protection, Hai Phong.

Graph 3: Distribution between offshore fishermen and inshore fishermen in Hai Phong from 2010 to 2016



Source: Data reported from Agency of Exploitation and Aquatic Resources Protection, Hai Phong.

5.2.2. Selection of exploitation fields

The result of study showed that in each district of Hai phong, exploiting activities of fishermen are always attached to characterized and traditional work, which has been inherited from the previous generations, as in Thuy Nguyen, trawlers and squid catching are the most popular; KienThuy, Do Son operate mainly in gillnet fisheries; Cat Hai operates mainly with trawlers and fishery services (Table 3). The total number of employees who are directly involved in the fishing in Hai Phong is 13,098 people in 2013, decreasing 3.1% compared to 2011. The number of employees are decreasing mainly in groups such as trawls, decreasing 4.2%; gillnet, decreasing 4.7%; 12.4% decrease in fishing; and 1.3% decrease in others.

Table 3. Traditional marine exploitation of fishermen in some districts of Hai Phong in 2016

TT	Districts	Fields of exploitation	TT	Districts	Fields of exploitation
1	Thuy Nguyen	Squid Catching,	5	DuongKinh	Gillnets, trawl
2	Cat Hai	Trawl	6	Hai An	Gillnet
3	Do Son	Trawl	7	Tien Lang	Trawl
4	KienThuy	Gillnet Gillnet			

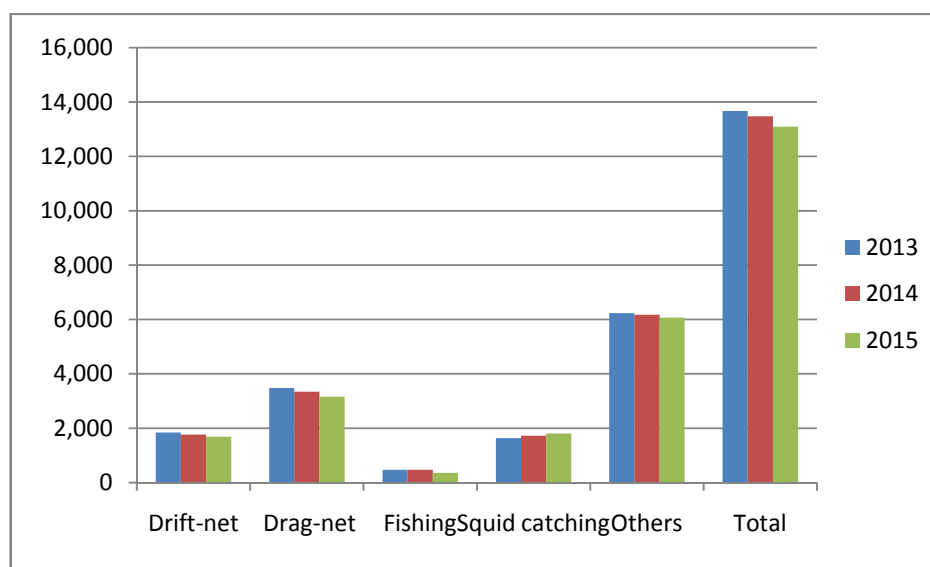
Despite the increase and decrease, basically there was no significant change in the labor structure of exploitation between occupational groups in three years, in which farmers may choose other professions such as traps (mainly inshore) account for a large proportion, over 46%; followed by gillnet fisheries, accounting for 24.1%; squid catching, accounting for 13.8%; trawlers, accounting for 12.9%, the lowest is fishing, accounting for 2.8% (Table 4).

Table 4. Participation of fishermen in marine exploitation during 2013 – 2015 based on exploiting activities

TT	Exploiting activities	2013		2014		2015		Comparison (%)		
		Number of labors (people)	Percentage (%)	Number of labors (people)	Percentage (%)	Number of labors (people)	Percentage (%)	2012 /2011	2013 /2014	Average

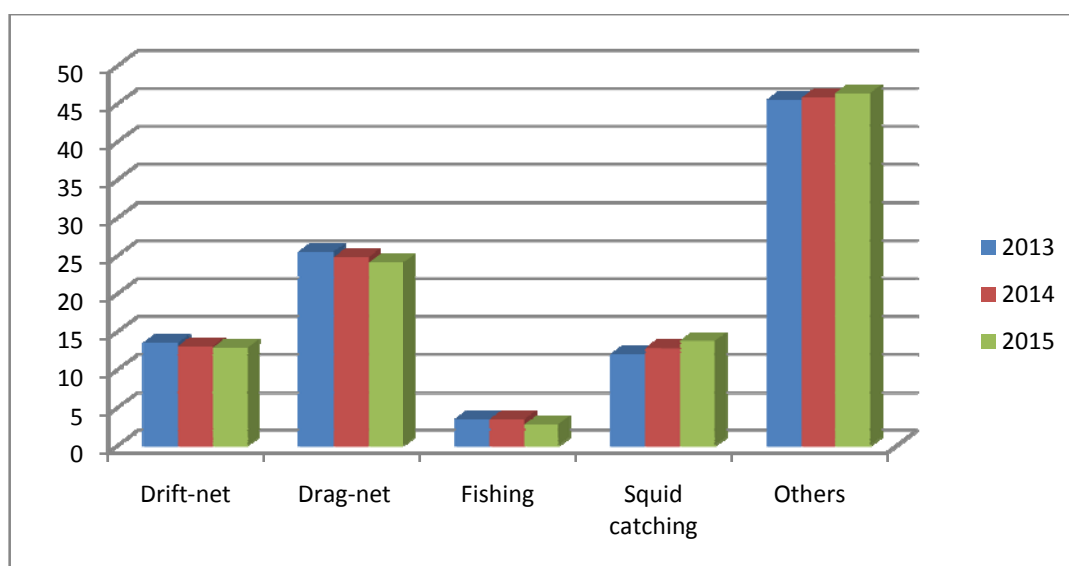
1	Trawl	1,844	13.5	1,765	13.1	1,692	12.9	95.7	95.9	95.8
2	Gillnet	3,484	25.5	3,342	24.8	3,162	24.1	95.9	94.6	95.3
3	Fishing	472	3.5	469	3.5	362	2.8	99.4	77.2	87.6
4	Squid	1,635	12.0	1,726	12.8	1,812	13.8	105.6	105.0	105.3
5	Catching Other	6,234	45.6	6,176	45.8	6,070	46.3	99.1	98.3	98.7
	Total	13,669	100.0	13,478	100.0	13,098	100.0	98.6	97.2	97.9

Graph 4: The situation of exploiting of seafood resources according to occupational groups (unit: number of labours)



Source: Data reported from Agency of Exploitation and Aquatic Resources Protection, Hai Phong.

Graph 5: The situation of exploiting of seafood resources according to the share of occupational groups (unit: %)



Source: Data reported from Agency of Exploitation and Aquatic Resources Protection, Hai Phong.

On average, nearly 44.3% fishermen do other jobs, in which the most popular choice is aquaculture, accounting for 11.1% and 6.9%. According to ship capacity, fishermen of boats under 20 CV have the highest rate of doing other jobs. In four surveyed areas, Phu Long Commune fishermen have the highest rate of doing other jobs, Lap Le and Dai Co has equal proportions, Ngoc Hai has the lowest percentage (Table 5). This reflects the fact that economic conditions of inshore fishermen are harder so they have needs for other jobs to generate more revenues. Therefore, when taking into account the improvement of the livelihoods of fishermen, we should pay more attention to the inshore fishermen by creating more favorable conditions for them to have other jobs and gradually help them escape from inshore fishery which is considered as excessive in current periods.

Table 5. Other activities of fishermen in early 2016

Surveyed areas	Boat group	Percentage of fishermen doing other activities (%)						Percentage of fishermen doing other activities (%)
		Seafood processing	Small business	Agriculture	Aquaculture	Service and tourism	Others	
Lap Le (Thuy Nguyen)	Under 20 CV	6.7	6.7	10.0	26.7	0.0	13.3	63.3
	From 20 to under 50 CV	10.0	10.0	3.3	20.0	6.7	10.0	60.0
	From 50 to under 90 CV	3.3	0.0	0.0	6.7	3.3	13.3	26.7
	From 90 to under 130 CV	3.3	0.0	0.0	3.3	0.0	10.0	16.7
	Above 130 CV	5.8	4.2	3.3	14.2	2.5	11.7	41.7
	Total							

Ngoc Hai (Do Son)	Under 20 CV	10.0	5.0	5.0	20.0	5.0	15.0	60.0
	From 20 to	5.0	0.0	5.0	10.0	10.0	15.0	45.0
	under 50 CV	3.3	0.0	0.0	6.7	6.7	10.0	26.7
	From 50 to	6.7	0.0	0.0	0.0	0.0	6.7	13.3
	under 90 CV	5.9	1.2	2.4	9.4	5.9	11.8	36.5
	Above 90 CV							
	Total							
Phu Long (Cat Hai)	Under 20 CV	12.5	7.5	0.0	7.5	22.5	12.5	62.5
	From 20 to	6.7	6.7	0.0	13.3	13.3	13.3	53.3
	under 50 CV	0	0	0	0	0	0	0
	From 50 to	0	0	0	0	0	0	0.0
	under 90 CV	2.2	7.3	0.0	9.1	20.0	12.7	65.5
	Above 90 CV							
	Total							
Dai Hop (KienThuy)	Under 20 CV	3.3	6.7	16.7	16.7	3.3	16.7	63.3
	From 20 to	3.3	3.3	6.7	10.0	10.0	10.0	43.3
	under 50 CV	0.0	10.0	10.0	0.0	0.0	10.0	30.0
	From 50 to	0.0	0.0	0.0	5.0	5.0	5.0	15.0
	under 90 CV	2.2	4.4	8.9	10.0	5.6	11.1	42.2
	Above 90 CV							
	Total							
Average	Under 20 CV	8.3	6.7	7.5	16.7	9.2	14.2	62.5
	From 20 to	6.3	5.3	4.2	13.7	9.5	11.6	50.5
	under 50 CV	2.9	1.4	1.4	5.7	4.3	11.4	27.1
	From 50 to	3.1	0.0	0.0	3.1	1.5	7.7	15.4
	under 90 CV	6.6	4.0	4.0	11.1	6.9	11.7	44.3
	Above 90 CV							
	Total							

Conclusions:

This study provides information related to climate change and its impact to the livelihood of the fishermen living in the coastal areas of the provinces of Hai Phong.

Marine resources tend to decline quite clearly and agricultural land are affected by saltwater intrusion. Meanwhile, environmental vulnerability has been threatening the livelihoods of fishermen. The livelihood strategies are selected by fishermen and implemented based on various factors, in which the most important elements are human resources and financial resources. The achieved livelihood outcome reflects the reality of the problems of livelihood in fishing for fishermen and at the same time shows that the livelihood of fishing for coastal fishermen in Hai Phong is facing many difficult problems, lack of unsustainability, especially for inshore fisheries.

To help improve the livelihoods of fishermen, Hai Phong city has a number of solutions to improve the environment vulnerability:

- Improving the quality of oceanographic forecasting and fishing grounds.
- Ensuring good quality of rescue, salvage and timely support for fishermen when sea accidents occur.
- Strictly controlling the quality of boats and the marine safety equipment of fishermen.
- Raising awareness and understanding of the fishermen about regulations in exploitation and international laws.
- Strengthening the protection and development of marine resources
- Construction of infrastructure and beach berth with consideration of sea levels to prevent saltwater intrusion.
- Strengthening the dike system to protect aquaculture farms.
- Changing the structure of different fisheries and species farming.
- Management of fisheries resources based on the community to enhance Fisheries resources.
- Promoting investments in boats and fishing equipments to develop offshore fishing,

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Appendices:



Figure 1: A fishermea is throwing net into the water



Figure 2: Fishermen are drawing a net to catch shrimp at shrimp farms







Figure 3, 4, 5, 6: These boats of fishermen land in fishing ports



Figure 7: A fisherwomen is classifying seafoods after fishing



Figure 8: After drying, Dried squid was collected on the coast





Figure 9, 10: Fish market on the coast



Figure 11: Onshore fishing





Figure 12, 13, 14: Fishing-net was collected after fishing



Figure 15: Shrimp farm before pumped water



Figure 16: Aeration machines is used at Shrimp farms