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# A FRAMEWORK OF PERCEPTION, RESILIENCE & BARRIERS TOWARDS CLIMATE ADAPTATION

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## **Foreword and Acknowledgement:**

In front of you lies my thesis, my final project in order to obtain my Master's degree in Environment and Society Study. In March 2020, I came back to my country for conducting my research. Vietnam is an agriculture-based country and there is approximate 67% of people living in rural. Agriculture is associated with economic and cultural development in Vietnam. Over the years, I have witnessed the difficulty of farmers facing the change in climate conditions. That is the driving force that motivates me to implement this topic and commit my future career to contribute to a more sustainable society.

First of all, I would like to express my gratitude towards my supervisor, Dr Maria Kaufmann of Radboud University, who supported me in the early stages of this research. I would like to thank her for her guidance and feedback during the phases of idea and research design. I would particularly like to thank for her sympathy for the difficulties that I have faced while doing research.

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## Abstract

*Farmers are widely recognized as the most vulnerable object of climate change. Indeed, Kien Giang farmers have suffered negative impacts of unpredictable weather, severe drought, saline intrusion and irregular rain patterns. Notwithstanding, farming activities also put the climate at risk as they release methane and nitrous oxide into the atmosphere. Towards this interactive relationship between agriculture and climate change, farmers need programs and policies of climate change adaptation to improve their knowledge and actions. The main aim of this study is to explore and forecast Vietnamese farmers' responses in the implementation of climate change adaptation practices in Mekong Delta. Perception, social resilience and barriers to implementing climate change adaptation strategies are favoured to investigate the weakness of current climate change adaptation strategies in Mekong Delta through the examination of farmers' responses in Kien Giang province. A triangulation method has been employed to collect the data: survey and unstructured interviews with farmers, in-depth interviews with key informants and secondary data. This method is promising to bring credibility and validity to the picture of the situation. As a result, a large part of farmers lack awareness of climate change causes, while a few of them prove high creativity and resilience capability.*

## Abbreviation

CCAS	Climate Change Adaptation Strategies
CC	Climate Change
FAO	Food and Agriculture Organization of the United Nations
GHG	Greenhouse Gases
IPCC	Intergovernmental Panel on Climate Change
UNFCC	United Nations Framework Convention on Climate Change

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# 1. Introduction

## 1.1. Background & Rationale

Global warming has been observed since the mid-20<sup>th</sup> century by NASA (NASA, n.d.). Using satellite instruments to diagnose the influence of solar irradiance on the Earth, scientists discovered that the Sun's energy output contributes to less than 10% of the global warming, whilst the remaining has been caused by humans for 50 years. To be specific, industrialized activities have given rise to the carbon dioxide (CO<sub>2</sub>) volume by 134 parts per million over the past 150 years. Along with other produces e.g. methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and water vapor (H<sub>2</sub>O) that constitute GHG, this combination blocks heat in the atmosphere which forces abnormal phenomena in the climate.

CC is visible in various forms: drought, flood, extreme heat, sea rise level, precipitation, etc. which negatively affect livelihoods. However, scientists find it difficult to detect the beginning causes and symptoms of these consequences, as CC results in a long period of time which is "too big, too slow, and too uneven to be seen" (Rudiak-Gould, 2013). This dubiousness or invisibility leads to the disagreement amongst the scientific community concerning how CC should be forecasted, measured and constrained. Additionally, people who are not specialized in sustainability studies might not be aware of the degree of GHG and CC, leading to a common misconception that they are far away from being negatively impacted (Rudiak-Gould, 2013). Therefore, environmental and sustainable development education is needed to enhance people's knowledge of the related issues.

Above all, farmers are widely recognized as the most vulnerable object of CC due to three main reasons. First of all, unfavorable conditions in the climate directly affect the agricultural industry which is their foremost and primary earning resource. In a broader setting, agricultural losses in quality and quantity put pressure on the national and world economy, as the



comprehensive economic development relies on the distribution and transformation of both rural and urban systems (Fox, 1970; Akkoyunlu, 2015). Additionally, a poor production of crops - as the world central nourishment which is very sensitive to CC - threatens the public health with famine or malnutrition (Kaiser, 1991; Harvey et al., 2014; FAO, 2015). Secondly, farmers often make up a significant portion of the population's poor sectors particularly smallholders in middle- and low-income countries, consequently they are dependent on natural resources, but have limited access to aid resources (Alston & Pardey, 2014; Hossain et al., 2016; Jamshidi, Asadi, Kalantari, Azadi & Scheffran, 2017). Overall, they have less chance to effectively recover from disasters. Last but not least, the lack of information, education, asset and resource relevancy in rural areas constrains farmers in middle- and low-income regions from understanding about CC and CCAS (Do, Vu, Kim, Hoang, & Wright, 2014; Kabir et al., 2016; Ho & Ubukata, 2017).

On the other hand, farming activities also put the climate at risk as they release methane and nitrous oxide into the atmosphere (European Environment Agency, 2015). Towards this interactive relationship between agriculture and CC, farmers need programs and policies of CC adaptation to improve their knowledge and actions. Besides, agricultural policies require a great attention too, whereby the use of materials and techniques for cultivation are guided with safety regulations and sustainable manufacturing processes. As farmers may lack warning information of CC based on limited access to communications systems or limited educational background to acquire scientific concepts, government policies can play a grounded role in orienting them how to be aware and respond to CC's causes and consequences. The absence of policies or lack of policy priorities is deemed as one of the main barriers for people to implement CCAS (Waters, Barnett & Puleston, 2014; Barnett et al., 2015).

The fact that all regions in the world have been suffering CC at different levels can be intimidating (Arnell, Lowe, Challinor & Osborn, 2019), amongst of which Southeast Asia is one of the worst contexts that witness a series of severe consequences and face potential environmental challenges, particularly Vietnam, Myanmar, Philippines and Thailand (NIC, 2010; Prakash, 2018). To break this down at a smaller regional level, the Mekong Delta is one of the three most vulnerable deltas in the age of CC worldwide regarding the sea level (ADB, 2013). Besides, the eroded area in this delta makes up over 50% of its coastline which shows its huge weakness of green natural insulation (Nguyet-Minh et al., 2019). Geographically, this region covers a large portion of southwestern Vietnam that encompasses thirteen provinces: Long An, Dong Thap, Tien Giang, An Giang, Ben Tre, Vinh Long, Tra Vinh, Hau Giang, Kien Giang, Soc Trang, Bac Lieu, Ca Mau and Can Tho - which accounts for the largest agriculture and aquaculture region that contributes 18% to Vietnam GDP (Le & Chinvanno, 2011; Tran, Halsema, Hellegers, Hoang & Ludwig, 2019). In addition, the Mekong Delta occupies over half of the country's rice production and more than 60% of aquaculture food (Nguyen et al., 2019).

## 1.2. Research Aim & Research Question

### 1.2.1. Research Aim

The ultimate purpose of this study is to explore and forecast Vietnamese farmers' responses in the implementation of CC adaptation practices in Mekong Delta (including maladaptive responses). Research on the correlation between farmers and CC is not new, yet widely approved as a significant branch of study in improving CCAS in rural regions. Perception, social resilience and obstructions to effectively adopt CCAS are centralized in this discourse as they link to how farmers conduct CC practices and support climate policies. Besides, opinions of many responsible officers are considered into the bargain to add values to the research.

To narrow the scope of investigation, this research focuses on the farmers in Kien Giang province, where the annual temperature in the low, medium and high emissions scenario was forecasted to increase by 1.5°C-2.0°C, 1.5°C-2.5°C and 2.5°C-3.5°C respectively by 2100 (ADB, 2013). The sea level was predicted to rise up to 72cm, 82cm and 105cm in the low, medium and high emissions scenario in comparison with the period of 1980-1999 (ADB, 2013). Along with other indexes e.g. win speed, rainfall, air pressure and relative humidity, Kien Giang has been suffering and likely to suffer three main hazards: inundation, saline intrusion and storm surge (Le & Chinvanno, 2011; ADB, 2013). The insights generated from the participants are contrasted with the implementation outcomes of the GR120 dated November 11<sup>th</sup> 2017 (Government Portal, 2020).

### ***1.2.2. Research Question***

The dissertation digs into the research question: "To what extent can CC adaptation policies in Mekong Delta influence farmers' responses in Kien Giang province?". Accordingly, five sub-questions were generated as follows:

1. "To what extent do farmers in Kien Giang province perceive and understand about CC in Mekong Delta?" - This sub-question aims to examine the awareness and degree of farmers' knowledge of CC, leading to insights about farmers' perception of their region's current and potential hazards.

2. "To what extent do farmers in Kien Giang province perceive and understand about CCAS in Mekong Delta?" - This sub-question explores farmers' awareness and understanding of national or regional policies in tackling CC. The outcomes reveal the degree of the government's influence and the role of local information resources at this scale.

3. "What are Kien Giang's farmers' personal strategies or tactics in resisting and adapting CC in Mekong Delta?" - This sub-question examines farmers' social resilience and adaptation ability

in the face of CC. The outcomes are expected to bring insights about how the government and responsible organizations can adjust their policies to match local farmers' experiences and interests.

4. "What are the main barriers that can prevent farmers in Kien Giang province from implementing the government and sub-government's CCAS in Mekong Delta?" - This sub-question plays a vital role in the research, aiming to gain insights about how and why farmers may struggle in following certain CC practices and policies, and what the government can do to weaken or remove these barriers.

5. "What are the opportunities for farmers in Kien Giang province under the CC situation?" - This sub-question looks out for CC's positive impacts in Mekong Delta or in what way farmers can take advantage of the situation.

### 1.3. Significance Of The Study

#### 1.3.1. Societal Relevance

The fundamental societal relevance of this study is to identify how related stakeholders in the chosen context can manage to adapt CC at best. Particularly, the outcomes of this research are expected to assist governments and responsible organizations in profoundly understanding climate issues at the individual and household level, and adjusting their policies to adapt specific settings.

Indisputably, CC is a global quandary that impacts the society on a large number of facets at scale: natural resource shortage, unequal distribution for the eco-socio-cultural living, poor well-being, poverty, marginalized groups, environmental insecurity for future life and so forth. The role of research on CC and CCAS is of weight to counteract these challenges by shedding light on how related stakeholders should perceive, forecast, adapt and change their behaviors or policies in response to unfavorable conditions caused by CC. Nonetheless, the complexity and multidimensionality of related components unveil CC as a wicked problem that contains stopgap

formulations of defining its causes and consequences, grey areas of accurate solutions, dependency on consequential strategies, correlation with other wicked problems, multiple assumptions and explanations, distress for people who are in charge or aim to settle it, etc. - as deduced from Rittel and Webber's (1973) definition of 'wicked problem' (cited in Sun & Yang, 2016). Moreover, the related stakeholders in a confusing problem like CC often fail to reach an agreement on the problem's scope, alternative solutions and desired outcomes, which turns the original wicked problem into a super-wicked one (Sun & Yang, 2016). Their different mindsets are shaped by political interests and resources, while they need to learn and adapt concurrently to put effects in a specific setting (Sun & Yang, 2016).

These enlighten on how and why responsible departments may fail to solve climate issues at the individual and household level, as their empirical insights and interests do not go in tune with these groups' socio-cultural experience. Though CC is commonly addressed to cause by human activities, solutions for CC cannot be accomplished by individuals, whereby governments need to step up. According to Valkengoed and Steg (2019), the role of individuals and households are barely included in CC adaptation agendas. Meanwhile, these groups can significantly contribute to CCAS' success due to three main reasons (Valkengoed & Steg, 2019). First, these groups directly suffer CC's effects. Hence, their understanding of adaptive measures can help them reduce climate risks themselves. Second, adaptation practices by these groups can decrease CC's effects and save implementation expenses. Third, their proactive practices of CCAS can encourage CCAS at a larger scale.

Picking up a similar perspective towards the significance of individuals and households in practicing CCAS, this research contributes to the understanding of the interactive relationship between individuals and households and authorities' actions in the face of CC. Particularly, as this

research sets out to investigate the weakness of current CCAS in Mekong Delta through the examination of farmers' responses in Kien Giang province, a conceptual framework between the core components of this thread ('perception', 'social resilience', 'barriers to the implementation of CCAS' and 'adaptive responses') formed in sub-section 2.2 is expected to assist policymakers in improving their CC adaptation schemes. As well, the framework is significant in order to provide farmers a safety net in the age of CC.

### 1.3.2. Scientific Relevance

CC draws intensive attention due to its massive impact on every aspect of our lives. Though the terminology implies complexly ecological theories, the influence of CC over political, societal, cultural, economic facets and so forth has inspired scholars to investigate it in various interdisciplinary branches of study. Research on CC has been favored by world leading organizations such as FAO or World Bank in association with agriculture. With respect to the dissertation's research aim, a great amount of similar topics can be found. For instance, Dixon and Stringer (2015) investigated frameworks of climate resilience and vulnerability for smallholder farmers in Sub-Saharan Africa. González-Hernández, Meijles and Vanclay (2019) emphasized the significance of household units regarding their barriers to CCAS in Nuevo Leon, Mexico. Behavioral attitudes towards CC as an implication of barriers to CCAS can be acquired in a case study of Kenyan farmers through Jalón, Silvestri, Granados and Iglesias' (2015) too. Or else, Jones and Boyd (2011) centralized on the relationship between human capabilities, social barriers and ecological systems. In Tanzania where the coastline has been apparently reconfigured by CC, both farming and non-farming households were surveyed to examine their resilience (Jones, Samman & Vinck, 2018).

In the case of CC in Mekong Delta, there exists numerous outstanding researches that shed light on the neighborhood's strengths of natural resources, and its high sensitivity in climate

hazards which negatively affects farming systems and livelihoods into the bargain. Amongst of which Dang, Li, Bruwer and Nuberg's (2014) research has a relatively similar aim to the dissertation's; herein the authors used qualitative methods to figure out farmers and agricultural officers' perception of CC and barriers to implement CCAS in Dong Thap province, Soc Trang province and Long An province. Soc Trang's farmers were also favored as the focal research point on their perception and adaptive behaviors towards CC in Ho and Ubukata's (2017) article, whereby quantitative and qualitative information were acquired to shed light on their understanding of saltwater intrusion over rice farming. Focusing on floods, Nguyen and James (2013) employed in-depth interviews to measure farmers' resilience in three communes in Ben Tre, Vinh Long and An Giang provinces. However, none of those researches in Mekong Delta link to a particular policy plan legitimately applied by the Vietnamese government. Instead, the end results are the authors' base to suggest adjustment or improvement for Vietnam's CCAS in general. Their academic work lights up societal characteristics and gaps that the government should consider while adopting current and future policies, yet it does not examine the degree of particular policies' influence on the participants.

Meanwhile, researches on CC policies in Mekong Delta mainly focus on the structure and distribution of the policy itself, which is different from the focal research point of this dissertation. For instance, Ha, Dieperink, Pham, Otter and Hoekstra (2018) studied the management system of freshwater to adapt CC under governance administration, whereby vertical integration, horizontal integration, public participation and informal network are measured for the management sufficiency. In particular of the chosen policies in the dissertation, research related to them is rare as they have been adopted not so long ago, which requires more time for scientists to measure outcomes.

Overall, academic articles related to specific CC policies in Vietnam are thin on the ground, likely to focus on analyzing the governance structure and conditions and reflect expert participants' opinions. Therefore, the exploration of farmers' responses in association with the chosen CC policy in this dissertation is expected to gain insights in a brand-new manner. Moreover, though a vast amount of researches emphasize the significance of perception, social resilience, barriers to the implementation of CCAS and adaptive actions in CC, the according models of assessing them are mostly fragmented into one or two of those concepts. Meanwhile, this dissertation proposes a more multidimensional framework that connects all of these facets.

## 2. Literature Review

### 2.1. Perception, Social Resilience & Adaptation Towards CC

#### 2.1.1. Perception Of CC

While *weather* refers to short-term changes happening in the atmosphere every single day, CC is the mix events of long-term changes in the weather that influence a wide range of environmental factors such as global temperature, photosynthesis, moisture, precipitation, land surface, ice cover and so forth (Nwoke, Nwoke, & Ukpai, 2009; Kumar, Tokas, Kumar, Lal, & Singal, 2018). CC has been scientifically investigated for 160 years, notwithstanding the length for this field of study, part of the fundamentals of CC and related concepts have been missed out insofar owing to the so-called invisibility or oblivious visibility of CC's phenomena (Weber & Stern, 2011). There has been uncertainty of measuring the extent of CC's effects on the natural ecosystem and humans' life, for instance: To what extent the warming leads to GHG emissions, or to what extent heat waves may affect the habitat (Weber & Stern, 2011). Though probabilities can be defined from climate catastrophes, those results tend to be endorsed rather than accurately estimated, and hardly predicted in a limited period (Weber & Stern, 2011). Therefore, these



ongoing struggles have affected policymakers to come up with prompt frameworks in response to CC.

Overall, CC, global warming and ozone depletion have been commonly considered to, directly and indirectly, alter the aquatic organisms, air quality, water resources, energy, human immune system, human settlements, etc. in an adverse manner (Nwoke, Nwoke, & Ukpai, 2009). Research by Horton and McMichael (2008, cited in Nwoke, Nwoke, & Ukpai, 2009) also emphasizes the risk of CC to natural resources and human beings through seven main types of health impact: thermal stress, vector-borne diseases, water and food-borne diseases, sustenance shortage, skin cancer, cataracts, and immune system clampdown. According to UNFCCC, billions of people have been suffering the depletion of fresh water and food due to the effects of an egregious ecosystem.

These adverse effects require a coalition of experts to tackle CC and global warming, as well as requiring administrators to delve into relevant policies for any arising issues. Regional realities require policymakers to greatly invest in infrastructure and construction to upgrade preventive systems for climate risks. For example, wells, reservoirs and prune tree cultivation are drought stressed; infiltration trenches, stormwater ponds and underground drainage are helpful to tackle flash flooding; vegetation and low-carbon electricity systems improve resilience in extreme heat events, etc. Nonetheless, the effectiveness of plans to counteract CC is such a conundrum, as CC adaptation methods need to be supported at both community and individual level. Meanwhile, human activities have been widely acknowledged as a crucial root of the negative impact on climate (Nwoke, Nwoke, & Ukpai, 2009; Hansen, Sato, & Ruedy, 2012; Dal et al., 2020). The strong development of industrialization, urbanization and deforestation have exacerbated the physiological setting, followed by GHG emissions (Kumar, Tokas, Kumar, Lal, & Singal, 2018).

The UNFCCC considered that people can quickly recognize environmental changes based on their profound interaction with the socio-ecosystem (1994, cited in Rankoana, 2018). On the other hand, various researches show that people dismiss or misunderstand about the causal relationship between their well-being and the environment (Read, Bostrom, Morgan, Fischhoff, & Smuts, 1994; Kabir et al., 2016).

To be specific, research by Kabir et al. (2016) in Bangladesh indicates that though the participants had certain knowledge of CC's reasons and effects, their explanation about CC phenomena was not comprehensive enough or even dubious, and almost half of them could not notice the sea level rise around the coastal areas. Moreover, their know-how mostly relied on mainstream means of mass media such as television or radio, rather than through any research by themselves or instructions by related authorities. Their discrepancies in the ability to acquire CC information also depend on their educational levels, whereby people who live near a school setting knew 3 times more than the others about CC and CC's health impact. Hence, the results imply that individuals from rural areas with limited access to media, education and favorably financial resources are more likely to be vulnerable to CC.

Regarding the Mekong Delta in Vietnam where rural villages occupy a vast acreage, 90% of the area has a lack of financial capital, and farming composes the main income for the workforce (World Bank, 2012; Ngo, 2019). Apart from shrimp farming, rice harvesting is an important earning source of the inhabitants, notwithstanding these agricultural industries generate an unstable income due to the lack of rainfall and intrusion of saltwater (Kandel, 2004; Smith, 2013; Nguyen et al., 2020). Similarly to Kabir et al.'s (2016) research, Do, Vu, Kim, Hoang, & Wright's (2014) quantitative and qualitative study shows that Vietnamese people from slum areas are more aware of CC and its risks. Ho and Ubukata (2017) also emphasized the advantage of education for

people in dealing with CC. In detail, the authors examined 80 farm households in Soc Trang province about their CC's perception. The results represent that 60% of the respondents from junior high to high school level were able to notice salinity in their surrounding areas, whilst 70% of the respondents with lower educational levels could not perceive any signals of CC. Besides, their recognition and judgments concerning CC are more or less following the provision of local information, whereby they may not take their personal observations into account if local institutions give different viewpoints towards the situations. Hence, limited access to steady earnings and adequate knowledge sources about CC and CC adaptation in non-slum areas generally put farmers in Mekong Delta in poverty and health threats.

#### *2.1.2. Social resilience In CC*

The concept of *Resilience* itself depicts the capacity of moving forwards unbeneficial, obstructive or harmful situations (Herrman et al., 2011; Windle, 2011; Zolnikov, 2019). Research on *Resilience* in life has been developed for roughly three decades, and become distinguishably influential in sustainability studies for 17 years, insofar of showing a close association with policies and practice of well-being advancement (Windle, 2011; Keck & Sakdapolrak, 2013). *Social resilience*, as an adaptive terminology of this concept, emphasizes the characteristics, effects and relevance of resilience at a community level (Kwok, Doyle, Becker, Johnston, & Paton, 2016; Jones, 2018). In terms of CC, *social resilience* demonstrates the ability of individuals and communities in adapting, counteracting, and recovering from climate variability and shocks with the centralization of critical assets and resources for vulnerability reduction in perturbation in the current time and long-run (Adger, Adams, Evans, O'Neill, & Quinn, 2013; Chiang & Huang, 2016; Subiyanto, Boer, Aldrian, Perdinan, & Kinseng, 2020). According to Carver (1998), the resilience process can be recognized at three levels: surviving, recovering and thriving.

Those concepts define the essence of social resilience measurement in understanding the effectiveness of resilience strategies, as well as upgrading the responsiveness to climate risks. Social resilience measurement can be adopted through objective or subjective approaches, herein objective evaluations focus on socio-economic indicators (often based on quantitative data) - which separates external judgment from the objects that actually suffer the climate's effects; whilst subjective evaluations complement to objective methods by providing perceptive opinions of self-valued resilience experiences, personal judgments of contemporary policies in response to climate risks and so forth (qualitative approach) (Jones, 2018; Jones, Samman, & Vinck, 2018). The nuances between both approaches are subtle and receiving certain disputes between researchers for the right way to exploit appropriate findings. Objective indicators mostly support households, and FAO's Resilience Index Measurement and Analysis framework (RIMA) is a popular approach. This model sheds light on a wide range of issues, comprising of the ability to assess basic services, assets and resources, adaptation capacity, social safety nets, and susceptibility to variability. The examination on these variables shows predefined standards and traits notwithstanding, forming difficulties of flexible adaptation toward the nature of specific situations (Jones, Samman, & Vinck, 2018). Thus, subjective approaches play the role of a helpful alternative or complement to objective methods' limitations by contributing people's experimental insights into this discipline at scale. Moreover, subjective approaches greatly build up the public's perception of risks, giving potentials to governments in implementing their strategies to cope with climate disturbance (Linden, 2017).

It is worth noting that the effectiveness of social resilience frameworks and processes is addressed based upon the specific context of an area, regarding plenty of factors such as budget plans, demographic traits, general customs and cultures, subnational governments' attitude, etc.

(Oliveira, 2009; Linden, 2017; Bachner, Bednar-Friedl, & Knittel, 2019). Regarding the case of Mekong Delta in Vietnam where the annual flood has been the most prominent risk to livelihoods over time, the status of those factors always comes to force in the government's plans of action. Based on the understanding of this neighborhood, the government currently focuses on five main sub-projects in enhancing climate resilience, including: (1) Identifying eroded coastal and riverbank; (2) Improving the water supply and drainage system, and tweaking the vast area of northern parts in Dong Thap province to stabilize the citizens' life; (3) Investing in infrastructure and construction to adapt the ecological system characterized in Cu Lao Dung; (4) Investing in infrastructure and construction to restrain erosion threats, particularly upgrading the clean water system to facilitate shrimp and prawn farming from the salinity intrusion; and (5) Investing in infrastructure and construction to preserve the forest, especially in Hoa Binh, Dong Hai district and Bac Lieu (Ministry of Agriculture and Rural Development of the Socialist Republic of Vietnam, 2020). Various innovative technologies have been utilized to adapt the climate risks accordingly. However, this holistic plan has faced plenty of obstructions mostly because of the farmers' low perception and motivation of resource protection and law compliance (Nguyen et al., 2020). Thus, the awareness enhancement for inhabitants of flood risks should be taken into account as the government's focal point in deploying their paradigms of climate resilience.

### *2.1.3. CC Adaptation & Barriers To The Implementation of CCAS*

*CC adaptation* refers to ongoing strategies and processes of adjusting CC caused by GHG emissions, and bring up relevant methods for future prevention from expected environmental variability (Jones, 2010; Climate Change Adaptation Technical Working Group, 2017). Based on how natural resources and humans' life are exposed with socio-economical and environmental infrastructure, and people's struggles and capacity to cope with climate hazards into the bargain, an abundance of climate variables such as rainfall, temperature, drought, win speeds, storms, sea-

level rise, ocean warming, ocean acidification, water sanity, etc. are examined to generate relevant policies and practice of CC adaptation (Climate Change Adaptation Technical Working Group, 2017). CC might be observed or recognized impulsively due to uncertainty resulting in CC measurement and prediction. Thus, it is vital that people are well informed of what changes should occur in their surroundings and over the global, followed by a plan of approaching arising issues with a proper understanding of CC, and accompanied by dynamic actions to cope with climate risks (Climate Change Adaptation Technical Working Group, 2017). *Adaptation* should be distinguished from *mitigation* as two processes that mingle to synergistically combat CC; CC adaptation is not part of CC mitigation (European Commission, 2015; Climate Change Adaptation Technical Working Group, 2017; González-Hernández, Meijles, & Vanclay, 2019). Though both processes come to the same goal of increasing awareness of CC and dealing with climate risks, *adaptation* proposes methods of enhancing adaptive capacity to vulnerabilities, whilst *mitigation* strategies focus on solving the cause of GHG emissions (Zhao et al., 2018). In addition, *adaptation* actions show responsiveness on a regional level, while *mitigation* ones reveal its positive impact towards the global setting over the long term (Zhao et al., 2018).

Apart from the requirement of well distinguishing approximate and confusing concepts, policymakers face a variety of challenges in deploying and accomplishing CCAS. These barriers can result from geographical, geological, societal, economical, political, cultural, psychological factors and so forth. Main challenges of CC adaptation in the context of Mekong Delta are noticed as follows. However, these findings do not represent all the problematic facets that farmer and governing bodies have met in CC and CCAS.

**2.1.3.1. Uncertainty Of Systematic Approaches To CC Evaluation And Adaptation That Leads To Nonresponsive Actions, Postponed Actions Or Inactions.** First and foremost,

the uncertainty of measuring and predicting climate risks brings skepticism towards the effectiveness of CCAS, particularly when policies and practice in response to CC are in critical need of coping with immediate environmental hazards. Related experts and administrators are required to design policies based on climate projections that contain uncertain variables in the natural ecosystem; also the stakeholders' decisions rely on their distinctive interests, beliefs and expectations of CC problems and socio-eco-cultural components (Hallegatte, 2008; Weber & Stern, 2011; Refsgaard et al., 2013). Uncertainty has been acknowledged as an ongoing struggle over time to understand CC and construct CCAS (IPCC, 2007; Refsgaard et al., 2013).

A framework of CCAS cannot be approved due to its lack of crucial factors and characteristics of a specific situation, as well as dismissing the dependency on indeterminable climate variables (Curry, 2011; Refsgaard et al., 2013). A model of CCAS may work at a certain time, but fail to adapt future contexts as climate variables keep altering, and adding extra expenditures on adaptive models later on. Moreover, people may rely on the assessment and results of prior models to forecast CC henceforth, which could generate misinformation for future advancement of CC concepts and CCAS. Understanding these obstructions, policymakers may be reluctant to deploy their proposals of stemming CC. In fact, postponed actions and inactions can cost them more to hit the target, as research efforts, budget and time for the adjustment of increasing consequences afterwards will be required especially in historical damages (Executive Office of the President of the United States, 2014; Sanderson & O'Neill, 2020).

Vietnam, as many other countries using uncertainly scientific frameworks as an excuse for their slow response or inaction, tends to implement CCAS reactively than proactively. A large number of adaptation and resilience plans focus on addressing disasters than taking initiatives. Many schemes of CCAS have been documented without being pulled in action. For instance, a

study on rice cultivation to tackle CC in Mekong Delta by the World Bank was filed away only for consideration (Johnson, 2016). Another reason contributing to the lack of relevant practices and policies of CCAS is the responsibility overlap between government ministries and agencies that negatively affects their horizontal and vertical integration, and leads to the lack of CCAS' implementation at the maximum level (Mackay & Russell, 2011).

**2.1.3.2. Funding Imbalance Between Structural And Non-Structural Measures That Prevents Medium- And Long-Term Benefits.** As stated by the Central Committee of Vietnam Fatherland Front (2020), the government and sub-governments have centralized on infrastructure and constructions (structural measures) in tackling CC in Mekong Delta. Meanwhile, there needs the assistance of non-structural interventions such as improving the quality and quantity of primary agricultural production (aquaculture, fruits, paddy), applying innovative and technological models in cultivation, re-planning the land use, livelihood diversification, propagandizing the importance of CCAS amongst inhabitants, insurance schemes, social safety nets, etc. To add in, a conference on CC policymaking in Mekong Delta taking place at the University of Economics Ho Chi Minh city campus in Vinh Long pointed out that CC there cannot be prevented entirely, which requires policymakers to turn risks into opportunities (EfD, 2020). Amongst of the proposed methods in the conference, non-structural measures are deemed as potential to effectively cope with unfavorable situations, particularly focusing on the creation of new species of livestock and plants. Those species are expected to possess a pertinent resistance to harsh conditions and ensure current and future market demands.

According to Associate Professor Tuan Anh Le of Can Tho University, current structural measures in Mekong Delta help the government deal with climate risks in a short term of 3-5 years, yet lack strategic activities for the medium term (5-10 years) and long term (10-30 years)



(Department of Climate Change - MONRE, 2015). Though these methods limit the negative impact of sea rise, he was skeptical of their efficacy as they devastate the mangrove ecosystem, disrupt livelihoods and agricultural production, increase inland water pollution, obstruct waterway traffic, destruct internal seaports' operations, and expose the weakness of national defense and security. Due to these facts, non-structural measures should be prioritized due to their long-run benefits and lower expenses, particularly in the face of sub-governments' limited management capability.

Regarding the role of non-structural measures, there has been a small amount of literature towards their benefits and models when compared with structural ones. Most of sustainable management practices focus on engineering techniques to gain visible objectives of CCAS whilst their performance is not long-lived (Yohe et al., 2007). Noticeably, structural measures require high-cost and large-scale buildings which can be often approved and made by the government and leading organizations with a strong financial capacity. Hence, the concentration of policies on these measures constrains an abundance of NGOs, small- to medium-corporates and individuals from supporting CCAS.

**2.1.3.3. Lack Of Sufficient Insurance And Reinsurance To Facilitate CCAS.** Insurance plays a critical role in financing mechanisms of CC adaptation and enhancing resilience towards vulnerabilities. In a simple way of understanding, the concept of insurance denotes the ability to make a payment to one party if unfavorable or harmful incidents or accidents happen to that party (Frank & McGuire, 1986; National Association of Insurance Commissioners, 2008). Apart from the money-wise, there is a close interrelationship between CCAS and insurance in terms of risk management and transforming risks from disasters. As stated by Pandurics and Szalai (2017), an insurance organization can contribute to risk identification and analysis regarding physical risks

(often referring to chronic hazards e.g. drought, extreme heat, flood or hailstorm that devastate properties and block resources), transition risks (driven by shifts in market preferences for a low-carbon economy), and liability risks (aiming to financially cover losses for a party who has physical injuries or economic injuries after the occurrence of disasters or accidents).

In the event of climate catastrophes, insurance can show its efficacy in supporting individuals, sub-governments and governments in recovering from losses as alternative capital and technical assistance. For policyholders who are reluctant to deploy CCAS due to the uncertainty of climate incidents in reality and CCAS' aftermath, effective roadmaps on insurance help solve the economic math for CC sufferers' life and health. Meanwhile, a miscalculation on insurance can lead to limited resources for the recovery phase while proposing and implementing CCAS. The significance of insurance is not a brand-new sector associated with CC adaptation plans in developed countries, but there exists the lack of insurance role's awareness and credibility in developing countries with a lower level of budget and risk perception.

In the case of Vietnam, people from agricultural parts in Mekong Delta lack resources of education and information to approach and understand the damage losses of CC, leading to their reluctance to pay for life insurance. There also sees a gap between Vietnamese organizations and their interests in CCAS that they seldom invest in insurance as well as CC adaptation projects; they tend to mind their business than participating in local operations (Department of Climate Change - Ministry of Climate Change, 2020). At the national level, the Vietnamese government issued roadmaps for agricultural insurance to cope with CC's consequences in 2011 and Decree 58/2018/ND-CP in 2018 (Online Newspaper of the Government - The Socialist Republic of Vietnam, 2018; Department of Climate Change - MONRE, 2020; National Database on Legal Documents - The Ministry of Finance, n.d.). However, those plans have been applied in a limited

amount of provinces. Particularly, these plans are applied only when CC disasters are officially announced and certified by the state. The period for those declaration varies due to their capacity of defining and approving the situation. This identifies the struggle of the government in managing risks and solving severe problems at an emergent level.

**2.1.3.4. Farmers' Intensive Dependency On Traditional Agricultural Species And Methods.** Each type of plant or livestock requires different climate conditions to grow. CC alters the boundary areas of each species' cultivation, leading to the difference of its production's quantity and quality. Due to this sensitive trait, agriculture is known as the largest economically impacted sector by CC (Mendelsohn, 2008). To adapt CC, there has been a robust shift from local supply to international supply that grew the agricultural trade value by over \$1.03 trillion between 2000 and 2016 (FAO, 2018). The trade helps solve the lack of agricultural production in many places that suffer CC's effects e.g. South Africa (towards successive droughts) or Bangladesh (towards severe floods). Overall, CC encourages four game-changers in agricultural economics: increasing technological methods to gain cost-effective options of production and flexibility, increasing climate migrants that change the regional workforce, transition to new varieties of plantation and livestock, and the emergence of growth management strategies that pursue a low-emissions goal (McCarthy, Lipper & Zilberman, 2018).

Similarly, the Vietnamese government has generated policies that develop innovative operations, resettle vulnerable communities, try new agricultural products and promote sustainable cultivation. However, there are various constraints in the socio-economy in Mekong Delta that challenge those practices, amongst of which originates from farmers' intensive dependency on traditionally rice-based farming systems. The paddy industry in Mekong Delta is featured with: maximizing the quantity but lack of quality, high productivity but low added value, intensive

exploitation of land and water resources and so forth (Ministry of Planning and Investment of the Socialist Republic of Vietnam, 2020). The farmers also focus on coconut and three types of livestock consisting of chicken, cows and pigs. Nonetheless, they faced a catastrophic price drop of livestock and shortage of coconut due to the severe drought in 2016, consequently a large number of the working age group moved to major cities as day labors (Nhan Dan, 2017). Besides, farmers have shifted from paddy growing to aquaculture breeding due to the huge discrepancy of income between these two industries (Nhan Dan, 2017). However, the lack of the government's prompt policies and budgets has created an uneven distribution of aquaculture infrastructure among communities, leading to regional conflicts in manufacturing operations (Nhan Dan, 2017).

**2.1.3.5. Lack Of Individuals' Awareness, Communication, Motivation And Willingness To Counteract CC.** People's attitude and understanding of CC can constrain the success of CCAS. A vast number of researches have highlighted the significance of education in gaining awareness of CC; people from non-slum communities with limited access to adequate information and learning resources show less knowledge of this field than ones from urban areas (Do, Vu, Kim, Hoang, & Wright, 2014; Kabir et al., 2016; Ho & Ubukata, 2017). People in the countryside can observe small changes based upon their farming experiences, but hardly link those with climate risks. Research in Narok County illustrates that a remarkable number of participants believe that those damages come from gods to punish humans' wrongdoings (Korir, 2019).

In fact, industrialization and urbanization in developed countries are crucial to cause CC. However, developing countries suffer up to 63% of carbon emissions all over the world due to more severe weather conditions, more dependency on agriculture and lack of assets to construct comprehensive CCAS (Mertz, Halsnæs, Oleson, & Rasmussen, 2009). Owing to these facts, the majority of farmers, particularly in developing countries, tend to acquire knowledge of CC via

mainstream media (television, radio, newspapers); social networks such as their neighbors rank the second most popular source of information; the remaining hears about CC thanks to institutions (NGO, local authorities, teachers, etc.), notwithstanding there exists an insignificant role of this source in their life (Kabir et al., 2016; Ho & Ubukata, 2017). Thus, mass media coverage seems to play a crucial role in how they learn about CC. In contrast, González-Hernández (2019) claimed that many people consider media news as an unreliable source of information. Meanwhile, institutions and local authorities should gain more worth in training people about CC know-how, as those organizations are equipped with experts and professional methods to discourse on this branch of knowledge.

Moreover, no matter people concern more or less about their environmental setting, the failure to apply CCAS at the individual level takes place because of people's lack of attention and interest to cope with CC. Numerous people address climate risks as something happening somewhere else or in a far future, or simply take the problem for granted and state that they will take it into account when hazards actually come (González-Hernández, 2019). Subsequently, interventions targeting CC solutions can be negatively affected by the behavioral willingness and poor risk perception.

## 2.2. Conceptual Framework & Operationalization

Models involving 'perception', 'social resilience', 'barriers to CCAS' and 'adaptive responses' vary. Regarding perception of CC, Linden's (2015) framework proves its efficacy in anticipating up to 68% of the variance, namely CCRPM. This model outlines the combination of three dimensions: cognitive factors, experiential process and socio-cultural effects. Adapted from this model, Eck, Mulder and Linden (2020) proposed an advance form as CCRPM+ that adds 'trust' into the picture of situation. To date, Zobeidi, Yazdanpanah & Bakhshi (2020) created a model to examine and predict people's perception of CC which sheds light that: (1) The more people believe

in the happening of CC, the more they perceive about climate risks; (2) The more they value the significance of the environment, the more they perceive about climate risks; (3) The more they understand about CC's causes and consequences, the more they believe in the happening of CC; and (4) The more they understand about CC's causes and consequences, the more they value the significance of the environment.

Regarding resilience, a vast amount of scholars adopt Checkland and Scholes' (1999) concept that depicts resilience based on three systems: hard, soft and mixed; hereby soft systems refer to human beings' resilience capacity. Resilience of soft systems is defined as dubious and hardly measured, as this concept intertwines with subjective psychological, economic and community factors. Psychological resilience depicts the ability to mentally and emotionally withstand vulnerable situations, and thrive to cope with potential crisis (Kais & Islam, 2016). Thus, resilience is not purely an adaptive capacity, but moreover a result of learned life lessons. Economic resilience relies on the demands, effects and resources within an economic setting; the terminology represents the capacity of economic sectors in resisting and recovering from exogenous shocks regarding both micro and macro levels (Briguglio, Cordina, Farrugia, & Vella, 2008; Kais & Islam, 2016). Community resilience implies the human capability within a specific group, whereby the members' skills in preventing CC, standing firm against CC's hazards and lessening CC's disasters' consequences are highlighted (Ahmed, Seedat, Niekerk & Bulbulia, 2004, Islam & Quek, 2014, cited in Kais & Islam, 2016). To holistically measure one's social resilience capacity, the three concepts should be concurrently noticed and examined. A resilient community is examined on the basis of that community's capitals and potential capacities in resisting and recovering from shocks. According to Kais and Islam (2016), these factors can be learned from: (1) How rich and available resources that community possess; (2) How responsive insofar that community can handle losses

with the assistance of those resources; (3) To what extent those resources can shed light on the circumstance's obstructions, leading to the modification and provision of current and future policies of CC adaptation; (4) How well those capitals can relate to other institutions for bettering CCAS; (5) How committed and willing the individuals in the community are.

Meanwhile, Carver (1998) developed a simple but coherent model of resilience which has been widely applied in the research community too, whereby the resilience capability is categorized into three levels: At the lowest level, people survive stress and accept to live in the unfavorable or harmful setting. For a higher level, they manage to regain losses from that setting. Finally, the thriving phase implies that people improve their sense of self, whereby they proactively prepare and change behaviors for future risks.

In terms of barriers to tackle CC, external factors such as resource availability, institutional support or socio-economic characteristics are often favored. However, these engage with CC practices at a national or global level and hinder the understanding of discreet, psychological factors that can rescue the problem from nature at the individual level. Nonetheless, internal barriers started to draw more attention from social scientists. For instance, Jones and Boyd (2011) mentioned 'behavior' as one of social barriers in practicing CCAS. Particularly, González-Hernández, Meijles and Vanclay (2019) favored the significance of 'lifestyle' amongst internal barriers to CCAS, whereby people who are familiar with their setting find it difficult to change behaviors.

Over most of the mentioned scientific papers throughout the literature review combining with the understanding of farmers in Mekong Delta, the factors that associate with the core elements chosen to anticipate farmers' responses to CC are synthesized as Table 1. Some patterns contain overlaps due to the strong linkage between them.

Table 1: Operationalisation

<b>Element</b>	<b>Domain</b>	<b>Explanation</b>	<b>Main factors that negatively affect the element</b>	<b>Main factors that positively affect the element</b>
<b>Perception</b>	Climate perception	How people beware and understand about climate.	<ul style="list-style-type: none"> <li>- Lack of information and communication</li> <li>- Poor education background</li> </ul>	<ul style="list-style-type: none"> <li>- Mainstream media</li> <li>- Local propaganda</li> <li>- Education</li> </ul>
	Climate risk perception	How people beware and understand about climate risks.	<ul style="list-style-type: none"> <li>- Lack of information and communication</li> <li>- Poor education background</li> <li>- Lack of motivation</li> <li>- Lack of interest</li> <li>- Lack of trust</li> <li>- Uncertainty of the urgency of CC</li> </ul>	<ul style="list-style-type: none"> <li>- Mainstream media</li> <li>- Local propaganda</li> <li>- Education</li> <li>- Real experiences</li> </ul>
<b>Social resilience</b>	Surviving	People continue to live in the unexpected event.	<ul style="list-style-type: none"> <li>- Lack of information and communication</li> <li>- Lack of skills and knowledge</li> </ul>	<ul style="list-style-type: none"> <li>- Skills and knowledge</li> <li>- Social relations</li> <li>- Confidence</li> </ul>
	Recovering	People bounce back from the unexpected event.	<ul style="list-style-type: none"> <li>- Lack of financial capital</li> <li>- Limited properties</li> </ul>	



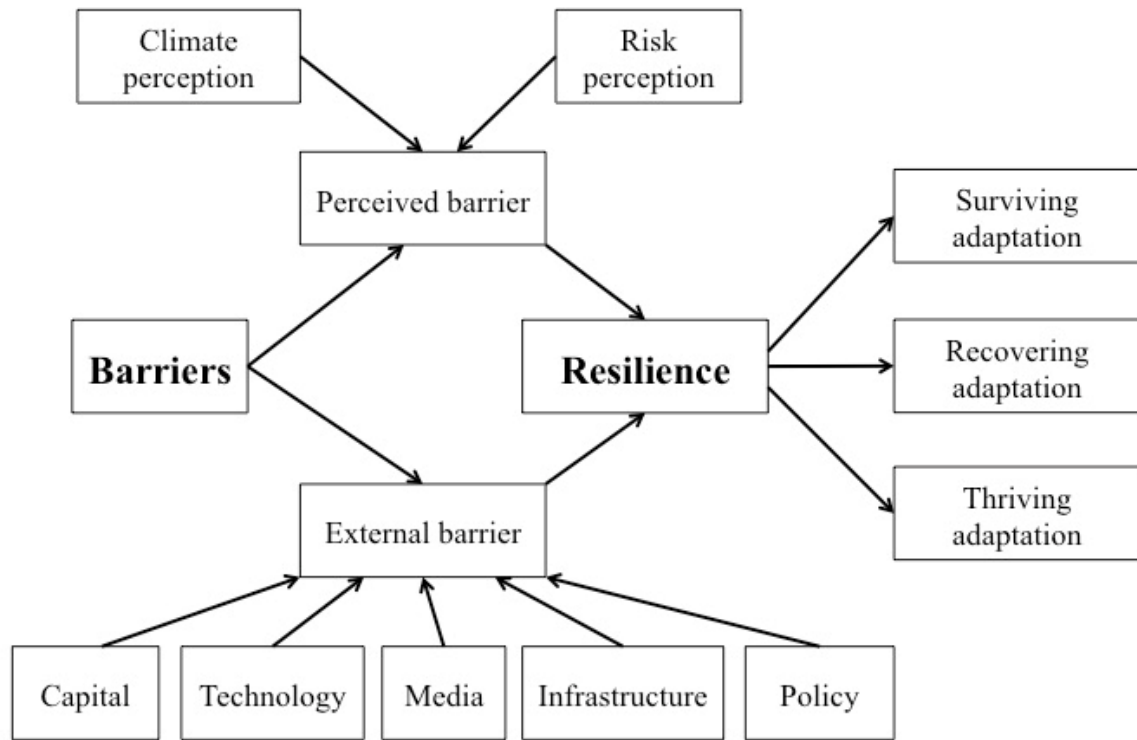
	Thriving	<p>People prepare resources and change behaviors to cope with future unexpected events.</p>	<ul style="list-style-type: none"> <li>- Limited access to assets and resources</li> <li>- Uncertainty of the situation</li> <li>- Familiar with the situation</li> <li>- Dependency on personal experience</li> <li>- Lack of confidence</li> <li>- Lack of alternative income resources</li> </ul>	
<b>Barriers to adaptive actions</b>	Internal barriers	<ul style="list-style-type: none"> <li>- Cognitive behavior: People believe that CC is not their problem, or not happening in present, or not happening in their setting.</li> <li>- Planning behavior: People are not aware of which resources they should access, or which option of</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of information and communication</li> <li>- Poor education background</li> <li>- Lack of motivation</li> <li>- Lack of interest</li> <li>- Lack of trust</li> <li>- Uncertainty of the urgency of CC</li> <li>- Lack of leadership</li> </ul>	<ul style="list-style-type: none"> <li>- Mainstream media</li> <li>- Local propaganda</li> <li>- Education</li> <li>- Real experiences</li> <li>- Leadership</li> </ul>

		CCAS they should participate in.		
	External barriers	External forces that are often out of an individual or household's reach and control, including: infrastructure, public services, technology, capital, information provision, media, government policies, etc.	<ul style="list-style-type: none"> <li>- Uncertainty of measurable CC systems</li> <li>- Lack of financial capital</li> <li>- Lack of technological capital</li> <li>- Lack of synergic support at a regional or global level</li> <li>- Lack of sustainable measures</li> <li>- Government's reluctance to design or apply CCAS</li> <li>- Lack of alternative measures for inhabitants</li> <li>- Lack of understanding of inhabitants' interests</li> </ul>	<ul style="list-style-type: none"> <li>- Financial capital</li> <li>- Technological capital</li> <li>- Synergic support (cooperating and collaborating with other regions or countries)</li> <li>- Profound understanding of CC's effects on individuals in specific settings</li> <li>- Alternative solutions</li> <li>- Sustainable solutions</li> <li>- Avoidance of postponed actions or inactions</li> <li>- Leadership</li> </ul>

*Table 1: Factors associated with perception, social resilience and barriers to CCAS*

Based on these concepts and the understanding of related factors, a conceptual framework of the relationship between farmers' perception, social resilience, barriers and adaptive responses in the context of implementing CCAS is designed as Figure 1. As depicted, 'Barriers' and 'Resilience'

are the focal points of the model, herein the concept of 'Barriers' is categorized in two types: external forces (External barrier) and internal forces (Perceived barrier). Psychologically, internal forces also contain shades of emotion. However, 'Perceived barrier' is opted to focus on the awareness of people towards 'Climate' and 'Risk'. In terms of 'External barrier', 'Capital', 'Technology', 'Media', 'Infrastructure' and 'Policy' are the five most repeated domains in a vast amount of researches that show a significant impact on the implementation of CCAS. Accordingly, people's 'Resilience' is affected by 'Perceived barrier' and/or 'External barrier' in the context of CC, as these barriers lead to people's perspective on how they should move forward from difficulties. Resilience and adaptation in CC share the commonality of protecting livelihoods from hazards. The model proposes combined concepts, namely 'Surviving adaptation', 'Recovering adaptation' and 'Thriving adaptation' (adapted from Carver's concept of resilience in 1998).



*Figure 1: Relationship between farmers' responses, social resilience and barriers to CCAS*

### 3. Methodology

#### 3.1. Philosophical Paradigm

A paradigm shows researchers' point of view about how they should make their research done, comprising of four main components: ontology, epistemology, methodology and methods (Scotland, 2012; Alharahsheh & Pius, 2020). As the paradigm reflects the researcher's cluster of beliefs, it is conjectural, incommensurable and obviously probative (Bryman, 2012; Scotland, 2012; Alharahsheh & Pius, 2020). The paradigmatic employment in research may contain an

overlap or arguments between different research tactics (Bryman, 2012). Therefore, this part is going to discuss how the methodological approach of this dissertation is chosen.

To clear this out, each element of paradigm is in need of being defined. First, *ontology* implies the question "what is" regarding the researcher's assumptions of the reality (Scotland, 2012). These assumptions often position in either of these perspectives: objectivism and constructionism, whereby objectivists believe that social actors in the reality are external to human control, whilst constructivists consider that those actors are dependent on people's learning process and experiences (Krauss, 2005; Bryman, 2012). In the case of this research, constructive reasoning is favored as the causes of CC have been scientifically recognized as a product of human activities.

Second, *epistemology* refers to a meaning-making concern, whereby researchers define their scientific approach to the topic based on the doctrine of positivism or interpretivism (Krauss, 2005; Bryman, 2012). To be detailed, positivists employ so-called "one way-mirror" research principles that are formulated on deductive methods; whereby they build research hypotheses in compliance with existing theories, the collected data is considered value-free, and the results are mostly constructed by testing hypotheses (Krauss, 2005; Bryman, 2012). In contrast, the people following an interpretive perspective appreciate different options about one single reality for their observation of research outcomes - an inductive process (Krauss, 2005; Bryman, 2012). This method acknowledges the influence of cognizant values apart from independent variables of absolute realism, therefore the validity of its results is in debate for individuality, subjectivity and plasticity (Krauss, 2005; Alharahsheh & Pius, 2020). Notwithstanding, the research question of the dissertation is formed on the interpretive belief since farmers' social resilience and adaptive responses are built by both their natural resilient capacity and lessons learned in past experiences. Though the barriers of their responses contain independent, external factors such as resource

availability, these entities are socially constructed too by the government. All of the core concepts adopted in this research are deemed as possibly diagnosed or altered.

Third, *methodology* demonstrates researchers' choice of strategies in observing and measuring research outcomes, which explains all the questions concerning what, when, where, how and why data should be filtered, gathered and scrutinized - which links straight to *methods* as the fourth component of the research paradigm that describes the particular techniques and tools applied for the data production process (Scotland, 2012). Qualitative, quantitative or mixed methodology can be applied due to each researcher's personal values of their branch of study and research topic. The ultimate choice is constructed by their anterior awareness of ontology and epistemology. The distinguishment between quantitative research and qualitative research has had a long history since the 1970s-1980s (Sale, Lohfeld & Brazil, 2002). While quantitative research is frequently adopted by the researchers who are keen on objectivism and positivism with deductive principles of examining theories, the latter lies within the interest of constructionism, interpretivism and inductive techniques (Bryman, 2012). The debate on finalizing a methodology is never less problematic in the research field, yet mixed-methods are proposed to combine both methodologies' strengths and shortcomings. This integral approach comes with arguments too owing to its broad scope of work and resources (Bryman, 2012). Nonetheless, the synergic methods have been widely welcomed since they blur the dominance of one only methodological approach, and are promising to add innovative outcomes into the bargain (Patton, 1990; Molina-Azorin, 2016).

Overall, constructivist ontology, interpretive epistemology and mixed methods are employed in this dissertation. However, qualitative techniques are predominantly utilized over quantitative

ones due to the author's interest in examining farmers' opinionated concepts based on an inductive principle.

### 3.2. Research Approach

Qualitative research, as the main approach of this dissertation, focuses on studying humans' personal concepts, opinions, experiences and emotions to figure out socio-cultural values or facts, which is often favored by interpretivists (Bryman, 2012; Abdulkareem, 2018). In this regard, researchers play the role of an observer and learner on the pulse of the research audience's worldview towards the topic, then interpret what they acquire into scientific phenomena (Denzin & Lincoln, 2011).

In general, there are six common qualitative methods: ethnography, narrative, phenomenological, grounded theory, case study and action research (Creswell & Poth, 2018; Abdulkareem, 2018). Each method serves for a distinctive set of values and beliefs emerging from the researcher's interests, leading to different ways of gathering and analyzing data. To be specific, ethnographic methods focuses on understanding the culture of a research context that requires researchers to spend a significant period to participate in that setting (Morgan-Trimmer & Wood, 2016; Abdulkareem, 2018). Narrative research, meanwhile, approaches the participants' thoughts and feelings on a sequence of events, whereby the researcher manages to link those stories with the present and form theories (Creswell & Poth, 2018). Phenomenological methods extract data from interpreting the experiences of unusual respondents or respondents' experiences in unusual events, which share commonalities with ethnography; however, phenomenology centralizes on describing individuals' viewpoints, whilst ethnography favors to explain a research group's culture (Lester, 1999; Katz & Csordas, 2003). For the researchers who concern the value of prior data, grounded theory is preferred to develop valid results (Bulawa, 2014). Case study, just as the name itself, studies a single or collective group in a bounded context based on the in-depth investigation;

this type is widely applied in sciences due to its ability to generate rich data and its adaptability in both quantitative and qualitative research (Starman, 2013). Action research is a participatory method involving in the collaboration between researchers and chosen respondents to gain an understanding of the research topic (Jong & Jung, 2015; Abdulkareem, 2018).

While contrasting the advantages and disadvantages of each method, case study is most likely to suit the dissertation author's interests as case study enables to infer in-depth results through the observation of multiple sources (individuals or organizations) and a detailed analysis in such a complex field as CC (Harrison, Birks, Franklin & Mills, 2017; Abdulkareem, 2018). Thus, in-depth interviews are adopted to examine the selected topic.

To emphasize, the choosing of qualitative research in general and case study in particular in this dissertation takes roots on the basis of this approach's characteristics described by Creswell and Poth's (2018) statements, that are, qualitative research enables to extract theoretical and practical values from a complex study field, yet also equipping the existence of individuals' role in the selected context. While CC is often discussed by organizations at a high level, the worth of those entities' opinions may bring skepticism forward as farmers are in fact the most vulnerable object in climate disasters. For a complex topic that contains confusing scientific concepts and uncertainty in assessing related variables, the adoption of qualitative research enables the researcher to generate data in a flexible and adjustable way - which guarantees that the selected context is well investigated, and the individuals' voice (farmers) is heard (Creswell & Poth, 2018). As qualitative research is favored by people who apply inductive analysis principles, the according methods can help fill gaps in their understanding of the research, while deductive methods are likely to focus on testing the accuracy of hypotheses (Creswell & Poth, 2018; Woiceshyn & Daellenbach, 2018).



Moreover, due to the author's understanding of local places in Mekong Delta, farmers here are highly reluctant to conduct surveys under quantitative methods. First of all, they are not familiar with filling detailed information on Internet-based surveys. If given alternatives as written surveys, they tend to not complete the paper or fill information randomly to save time. The best way to approach them for surveys is to assign a person being side by side who instructs and supervises them to finish the answers. This action is possible, yet requiring remarkably efforts. However, quantitative methods are not neglected in the chosen research, as it can complement to qualitative methods' weaknesses, particularly in examining the scope of measurable values. In the dissertation, quantitative methods greatly help the author gather and evaluate demographic information in a short amount of time, which enhances the understanding of the correlation between farmers' perception and capabilities and their educational, family and environmental background.

Though there frequently exists the debate on which type of methodology, quantitative or qualitative, should be adopted to generate valid outcomes, there are no clear arguments that each type's strengths can dominate the values of the another. Both types are constructed on unified logics and critical reasoning that serve different points of view. While qualitative methods can enhance the understanding from subjective perspectives yet extracted from real experiences, a quantitative process enables researchers to generate the accuracy and objectivity of the chosen topic (Bryman, 2012). Thus, both qualitative and quantitative methods are combined to examine the research topic in the dissertation for greater awareness of related issues.

Apart from those approaches, the author collected secondary data including official desk documents from various responsible departments such as the People's Committee in the chosen province or the Ministry of Education and Training. The application of multiple sources for the

study (consisting of collecting data from quantitative surveys, observing farmers' experiences based on interviews and extracting data about the agricultural performance from authorities) forms a triangulation method to verify relevant and comprehensive outcomes. This triangulation method is promising to bring credibility and validity to the picture of situation. According to Rahman (2012), a triangulation method is widely carried out in social sciences, as it discovers, describes and explains the research from different perspectives and instruments, leading to the achievement of diverse findings both theoretically and practically.

### 3.3. Sampling & Data Collection

As previously mentioned, the research focuses on CC's related problems and people in Kien Giang province. Amongst 15 administrative divisions, Hon Dat district is the hardest hit by severe drought and salinity, while its crop industry forms the largest sector over the province (Tùng, 2020). Besides, An Bien district the leading aquaculture area of Kien Giang province has been suffering vast effects of CC too (Viet Fisheries Magazine, 2020). The research process was applied in these two districts, whereby data were extracted from multiple sources through interviews and survey questionnaire.

In a research project, interviews embody the empirical strength of acquiring a vast amount of information related to the interviewee's beliefs, feelings and experiences, which help researchers open the door of prior unknown answers (Lilleker, 2003). Interviews, as one of the most common tools of gathering data in qualitative research, are categorized in three types: structured (or standardized), semi-structured (or semi-standardized) and unstructured (unstandardized) (Ryan, Coughlan & Cronin, 2009; Bryman, 2012). In structured interviews, respondents are oriented to conduct the interviewing process in one only way, all the respondents receive an identical questioning schedule and context (Ryan, Coughlan & Cronin, 2009; Bryman, 2012). By this way, the researcher expects fewer deviations in nature of responses (Ryan, Coughlan & Cronin, 2009;

Bryman, 2012). Thus, this method engages with close-ended questions and a formal style. In contrast, unstructured reviews are employed under no specific frameworks, whereby both interviewers and interviewees can be flexible to participate in the process regarding sequence, types of answers, direction, stimuli, etc. as long as the interviewee can provide insights into the main themes of a topic (Ryan, Coughlan & Cronin, 2009; Bryman, 2012). This method often takes place in an informal fashion, the interviewee tends to receive open-ended questions (Ryan, Coughlan & Cronin, 2009; Bryman, 2012). Meanwhile, semi-structured interviews' characteristics lie between structured and unstructured interviews' manners. The questioning thread follows predetermined research inquiries, but the interviewer facilitates the interviewee to answer in a more flexible way with unscheduled principles, as well as welcomes them to narrate stories with the provision of unanticipated insights (Ryan, Coughlan & Cronin, 2009; Bryman, 2012).

As CC is an ongoing problematic and complex phenomenon, open-ended questions and flexible manners were favored for the interviewing process. Therefore, semi-structured and unstructured interviews were adopted to investigate the research topic both via phone call and in-person, whereby one-to-one interviews took place to help the researcher directly and conveniently unpack non-verbal expressions as cues of the interviewees' real attitudes and feelings (Ryan, Coughlan & Cronin, 2009). Undeniably, interviews based on opinionated values contain subjectivity, which raises the question towards their end results' validity (Lilleker, 2003). Besides, interviewing takes time and often serves for qualitative research (Bryman, 2012). Thus, a self-completed questionnaire (survey form) was designed for quantitative research into the bargain. Overall, questionnaires are a common tool for researchers to collect a huge amount of data in a shorter amount of time. A questionnaire can be formed on the Internet or paper sheets. This instrument holds within it many advantages as the participants can complete it in a far more flexible

way and not limited by schedules, while interviews require both parties to arrange a meet-up. However, the reliability of the end results is filled with skepticism just as much as interviews' opinionated values, as the researcher cannot directly examine if the surveyees answer the questionnaire with truthful or random information. Moreover, questionnaires are employed over a wide scope, thus inaccurate answers may lead to wrong measurements.

There is hardly any agreement on the most valid and reliable way to conduct a research process with interviews for qualitative approach or survey questionnaires for quantitative approach. Hence, these tools were implemented with caution in different sample categories. A sample, or a chosen group of people to participate in the research process, can be taken based on a probability or nonprobability sampling technique (Bhardwaj, 2019). Probability sampling is considered as more systematic as the sample is representative to an extent, which guarantees less bias for the collected data afterwards; this technique requires researchers to look out for people that share homogenous traits related to the research inquiry (Bryman, 2012). Meanwhile, nonprobability sampling prefers to pick participants based on more convenience, which helps researchers save time and cost yet probably engages with sample errors (Bryman, 2012). In the context of this dissertation, the sample must strongly associate with agricultural settings and have knowledge of farming systems. Thus, probability sampling was chosen.

Overall, there are five types of probability sampling: simple random sampling, stratified random sampling, systematic sampling, cluster sampling and multistage sampling (Bhardwaj, 2019). Participants are taken by chance with the use of simple random sampling; people share the same opportunity to involve in the research process. As probability sampling favors homogeneity, simple random sampling often takes place in such communities. Stratified random sampling techniques first-hand form subgroups with certain criteria for the potential participants, then decide

the ultimate choice by randomly selecting people from those groups. This technique requires a clear plan of action to target the research audience and seek related information about them to construct groups. Systematic sampling refers to the selection of participants at a regular interval with predetermined numbers. This technique is favored in a large and diverse population where the researcher has more likeliness to approach their expected sample. Cluster sampling can be likened to stratified sampling as both of them refer to the fragmentation of a population. However, they are distinctive in nature. While stratified sampling requires researchers to proactively categorize the population into subgroups, cluster sampling helps researchers pick participants based on already-existing groups or clusters. Multistage sampling can be likened as an advanced form of cluster sampling, whereby already-existing clusters keep being categorized into sub-clusters.

All of the participants in the research process were selected by the simple random sampling technique as it is more convenient and time-saving. However, the data collection method for each sample was conducted differently.

### *3.3.1. Semi-Structured Interviews With An Expert And Officers*

Besides the concentration on farmers, responsible officers' opinions are vital too to enhance the understanding of the chosen setting. They were selected based on expertise and functional positions in responsible departments related to CC management at different levels. These professionals contribute to the profound understanding of the research topic, and help shed light on the local areas' characteristics. All of these interviews were recorded under the participants' permission. As some officers refused to join the research process, the number of interviews dropped from the expected ten to five. Their personal information is confidential except the Associate Professor Tuan Anh Le (Assoc. Prof. Le) under their permission. For more details, Assoc. Prof. Le is the Deputy Director of the Research Institute of CC, and Senior Lecturer in

Faculty of Environmental and Natural Resources in Can Tho University (Can Tho city, Vietnam). He possesses in-depth know-how of CC adaptation and mitigation, particularly in water supply management.

While all the interviews for them share similar questions towards farmers' perception, barriers to CCAS and opportunities in CC, the questionnaire for Assoc. Prof. Le emphasizes the role of institutional policies in CCAS. In detail, the questionnaire for Assoc. Prof. Le consists of five main themes: farmers' perception of CC, personal judgment of the current CCAS, farmers' resilience capability, farmers' barriers and opportunities in CC, and personal judgment of the current insurance program for farmers in CC (Appendix 5). Meanwhile, the questionnaire for the officers constitutes four themes: their perception and farmers' perception of CC and CCAS, their understanding and judgment of the current CCAS, farmers' barriers and opportunities in CC, and their thoughts of climate shock scenarios (Appendix 6).

As some officers refused to join the research process, the number of interviews dropped from the expected ten to five as below (personal information was allowed to publicize by the interviewees):

- Associate Professor Tuan Anh Le (Assoc. Prof. Le) - The Deputy Director of the Research Institute of CC, and Senior Lecturer in Faculty of Environment and Natural Resources in Can Tho University (Can Tho city, Vietnam). He possesses in-depth know-how of CC adaptation and mitigation, particularly involving water supply management.
- Ms. Linh - The officer in Agricultural and Aquaculture Extension Center of Kien Giang province.

- Mr. Binh - The Deputy of the Agriculture and Rural Development Department of Hon Dat district in Kien Giang province.
- Ms Trang Nghiep - The officer of the Agricultural Technology Department of Hon Dat district in Kien Giang province.
- Mr. Nguyen - The Chairman of Farmer's Union of Tho Son commune of Hon Dat district in Kien Giang Province.

### *3.3.2. Unstructured Interviews With Farmers*

There were totally 17 farmers participating in such interviews. They are from both Hon Dat district and An Bien district. Farmers in these areas tend to refuse the interviewing process as they are afraid of encountering scammers. Thus, some dwellers were hired to help approach the farmers. The interviewing process was adopted informally as much as possible to make them feel comfortable around the interviewer. All the interviews were face-to-face; the recording and noting were only made under their permission. The questionnaire content for farmers includes four main themes: their personal and household information, their perception of CC, their resilience capability, and what challenges them to implement CCAS. (Appendix 7)

### *3.3.3. Self-Completed Questionnaire With Farmers*

Though the simple random sampling technique was adopted, the survey favors the participation of the farmers who maintain their work in rice cultivation. As the farmers here are not used to with conducting Internet-based surveys, there needs a third party's assistance to instruct them how to complete the questionnaire. Thus, two dwells who work for the management department of the chosen communes were hired to control over this process. Besides, these two people had helped to propaganda about this activity in general meetings with farmers, encourage farmers to bring survey sheets home, and hand the sheets back to the management department after

completing the survey. Amongst the 160 sheets sent to the responsible people who helped manage the survey process, 115 ones were finished.

The survey questionnaire is constructed with six main parts: (A) The surveyee's personal and household information; (B) The surveyee's agricultural properties; (C) The surveyee's financial capacity; (D) The surveyee's capability of accessing public services; (E) The surveyee's agricultural major and techniques; (F) The surveyee's awareness of CC; (G) The surveyee's resilience capability; and (H) The surveyee's barriers to implementing CCAS (Appendix 8).

### 3.4. Data Analysis

#### 3.4.1. *Thematic Method For Qualitative Data*

Qualitative analysis methods have been developed on the fundamental of identifying common patterns (Akinyode & Khan, 2018; Archer, 2018; Creswell & Poth, 2018). The commons methods are defined as Content Analysis, Thematic Analysis, Narrative Analysis, Conversation Analysis, Grounded Analysis and Discourse Analysis (Archer, 2018). These techniques are more or less different from each other; notwithstanding, they share a relatively similar analysis route based on a coding principle: The analysis process fragments the collected data into smaller sections to serve for the coding step, then regroups the coded results into patterns or themes (Archer, 2018). As qualitative data is gathered based on opinionated verbal expressions, the raw data can be scattered and hardly associated with the research inquiry. Thus, the coding phase takes the dominant role in organizing patterns and interpreting outcomes. According to a vast amount of scholars, the thematic process is the foundation to expand and modify other qualitative analysis methods (Braun & Clarke, 2006; Vaismoradi, Jones, Turunen & Snelgrove, 2016; Akinyode & Khan, 2018; Archer, 2018). Due to this underlying significance, thematic analysis was adopted for the research. Moreover, this method gives explicit meanings to the outcomes and reduces abstract descriptions (Vaismoradi, Jones, Turunen & Snelgrove, 2016).



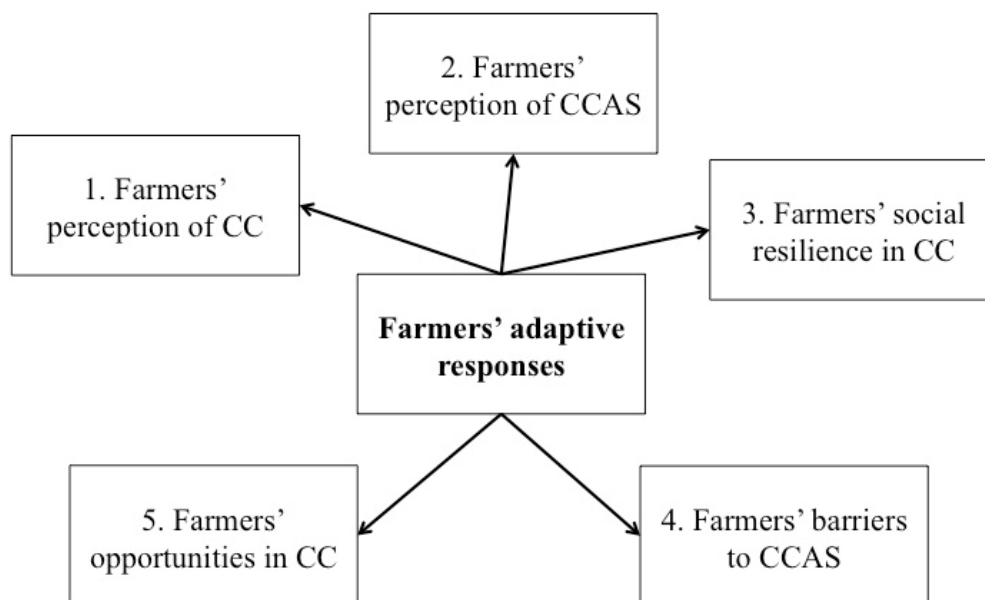
The structure of a thematic process comprises of four main phases (Vaismoradi, Jones, Turunen & Snelgrove, 2016). First of all, the researcher approaches the transcriptions of qualitative interviews to figure out both meaningful and dubious details, namely Initialization phase. This stage provides the researcher with an overview of the main trends and potential issues in interpreting data. During the Initialization stage, texts are coded to extract relevant information. Unlike quantitative analysis methods that enable measurable mechanisms to extract accurate results, qualitative analysis methods require the researcher to understand the nature of verbal expressions. As such, Vaismoradi, Jones, Turunen & Snelgrove (2016) proposed a five-set framework of coded values: Conceptual code - referring to the content that contains key perceptions or dimensions related to the study; Relationship code - capturing the connection between domains; Perspective code - applied for the respondents' feelings and attitudes; Characteristic code - referring to the respondents' traits that link with the research phenomenon; and Setting code - capturing the context where the study phenomenon occurs.

Construction, as the second thematic phase, is the researcher's reflection step to classify and contrast the prior coded values, by which those values can be reorganized and labeled to match with what the research seeks for. After this, the researcher uses their own words to express those outcomes' meanings, and translate content into the target language if required. The newly expressed content is then described with details to clarify the main themes.

Next, the Rectification/Verification phase requires the researcher to reflect on the updated data set again. To be specific, the researcher immerses themselves into the content to enhance an in-depth understanding of the themes and their meanings. However, a distancing step is needed into the bargain, whereby the researcher tries to perceive the content in a fair and critical manner as an outsider of the context, in order to avoid their personal sentiments. By these ways, the data

can be compared and contrasted with the prior knowledge acquired from an existing literature review with transparency. Subthemes can be developed to form more analytical values for the data. After the Initialization, Construction and Rectification phase, the themes and subthemes are described and explained to answer the beginning research question.

The thematic analysis was applied for the research, all the transcriptions of interviews were translated from Vietnamese to English. The main theme corresponds to the research question, whilst the subthemes were generated based on the research sub-questions as Figure 2.



*Figure 2: Themes and subthemes created during the analysis process*

### **3.4.2. Survey Method For Quantitative Data**

There are four main types of quantitative analysis methods: Survey research, correlational research, causal-comparative research and experimental research (Bryman, 2012; Apuke, 2017). Accordingly, survey research focuses on gathering information about the chosen sample's traits based on a questionnaire (Appendix 8). This method mostly adopts close-ended questions, offering researchers an overall picture of the population's demographic and behavioral characteristics

(Ponto, 2015; Apuke, 2017). Correlational research attempts to obtain the correlation between given variables featured by the sample (expected results include 'positive correlation' and 'negative correlation'); this relationship is determined by computed coefficients between independent and dependent variables (Bryman, 2012; Apuke, 2017). Causal-comparative research also examines variables, yet to find a cause-effect relationship between them (Apuke, 2017). Experimental research, as widely adopted in psychology, looks for one variable's response to another variable (Bryman, 2012; Apuke, 2017).

As this research mostly favors an inductive and exploratory thread of analysis, survey design was opted for gaining descriptive outputs. The survey includes a list of demographic and Likert-scale multiple-choice questions. Some open questions were given too for the examination of the participants' awareness, resilience and adaptive responses in CC. After the participants finished it, the results were inserted in Excel and categorized by the Count function.

### 3.5. Ethics

Ethics are guided by social norms in conducting a research project (Akaranga & Makau, 2016; Vilma, 2018). These norms keep bringing in more debates as researchers differ in values and beliefs for what means 'acceptable' to gain research ethics, especially when research bodies all thrive for their credentials (Bryman, 2012). Ethical issues in research oscillate between severe actions such as disguising researchers or using pseudo-respondents and discreet, elusive cases (Bryman, 2012). Nowadays, when people are more aware of the gravity of unethical research, it is found harder to figure out ethical dilemmas. Bryan (2012) also claimed that ethical issues tend to be deemed as violation in applying specific research methods, notwithstanding, the cases occur in far more diverse situations.

According to Diener and Crandall (1978, cited in Bryman, 2012), ethical issues often lie within four domains: Harm to respondents, lack of consent, harm to privacy and fraud. With

respect to the first domain, this refers to any physical or mental strains caused by the research process on participants (Bryman, 2012). One of the attempts to shower participants with comfort is to keep their personal information and recordings confidential, which is on convergence with the aim of not invading their privacy (Bryman, 2012). This domain leads to the concept of beneficence, whereby the researcher is obliged with facilitating benefits and reducing risks of harm to their research audience (Akaranga & Makau, 2016; Vilma, 2018). Moreover, it is further addressed that physical or mental harm can happen with researchers too, whereby their research is in need of approaching sensitive and abuse cases (Bryman, 2012). In the context of this dissertation, physical and mental incidents did not occur, as the research topic relates to farmers' usual agricultural activities where there would be no ways to upset the participants. Though the research is politics-related, it only focuses on understanding their perception and their thoughts are all respected. The respondents were approached through a townie in the local management department to gain their trust.

The second domain of ethical issues, namely lack of consent, should be deemed as the most common dilemma in research. In this case, researchers are advised to provide information as much as possible, so that people gain sufficient details of the research purpose and decide to join the research process or not (Bryman, 2012). A research project can be conducted by law under many circumstances, notwithstanding, participants deserve to understand how and why they should contribute to the process (Bryman, 2012). The solution does not lie within the scope of both parties' verbal or written agreement, many researchers in fact fail to efficiently explain the significance of their study, or fail to provide all participants with similar information (Homan, 1991, cited in Bryman, 2012). Particularly, some participants may change their attitudes and behaviors which prevents the researcher from successfully achieving their consent or acquiring sufficient data

(Bryman, 2012). Thus, informed consent forms were provided to guarantee that farmers conducted interviews and surveys on their volunteering. As a large number of them do not understand research and questions used for the research, they were explained with simple and understandable terminologies by the dissertation author and other knowledgeable dwellers. However, this raises skepticism surrounding how precisely the respondents understood the topic, which challenged the general analysis process and theme interpretation.

Privacy invasion, as another domain of common ethical issues in research, refers to the guaranteeing that participants' personal information and life are respected, whereby informed consent forms take a crucial role (Bryman, 2012; Akaranga & Makau, 2016). Without the participants' permission, their personal information must be anonymous. This strongly associates with the first domain of ethical issues, that is, researchers are in charge of protecting participants from physical and mental harm. In some projects related to abuse cases, confidentiality is extremely important.

Last but not least, research projects may contain deception in various ways. Some researchers do not tell participants truth or they only release part of the truth (Bryman, 2012; Akaranga & Makau, 2016). Apart from common sense that this action is not nice and fair, it questions the researcher's self-interest and self-criticism while research should be conducted with transparency (Bryman, 2012). Researchers can also mislead the audience with fraud data or plagiarism (Vilma, 2018).

## 4. Results & Discussion

### 4.1. Demographic Insights

Based on the descriptive quantitative research, a big picture of farmers' household information in Hon Dat and An Bien district was acquired. There is a significant discrepancy of

gender distribution in these districts, where the number of men is four times larger than that of women. Most of the people are at the working-age (34%, 45% and 25% of the participants aged 30-40, 40-50 and 50-60 respectively). The majority of them have the primary to secondary school qualification, while two people are illiterate. The Kinh people predominate as four times as the Khmer. For the most part, two people in each household are in the agricultural workforce.

In terms of assets, almost 100% of the people do farming on their own properties, most of which are from two to three hectares wide. Rice is their main source of income. More than half of them earn extra from various fields such as wage jobs, livestock or aquaculture. Nearly 80% of them can afford daily needs with their income. When it comes to more capital, they tend to borrow from their folks or banks. In the scenario of natural disasters, the majority of them claimed that their budget is not sufficient enough to cover losses.

In these settings, bike is their primary means of transportation to reach common places e.g. markets, schools and clinics. It often takes them from ten to thirty minutes to get to the nearest ones. Most of them are satisfied with those places' facilities. Thus, they are likely to have a proper network for information and communication.

The answers show that most of them can approach news about CC on a daily basis. Notwithstanding, their frequency of receiving technical information to cope with CC varies, that is, 30.70%, 30.70%, 20.18% and 12.18% of them can access the information once per day, once per week, once per month and once per three months respectively, while the remaining had no ideas about this.

Specifically, in farming activities, a predominant amount of them have worked in agriculture for at least ten years. The number of people applying the monoculture rice system is not much of difference from those who favor the rice-shrimp model. In response to CC, the three leading

measures include: Diversifying varieties, actively managing water and altering cultivation techniques, which goes in tune with the fact that the majority of them have changed farming techniques in the past ten years. The majority of them can observe the change in natural resources. Nonetheless, their awareness of CC is questioned as a large part of them have not noticed the precipitation and drought level over 10 years. They are inclined with the idea that CC's effects are not real or clear. Even so, most of them agreed that inorganic fertilizers are harmful, and environmentally-friendly farming patterns are supported.

In the scenario of climate disasters, over 70% of the farmers consider that the information source is prompt and useful for them. Approximately 60% of them are willing to learn new technologies and techniques to increase their farming productivity. Up to 84% of them approved the positive effects of new models today. However, most of them believed that the government's support would not be effective enough in helping them counteract CC. They expected the government to invest more in farming systems with advanced technology-based know-how, along with improving infrastructure e.g. land traffic, drainages or facilities to prevent salinity. The farmers also looked forward to social organizations' participation in this picture. Besides, most of them suppose that individuals and households should be responsible for tackling CC.

## 4.2. Subthemes' Findings

### 4.2.1. *Farmers' Perception Of CC*

The interview results show that farmers are aware of visible changes in the climate. All of them recognize CC's symptoms due to the unusual rainfall and temperature in crops. This goes in tune with Assoc. Prof. Le's opinion about farmers' perception of CC, for more details, their understanding of climate risks has improved in the past twelve years, especially the ones living near the coastline or ones owning big farms. Before that, they remained unconcerned about the environment as CC did not impact their produce apparently. To date, they can figure out the change

in climate factors from ten years ago. However, there are strong discrepancies in CC knowledge between people who frequently update information about CC and the ones who do not. The former group (which accounts for one-third of the respondents) are aware that human activities are the foremost root of climate catastrophe, that is, deforestation devastates the environment and puts livelihoods in various risks in the long run. Though this definition is not complete, their concern towards sustainable issues is worth being appreciated, as it forms their willingness to implement CCAS. For instance, *"I think it (CC) will last long, not only a few years so far. CC is not something humans can solve immediately. People can plant more trees to counteract it as said in commercials, but now that forests remain being destroyed, the climate has to turn them down... Drought is only part of it... Everyone should be similarly responsible to rescue the situation. You see I've got home plants to help counteract CC as advised in commercials."* Noticeably, a good understanding of CC reveals their resilience and creativity in adapting hazards such as *"Yeah, farming is far more difficult today because of CC. However, we can adapt it well if enlightened with modern knowledge... Technology is must-applied... We're all freed from issues thanks to equipment."* Interestingly, this respondent is an old man Nguyen Van Ut who was retired from farming, and his educational background stops at the primary school level. He also frequently watches agricultural television programs where leading professors such as Tran Van Hai or Nguyen Bao Ve play the host role in instructing farmers towards new methods. Thus, the educational level may affect people's know-how of CC as proven in many research papers, but this is not always the case.

For the latter group who is able to beware but not sure in details about CC, they noticed climate issues when their paddy was destroyed by salinity and flooding along with the emergence of pests. They believe that CC is created by God or deity. They follow the news too, but mostly



rely on personal experiences. They also lack the motivation to cope with the situation and wait for a better season rather than proactively seeking methods. *"He (referring to God or deity) wants rain or sun, let's just leave him that way. I will follow the crop calendar then manage things. No matter what I cannot control over it."*, or *"I know about it but not like I'm scared of it. If it's flooding I will just live with floods. There's nothing I can do."*

According to the officer respondents, farmers' perception of CC is affected by three main reasons. First of all, they acquire information from mainstream media. Second, they follow the NGOs' training in their local settings. Third, they are ware of CC based on real experiences. Contrasting this insight with the interview answers, the third reason and local propaganda play the most important role in enlightening farmers about CC's effects (100%). More than half of the respondents noticed CC on mainstream media after withholding severe losses in their agricultural products. Meanwhile, the significance of NGOs was hardly found. This raises a question surrounding the influence of responsible organizations in approaching farmers in Hon Dat and An Bien. It is worth noting that some farmers mentioned that NGOs' activities have been lessened in recent years, and farmers manage to understand climate risks themselves. Thus, local units should organize more programs for farmers to learn about CC and practice CCAS.

#### **4.2.2. Farmers' Perception Of CCAS**

In the face of CC, the Vietnamese government's CCAS including the GR120 prioritize certain cultivation techniques in Mekong Delta whereby sparse planting (low density of 30cm spaced rows) is favored to grow rice (Ministry of Agriculture and Rural Development of the Socialist Republic of Vietnam, 2018). Farmers are encouraged to adopt GKG1 and GKG9 rice varieties with organic fertilizers in large-scale fields to gain high-quality outputs (Le, 2019). Besides, the shrimp-rice rotational model is applied to improve coastal farmers' livelihoods. These methods and so forth increased the proportion of high-quality paddy by 75% between 2017 and 2018 (Le, 2019).

Nonetheless, this result emerged from the cooperation between various projects rather than the GR120 itself (Le, 2019).

When interviewing farmers in terms of these new farming ecosystems, five of them are reluctant in the transition to new rice species and techniques. While one of them is afraid of the investment input though foreseeing the potential of these models, the others showed little concern about those and ignored local training for upgraded methods. They also fall into the less-perceived group of CC depicted in Sub-section 4.2.1. Notably, two of them have negative perspectives on training schemes. One considered these activities as a show-off and way to leak money by the superior; one insisted on following traditional techniques from personal experiences and disregarded engineers' qualifications. *"Training takes place sometime, but there is nothing to do with these. It's God. Misfortune is because of God... I used to join them, now I get deadly bored. For what sake? Just all trite!... Engineers are no different from farmers. Training what?"* Meanwhile, the majority of respondents approved the effectiveness of new varieties and cultivation techniques. One of them claimed that sparse planting reduced expenses on pesticide and fertilizer. Another respondent thought that productivity after applying sparse planting remained the same or a bit less, even so, he is happy as this technique limits the rice collapse. Overall, they like learning things and complement new lessons to their prior skills and knowledge. Based on a better understanding of CCAS, some of them well perceive self-resilience and responsibility instead of solely blaming on the situation. *"Yeah, that's very good. That prevents risks. Otherwise, it's a necessary evil... If we know more to change, we will be fine. Ones who stick to traditions must be ripped apart... Long ago we knew nothing about news or CC... If we keep thinking the same, we will be bound to inertia."* Due to an officer, the application of new methods often faces many

difficulties at the first beginning, since it takes time to show farmers that these methods are beneficial.

In terms of fertilizer, the majority of farmers use both organic and inorganic fertilizers. Most of them understand about chemical fertilizer's harm but not willing to eliminate it all over as chemical products are far more affordable with perceptible effects. *"People basically prefer chemical fertilizer as it shows visible results, the organic one's effects are slow. Plus, now both of them cost the same, but the organic one needs more care."* Particularly, two people of this cluster have advanced knowledge of fertilizer types when compared with the remaining. They respect sustainable strategies and support others to utilize organic and bio-fertilizers. Meanwhile, 29% of the respondents only use chemical ones as they believe this is the only solution to maximize their crop yield.

Apart from modern techniques, infrastructure and constructions as the leading measure to tackle CC quickly, in fact, brought up few opinions. Overall, the farmers expected the improvement of land traffic systems, drainage ditches, paddy dryers and pumps. Regarding traffic, many farmers rely on waterways as this system costs them less in transporting goods. Drainage ditches also take a critical role in CCAS; notwithstanding, one respondent considered that they are useless towards salinity. Amongst these facilities, the requirement of paddy dryers lifts up remarkable insights. According to some respondents, farmers no longer prepare dryers for business as this system costs around a billion of Vietnam dong, but can be used only once in a while during crops. *"Each time going to the drying area, you have to register for electricity and stuff... You must get labors. You can ask for it but let's say a household that wants to open a drying system, you are going to invest billions... Of course, there are such households with investment capacity, but you invest in it then during the summer-fall and winter-spring crops who needs to dry paddy? Then*

*you just leave it that way for the whole year... You'd go bankrupt."* Another respondent complemented to the challenge of self-possessing a dryer, as in *"We can't dry paddy, as mongers want to purchase paddy with cheap price then dry it themselves... Before we used to do it ourselves... Now we are passive... We just harvest then sell and they will dry it."*

Overall, the reluctance to approach new systems and the capability to possess equipment imply farmers' lack of financial capital. The majority of respondents admitted hearing about the government's financial support in CCAS, and shared the same opinion that those budgets are not sufficient. However, one of them believes that subordinate governments skim money from that source. Meanwhile, some people empathize with the government's difficulties in solving abundant disasters at once. *"Probably no support this year. I guess so as there are the Covid and storms in the Central. The ones in storms are much more miserable than us, so we should sympathize with the government. If funding everyone then no more money left to support."* This topic also sheds light on farmers' understanding of procedures. For example, *"For support, they have to have policies and plans. A circular is sent from the government to regions, then they will go examine to see who loses how, then they will report back to the executive, then will have to wait for their scheme... Local officers know the real situation, they surveyed before but then could just wait... If given no policies, we will have to accept this."*

Overall, how farmers perceive CCAS can be grouped in three levels: First, farmers show little trust in the government, along with more or less understanding of the real situation, they may generate little concern about the government's operations including CCAS, or worse, they disregard the government's role. Second, farmers are neutral about the context; they look out for the government's support but accept the government's weaknesses into the bargain. Third, farmers

appreciate the government's efforts and believe that all the stakeholders including themselves should be responsible for dilemmas.

#### *4.2.3. Farmer's Social Resilience In CC*

In this part, the resilience capability is discussed in terms of Carver's (1998) concept of resilience phases, whereby the Surviving phase refers to no or little change in farmers' behaviors after suffering CC, the Recovering phase emphasizes the importance of learning from failure or losses, and the Thriving phase takes place in action to cope with hazards. There exist grey areas between these phases, particularly between Recovering and Thriving. For example, people may question the degree of the learning process in Recovering stage, as learning is an active cognitive invention to change the situation. Nonetheless, the dissertation's researcher favors the concept that Recovering is inclusive of actions in improving a problem, whilst Thriving refers to innovative actions in remarkably changing a long-term future. Each farmer may experience all those stages during CC. Their behaviors can change by time when they have more access to information and science. In some cases, disasters can motivate their creativity to grow stronger.

According to the results, the ones who show no to very little resilience, as implied in the Surviving phase, belong to the less-perceived cluster towards CC and CCAS. Meanwhile, those who proactively and willingly acquire new adaptive measures fall in the more-perceived group. A positive correlation between resilience and perception can be interpreted here, in detail, the less people perceive risks, the less they are aware of the significance of learning and changing for a better future and vice versa. In total, four of the respondents revealed their resilience capability at a low level in tackling CC. They strongly focus on personal experiences rather than enhancing knowledge. Under the circumstance of climate effects, they tend to let things be and wait for mongers to purchase rice. *"There haven't been specific measures. Just go with the flow. That's the fact."*

All of the farmers show more or less capability in bouncing back from climate troubles. Their main tactics include: Preparing infrastructure themselves, updating information, setting aside a contingency budget and working part-time. 100% of the respondents tried to build or strengthen their dams, drainages, water supply, etc. to prevent salinity. More than half of them attempted to acquire news, skills and knowledge of CC via mainstream media and local organizations. *"I watch it all the time... I'm full of experience with that... Usually watch things each night, or in the daylight."* Besides, the farmers highlighted the importance of a backup budget. *"Not sure about others, but you know I have a financial plan ahead."* Apart from those, farmers work as wage labor in their spare time to diversify income sources.

Regarding the manifestation of Thriving responses, six of the respondents asserted the importance of new investment. They favored the benefits of new varieties, new cultivation techniques and modern equipment in solving agricultural problems. For instance, *"Investing in technology is the same as traditional tools, but we are going to gain good profits. As long we dare spend more, we will earn more..."* The same number of people supported the growth of science and technology in coping with CC. They started to join more training activities and look for such programs on television to enhance their knowledge. *"Annually the Agricultural Department and some production organizations provide technical training. I have improved a lot each year. The second point is that I extract lessons from real experiences into the bargain. It's not like we will be always successful... Each land has its features".* Besides, the farmers become more interested in collectives and cooperatives. The majority of them (roughly 64%) joined these groups and related programs. They considered that the participation in these activities enables them to cultivate the same variety with similar techniques altogether, which prospers outputs for trading. Moreover, cooperatives and collectives are administrated by the government and subordinate

governments, subsequently, the members have more access to assets and resources. The strong relationship between those groups and agricultural scientists also favors the members to upgrade their skills and knowledge conveniently. Thus, the ones who take part in collectives and cooperatives can grow their knowledge and network in the long run. *"Joining the collective is very beneficial... We plant rice together... The government supplies water and stuff."*

To sum up, farmers' perspectives of coping with CC vary. On the whole, there exists the critical role of science, technology and community-based organizations in their resilience strategies. A question should be raised surrounding how to grow between phases of the resilience process. To develop from the Surviving to Recovering phase, people are in need of eliminating a passive attitude in dealing with dilemmas. This transformation of awareness requires responsible organizations to well approach farmers and provide them with sufficient information about the potential of changing their customs. Between the Recovering and Thriving phase, Ledesma (2014) emphasized the significance of growing a strong sense of self. It is vital that farmers understand their strengths and opportunities in a broader framework rather than relying on natural resources or traditional techniques.

#### **4.2.4. Farmers' Barriers To CCAS**

Though various challenges in tackling CC can be interpreted from the prior sub-sections such as lack of knowledge, mistrust in the government, lack of science and technology, dependency on natural resources, non-diversified income sources, etc., the core roots that bring difficulties to farmers in CC can be inclusive in three facets. The first barrier should be stated as farmers' lack of financial capital. 100% of the interviews with both farmers and officers reveal that limited capital plays the foremost role in constraining farmers from approaching resources, which explains a series of dilemmas mentioned from the beginning of the research. Without financial capital, farmers are reluctant in the transition to new varieties and cultivation methods, unless they are able

to observe trials and the corresponding effects. *"I feel afraid. I've got only two seasons annually. I dare not transform mine with new techniques. As in if I knew about it already, I would keep doing it step-by-step like A then B, C, D, Z. But the new technique is strange to me, I'm not sure how to collaborate with it. If given some trials, it should be okay. But I need someone to instruct me in terms of that. Otherwise, I may lose a bunch."* This goes in tune with several officers' opinions that though farmers learn fast on modern techniques, their positive responses are limited by the financial input and lack of trials with immediate effects. From a similar perspective, a farmer claimed that *"There was a program one year ago or so. Something about sustainable paddy. The company brought their fertilizers, but I did not follow it then. Recently I have tried it and the environmental effects turn so good. However, I cannot see much of business profit..."*

Regarding this dilemma, one officer asserted that the amount of supporting budgets for agriculture became lessened. This leads to an odd cycle: The government encourages farmers to implement CCAS themselves, but farmers can hardly implement CCAS without the government's financial support. Another officer also shed light that the budget assigned for local regions is too little. According to him, the district receives four billions of Vietnam dong annually, notwithstanding, this amount has to be distributed for all the communes. Meanwhile, another officer claimed that agriculture is in need of around fifteen billions for one district.

The second barrier of farmers in the implementation of CCAS is determined as the instability of market outlets for agricultural produce. Twelve out of the farmer respondents (over 70% in all) mentioned their obstructions in planting and selling rice. Rice varieties, planting techniques and quantities can be bound by the purchaser. Farmers often sell their produce to either firms or mongers. Making business with each stakeholder has its advantages and disadvantages. Concerning firms, farmers sign an off-take agreement with them, whereby the firm is at the helm



of facilitating inputs and guarantee market outlets for farmers. As a result, farmers can cultivate in large-scale fields without worrying about capital (Bui, 2019). However, many farmers do not deem sponsored inputs and stable outputs as paid-off. They often compare the selling price with ones working with mongers. In all fairness, *"Some companies worked with farmers for high-quality paddy, but they gave farmers normal varieties. No pieces of training were accomplished, turning to the impending death of paddy."* As stated by one officer, the firm's purchase price is always lower than the market price, which explains why farmers prefer to sell their produce to mongers. However, all of the farmer respondents complained that mongers force them to sell paddy at a low price. Mongers are also not willing to buy their whole produce, which frustrates farmers in terms of financial stability. Another problematic facet of the farmer-monger combination was shed light by another officer, that is, *"Mongers buy from the outside to the inside, so the farmers who live a bit far away will be subject to more losses."* However, the role of mongers in those settings is crucial, as poor traffic conditions in rural areas enable mongers to approach farmers more easily than firms do (Nguyen, 2018). Overall, the government and subordinate ones do not invade the business between farmers and other parties, as farmers are dependent on those to generate profits.

Last but not least, the effective implementation of CCAS is challenged by the lack of communal sense. Two amongst the farmers considered that people are not unanimous for the same goal of supporting each other and supporting the community in CC. Though the majority of farmer respondents are interested in joining collectives and cooperatives, they do not understand the nature of these groups. According to one officer, *"Farmers have not understood about cooperation, cooperatives, collectives. They think that joining those will benefit them something, they do not think that they join those to reduce expenses by doing business themselves."* Ultimately, farmers' customs are individual or household-based. They form a different mindset from the

government, sub-governments and firms. Meanwhile, CCAS require a solid collaboration between regions and departments. According to Mr Hoan Minh Le the Provincial Party Secretary in Dong Thap province (Hoang & Chi, 2017), three stakeholders including farmers, firms and local government need to collaborate altogether. Otherwise, given any policies, the situation will get obstructed by the distinctive values and beliefs in groups. Thus, he mentioned the significance of leadership in gaining expected outcomes. *"Agricultural thinking is seasonal. Corporate thinking is business. Government thinking is term. This puts pressure on long-run plans which should last between five and ten years for the cooperation."*

Plus, from Assoc. Prof. Le's perspective, farmers find difficult to implement CCAS because of: (1) Conservation and self-absorption (taking quantity over quality), (2) Dependency on perceptible observation, (3) Harsh weather, (4) Lack of insurance, (5) Oblivious warning of natural disasters (where, how), (6) Procedures, (7) Infrastructure and construction, (8) Knowledge, (9) Community, (10) Capital, (11) Uncertain forecast systems, (12) Leadership and (13) Criteria from the higher authority. According to him, media should not be counted, but media influences farmers on pursuing certain varieties and methods. Above all, he believes that leadership is the central point: *"The biggest reason is that no one conducts this orchestra."*

#### **4.2.5. Farmers' Opportunities In CC**

In the face of CC and GHG where negative effects outweigh positive ones, seeking potentials of growth in a catastrophe is essential for sustainable livelihoods apart from immediate measures such as infrastructure or constructions. Regarding the research case, there is apparent room for farmers in terms of qualification development. The results show that over half of the farmer respondents are interested in acquiring new techniques to tackle CC and increase productivity. The uncertainty of unfavorable climate conditions also requires the inhabitants to lift up their knowledge of CC via information and communication means. As mentioned by Assoc. Prof. Le,

farmers' perception of CC has significantly grown in the past twelve years. The visible change in rainfall, temperature, salinity and so forth, along with the wide spread of mass media, have brought up farmers' concern about their surroundings and activities. The increase of farmers' awareness of CC, technological and communication skills will favor themselves in pursuing smart models in agricultural systems.

Moreover, CC has transformed the socio-economical situation in Mekong Delta, whereby farmers have taken up new varieties and cultivation techniques. According to Professor Vo Xuan Tong (Dinh, 2019), the Mekong Delta is filled with crops. The irrigation system has mostly focused on paddy for over forty years. Nevertheless, a large number of households account for the poor sectors. In his opinion, this is an opportunity to transform and diversify agricultural systems in Mekong Delta. To date, many farmers have shifted from traditional rice cultivation to aquaculture production. Currently, Kien Giang province is one of the leading aquaculture areas in the Mekong Delta (Viet, 2018).

#### 4.3. The Influence Of GR120

As obtained from Assoc. Prof. Le, the GR120 has been not holistically applied due to many reasons. First, there is a poor interconnection between responsible departments and between regions. Second, inter-regional cooperation is not compulsory, leading to uneven distribution in applying the policy. Third, each region centralizes their own benefits. Fourth, there is a lack of benefit-sharing laws. Fifth, there is a lack of financial support. Sixth, the policy is likely to orient people than deploy actions. Seventh, there is a lack of binding in the implementation of the policy.

However, the application of GR120 has shown its positive effects. According to the People's Committee of Kien Giang province's Report on the implementation of GR120 (Kien Giang Portal, 2020), remarkable outcomes that directly relate to farmers' agricultural systems and activities have been generated:

1. 146 biogas plants have been put into operation to dispose livestock waste. These systems have reduced livestock pollution and helped households save 240,000 Vietnam dong per month for the gas cost.

2. The rice production structure has been transformed from two crops in winter-spring and summer-autumn to three intensive farming crops in winter-spring, summer-autumn and autumn-winter of almost 90,000 hectares to ensure adequate flood control in the western districts of Hau river (Giong Rieng, Tan Hiep) and the Long Xuyen quadrangle (Hon Dat).

3. Results of investigation in preserving and developing aquaculture resources, especially *Notopterus notopterus* (since the end of 2018) and *Portunus pelagicus*: The total number of G1 breed is 788,203, the total number of G2 released to the sea is 13,576.

4. The model of shrimp farming with sustainable techniques has been applied on a wide range: Ha Tien, Kien Luong, Hon Dat, Giang Thanh, An Bien, Vinh Thuan and An Minh. This model meets the VietGAP standards and generates a high productivity level of 2-3 tons per lake (each lake is 500 meters). The application of this model.

Overall, the report shows that a significant number of farmers have proactively engaged with new varieties and methods. More of them started to transform from traditional crop systems to the shrimp-rice farming model to diversify the income in both agriculture and aquaculture. It is shown that between 2017 and 2018, the GDP of the Mekong Delta in general reached 7.8% as the highest level when compared with four previous years. In 2018, the Mekong Delta's shrimp products reached 0.623 million tons which accounts for 70% of the national shrimp products. Fruits weight around 60% of national fruits which is equivalent to 4.3 million tons. As for crops which are the most central product in the region, paddy made up 24,5 million tons nationally (56%).

Thus, though the research findings show that many farmers are not aware of CC effects, and reluctant in the transition to new varieties and new cultivation techniques, the outcomes after a few years of implementing the GR120 reveal positive results. This indicates that farmers in Kien Giang province in particular and in the Mekong Delta in general have approached more to policies and advanced their skills and knowledge. Those outcomes of implementing CCAS especially the GR120 demonstrate that farmers start to be more aware of new models in improving their productivity. They started to diversify their job fields in terms of fruits, shrimp and fish.

However, the interview process also sheds light that farmers can only notice the importance of new methods after being clearly instructed and withholding clear effects. Thus, the application of these upgraded methods is in need of organizing more trial activities to prove its benefits to farmers. Moreover, one of the farmer respondents said that though participating in collectives and cooperatives brings significant benefits for individuals and communities, those groups' activities become stagnant over time due to the lack of leadership. In the GR120, the role of these groups are also centralized. Thus, this fact brings skepticism towards the effectiveness of those groups' operations. Moreover, the establishment of collectives and cooperatives are dependent on land planning and certain conditions. As a result, some farmers respondents claim that they have not joined those groups as there are no such groups in their areas. However, most of the ones who have not participated in collectives and cooperatives shared the commonality of their desire to join and to be supported by those community-based units. This raises a question on how the governing bodies should construct and operate those groups to improve farmers' benefits.

## 5. Conclusion

### 5.1. Research Implications

The research on Hon Dat and An Bien district in Kien Giang province significantly sheds light on farmers' characteristics and main factors that influence them in CC. Based on descriptive survey and unstructured interview methods, some central findings were found:

1. These districts have been suffering severe salinity and drought. The majority of farmers in these settings are at the working-age. They strongly rely on rice cultivation with the use of monoculture rice system or rice-shrimp model. Most of them can easily access to public facilities to update information.

2. All of the farmers are aware of changes in the climate, particularly when those negatively impact their paddy production. Nonetheless, a large part of them have little understanding of what CC is and why CC happens. For the group who are more knowledgeable of CC, they consider deforestation the topmost cause. Real experience and local propaganda play the most essential role in notifying farmers of climate risks, followed by mainstream media. NGOs' training was hardly mentioned as the farmers' prompt source of information, which contrasts with Assoc. Prof. Le's survey in 2018. Unlike some scientific papers that point out that educational background can affect people's perception of CC, this research generates no insights about the relationship between demographic characteristics and people's perception.

3. Regarding CCAS, the most part of farmers recognize the new varieties and techniques' positive effects on their agricultural systems, whereby low-density cultivation and large-scale fields are favored. They often use both organic and chemical fertilizers, as the latter is more affordable and brings apparent effects. In terms of infrastructure and constructions to tackle CC, farmers think that land traffic systems should be improved for convenient transportation. Some of

them emphasize the necessity of paddy dryers. On a whole, people's responses to CCAS include three group: Negative, Neutral and Self-Responsible.

4. Farmers resist and adapt CC in different ways. The majority of them proactively prepare systems to prevent salinity. They also appreciate the significance of cooperatives and collectives in tackling CC and training knowledge. Notably, the adoption of science, technology and community-based units greatly contribute to people's resilience. However, some farmers neglect the importance of technical training due to mistrust or reliance on personal experience; many farmers misunderstand the structure of collectives and cooperatives, whereby they consider these groups as the government's complete support.

5. There are three main barriers that challenge farmers in implementing CCAS, that is, lack of financial capital, instable market outlets and lack of communal sense. Capital comes forward as the core problem of farmers' CCAS implementation. Some of them are reluctant to try new varieties and methods as those cost them certain expenses for the inputs, while they are not aware of the effects afterwards. Second, farmers struggle with output markets especially in difficult periods when they lose rice quantity and quality by floods or salinity. Farmers work with firms or mongers. While firms offer farmers stable inputs and outputs with off-take agreements, mongers do not purchase all but offer farmers with higher purchase price. On the whole, farmers are familiar with relying on mongers, notably all the interviewees complained that their selling price is forced to be low by mongers. Third, farmers are familiar with smallholder-based operations, though being aware of community-based units' benefits. Some other barriers to implementing CCAS also count such as dependency on personal experiences, dependency on traditional methods, lack of knowledge, lack of technology, mistrust, etc.

6. CC brings opportunities for farmers to upgrade their skills and knowledge, especially in modern techniques and technologies. The regional socio-economy is expected to be sustainable, transformative and diversified to well counteract CC.

## 5.2. Managerial Implications

The research findings imply certain problems in the local management system. First of all, though farmers can access to information and communication means, their awareness of CC and CCAS is limited. The educational level counts, but some farmers with a very low educational background show their creativity and responsiveness in adapting climate issues. Local propaganda helps farmers shed light on CC, notwithstanding, the information is not sufficient to lift up their perception of risk. The majority of farmers give concern about CC only when they withhold extreme climate events that negatively impact their production. Thus, local departments should educate the inhabitants in terms of what and how they may lose in CC. These pieces of training need to centralize on farmers' agricultural losses and corresponding solutions in detail, rather than explaining scientific information and general impacts. According to Assoc. Prof. Le and other officers, farmers need to be exposed with the explanation of direct impact on them.

Secondly, there need clear laws and regulations in terms of how stakeholders share benefits in cooperative activities. With limited budgets assigned for each province in supporting agriculture, governing bodies are reluctant to collaborate with other regions or departments. They can only focus on their own benefits. Thus, the Vietnamese government should issue schemes on benefit-sharing policies, and put more binding into cooperative actions between regions and organizations. The stakeholders need coherent and explicit policies to understand who should be in charge of what.

Thirdly, farmers are in essential need of agricultural insurance. The lack of appropriate schemes concerning this clearly puts organizations in pressure, as they have limited financial



capital to support farming systems, especially NGOs and small- to medium-enterprises. Particularly in CC, the lack of agricultural insurance contributes to farmers' struggles in coping with the aftermath of natural disasters. In addition, governing bodies should educate farmers about the benefits of purchasing insurance in terms of their health and production risks.

Fourthly, farmers should be motivated to participate in non-agricultural fields to diversify their skills and knowledge. The strong reliance on agriculture constrains their understanding of diversifying income sources. Subsequently, they tend to wait for government support or wait for the next agricultural season after suffering losses in CC. According to Assoc. Prof. Le, farmers today are dependent on equipment, they do not have to take care of crops as much as they used to. Thus, local units should expand new fields for them to try new skills and jobs during the intervals between crops. Farmers need to understand the importance of diversified earning sources and backup budgets.

Fifthly, governing bodies should favor field trials, so that farmers can learn about the effects of new varieties and techniques. Due to the research findings, many farmers reveal that they want to try new methods to increase productivity. They are reluctant to invest in those without directly observing the effects and without clear instructions.

Sixthly, the government should consider clear policies for backup plans and budgets in CC. Currently, provincial governing bodies are dependent on a very low budget. The fact that Vietnam is a developing country with limited financial capital is understandable. Therefore, those policies are promising to clarify how the stakeholders should distribute and utilize the assigned budget.

Seventhly, there needs policies of market outlets for farmers, so that they will not rely on mongers as current. According to Assoc. Prof. Le, farmers should be favored to sell their produce in more flexible terms. Particularly, local training should be conducted in terms of explaining the

benefits of cooperating with enterprises. Farmers should also be exposed with knowledge of business agreements to avoid fraud.

Eighthly, traffic systems should be improved, so that farmers can easily access other regions to make business. This also greatly helps business firms and NGOs in approaching rural areas to conduct training and assist farmers promptly in natural disasters. Today, many farmers crave for in-land systems, so that they can have a chance to expose with other regions to expand their business. Also, the development of traffic systems will contribute to the information and communication means, which offers a bridge for farmers to acquire their knowledge and skills in different areas with different people and qualifications.

Ninthly, though the benefits of collectives and cooperatives are visible. The fact that those groups operate based on self-management brings skepticism on their effectiveness in the long run. Meanwhile, leadership is one core element that explains why farmers do not follow CCAS well. Therefore, the government should consider the construction and development of these groups. For instance: Who should manage the group? How should the group be managed? Is it relevant if the group can collaborate with other units for better development? Does the government need to manage and support these groups in a longer term before they can operate by themselves?

Tenthly, the government should emphasize the significance of technology and science amongst rural areas. The lack of technology and science obviously puts farmers under pressure in approaching and understanding new techniques. Due to this lack, they are reluctant to change their behaviors. Consequently, they tend to rely on personal experiences to cope with difficulties, harms and dilemmas. Thus, local units and NGOs should approach farmers on a frequent basis to upgrade their skills and knowledge of new methods for agricultural and aquaculture systems.

Last but not least, a conceptual model is proposed to help policymakers adjust and examine their policies in the future. This model emphasizes the importance of farmers' barriers to implement CCAS, and their resilience capability after taking those barriers into account. To be specific, there are two types of barriers that can significantly impact people in generating their decisions. First, perceived barriers, which result from internal forces, are the mechanism for them to decide how they should take CC into account that includes risk perception and climate perception. Second, the external forces are emphasized as giving a remarkable influence on their decisions, whereby technology, media, financial capital, policy and infrastructure should be deemed as the most important domains.

Overall, to answer the research question, farmers are indeed exposed with CCAS including the GR120, though their responses vary due to distinctive perceptions of climate risks. The degree of CCAS' influence on farmers can be categorized in three group. The first group, namely the less-perceived group, has limited ideas about CC's causes and effects. They are aware of the variability, but not willing to approach new methods to tackle CC. They rely on personal experiences and ignore the significance of local training and community-based activities. This leads to their passive reactions under CC - Surviving adaptation. The second group, namely the neutral-perceived group, forms the most part of the research audience. They are more knowledgeable than the first group and more active in approaching new methods. However, they do not proactively change their behaviors to better the situation in the future - Recovering adaptation. The third group, namely the self-responsible group, shows significant know-how of CC and CCAS when compared with the others. They proactively join collectives, learn new methods via local training and television programs, and invest in modern equipment. Moreover, they support people to do the same to help others counteract CC - Thriving adaptation.

## 6. Limitations

The researcher acknowledges certain issues in conducting the research project. First of all, qualitative research based on humans' perspectives, emotions and attitudes contains bias for the end results when compared with quantitative research. As the number of participants for the interview process is relatively medium (under thirty people), discrepancies between their opinions are oblivious. On the other hand, quantitative research based on survey, though being conducted with a significant sample, also embodies inaccuracy as farmers do not profoundly understand certain terms. Though the researcher and dwell assistants did explain on those, the participants tended to copy others' answers. Thus, future research related to CC and farmers should be inclusive of a better sample for qualitative research, a more complex method of quantitative research such as correlational or causal-comparative analysis and a wider range of secondary data.

Secondly, there needs in-depth research to prove the efficacy of the proposed conceptual model. To measure its effectiveness, quantitative analysis is in need. The research findings share commonalities with the model description. However, the results do not represent all cases and lack methods to quantify its degree. Therefore, future research with quantitative methods are vital to examine the degree of this framework.

Thirdly, the research findings reveal insufficient insights about the relationship between farmers' responses and the GR120. Though farmers' perception and barriers to implementing CCAS were shed light, the results hardly induct explicit conclusions on the influence of the GR120. Besides, the combination between many sustainable projects in Kien Giang province constrains the examination of the GR120's influence itself. It is suggested that future research

related to specific policies should dig into more measurable variables and apply policy analysis techniques.

Last but not least, the research was conducted based on a limited period. Thus, it can contain the lack of scientific knowledge of agricultural and aquaculture systems. Also, the researcher could not work directly with all the farmers respondents during the research and needed to rely on some dwells to complete the project. This was because farmers are reluctant to meet new people. To avoid the mistrust problem, the researcher tried to approach farmers through the introduction of local people. However, as they are not familiar with the research process, some answers may be generated with bias and caution. For example, some farmers were not ready to tell the researcher what they actually thought and felt about the current policies and the implementation of those policies in their local area. Thus, in the future, there needs a more holistic plan in approaching farmers with longer time, so that the participants can be more open to share their opinions towards the related topics.

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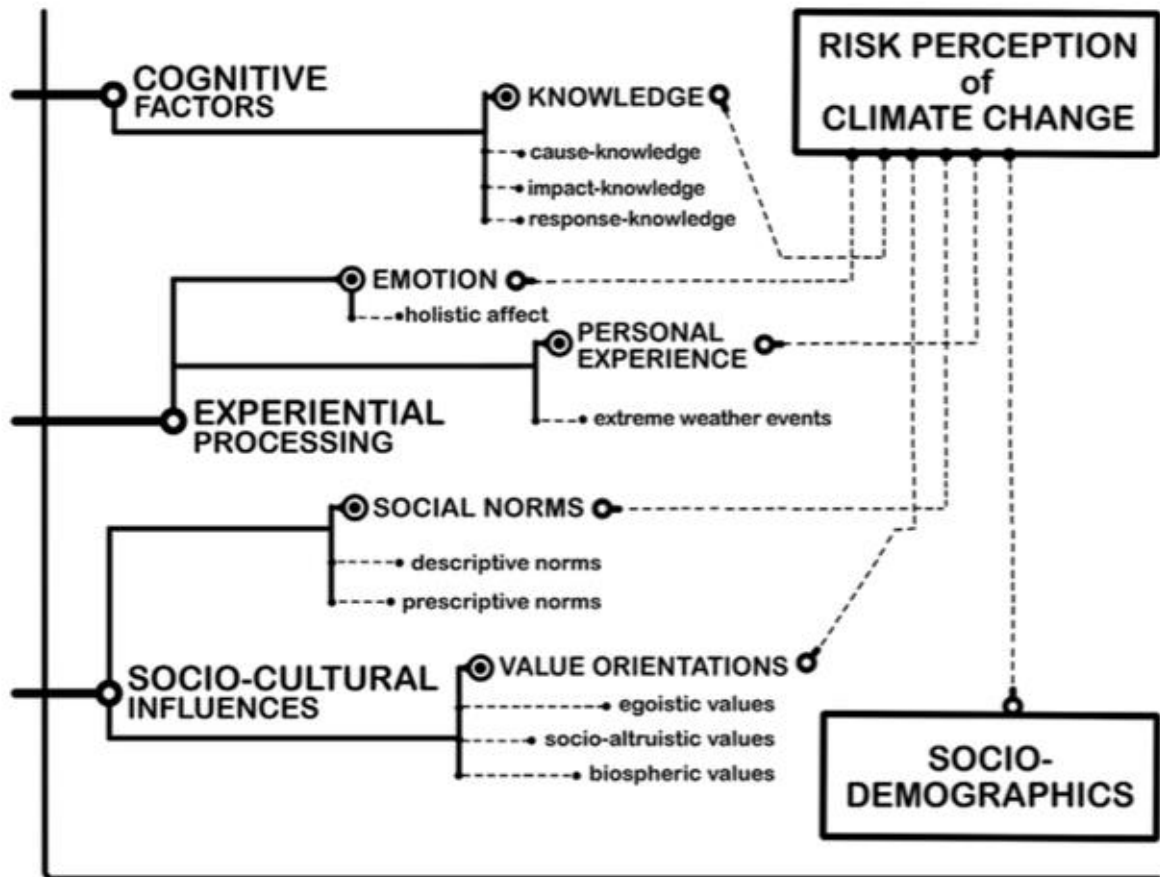
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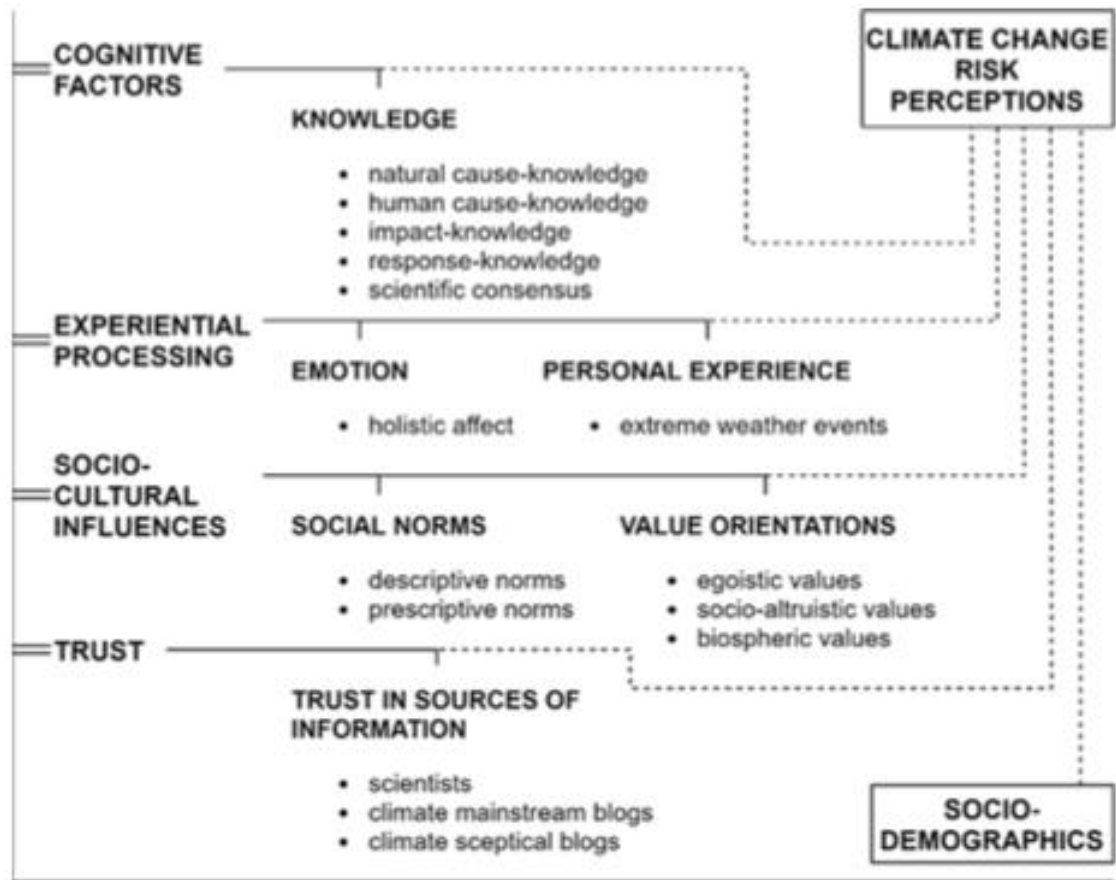
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## Appendix

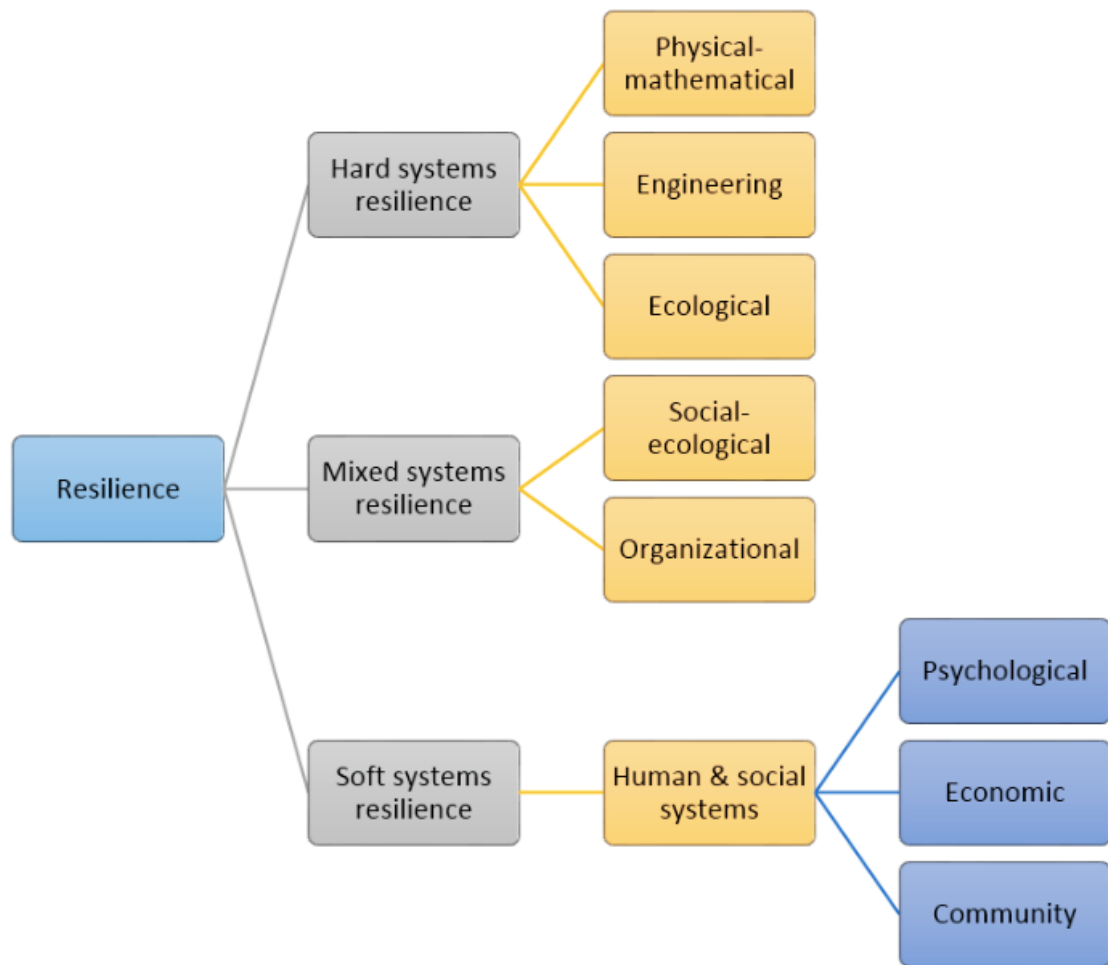
1 . Linden's (2015) CCRPM



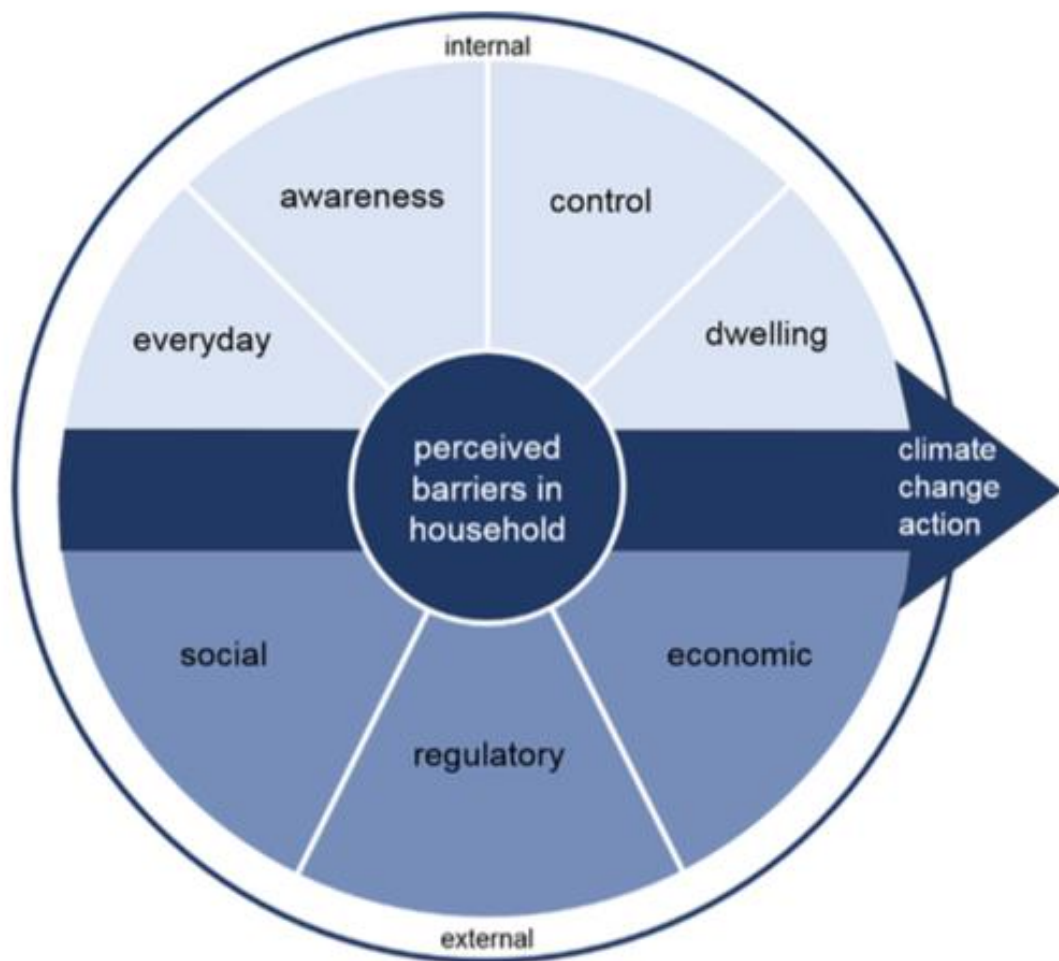
2. Eck, Mulder and Linden's (2020) CCRPM+



### 3. Kais and Islam's (2016) resilience model



4. González-Hernández, Meijles and Vanclay's (2019) model of perceived barriers



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## 5. Semi-structured interview with an expert – Questionnaire

*First of all, thank you for agreeing to share your ideas and time to help the research.*

*The questions below aim to gain a deeper understanding of how the Kien Giang province's policies influence farmer's responses and increase social resilience in agriculture for the region.*

*The interview will be recorded and saved as data for the research. You can free decline to answer any question and you have the right to withdraw from participating at any time.*

*Đầu tiên, cảm ơn thầy đã đồng ý chia sẻ ý kiến và thời gian để giúp hoàn thiện bài nghiên cứu.*

*Những câu hỏi bên dưới nhằm để có thể hiểu sâu thêm về những chính sách của tỉnh Kiên Giang nhằm tăng sức chống chịu và phát triển một nền nông nghiệp bền vững cho khu vực.*

*Nội dung của buổi phỏng vấn sẽ trong đây sẽ được lưu lại nhằm làm tài liệu nghiên cứu cho luận văn. Người trả lời phỏng vấn tự do trả lời theo ý kiến cá nhân, và có thể không trả lời nếu cảm thấy nó không phù hợp với bạn.*

### 1. Perception of CC (*Nhận thức về biến đổi khí hậu*)

1.1. In your opinion, how important the climate change adaptation strategy in Kien Giang Province is? (*Tầm quan trọng của chính sách ứng phó với biến đổi khí hậu tại tỉnh Kiên Giang?*)

1.2. In your opinion, are farmers aware that climate condition is getting more severe because of impacts of climate change? How has the farmer's perception changed compared to before?

*(Theo thầy thì người nông dân có nhận thức được những thay đổi của điều kiện thời tiết càng ngày càng khắc nghiệt (hạn hán, lũ lụt) là do ảnh hưởng của biến đổi khí hậu hay không? Nhận thức của người nông dân thay đổi như thế nào so với trước đây không?)*

1.2.1. If the climate change information has not been widely disseminated in community, what is the reasons? What is the government means for improvement? (*Nếu như người dân chưa được*

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*phổ biến rộng rãi, vậy thì theo thầy nguyên nhân là gì? Chính quyền có phương pháp để cải thiện là gì?)*

2. Climate change adaptation policy (*Chính sách ứng phó với biến đổi khí hậu*)

2.1. How do you think about farmers' response to the changes in climate change adaptation strategies (cultivation schedule, technique, etc.) (positively or negatively?) Why?.

*(Thầy thì đánh giá phản ứng của người dân về sự cần thiết của sự đổi mới chính sách nông nghiệp (thay đổi lịch thời vụ, giảm lượng giống gieo sạ, v.v...) để ứng phó với biến đổi khí hậu như thế nào (ủng hộ hay tiêu cực)? Tại sao?)*

2.2. Do you evaluate the effectiveness of policies to propagandise and encourage the application of new techniques in agriculture, training classes of local authorities for farmers in changing the model under the new policy? (*Thầy đánh giá hiệu quả của những chính sách tuyên truyền và khuyến khích áp dụng kỹ thuật mới trong nông nghiệp, lớp tập huấn của chính quyền địa phương cho người nông dân trong chuyển đổi mô hình theo chính sách mới?*)

2.3. What is the role of social groups, organization in the movement of farmer? (*vai trò của tổ chức xã hội trong vấn đề thay đổi của người dân?*)

3. Increase resilience toward climate change (*Tăng tính chống chịu của người dân trước tác động biến đổi khí hậu*):

3.1. How has the agricultural restructuring helped increase resilience? What is your opinion on the effectiveness of this new agricultural policy? (*Chính sách chuyển đổi cơ cấu nông nghiệp giúp người dân tăng tính chống chịu như thế nào? Đánh giá của thầy về hiệu quả của chính sách nông nghiệp mới này cho đến thời điểm hiện tại*).

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3.2. How is the importance of distance to water in increasing people's resilience? How do you appraise supply capacity of irrigation system in the drought season and inundation? *(Tầm quan trọng của khoảng cách với nguồn nước trong tăng sức chống chịu của người dân như thế nào? Thầy đánh giá chuẩn bị trong công tác xây dựng trữ nguồn nước, dẫn nước cho người nông dân trong canh tác vào mùa hạn, ngập mặn như thế nào?)*

4. Barrier and opportunity *(Rào cản và cơ hội)*

4.1. The news stated that although local authorities encouraged people to apply the new agricultural techniques but many farmers have still used traditional ones. What do your think about this statement, is this phenomena popularity? If the statement is true, what is the main reason? *(Báo chí vẫn đưa tin mặc dù chính quyền địa phương khuyến khích người dân tuân theo những biện pháp mới trong nông nghiệp nhưng người nông dân vẫn thực hiện theo thói quen/kinh nghiệm truyền thống. Theo thầy đánh giá vấn đề này như thế nào, tính phổ biến của nó? Và nguyên do chính là gì?)*

4.2. How did the local government improve this situation? *(Chính quyền địa phương có phương thức nào cải thiện?)*

4.3. Some statements mentioned that small farmers are incapable of adopting the changes in climate change strategies. What are the main barriers that farmer confront to apply changes in agriculture policy? *(Theo tin tức báo đài, thì có đề cập đến hiện nay những hộ nông dân nhỏ thì*



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*khó đáp ứng được những cải tiến chính sách mới này. Theo thầy những rào cản chính khiến người dân khó khăn áp dụng những thay đổi trong nông nghiệp là gì?)*

4.4. Which measures have local government taken to support the people? *(Chính quyền địa phương có thực hiện biện pháp nào để hỗ trợ người dân?)*

4.5. Is there any organization supporting farmers? And how? *(Có các tổ chức xã hội nào (ngoài cơ quan nhà nước) tham gia giúp đỡ nông dân trong thực hiện nông nghiệp bền vững.)*

5. Scenario in cases of climate related shocks *(Trong trường hợp có thiên tai)*

5.1. How do you think about warning of natural disasters with farmers, whether effective or ineffective in warning, people have easy access to information? *(Thầy nhận định như thế nào về công tác cảnh báo thiên tai với người nông dân, hiệu quả hay không hiệu quả trong việc cảnh báo, người dân có dễ tiếp cận thông tin?)*

5.2. The state has a financial support for farmer when crops are damaged by natural disasters and epidemics. How do you think the effectiveness of this policy is? *(Theo em được biết, nhà nước có chính sách hỗ trợ tài chính cho người nông dân khi mùa màng bị phá hoại do thiên tai, dịch bệnh. Theo đánh giá của thầy về hiệu quả của chính sách này như thế nào?)*

Thanks for taking the time to join the interview. Could I contact you if I have other questions related to the topic today? Please keep in touch in case you want to receive research results.

*(Cám ơn đã dành thời gian hoàn thành câu hỏi. Hãy giữ liên lạc trong trường hợp bạn muốn nhận kết quả của bài nghiên cứu.)*

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## 6. Semi-structured interview with local authorities – Questionnaire

*First of all, thank you for agreeing to share your ideas and time to help the research.*

*The questions below aim to gain a deeper understanding of how the Kien Giang province's policies influence farmer's responses and increase social resilience in agriculture for the region.*

*The interview will be recorded and saved as data for the research. The interview will be recorded and saved as data for the research. You can free decline to answer any question and you have the right to withdraw from participating at any time.*

*Đầu tiên, cảm ơn thầy đã đồng ý chia sẻ ý kiến và thời gian để giúp hoàn thiện bài nghiên cứu.*

*Những câu hỏi bên dưới nhằm để có thể hiểu sâu thêm về những chính sách của tỉnh Kiên Giang nhằm tăng sức chống chịu và phát triển một nền nông nghiệp bền vững cho khu vực.*

*Nội dung của buổi phỏng vấn sẽ trong đây sẽ được lưu lại nhằm làm tài liệu nghiên cứu cho luận văn. Người trả lời phỏng vấn tự do trả lời theo ý kiến cá nhân, và có thể không trả lời nếu cảm thấy nó không phù hợp với bạn.*

### A. Information of interviewee :

1. Could you introduce about your work? (Bạn có thể giới thiệu về công việc của bạn)

### B. Climate change perception:

2. How and to what extent have changes in climate condition impacted agriculture in Kien Giang/ Hon Dat/ An Bien? Compared with last 10 years? (Bạn nhận xét những thay đổi của thời tiết gần đây có ảnh hưởng như thế nào với nông nghiệp tại Kiên Giang/ Hòn Đất/ An Biên? Theo bạn nhớ nó có thay đổi nhiều so với quá khứ.)
3. In your opinion, how is farmer's awareness of climate change and its impact on their livelihood? (VẬY theo ý kiến của bạn, suy nghĩ và phản ứng người nông dân đối với vấn đề biến đổi khí hậu như thế nào?)
4. How does farmers' awareness influence their decision to adopt climate change adaptation strategy, measures? (Và nhận thức của người dân họ ảnh hưởng như thế nào với quyết định của họ là áp dụng các mô hình, kỹ thuật nông nghiệp mới?)
  - How does local government enhance their awareness? (Chính quyền đã thực hiện như thế nào để thuyết phục người dân tham gia, hay nâng cao nhận thức).

### C. Climate change adaption- (Về chính sách ứng phó với biến đổi khí hậu trong nông nghiệp)

5. What is the agricultural approaches be applying in your province to cope with climate change? (Bạn có biết những phương pháp trong nông nghiệp tại tỉnh mình để ứng phó với thay đổi khí hậu là gì?)

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6. In your experience, how has the farmers' perception of adaptation changed for 10 years ago? *(Theo kinh nghiệm bạn, phản hồi từ người nông dân, đặc biệt là hộ nông dân nhỏ về những thay đổi như thế nào so với trước đây (so với 5 năm, 10 năm trước)?*
  7. How does your department convince or increase farmers' confidence to change into the new approaches? *(Làm như thế nào để thuyết phục, tăng niềm tin của người nông dân đối với những thay đổi là tốt hơn?)*
  8. Are new methods in recent years more widely used by people than before? Why and why not? *(Những phương pháp mới trong nông nghiệp này có được người dân đón nhận, tính phổ biến như thế nào? Tại sao?)*

#### D. Resilience:

9. How do new agricultural approaches help increase resilience? What is your opinion on the effectiveness of this new agricultural policy? *(Những thay đổi này giúp nông nghiệp tăng sức chống chịu với thay đổi của thời tiết như thế nào?)*
10. How do those approaches help enhance quality of farmer's life? *(Phương pháp mới này mang lại cải thiện cuộc sống của nông dân như thế nào?)*
11. How do those approaches contribute to sustainable development in terms of society, economy and environment? *(Bạn đánh giá những đổi mới trong nông nghiệp đóng góp vào phát triển bền vững như thế nào về kinh tế lâu dài, về vấn đề môi trường)*
12. What is the role of local government in this development? *(Vai trò của chính phủ, cơ quan địa phương trong thay đổi là gì?)*

#### D. Barriers

13. Which main barriers have influenced farmer's decision to adopt new adaptation measures? *(Theo bạn, những khó khăn và rào cản chính nào ảnh hưởng đến người dân về đáp ứng chuyển đổi trong nông nghiệp?)*
  - About the financial capital (difficulties and form of capital support)
  - About the infrastructure (water supply, irrigation system, transportation,...)
  - About skill and knowledge (training new technique)
  - About information, media (on time, accurate information)
14. Can the output are guaranteed? With the new technology, the input cost for production will increase. Will it cause difficulties for people? If not, why? *(Người dân có thể đảm bảo đầu ra? Với kỹ thuật mới thì giá thành nông sản nâng cao, theo kinh nghiệm của bạn thì đây có gây khó khăn cho người dân không?)*

#### E. Scenario in cases of climate related shocks (Trong trường hợp có thiên tai)

15. How do you think about warning of natural disasters with farmers, whether effective or ineffective in warning, people have easy access to information? *(Thầy nhận định như thế nào về công tác cảnh báo thiên tai với người nông dân, hiệu quả hay không hiệu quả trong việc cảnh báo, người dân có dễ tiếp cận thông tin?)*
  16. The state has a financial support for farmer when crops are damaged by natural disasters and epidemics. How do you think the effectiveness of this policy is? *(Theo em được biết, nhà nước có chính sách hỗ trợ tài chính cho người nông dân khi mùa màng bị phá hoại do thiên tai, dịch bệnh. Theo đánh giá của thầy về hiệu quả của chính sách này như thế nào?)*
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17. If farmers are affected by natural disasters (drought, intrusion, floods, etc.), to whom will the farmers report? How will they be helped? *(Nếu như nông dân gặp ảnh hưởng từ thiên tai (khô hạn, xâm nhập mặn, lũ lụt, v.v...) thì người nông dân sẽ phản ánh với ai? Sẽ được giúp đỡ với biện pháp như thế nào?)*

Thanks for taking the time to join the interview. Could I contact you if I have other questions related to the topic today? Please keep in touch in case you want to receive research results.

*Cám ơn đã dành thời gian hoàn thành câu hỏi. Hãy giữ liên lạc trong trường hợp bạn muốn nhận kết quả của bài nghiên cứu.*

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## 7. Unstructured interview with farmers:

Topic and Questionnaire:

### A. Farmer's information (thông tin cá nhân)

1. What is your name? How old are you? (Họ tên của ông/bà là gì? Bao nhiêu tuổi?)
2. What farming model, how many years? (Loại hình ông/bà canh là gì và đã thực hiện bao lâu?)

Are you applying the change in agriculture according to the new strategy of government?)

3. How many member involving in farming are there in your family? (Nhà ông/bà có bao nhiêu người làm nông?)
4. Where is main income from? Are there other income source and what is it? (Nguồn thu nhập chủ yếu của gia đình? Có những nguồn thu nhập khác không?)

### B. Climate change perception/ risk perception:

5. Could you compare the climate condition now with one in the past 10 years? (Ông/bà có thể so sánh sự thay đổi thời tiết bây giờ với mười năm trước không?)

Note: If interviewee was not sure about the changes, ask about drought, saline intrusion, unpredictable rainfall in recent years.

6. How has your household been affected by the change of climate condition (droughts, saline intrusion (salty groundwater), unpredictable rainfall (Và những biến đổi đó ảnh hưởng như thế nào đến việc sản xuất của mình?)
7. In your opinion, what is main reason lead to changes of the climate condition? How do you know? (Theo ông/bà những thiên tai gần đây có phải do đâu? Ông bà biết thông tin này từ đâu)
8. Do you think that severe weather events will continue to happen regularly in the future or even worse? Why? (Ông bà có cho rằng nó sẽ kéo dài, tức là sẽ tiếp tục xảy ra trong tương lai và có khi còn nặng hơn? Tại sao?)

### C. Resilience:

9. Are they satisfied about current farming situation? Why/why not? (Ông/ bà có hài lòng về cánh đồng hiện tại của mình không? Tại sao?)
  10. Which adaptation measures are you applying in farming now? (Những phương pháp áp dụng để cho chính sách
- How have they helped to cope with natural disasters/ climate change? Is the productivity better compared to before? (Những cách đó giúp bạn chống chịu với thiên tai như thế nào? Năng suất có tốt hơn?

- 
- If you have not applied any measures, what is the reason? (Nếu bạn không áp dụng những phương pháp mới, tại sao lại như vậy?)

11. To what extent was your household able to recover from these events? (Bạn làm cách nào gia đình bạn vượt qua được thiên tai, và thời tiết thay đổi đó?)

Think about crop or income diversification, knowledge (training), access to money (loans), the severity of the shock, access to climate change information.

- Did you need external support from friends, loans, government etc. to recover from these events? (Bạn cần sự giúp đỡ bên ngoài để phục hồi sau thiên tai không?)
- If your crop fails, is your household able to take care of its daily needs? (Nếu thất mùa, ông/bà có thể lo cho cuộc sống hằng ngày không?)
- If yes, how? If no, how do you try to solve this? (Nếu được, thì bằng cách nào? Nếu không, làm cách nào ông/bà vượt qua)

#### D. Barriers:

12. What difficulties do you meet in farming and apply adaptation measures? (Theo anh/chị thì khó khăn mình đang gặp phải trong nông nghiệp là gì? Có khó khăn khi chuyển qua mô hình mới không? Tại sao?)

Think of financial capital, skill and knowledge, infrastructure improvement, policy, accurate information, output?

- In case the farmer has not applied adaptation: Do you have any plan to cope with the negative influences of climate change?

Thanks for your participation!

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## 8. Survey farmer:

### **Bảng khảo sát nhận thức của người nông dân đối với biến đổi khí hậu và những kỹ thuật mới trong nông nghiệp.**

#### **Survey of farmers' awareness of climate change and new agricultural techniques**

Giới thiệu/ Introduction:

Dear participant,

First of all, thank you for taking the time to fill in this questionnaire, which will take up to 10 minutes. My name is Nguyen Thi Thuy Van and I am student of the master Environment and Society Studies at the Radboud University in the Netherlands. I do this research for my master thesis. The purpose of this questionnaire is to analyze the ways farmers adapt to the change of climate condition. Participation in the research is anonymous. Your answers will be kept confidential and will solely be used for research purposes. To ensure that all your information is confidential please do not include your name. If you choose to participate in this survey, please answer all questions as honest as possible. Filling in this survey is voluntary and you may decline to answer any question and you have the right to withdraw from participating at any time.

Kính gửi người tham gia,

Lời đầu tiên tác giả xin cảm ơn quý vị đã dành thời gian điền vào bảng câu hỏi dài khoảng 10 phút này. Tôi là Nguyen Thi Thuy Van là học viên cao học ngành Môi trường và Xã hội học tại trường Đại học Radboud ở Hà Lan. Tôi thực hiện nghiên cứu này phục vụ cho luận văn thạc sĩ của tôi. Mục đích của bảng hỏi này nhằm phân tích những cách thức mà người dân thích ứng với những thay đổi của khí hậu gần đây. Người tham gia không cần phải thể hiện rõ danh tánh. Các câu trả lời sẽ được giữ bí mật và chỉ phục vụ cho mục đích nghiên cứu. Nếu bạn sẵn lòng tham gia xin trả lời các câu hỏi đúng sự thật như có thể. Người tham gia sẽ hoàn thành bảng hỏi trên tinh thần tự nguyện và hoàn toàn có thể từ chối trả lời bất kỳ câu hỏi nào cũng như từ ngừng tham gia bất kỳ lúc nào trong quá trình phỏng vấn.

#### QUESTIONNAIR:

A. Thông tin chung về nông hộ/ Smallholder's general information	
1. Huyện/ District a. Hòn Đất b. An Biên	2. Giới tính/Sex a. Nam/Male b. Nữ/Female
3. Tuổi/Age : _____	

<p>4. Trình độ học vấn/ Literacy levels</p> <p>a. Không đi học/ Nonliterate → Đến câu số 5/Move on to Q5</p> <p>b. Cấp 1/Primary School</p> <p>c. Cấp 2/Secondary School</p> <p>d. Cấp 3/ High School</p> <p>e. Cao đẳng/ Associate</p> <p>f. Đại học/ College/University</p>	
<p>5. Biết chữ/ Be able to read</p> <p>a. Có/Yes</p> <p>b. Không/No</p>	
<p>6. Dân tộc/ Ethnicity</p> <p>a. Kinh/ Vietnamese</p> <p>b. Khơ me/ Khmer</p> <p>c. Hoa/ Chinese</p> <p>d. Khác/Other</p>	
<p>7. Gia đình có bao nhiêu thành viên?/How many people are there in your family?</p>	<p>_____ (Người) (people)</p>
<p>8. Có bao nhiêu người đang tham gia lao động kiếm tiền?/ How many working adults are there?</p>	<p>_____ (Người) (people)</p>
<p>9. Có bao nhiêu người trong gia đình cùng canh tác nông nghiệp? How many farmers are there in your family?</p>	<p>_____ (Người)(people)</p>

B. Tài sản nông hộ/ Smallholder's assets	
<p>10. Ông/Bà có sở hữu đất đai đang canh tác không? Are you the owner of the farmland?</p>	
<p>a. Có/ Yes</p> <p>b. Không/No. Thuê đất/Renting</p>	<p>c. Không/No Khác/Other _____</p>
<p>11. Diện tích canh tác nông nghiệp của Ông/ Bà là bao nhiêu? How big is your farmland?</p>	<p>_____ (ha)</p>



<b>C. Tài chính nông hộ/Smallholder's finance</b>	
12. Nguồn thu nhập chính của gia đình mình là gì?/ What is your main source of income? ..... .....	
13. Gia đình mình còn có nguồn thu nhập phụ nào khác không?/ Do you have any extra sources of income? a. Có/Yes b. Không/No. đi tới câu 17/Move on to Q17	
16. Nguồn thu nhập phụ khác là gì? (Có thể chọn nhiều lựa chọn)./ What is your income from other sources? (You can choose more than one) <div style="display: flex; justify-content: space-between;"> <div style="width: 48%;">           a. Trồng trọt/Cultivation            b. Chăn nuôi và Buôn bán rau màu thịt cá/ Livestock and Agriculture products trading            c. Làm thuê/ Worker            d. Sản phẩm thu từ tự nhiên/ Products from natural sources            e. Những công việc/ hoạt động kinh doanh khác/ Other business         </div> <div style="width: 48%;">           f. Đánh cá/ Fishing            g. Buôn bán khác ngoài rau màu thịt cá/ tiền cho thuê đất/ Other trades aside from agriculture products/ Land lease            h. Tiền từ người khác gửi về cho/ Remittances            i. Khác: .... / Other....         </div> </div>	
17. Thu nhập hằng tháng của hộ mình là bao nhiêu?/ What is your household's/farm's monthly income? _____ VND	18. Thu nhập của ông/ bà có đủ để trang trải cuộc sống hàng ngày? Is your income good enough to maintain your standard of living? a. Có/Yes b. Không/No
19. Gia đình mình có để dành tiền tích lũy không? Do you have any saving accounts? a. Có/Yes b. Không/No	
20. Nếu gia đình Ông/ Bà gặp biến cố và cần tiền trong trường hợp khẩn cấp, Ông/ Bà có thể nhận giúp đỡ từ nguồn khác không?/ In case of money shortage, would you be able to get support from any other sources or organisations? a. Nhận hỗ trợ từ chính phủ/ bảo hiểm/ Government loans/Insurance claim b. Đi vay ngân hàng/ Bank loans c. Đi mượn từ họ hàng và bạn bè/ Family or friend loans	

21. Ông/ Bà bị mất mùa hoặc sản lượng giảm do thiên tai (hạn hán, nhiễm mặn, lũ lụt...), tài chính Ông/ Bà có đủ khả năng lo cho cuộc sống và vụ mùa kế tiếp không?/ In the events of crop failure or natural disasters (drought, flooding, soil salinity, etc.), would you be able to secure your life as well as your farming practices?

a. Có/Yes (Skip Q22)

b. Không/No. Trả lời thêm câu 22/Please answer Q22

22. Trong trường hợp đó, ông/ bà có thể nhận giúp đỡ từ nguồn khác không? In that case, would you be able to get help from other sources or organisations?

a. Nhận hỗ trợ từ bảo hiểm/ Insurance claim

b. Đi vay ngân hàng/ Bank loans

c. Đi mượn từ họ hàng và bạn bè/ Family or friend loans

#### D. Tiếp cận với các dịch vụ công cộng và thông tin/ Accessibility to public service and information

24.	22. Ông/ Bà di chuyển bằng phương tiện gì? (Đi bộ, xe đạp, xe máy, xe hơi, khác)/ How do you get to these following places? (On foot/ by motorbike/ by car/ others?)	Bao xa cách nhà mình? (phút)/How long does it take to get there? (Number of minutes)	Chất lượng các dịch vụ này như thế nào/ Quality of public service				
			Very bad (Rất tệ)	Bad (Tệ)	Neutral (Không ý kiến)	Good (Tốt)	Very Good (Rất tốt)
Chợ gần nhất/ Nearest market							
Trường học (cho trẻ con trong nhà) gần nhất/ Nearest schools for the kids							
Phòng khám gần nhất/ Nearest clinics							

25. Ông/ Bà có thường nhận được tin tức liên quan thay đổi điều kiện thời tiết bao trong năm? How often are you updated with weather news annually?

a. Chưa bao giờ/ Never	d. Một tháng một lần/ Once a month
b. Mỗi ngày/ Every day	e. Ba tháng 1 lần/ Once per three months
c. Một tuần một lần/ Once a week	f. Một năm một lần/ Once a year

26. Ông/ Bà có thường nhận được tin tức liên quan đến kỹ thuật áp dụng trong nông nghiệp để nâng cao khả năng khắc phục ảnh hưởng của biến đổi của thời tiết/ Are you often provided with information regarding agricultural-based techniques to cope with climate change?

g. Chưa bao giờ/ Never	j. Một tháng một lần/ Once a month
h. Mỗi ngày/ Every day	k. Ba tháng 1 lần/ Once per three months
i. Một tuần một lần/ Once a week	l. Một năm một lần/ Once a year

<b>E. Hoạt động canh tác/ Farming practices</b>
25. Ông/ Bà làm nghề nông được bao lâu rồi? How long have you been a farmer?_____ (Năm/Number of years)?
26. Loại hình nông nghiệp canh tác: Which farming model is applied at your farm?
a. Chỉ trồng lúa/ Rice farming b. Lúa- Tôm/ Rice – Shrimp farming c. Xen canh lúa màu/ Companion planting d. Nuôi tôm quảng canh/ Extensive shrimp farming e. Khác..... / Other
27. Ông/ Bà có trồng trọt hoặc chăn nuôi gì khác không?/ Are you planting or raising any other kinds?
a. Có, cụ thể là /Yes (Please specify)..... ..... ..... b. No (Không)
28. Những phương pháp được sử dụng để ứng phó với biến đổi khí hậu:/ Which solutions do you apply to deal with climate change?
a. Thay đổi thời gian mùa vụ/ Crop rotation b. Thay đổi kỹ thuật gieo trồng/ Applying varieties of cultivation techniques c. Đa dạng hóa các loại giống tùy thích hợp từng thời điểm/ Switching between seed types following change in the weather d. Chủ động trong quản lý nước (xây nơi trữ nước, cống đập, tưới tiêu)/ Government Policy in managing the risk in agriculture production (reservoir, irrigation solutions) e. Đa dạng nguồn thu nhập khác. Là...../ Diversifying your source of income, which is... f. Chuyển nhà đi nơi khác...../ Move to other place... g. Cách khác. Là...../ Other solution which is....

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<p>29. Trong 10 năm qua Ông/ Bà có thay đổi kỹ thuật hoặc mô hình canh tác nông nghiệp của nhà mình không? Have you made any changes regarding your farming techniques or model over the last 10 years?</p> <p>a. Có/Yes b. Không/No đi tới câu 32/ Go to question 32.</p>
<p>30. Lý do chính mà Ông/ Bà thay đổi kỹ thuật canh tác là gì?/ What are the main reasons behind switching to other farming techniques?</p> <p>.....</p>
<p>31. Ông/ Bà có thấy hoạt động canh tác nông nghiệp bây giờ khó khăn hơn 10 năm trước không? Tại sao? /Have you experienced any difficulty in farming in the present, compared to 10 years ago? Why?</p> <p>.....</p>
<p>32. Ông/bà sử dụng phân hữu cơ? Hay các biện pháp bảo vệ môi trường khác/ Do you use organic fertilizers? Or what measures do you take to achieve greener farming?</p> <p>.....</p>

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**Đánh dấu vào ô bạn cho là đồng ý hay không đồng ý với các phát biểu bên dưới./ Please tick in the box if you agree or disagree with the statements below**

**Trong đó/In which**

1. Rất không đồng ý/ Strongly disagree
2. Không đồng ý/ Disagree
3. Trung lập/ Neutral
4. Đồng ý/ Agree
5. Rất đồng ý/ Strongly agree

**F. Nhận thức về biến đổi khí hậu/ Awareness toward climate change**

<b>Phát biểu/ statements</b>	<b>Hoàn toàn không đồng ý/ Strongly disagree</b>	<b>Không đồng ý/ Disagree</b>	<b>Bình thường/ Neutral</b>	<b>Đồng ý/ Agree</b>	<b>Hoàn toàn đồng ý/ Strongly agree</b>
1. Tôi không chú ý đến thay đổi lượng mưa trong vòng 10 năm qua/ I have not noticed the change in precipitation over the past 10 years					
2/ Tôi không chú ý rằng khô hạn xảy ra dài dạn trong 10 năm qua/ I have not noticed the length of drought in the past 10 years					
3. Khi đọc biến đổi khí hậu trên tin tức bạn cho rằng đó là không thật, chỉ hù dọa/ You think that news about climate change are fake.					
4. Ảnh hưởng của biến đổi khí hậu có thể diễn ra vào 50, 100, 200 năm sau. Nên chúng ta không cần quan tâm, vì đó là chuyện của thế hệ sau./ The negative effect of climate change will take place in the next 50, 100, or 200 years later. It really is not our concern. Let the next generation cope with that.					

5. Sự thay đổi thất thường của thời tiết là do ông trời từ nào đến giờ, điều này cũng thường xảy ra. Nên nó có thể tốt lên mà cũng có thể xấu đi. Chứ không phải sẽ thay đổi càng ngày càng nghiêm trọng hơn./ The unpredictable change in the climate, which could be better or worse, is a matter of nature. The possibility of the climate getting worse and worse is low.					
6. Ảnh hưởng nghiêm trọng của biến đổi khí hậu đang ngày càng tăng/ The amount of damage resulting from climate change are increasing.					
7. Tôi thấy không nên sử dụng phân bón vô cơ, vì chúng ta phải bảo vệ môi trường/ We should not use synthetic fertilizer because it is harmful to the environment					
8. Sử dụng các mô hình trồng trọt thân thiện với môi trường là rất tốt/ Applying green farming models is great.					

**G. Nhận thức nâng cao sức chống chịu cho nông nghiệp/ Awareness of improving agricultural resilience**

<b>Phát biểu/Statement</b>	<b>Hoàn toàn không đồng ý/ strongly disagree</b>	<b>Không đồng ý/ disagree</b>	<b>Bình thường/ neutral</b>	<b>Đồng ý/ agree</b>	<b>Hoàn toàn đồng ý/ Strongly agree</b>
1. Tôi không đủ tiền để thay đổi kỹ thuật trong nông nghiệp chỉ vì biến đổi khí hậu./ I can't afford switching to new technique just because of climate change.					
2. Thu nhập và trợ giúp nhà nước đủ để giúp tôi ứng phó với thất thoát do ảnh hưởng của thiên tai/ My income and government support is good enough for me to cope with natura disasters					
3. Tôi nhận thông tin thông báo thiên tai và thời gian thời vụ dễ dàng, kịp thời/ I have access to information regarding natural disaster and crop plans promptly					
4. Những kinh nghiệm trong nông nghiệp lâu năm có thể giúp tôi khi gặp thiên tai, không cần làm theo chỉ dẫn từ chính					

quyền địa phương/ My wisdom on farming practice can save me in the event of natural disaster, so I think I don't really need to follow instructions from the local authorities.					
5. Kinh nghiệm đối phó thiên tai trong những năm qua giúp tôi chuẩn bị cho ảnh hưởng xấu có thể xảy ra trong năm tới/ My experience in dealing with natural disasters over the years has prepared me well for coping with bad consequences in the following year.					
6. Tôi muốn đổi sang kỹ thuật mới để tăng năng suất/ I want to switch to new technique to increase productivity.					
7. Những kỹ thuật mới tôi thấy dễ áp dụng/ I find that new techniques are easy to apply					
8. Thu nhập sau khi thay đổi kỹ thuật/ mô hình mới tốt hơn so với trước kia/ Earning after applying new techniques / new models are higher than before.					
9. Tôi cho rằng năng suất cách trồng của mình đã tốt/ I believe the productivity of my farming is good enough					

#### H. Rào cản/Limitations

Phát biểu/Statements	Hoàn toàn không đồng ý/ Strongly disagree	Không đồng ý/ disagree	Bình thường/ neutral	Đồng ý/ agree	Hoàn toàn đồng ý/ Strongly agree
1. Rất khó khăn cho tôi khi tôi phải thay đổi cách canh tác để ứng phó với biến đổi của khí hậu/ It is very difficult for me to switch to new farming techniques in response to climate change.					
2. Tôi thấy cách trồng mới không có lời bằng cách truyền thống./ I find new farming method is less profitable than the traditional way.					

3. Tôi thấy những kỹ thuật mới sẽ không có tác dụng gì với thay đổi của thời tiết/ I think the new techniques won't be any good in the change of weather.					
4. Tôi thấy cần thay đổi cách canh tác để ứng phó với ảnh hưởng từ biến đổi thời tiết/ I feel the need to change my farming method to cope with the effects of climate change					
5. Canh tác theo cách mới tốn chi phí hơn nhưng lại không đảm bảo đầu ra cho nông sản/ The new way of farming is costlier but does not guarantee the output of agricultural products.					
6. Cần nhà nước hỗ trợ nhiều hơn cho người nông dân để thay đổi canh tác/ I'd like to get more support from the government in applying new farming method					
7. Nhà nước cần đầu tư những kỹ thuật tiên tiến trong nông nghiệp/ The government needs to invest in advanced techniques in agriculture					
8. Cần cải thiện hệ thống dẫn nước, xả nước, ngăn mặn vào tới đồng ruộng/ It is demand that the system of irrigation be improved in order to prevent salinity from reaching the paddy fields					
9. Đường xá vẫn còn cần cải thiện hơn nữa để vận chuyển nông sản thuận tiện hơn/ Roads system should be upgraded for the convenience of transporting agricultural products					
10. Những tổ chức xã hội sẽ giúp nông dân tránh những thiệt hại từ thay đổi thời tiết/ Social organizations should help farmers avoid any damage caused by change in the climate					
11. Nhà nước có trách nhiệm giúp chúng tôi tránh những thiệt hại từ thay đổi thời tiết./ The government has a responsibility to help us avoid any damage caused by weather change.					
12. Chúng tôi có trách nhiệm chủ động thay đổi để ứng phó biến đổi khí hậu/ We					



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must take action in response to climate change					
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