RESEARCH TITLE: ASSESSMENT OF IMPACTS OF AND ADAPTATION TO CLIMATE CHANGE IN FISHERIES IN THE COASTAL AREA OF THUA THIEN HUE PROVINCE, VIETNAM

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Introduction

- As a coastal province, Thua Thien Hue always suffered heavy losses from climate change.
- Increasing typhoon, cyclone, flood, drought, landslide, land erosion have influenced on crop, livestock and fisheries failure
- Assessment of impacts of and adaptation to climate change in fisheries of community and farmers to climate change are an important part in Provincial Target Program.


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In achieving expected research, the research pursues to address below objectives:

1. Identify climate change trends and climate extreme events;

2. Assess impacts of climate change on fisheries (including fishing and aquaculture) sector;

3. Identify adaptation options to climate change in fisheries; and

4. Promote solutions/strategies to enhance adaptive capacity to climate change in fisheries and agriculture in Thua Thien Hue province, Vietnam.

METHODS AND DESIGN

To evaluate impacts of climate change on fisheries and agriculture production in the research areas, investigation, collecting data from multiple sources including secondary and primary data were used.

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RESULTS AND DISCUSSTION

1. Climatic Features of Thua Thien Hue

- **The temperature**

Table 1. The average temperature across the year in Thua Thien Hue province

Measurement period (Years)	Months												Averag (^{o}C)
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	
1975 –1985	20.0	20.9	23.1	26.0	28.3	29.3	29.4	28.9	27.1	25.1	23.1	20.8	**25.2**
1986 – 1995	20.4	21.3	22.4	26.0	28.1	29.4	29.3	29.0	27.4	25.2	23.1	20.1	**25.1**
1996 – 2015	19.9	21.2	23.1	26.1	27.8	29.1	28.9	28.1	26.3	25.0	22.8	20.8	**25.0**
Average (^{o}C)	**20.1**	**21.1**	**22.9**	**26.0**	**28.1**	**29.3**	**29.2**	**28.7**	**27.0**	**25.1**	**23.0**	**20.6**	**25.1**

◆ Rainfall

Table 2. Average rainfall at Thua Thien Hue in the periods 1975 – 2015

Measurement period (Years)	Months												Average (mm)
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	
1975 - 1985	161.3	62.6	47.1	51.6	82.1	116.7	95.3	104	473.4	795.6	580.6	297.4	2867.7
1986 – 1995	81.55	49.13	29.24	50.02	107.5	77.75	68.51	182.4	288.7	742.2	455.4	257.1	2389.7
1996 – 2015	121.4	52.25	70.17	72.45	134.4	94.83	81.76	243.2	537.4	700.3	615.1	367.4	3091.1
Average (mm)	121.4	54.6	48.8	58.0	108.0	96.4	81.8	176.5	433.2	746.0	550.3	307.3	2782.9

◆Floods

Flooding is a weather phenomenon that is usually dangerous and causes heavy losses in lives and property of the people the province

We can generally classify floods in Thua Thien Hue province into 3 categories:

- Early floods (Tieu man): small and start from May to June caused by the heavy rain sub-season of early summer
- Late floods: small floods that subside after a short period of time. They occur from late December to early January of the next year. Duration of late floods are longer than early floods, pasting around 7 days.
- Main floods: occur from October to December at the same time of main rainy season in Thua Thien Hue province. In fact, about 7 – 8 floods a years were recorded.

Table 3. Historical flood from 1894 to 1999 at Thua Thien Hue province

Month/year	Damage
May, 1894	Damaged village and kill many people
October, 1897	Flood and tide closed Eo estuary (HoaDuan) and Sut estuary (Thuan An)
September, 1904	Flood broken 4 spans of TrangTienbrigde and PhuocDuyen towe at Linh Mu pagoda. Second time closed Eo estuary (HoaDuan) and Sut estuary (Thuan An)
October, 1928	Broken Thuan An dam
September, 1930	Broken Tu Hien estuary and Thuan An estuary
September, 1980	Killed 173 people
July, 1981	Destroyed 40.000 houses
October, 1983	Killed 252, and hurted 115 people
October, 1985	Killed 604, hurted 234 and losted 98 people
October, 1989	Killed 140 people
October, 1989b	Killed 53 and hurted 766 people
October, 1992	Killed 7 people
November, 1998	Killed 31 people
November, 1999	Killed 373 people

◆Typhoons

Table 4. Number of typhoons that hit Thua Thien Hue province

Years	**1965**	**1968**	**1970**	**1971**	**1977**	**1982**	**1983**	**1985**	**1987**	**1991**	**1992**	**1997**	**2002**
No. of typhoons	1	1	3	3	4	4	8	2	5	5	6	4	1
Years	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
No. of typhoons	2	2	3	3	2	2	2	3	1	2	2	3	3

2. The climate change factors affecting fisheries activities in Thua Thien Hue

Factors such as rising temperatures, floods, droughts…had in recent years shown a direct impact on fisheries activities in Thua Thien Hue

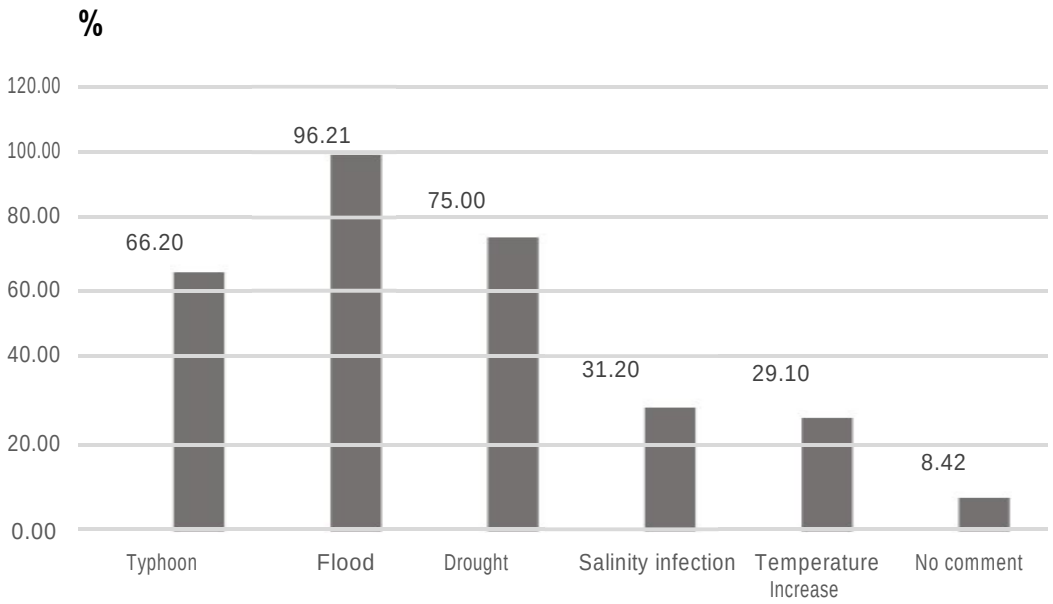

Figure 2. Factors that affect fisheries activities (Field surver, 2015, n = 122)

Table 6. Impacts of flood and changing flood regime on fishers

Order	Impacts of flood regime (before 1999)		Impacts of changing flood regime (after 1999)	
	Impact items	**Impact level**	**Impact items**	**Impact level**
01	Loss of property	+++		
02	Loss of houses	+++		
03	Loss of lives	++		
04	Loss of fishing gears and boats	++	Loss of fishing gears and boats	+
05	Lack of food during inundation time	++		
06	Difficulty in transportation	+	Difficulty in transportation	+
07	Reduced fish catch	+	Reduced fish catch	+++
08	Increased fishing days off	+	Increased fishing days off	+++

Source: Focus group discussion and in-depth interview with fishers, 2015, n=122
(Note: +++: Strong impact; ++: medium impact; +: low impact)

◆ The impacts of flooding and the changing flood regime on aquaculturalists

Table 7. Impacts of flood and changing flood regime on aquaculturalists

Order	Impacts of flood regime		Impacts of changing flood regime	
	Impact items	Impact level	Impact items	Impact level
01	Loss of property	+++		
02	Loss of houses	+++		
03	Loss of lives	++		
04	Lack of food during inundation time	++		
05	Loss of stored food (unhusked rice)	++		
06	Difficulty in transportation	++	Difficulty in transportation	++
07	Shrimp pond edge eroded and broken	++	Shrimp pond edge eroded and broken	++
08	Massive death of shrimp and fish due to environmental shock	++	Massive death of shrimp and fish due to environmental shock	+++
09	All shrimp, fish and crab go outside the ponds	+	All shrimp, fish and crab go outside the ponds	+++
10			Water pollution	++
11	Loss of crop	+	Loss of crop	++

Source: Focus group discussion and in-depth interview with aquaculturalists, 2015, n=122

(Note: +++: Strong impact; ++: medium impact; +: low impact)

Table 8. The change of early flood "tieu man" and floods

Flood item / Indicators	"Tieu man" flood		Floods	
	Before	**Recent years**	**Before**	**Recent years**
Frequency (number of flood per year)	1	1	3 – 4	more than 4
Intensity	Small	Rather big	Big	Small
Duration (day)	1 – 2	3 - 7	3 – 5	7 – 15
Abnormal	Around 20 of April	Earlier or later	Start from August to November	Start from September to December, even February
Degree of predictability	Can predict	Can not predict	Can predict exactly depending on the folk-song and ancestor experience	Can not predict
Trend		Bigger and bigger		Higher frequency, less intensity

Source: Focus group discussion, 2105

- **Impacts of drought and high temperatures in fisheries**

Temperature plays an important role in the growth and development of organisms in general and of aquaculture species in particular. Heat makes water temperature rise to excessive levels and kills farmed aquatic species.

Prolonged heat incidence occurs from May to August each year when average monthly temperature rose to a high of 29° C (Table 1).

The highest air temperature is measured in days. Sometimes, up to 39° C lasts for several days, causing severe damage to agriculture and aquaculture in the province.

3. SUMMARY AND CONCLUSIONS

➢As a coastal province, Thua Thien Hue always suffered heavy losses from climate change:

-Floods and typhoons have occurred with stronger intensities, and tide amplitude has changed drastically. All these have had significant impacts on agriculture and fisheries activities at the province.

- Both the early flood *"tieu man"* flood and rainy season floods have become less predictable. The change of the flood regime alters its impacts on the livelihoods of fishers and aquaculturalists. Loss of houses, property and lives have relatively lost significance for these livelihoods compared to the reduction of the lagoon productivity

4. POLICY IMPLICATIONS AND RECOMMENDATIONS

For the fisheries sector which mainly aquaculture

➢Revert to the original state of lagoons, low effect of feeding areas. Focus on high tide feeding areas, pool on sand. Develop more feeding cage model.

➢Develop strategies for aquaculture development in the context of climate change. Develop safe aquaculture areas under sustainable development strategies. The identification of suitable culture location can also avoid the phenomenon of prolonged drought, floods, the sudden change in salinity ponds.

➢Strengthen propagation, dissemination of knowledge, information, and raise awareness of officials and people about climate change its impact as well as the methods and strategies for adaptation and mitigation

- Prioritize native species that have been cultured and adapted well; the hybrid species, invasive characteristics have adapted well to the vagaries of the environment, the polyculture species capable of together; these species have economic value and have good market such as Rabbitfish, mullet, spotted scat, grouper, Kinh etc.

- Speed up the implementation of the Government's decree on support policies for damage caused by natural disasters and epidemics in aquaculture.


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Thank you very much