MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT

REPORT ON REGIONAL SOCIAL ASSESSMENT

FOR

MEKONG DELTA INTEGRATED CLIMATE RESILIENCE AND SUSTAINABLE LIVELIKHOODS PROJECT (MD-ICRSL)

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Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods Project

Regional Social Assessment

Revision

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CONTENTS

ACRONYMS

%	per cent
°C	degree Celsius
ha	hectare
kg	kilogram
km	kilometres
km²	square kilometres
m	metres
m²	square metre
ppt	parts per thousand
VND	Vietnamese Dong (22,400 VND = 1 US$)

ASS	Acid Sulphate Soils
CTU	Can Tho University
DARD	Departments of Agriculture and Rural Development
DoNRE	Department of Natural Resources and Environment
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
FS	Feasibility Study
GDP	Gross Domestic Product
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
IUCN	The International Union for Conservation of Nature
MARD	Ministry of Agriculture and Rural Development
MDICRSL	Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods Project
MoNRE	Ministry of Natural Resources and Environment
PC	People's Committee
PFES	Payment for Forest Environmental Services
PMU	Project Management Unit
PPC	Provincial People's Committee
SIA	Social Impact Assessment
SLR	Sea Level Rise
SP	Sub-Project
WB	World Bank

EXECUTIVE SUMMARY

This Regional Social Assessment has been produced in order to support the preparation of the *Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods* Project (MDICRSL).

The findings, analysis and recommendations of this RSA informs the sub-project feasibility studies and their Environmental and Social Impact Assessments (ESIAs), and other safeguard instruments.

The focus of the RSA is on the sub-projects of Components 2, 3, and 4 of the MDICRSL. During preparations, the following sub-projects were identified.

Table 1. List of MDICRSL sub-projects

Sub-projects (Location)	Regional Impacts
Component 2: Managing Floods in the Upper Delta	
Sub-project 1 (SP1 - An Giang –Kien Giang)	Flood diversion
Sub-project 2 (SP2 - Upper An Giang)	Increase water retention during floods
Sub-project 3 (SP3- Dong Thap)	Alternative livelihoods during flooding season
Component 3: Adapting to Salinity Transitions in the Estuary	
Sub-project 4 (SP4 - Ben Tre)	Transition to a saline-brackish economy
Sub-project 5 (SP5 - Ben Tre)	Adjusting land-use for greater resilience
Sub-project 6 (SP6 - Tra Vinh)	Mangrove restoration, coastal protection
Sub-project 7 (SP7 - Soc Trang)	Transition to a saline-brackish economy
Component 4: Protecting Coastal Areas in the Peninsula	
Sub-project 8 (SP8 - Ca Mau)	Mangrove restoration & coastal protection
Sub-project 9 (SP9 - Kien Giang)	Transition to a saline-brackish economy Increase freshwater retention in specific areas
Sub-project 10 (SP10 - Bac Lieu)	Mangrove restoration & coastal protection

1. METHODOLOGY

The research utilized a combination of following methods:

- Desk based review of literature and available statistics
- Field-based focus group workshops using open-ended interviews in sub-project areas
- Closed-ended household questionnaires

The focus groups were conducted between 12 October and 15 November 2015. They were divided into government and community groups. For the community groups, two socio-economic groups (poor and better-off) were interviewed to ensure that the data collected on capacity to respond to climate change could be differentiated according to these two socio-economic groupings. Further differentiation based on gender was also conducted during the focus groups in order to understand the specific needs of women. In total, at the community level, 3 focus groups consisting of 10 persons each per sub-project area were interviewed in parallel.

Detailed socio-economic statistical data was collected through household surveys utilizing a closed-ended questionnaire. This field work was conducted between 26 October and 28 November 2015. Approximately fifty household interviews were conducted per sub-project area.

2. REGIONAL SOCIO-ECONOMIC CONTEXT

2.1 General economic context

Over the last 3 decades, improvements in water infrastructure and management, technical advances, and policy reforms has increased the delta's rice production from 4.5 million tons in 1976 to 24.6 million tons in 2012 of which 8 million was for export. The Mekong Delta has been critical for Vietnam's development and also for regional food security. It produces 50% of Vietnam's rice (90% for export) and 70% of its aquaculture products.

However, over the last decade, a number of natural and anthropogenic changes are placing significant development pressures on the Mekong Delta. Intensified production has taken its toll on the natural resources and environments of the Delta. Furthermore, climate change is expected to further threaten lives, livelihoods and assets in the Mekong Delta. Rice yields in the Mekong Delta are expected to decline from 6-12% due to resulting inundation and salinity intrusion, while aquaculture production will also be affected.

Socio-economic stresses are also apparent. Under stress from multiple economic and environmental pressures and risks, small-scale farmers increasingly have difficulties securing a minimum level of profitability and a stable livelihood base (World Bank, 2014). While both the poverty rate and income inequality in the Mekong Delta is lower than the national average, the gap between the poor and rich has been growing over the last decade in the Mekong Delta. The gap between the lowest income quintile and the highest income quintile in 2004 was 6.7 times and this had grown to 7.7 times by 2012.

2.2 General Social Context

2.2.1 Population and population growth rates

The population of the Mekong Delta was approximately 17.5 million, or 19% of the Vietnamese population in 2014. The population growth rate has been relatively stable since 2010. Growth rates in the 7 provinces range between 0.1% (Soc Trang) and 0.6% (Kien Giang).

2.2.2 Population density of provinces

The average population density of the Mekong Delta in 2014 is approximately 432 persons/km2.

2.2.3 Migration in and out of provinces

Over the last 5 years, the project provinces have consistently experienced a net outward migration of their populations. In 2014 the Mekong Delta average was - 6.7%. The net migration rates of the project provinces range between -5% for Tra Vinh and -13.6% for Ca Mau. The outward migration trend has increased slightly in all the Provinces since 2012.

2.2.4 Ethnicity

The distribution of ethnic minorities is unevenly distributed across the Mekong Delta Provinces. Within the project provinces, Soc Trang, Tra Vinh and Kien Giang have the largest populations of ethnic minorities (36%, 32%, 15% respectively). An Giang and Ca Mau have relatively small populations and Ben Tre and Dong Thap have negligible populations. The distribution of ethnic minority populations within the Provinces is similarly unevenly distributed. In general, considering the provinces with the largest populations of ethnic minorities – Soc Trang, Tra Vinh, Kien Giang,

An Giang and Ca Mau - the project areas (Districts) within these Provinces have a lower proportion of ethnic minorities in comparison to the Provincial proportion.

2.2.5 Income and income distribution

Monthly income per capita data reveals that Mekong Delta citizens earn 1.8 million VND/mth which is lower than the national average of almost 2 million VND/mth in 2012. While income inequality in the Mekong Delta is lower than the national average, the gap between the poor and rich has been growing over the last decade in the Mekong Delta. The gap between the lowest income quintile and the highest income quintile in 2004 was 6.7 times and this had grown to 7.7 times by 2012.

2.2.6 Poverty in provinces

Between 2006 and 2012, the poverty rate in the Mekong Delta has consistently declined (from 13.5% in 2006 to 10.1% in 2012) and been lower than the national average. In 2012, the average poverty rate in the Mekong Delta was 10.1 % while the national average was 11.1%.

2.2.7 Employment

Employment data shows that the proportion of the employed population in Vietnam and the Mekong Delta over the last 5 years has been relatively stable with very little growth - within a 2% band between lows and highs.

2.2.8 Gender issues

Women's opportunities for employment in rural Mekong Delta, although better than men, are below the national average. The data reveals that 1.83% of women who register for employment are not able to find work compared to the national average of 1.49% for women.

For women in the Mekong Delta, literacy is a significant issue. Literacy is closely linked to poverty and is an important indicator of social vulnerability. The data on literacy shows that only 93 % of women in the Mekong Delta are literate which is lower than for men at 96.4% and the national average of 94.7% for both men and women.

2.2.9 Land Use Patterns and Agriculture

Land use patterns show that the largest areas of annual crop land (predominantly rice) are located in Dong Thap, An Giang, Kien Giang, and Soc Trang. The other significant land use is for aquaculture. The largest areas of aquaculture land, in descending order, are found in the coastal provinces of Ca Mau, Tra Vinh, Soc Trang, and Ben Tre.

2.3 Vulnerable Populations in the Mekong Delta

2.3.1 Rural Landless and Land-Poor

There are several possible causes of rural landlessness in the Mekong Delta. A young family, starting out from a poor parent family very likely inherits no or little land from their parents. Family catastrophes such as serious illnesses of family members or sudden loss of the family breadwinners and successive failures of crops may result in the family selling land to take care of immediate needs and/or to pay debts. With limited resources, they are unable to diversify their income and have to rely on earnings from hired labor and exploiting natural resources for livelihoods. The poor include the 'land-poor'. Today, an average farming family of five members

owning under one hectare of rice land can be considered land-poor as the family cannot survive on the income from rice farming alone - be it double cropping or triple cropping.

2.3.2 Ethnic Minorities

Poverty and vulnerability in the Mekong Delta has a strong ethnic dimension as shown by the data in the following table.

Table 2. Poverty index, Mekong Delta (Source: Poverty Profile, GSO, 2014)

	2010			2012		
Ethnicity of household head	Poverty head count	Poverty gap	Poverty severity	Poverty head count	Poverty gap	Poverty severity
Kinh and Chinese groups	12.9	2.7	0.9	9.9	1.9	0.6
Others Group	66.3	24.3	11.3	59.2	19.2	8.2

The data in the table shows that the poverty rate, poverty gap, and poverty severity of the Kinh and Chinese group, combined, is much lower than those of the group comprising the other ethnicities, mainly Khmer. In the Mekong Delta, 93% of the population belong to the Kinh mainstream Vietnamese group and 7% are ethnic minorities including Chinese, Cham, and Khmer. The Khmer in the Delta is the largest ethnic group with a total population of 1.26 million (GSO population census, 2012). Among the three groups, the Khmer is the poorest and most vulnerable group, followed by the Cham while the Chinese have an equal standing with the Kinh.

3. SOCIO-ECONOMIC AND VULNERABILITY ASSESSMENTS OF ADAPTATION MODELS

3.1 Socio-Economic and Vulnerability Assessment of Flood-Related Community Adaptation Models

3.1.1 Proposed Flood-Related Adaptation Models

From Triple Rice to Rice-Aquaculture

In both Provinces, there is little support from farmers that are currently doing triple rice cropping to convert to other models involving flood retention. The extremely low flood this year and damages incurred from freshwater shrimp farming serves to increase the risk perceptions of triple-crop farmers.

From Double Rice to Rice-Aquaculture

- Adaptation Model 1: Winter-Spring rice crop + flooded field for Giant Freshwater Shrimp extensive aquaculture.
- Adaptation Model 2: Cash Crops + Floating Rice and Giant Freshwater Shrimp in the flood season.
- Adaptation Model 3: Cash Crops + Floating Rice and Capture Fisheries.
- Adaptation Model 4: Winter-Spring rice crop + 2 crops of fodder + Flooded field for capture Fisheries.

3.1.2 Climate Change Vulnerabilities

More intense droughts, flood variability, higher ambient temperatures and abnormal weather conditions increase the challenges of managing aquaculture in a flood plain context. Combined with low flood levels, the hotter ambient temperatures render water too hot for shrimp to survive. Water needs to be pumped in to maintain a minimum of 1 meter depth of standing water for the survival and growth of the shrimps. These challenges which can be managed need to be

considered against the regional flood management and ecosystem benefits of increasing the flood retention areas.

3.1.3 Environmental threats to livelihood model

Shrimp farmers in the Dong Thap focus group reported two main sources of water pollution as a concern. They are from semi-intensive fish aquaculture ponds and rice agriculture. In An Phu, An Giang province, poor quality flood waters coming from over the Cambodian border are a reported concern. Farmers reported fish, snail, and shrimp kills with the presence of the water. Farmers think this could be a serious threat to the proposed flood season shrimp farming.

3.1.4 Basic financial analysis of flood related adaptation models

Rice Farming (double and triple rice cropping)

Double rice cropping produces annual profits of approximately 33 million VND/ha. In comparison, triple rice cropping produces marginally higher annual profits of approximately 38 million VND/ha (Dong Thap data).

Floating Rice

The annual profit from a flood season floating rice crop is between 25 million VND/ha and 55 million VND/ha. This is comparable to the profits from a year of intensive rice cropping which is approximately 38 million VND/ha. In all cases, planting an additional cash crop during the dry season (cassava, Allium chinense, or red chilly) results in profits above that for triple rice cropping.

Giant Freshwater Shrimp

Giant freshwater shrimp produces profits of approximately 33 million VND/ha per crop. Combined with the winter-spring rice crop which produces a profit of 21 million VND/ha, a rice-shrimp crop produces a combined annual profit of 54 million VND/ha. This is approximately 1.4 times the 38 million VND/ha profits generated from triple rice cropping.

3.1.5 Social Issues in flood related adaptation models

Ethnicity

In An Giang and in Dong Thap, the ethnic Khmer, Cham and Hoa have largely inter-married with Kinh and are largely integrated into the wider land holding Kinh communities. Their integration has led to Vietnamese language being widely used in the area, and the need for project communication to be done in other ethnic languages is unnecessary.

Poverty and landlessness

In An Giang, Tri Ton and Tinh Bien Districts have relative high rates of poverty which corresponds with the high proportions of ethnic minorities living there. Livelihood investment priority could be directed to the Tri Ton area to create employment opportunities for the poor. In Dong Thap, Hong Ngu District which has a higher rate of poverty than the Mekong Delta average should receive livelihood investment priority.

Employment

Underemployment is a problem for the landless and poor in both An Giang and Dong Thap, affecting both men and women. The demand for labor in rice production has been declining

over many years because of mechanization in which, many previous tasks such as harvesting have been taken over by machines. Heavy use of herbicides has also eliminated the need for hand-weeding, reducing work opportunities for poor landless women in particular. Compared to 10 years ago, the length of an average working day has dropped around 40 to 50 % (focus group participants).

Social structures and cooperatives to support livelihoods, and credit access

The Women's Union (WU) and Farmer's Union (FU) are active in the project areas. While the Women's Union membership is open to all women, poor women in particular are attracted to the Women's Union because can access various poverty reduction, micro-credit, income generation, job creation, and women's health initiatives of the Women's Union. In contrast, the Farmer's Union attracts only land holding men who are able to make practical use of the agricultural extension training courses that are run by the FU. Poor and landless households are generally excluded from this opportunity to gain new knowledge.

There is a very strong presence of formal cooperatives (*Hop Tac Xa*) in the project area. For example, just in Tam Nong District, Dong Thap alone, there are 38 active cooperatives, including 32 farming and 6 non-farming cooperatives.

Apart from the credit that is available to members of the self help groups and cooperatives, credit is available in the project area in the form of micro-credit for the poor from the Women's Union, and the Social Policy Bank. General credit for agricultural investments such as buying seed and inputs is available from the Bank for Agriculture and Rural Development (Agribank). However, relatively high proportions of the community are indebted and household surveys indicate the need to support farmers with investment capital for new livelihoods.

The strong presence of the WU and FU, and cooperatives suggests that there are strong community structures and cultures present that can ensure a collective approach to upscale the flood-based adaptation models.

Cultural Heritage

There were no concerns over the loss of cultural heritage in both Dong Thap and An Giang as a result of the proposed livelihood changes. In double rice cropping areas, ancestral graves have never been built on flooded land or if they have, they are built on raised platforms to keep them above flood water. No other types of cultural heritage like places of worship or cultural practices were identified as being of concern.

3.2 Socio-Economic and Vulnerability Assessment of Brackish Water Community Adaptation Models

3.2.1 Proposed brackish water adaptation models

The proposed brackish water adaptation models consist of:

- Alternating rice-shrimp system (Ben Tre)
- Double rice cropping to alternating rice-shrimp system (Kien Giang)
- Mangrove-shrimp to organically certified mangrove-shrimp (Ca Mau, Ben Tre, Tra Vinh)
- Sugarcane to intensive shrimp (Soc Trang)

3.2.2 Climate change vulnerabilities

The transition from double rice cropping to rice-shrimp in Kien Giang, and investments in organically certified mangrove-shrimp in Ca Mau, Tra Vinh and Ben Tre represent significant livelihood adaptations to climate change which will reduce community vulnerabilities. While the transition from sugar cane to intensive shrimp on Cuu Lao Dung appears to be a good adaptation to increasing salinity levels, there could be more effective adaptation models that address increasing salinity, higher ambient temperatures, and sea level rise (SLR). For example, mangrove-shrimp can tolerate higher ambient temperatures and trap up to 20 cm of sediment a year.

3.2.3 Environmental issues

Alternating rice-shrimp systems (Ben Tre)

Disease from intensive shrimp aquaculture can impact on the alternating rice-shrimp and mangrove-shrimp systems. Without proper zoning or land use planning, controlling disease transfer from intensive shrimp farming is almost impossible.

Double rice cropping to alternating rice-shrimp system (Kien Giang)

Agro-chemical effluent discharges from behind the proposed salinity control sluices in An Bien and An Minh, Kien Giang, may possibly impact the near-shore blood cockle farms. These possible effects need careful consideration in the environmental impact assessment.

Sugar cane to intensive shrimp (Soc Trang)

Increased use of groundwater, for sugar cane irrigation and for shrimp farming in the dry season, or for any other reasons, will increase land subsidence. There are presently no studies available on the sustainability of present agricultural and household ground water extraction, **and** its relationship to land subsidence.

3.2.4 Basic Financial Analysis of Brackish Water Adaptation Models

Alternating rice-shrimp systems (Ben Tre)

The alternating rice-shrimp systems in Ben Tre consist of two models. The first is a conventional model based on one rice crop in the wet season, and one brackish water shrimp crop in the dry season. This system produces total annual profits of approximately 102 million VND/ha, of which 96% comes from shrimp. The second 'enhanced' model integrates the culture of the giant freshwater shrimp into the wet season rice crop as an additional income generating crop. The annual profits from this model are approximately 144 million VND/ha (see Table 17), or approximately 1.4 times the profit of the conventional model.

Double rice cropping to alternating rice-shrimp system (Kien Giang)

Double rice cropping in Kien Giang generates an annual profit of approximately 10 million VND/ha. The alternating rice-shrimp system in Kien Giang generates an annual profit of approximately 28 million VND/ha. The transition from double rice cropping to a rice-shrimp system will almost triple the profits of the transition farmers which makes the transition economically attractive.

Mangrove-shrimp to organically certified mangrove-shrimp (Ca Mau, Tra Vinh and Ben Tre)

Non-certified mangrove shrimp systems in Ca Mau generate annual profits of approximately 38 million VND/ha. By obtaining organic certification, similar farms are able to increase profits by between 7 and 10 million VND/ha, representing a 20% to 26% increase respectively.

In Ben Tre Province, annual profits from non-certified mangrove-shrimp systems are approximately 32 million VND/ha. In Tra Vinh Province, profits from non-certified mangrove-shrimp systems are approximately 21 million VND/ha. Increases of approximately 20%, which is the lower end of the Ca Mau experience, could be expected by introducing organically certified shrimp into Ben Tre and Tra Vinh.

Sugar cane to intensive shrimp (Soc Trang)

Sugar cane growing on Cuu Lao Dung produces annual profits of approximately 28 million VND/ha. In comparison, the annual profits from intensive shrimp farming is approximately 398 million VND/ha.

3.2.5 Social Issues in Brackish Water Adaptation Models

Ethnicity

Ethnicity is not an issue in Ben Tre and Ca Mau as they have some of the lowest populations of ethnic minorities in the Mekong Delta. There are significant ethnic minority populations in An Bien District (Kien Giang), Cuu Lao Dung (Soc Trang), and Duyen Hai District (Tra Vinh). In all of these districts, the proportions of ethnic minority populations are lower than the Provincial proportions. According to focus group participants, the ethnic Khmer have largely integrated into the Kinh community and have inter-married with the Kinh. However, this group makes up a large proportion of the poor and landless, and work as hired laborers on aquaculture and sugar cane farms as well as collecting natural aquatic resources to sell to aquaculture farmers as feed stock for shrimp. Language is not an issue because the Khmer have largely integrated into the Kinh community and are able to communicate in Vietnamese.

Poverty and Landlessness

The poverty rates of the sub-project areas in Kien Giang, Ca Mau, and Soc Trang are lower than the Mekong Delta average. However, the poverty rate in Thanh Phu District (Ben Tre) is relatively higher than the Mekong Delta average. In all sub-project areas, the main reason focus group participants identified as a cause for poverty is generational and closely linked to landlessness. Declining coastal aquatic resources have been declining over the years which make it difficult for poor households that are reliant on natural resources as one of the main sources of income to break the poverty cycle.

A concern expressed during most of the focus group consultations is that because the project is focused on assisting land-holding aquaculture farmers where no additional labor will be required, the poor do not benefit from the project.

Gender

The major reported issue related to women's inequality in most of the sub-project areas is illiteracy amongst women which hinders their capacity to earn higher off-farm incomes. Data from the household surveys suggest that a large percentage of the household heads who are women had only a primary school education

No major changes in gender workloads are expected in the transition to alternating rice-shrimp systems or the certification of mangrove-shrimp systems. However, reduced employment opportunities for women will result in the transition from sugar cane to intensive shrimp (see below).

Employment

The lack of employment opportunities has been cited by focus group participants as a reason for poverty in most of the sub-project areas. Many of the sub-project areas are remote from places of employment and the out-migration rates reported by focus group participants are relatively high with between 3 and 8 out of 10 families having at least one member of the family leaving to work in industrial zones.

The transition from sugar cane farming to intensive shrimp farming can be expected to have a significant impact on employment opportunities for both poor men and women. In particular, employment opportunities for women who gain significant employment from sugar cane growing will be significantly impacted because of superstitious beliefs that women will bring bad luck to the shrimp crop.

Social Structures and Cooperatives to support Livelihoods, and Credit Access

In general, the sub-project areas have fewer formal cooperatives than in the upper delta areas and tend to rely much more on collective (*To Hop Tac)* and self help groups. Both the Farmers Union and Women's Union are active in the sub-project areas with initiatives in a range of areas including employment generation, income improvement, vocational training opportunities, training in household financial management and loan management, etc.

As in the upper delta, relatively high proportions of the community are indebted and the household surveys indicate a need to support farmers with investment capital for the new livelihoods.

Sources of micro-credit are available in the sub-project areas for the poor from the Bank for Social Policy, the Women's Union and development projects.

Cultural Heritage

No significant impacts on cultural heritage were identified in any of the brackish water transition models being proposed.

Social Impact from Infrastructure

Focus group participants have raised concerns over the design of the proposed sluice gates on water way transportation in An Bien (Kien Giang), Cuu Lao Dung (Soc Trang) and Thanh Phu (Ben Tre). The design of the sluice gates needs to allow boats to be able to pass through, the closure of the sluice gates needs to be minimized, and their operational schedule made known to the community.

4. RECOMMENDATIONS

4.1 Addressing Climate and Environmental Vulnerability

4.1.1 Structural works to support livelihoods

- Utilize the expertise of agricultural and aquaculture specialists to optimize the structural designs supporting livelihood models. Ensuring that structural component design can better control the water availability and quality needs of the respective livelihood models will be critical to reducing farmers' climate/environmental risks.

4.1.2 Water quality and zoning/land use planning

- Water quality issues need to be addressed particularly in models that involve aquaculture (both fresh and brackish water) if the livelihoods are to be sustainable. Many of the sub-project areas are in sub-optimal areas in terms of water quality and water control infrastructure.
- The land use plans in Ba Tri, Ben Tre, should be revised with the multi-disciplinary assistance of agricultural, aquaculture and forestry (mangrove-shrimp) specialists. The conflicting coastal land use and canals between the sea dyke and District Road 16 makes water quality management extremely difficult.
- Assess and monitor the possible impacts of persistent organic pollutant discharges from behind the salinity control sluice gates (KG) on coastal aquaculture.

4.1.3 Groundwater extraction and land subsidence

- Conduct studies on groundwater extraction and land subsidence in Cuu Lao Dung in order to better inform the livelihood investments. Combined groundwater pumping for dry season sugar cane irrigation and household water supply will lead to continued subsidence which compounds sea level rise.

4.2 Addressing Social Vulnerability

4.2.1 Farmer willingness to adopt livelihood adaptation models

- Locate pilot livelihood demonstrations near successful models in order to change farmer's risk perceptions. Triple rice crop and double-rice crop farmers, as well as floating rice farmers perceive the failure risks of flood-based livelihoods as relatively high. Similarly, coastal intensive rice growing farmers (eg. Ba Tri) and sugar cane farmers also perceive the risks of intensive shrimp as relatively high in comparison to intensive rice and sugar cane growing.

4.2.2 Addressing market risks

- Reduce the risk of over-supply by working with agribusinesses from the start on a staged incremental approach. A staged approach to up-scaling is essential so that markets can be tested and agribusinesses have time to expand their markets or find new markets incrementally.

4.2.3 Diversity of and within adaptation models

- In some sub-projects the proposed livelihood options are relatively narrow and there is some scope, with expert advice, to increase the number of models over time.

- Sharing lessons and experience between sub-projects could also help increase diversification. For example, the Ben Tre rice-shrimp models add giant freshwater shrimp to the wet season rice crop, and this model could be adopted in the Kien Giang rice-shrimp systems.
- Organic certification, clean production standards (eg. VietGAP), and product branding should be supported to help open up and diversify markets.

4.2.4 Farmer Support

- The use of farmer cooperatives or collective groups to implement the livelihood adaptations should form the basis of the livelihood implementation strategy for the sub-projects. Forming new cooperatives, or implementing through existing cooperatives, will help to instill farmer confidence through collective risk sharing, particularly with risk-averse farmers that may be unwilling to adopt the new adaptation models.
- Start-up capital needs to be provided to fund the livelihood investments. Farmers will not be able to fund the livelihood investments by themselves because most farmers have some level of debt. Capital for investment was the highest priority support requested by farmers.
- Hire aquaculture and agriculture specialists to support cooperatives/collective groups, extension agencies, and farmers with technical training and development support.
- Mass organisations, in particular the Farmers Union and Women's Union, should play a central role in supporting farmers and cooperatives to mobilize, organize extension training, facilitating farmer to farmer exchanges, monitor model performance, etc.
- Encourage agribusinesses to establish hatcheries capable of producing high quality aquaculture seed as close as possible to the sub-project sites.
- Develop predictive decision support tools that can provide early warning of droughts and floods to farmers. The intense El Nino this year has highlighted the need to develop predictive tools that could help inform farmers on what crops they should be investing in.

4.2.5 Poverty and landlessness

- Livelihood support for the landless in the sub-project areas should be established or extended from existing micro-credit sources and development programs in order to avoid increasing inequality between better-off farmers and the poor.
- Encourage agribusiness, particularly vertically integrated companies, to extend their value chains to create employment opportunities for the poor. The Provinces could offer land and tax concessions in order to attract the agribusiness investment.

4.2.6 Public consultation and participation

- The following consultations are required in addition to those already mandated to be conducted for safeguards (i.e. resettlement & environment).
    - Livelihood model acceptance
    - Micro-credit livelihood options and design
    - Waterway transportation – sluice gate design and operational schedules

  More specifically, the public consultations and community participation initiatives should take into account the following recommendations related to literacy levels and women's needs.

- Project communications must be supplemented by verbal communications. Project implementation at a community level should not rely solely on written documents/communications (eg. for compensation, technical training, etc.). In most of the

sub-project areas, the level of education is low and there are relatively high levels of illiteracy, particularly amongst women and ethnic minorities.

- Extension training programs should ensure that they are done in a manner and time that allows women to adequately tend to their domestic duties, ie. childcare, meal preparations, etc.

4.2.7 Sluice gates and waterway transportation

- Sluice gate designs need to ensure that boats can move in and out optimally. In areas with heavy traffic, for example fishing communities (Kien Giang, Soc Trang, Ba Tri-Ben Tre), the gates should be designed to enable fishing boats to be moved in or out within the period of time that the gates can stay open in that location.
- The management agency responsible for the sluice gate operations needs to design an operational schedule with the community that details the exact opening and closing schedules for the gates so that the community is able to plan its use of the waterway and minimize the impact of lost time and fuel while waiting for the gates to open.

1. INTRODUCTION

1.1 PROJECT DESCRIPTION

This study, the Regional Social Assessment, has been produced in order to support the preparation of the *Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods* Project (MDICRSL).

The overall objective of this study is to better understand the impacted communities in order to improve community engagement in long-term delta investment planning processes to ensure long-term sustainability and client ownership of the proposed investments. It does so by engaging with selected Delta communities in order to enhance the understanding of current climate change adaptation practices and social impacts that may result from the proposed MDICRSL livelihood investments.

The findings, analysis and recommendations of this RSA informs the sub-project feasibility studies and their ESIAs, and other safeguard instruments.

The focus of the RSA is on the sub-projects of Components 2, 3, and 4 of the MDICRSL. During preparations, the following sub-projects were identified.

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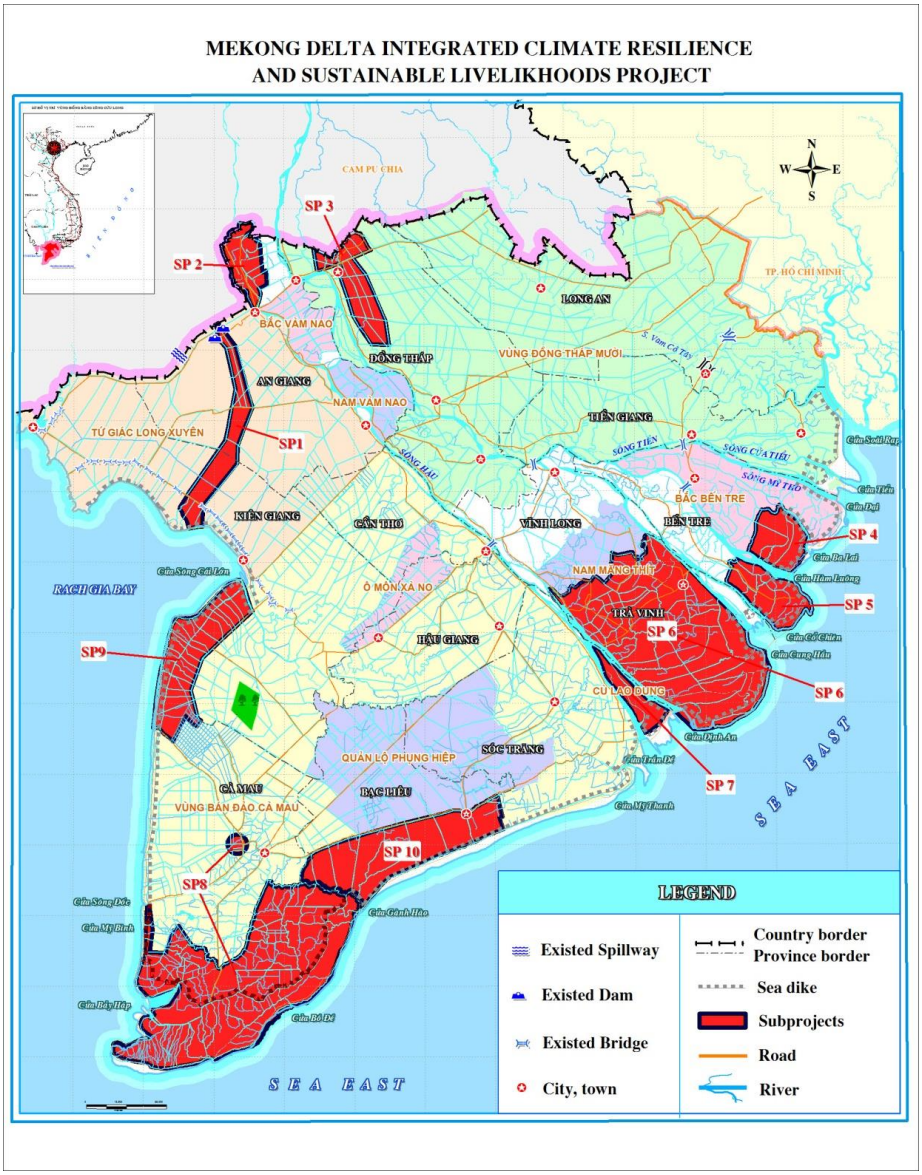
Component 4: Protecting Coastal Areas in the Peninsula	
Sub-project 8 (SP8 - Ca Mau)	Mangrove restoration & coastal protection
Sub-project 9 (SP9 - Kien Giang)	Transition to a saline-brackish economy Increase freshwater retention in specific areas
Sub-project 10 (SP10 - Bac Lieu) [2]	Mangrove restoration & coastal protection

A summary of the Sub-projects are provided in Annex 1.

[1] It should be noted that this RSA does not include a field survey of the Tra Vinh sub-project because at the time of the field work, the sub-project primarily consisted of three sluice gates without any livelihood investments and whose FS, ESIAs and RAP had recently been completed (Oct 2014) with the assistance of JICA. However, the VAWR has conducted field surveys to investigate and update on resettlement issues which is covered in the RAP for the Tra Vinh sub-project. The proposed mangrove investments were also not included in the sub-project at the time of the field work, but secondary documentation on mangrove-shrimp livelihoods has been reviewed for this RSA.

[2] It should be noted that this RSA does not include information for SP10 in Bac Lieu because the sub-project was not yet defined at the time of the RSA field work.

Figure 1. Location of sub-projects



1.1 METHODOLOGY

The study was designed to undertake the following 3 tasks:

Task 1: Climate Change Vulnerability Assessment

- Conduct a rapid climate vulnerability and capacity assessment (VCA) to understand the existing community-level adaptation capacity and coping measures. VCA should include mapping of poverty, natural resources, livelihoods (agriculture and aquaculture, land-use planning and land zoning practices), cropping calendar (integrated with climate change scenario exercises), and hazards and the hot spots.
- Conduct climate change impact assessment to identify the development impacts of existing and planned investments in the three pilot Delta areas, and support adaptation plans.

Task 2: Identifying Innovative Measures for Climate Resilience

- Lead stakeholder engagement activities to aggregate information on climate change adaptation practices and community motivations and identify innovative initiatives that would increase community resilience to impacts of climate change.
- Help design livelihoods support activities that would be suitable to complement the proposed low regrets investments for these three targeted areas. Explore possible ideas for establishing farmer/fisher support schemes and risk insurance/social protection measures in the face of changing livelihood practices.
- Identify potential opportunities for improving organization (such as farmer groups, shrimp cooperatives etc., etc.) for better market access, export potential, etc.

Task 3: Social Analysis for Project Areas

- Provide a brief description of typical features of the geographical area in the three selected project locations in terms of current population, social and economic activities - particularly issues related to livelihoods as well as social and public recreational assets, geography, and environment.
- Review, evaluate and present:
  - Available baseline data on the relevant social, economic and physical cultural heritage characteristics within the project area of impact taking into account the present activities (e.g., current irrigated agricultural practices, water supply, river transportation, tourism, etc.) relevant to the project investments in a strategic manner.
  - Social, economic impacts: community structure around the piloted area; inventory of community activities and production systems (e.g., agriculture, aquaculture, industry, small businesses); level of income, any public infrastructure and social services (goods and services); and a description of any direct, indirect and induced impacts on livelihoods; poverty mapping.

The research utilized a combination of following methods to undertake the 3 tasks:

Tasks	Methods
1	• Field-based focus group workshops using open-ended interviews in sub-project areas (Annex 2)
2	• Field-based focus group workshops using open-ended interviews in sub-project areas (Annex 2) • Closed-ended household questionnaires (Annex 3)
3	• Desk based review of literature and available statistics • Field-based focus group workshops using open-ended interviews in sub-project areas (Annex 2) • Closed-ended household questionnaires (Annex 3)

Desk Review

The desk review focuses on two areas which contribute to Section 2 of this report on the Regional Socio-Economic Context.

1. *Socio-economic profiles of the populations in the project provinces:*
   a) Population and population growth rate for provinces – compared to MD and Vietnam average.
   b) Population density of provinces - compared to MD and Vietnam average.

c) Migration in and out of provinces
d) Gender issues
e) Ethnic Minority Issues
f) Income trends - compared to MD and Vietnam average.
g) Poverty in provinces - compared to MD and Vietnam average.
h) Unemployment - compared to MD and Vietnam average.
i) Employment and Poverty Distribution
j) Land Use Patterns and Agriculture

The sources for this data include the Government Statistics Office website (http://www.gso.gov.vn/Default_en.aspx?tabid=766) which includes the 2012 Living Standards Survey, and the 2014 Provincial Statistical Yearbook for all 7 provinces.

2. Types of livelihoods that are found within the sub-projects

This section provides information on livelihood models that have been targeted for intervention in the sub-projects. The description includes on-farm practice, and the advantages and challenges of the livelihood models. Information and data is sourced from existing reports and supplemented by the field work described below. These models include:

a) Triple rice cropping (SP1, SP2, SP3, SP4)
b) Double rice cropping (SP1, SP2, SP3, SP5)
c) Floating rice (SP1, SP2)
d) Rice and Giant Freshwater Prawn (SP1, SP2, SP3)
e) Rice and lotus (SP3)
f) Rice and brackish water shrimp (SP5, SP9)
g) Extensive shrimp (SP4, SP5, SP6, SP8, SP9)
h) Intensive shrimp (SP4, SP5, SP6, SP8, SP9)
i) Mangrove shrimp (SP4, SP5, SP6, SP8, SP9)

Focus Group Meetings (Sub-projects 1-9 excluding 6)

Field work for this study was conducted between 12 October and 15 November 2015. The field work, which was led by the International Union for Conservation of Nature (IUCN), was conducted sequentially through field-based focus group interviews in each of the sub-project investment areas (see Annex 2 for interview guide). The focus groups were divided into government and community groups. For the community groups, two socio-economic groups (poor and better-off) were interviewed to ensure that the data collected on capacity to respond to climate change (CC) could be differentiated according to these two socio-economic groupings. Further differentiation based on gender was also conducted during the focus groups in order to understand the specific needs of women. In total, at the community level, 3 focus groups consisting of 10 persons each per sub-project area were interviewed in parallel.

Group	Participants	Duration
Provincial Project Preparatory Team	Provincial and District level agencies including Women's Union	Half day
Commune government	Commune PC, Farmers Union, Women's Union, Youth Union	Half day
Community (Focus Group)	30 participants divided into 3 groups: 1. 10 poor households (including landless and land-poor) 2. 10 better-off households 3. 10 women	1 day
Individual households	At least 1 poor household and 1 better-off household	Half day

Provincial and District authorities

Each field visit began with a meeting with the Provincial Project Preparatory Team consisting of relevant departmental staff at both the Provincial and District level. The purpose of this meeting was to listen to provincial perspectives of the project impact and vulnerabilities, and to receive an update on the sub-project design.

Commune Government

Before meeting with the community, a meeting with the Commune government was held to discuss sub-project boundaries, project beneficiaries, how they plan to manage the project and its impacts, any challenges that they anticipate, etc. Where a sub-project involves more than one commune, several commune governments were invited for interview. These meetings were held separately from the Community focus groups.

Community focus group meetings

The selection of the community participants for the focus groups were done in consultation with the provincial and district government focal persons during preparatory meetings between 14 and 18 September for An Giang, Dong Thap and Soc Trang, and 5 and 9 Oct. for Kien Giang, Ca Mau and Ben Tre. The following criteria were utilized for participant selection:

- Poor household (10 persons including landless and land-poor)
- Better off household (10 persons)
- Women (10 persons)

For each of the above groups, additional selection criteria included:

- Ethnicity
- Representatives of different livelihoods
- Households slated for resettlement

For each sub-project area, a full day consultation with the community was conducted. An open-ended interview was used to collect qualitative information (see interview guide at Annex 1). Approximately 30 participants were invited to the community meeting. The 30 participants were divided into 3 separate focus groups of 10 persons each consisting of: 1) poor households; 2) better-off households; and 3) women. The 3 focus groups were interviewed separately in parallel for a full day.

The focus group interviews were supplemented by a half day of open-ended interviews with at least two household (one poor and one better off) and on-farm observations to obtain a greater level of detail on issues raised during the focus groups.

Household interviews to collect quantitative socio-economic data (Sub-projects 1- 9 excluding 6)

Socio-economic household data was collected by a survey team led by the Centre for Water Management and Climate Change (WACC) through a household survey questionnaire utilizing a closed-ended questions (see Annex 3). This field work was conducted between 26 October and 28 November 2015. Approximately fifty household interviews were conducted per sub-project area. In total, 400 households were interviewed. The household interviews followed the focus group meetings by approximately a week later so that the focus group team, together with the commune government, could provide advice on the sampling locations that would cover most of the sub-project locations, representative livelihoods, and issues. The households for interview were then randomly selected from that particular locality.

2. REGIONAL SOCIO-ECONOMIC CONTEXT

2.1 GENERAL ECONOMIC CONTEXT

With around 17.5 million people (19% of the Vietnamese population), like many other deltas, the Mekong Delta is densely populated with 431 persons/sq. km. In 2012, 75% of the population was rural. The annual income per capita in the Mekong Delta was approximately 21.6 million VND (approx 980 USD) which is lower than the national average of almost 24 million VND in 2012. Although the economy in the Mekong Delta is growing, its growth rate is slower than the national average.

The economic reforms since Đổi Mới began in 1986 have had a major influence on the socio-economic development of the delta. Policies that unshackled farmers and markets, together with new investment policies, resulted in more efficient production systems including investments to improve water infrastructure, particularly for irrigation development.

Investments in high flood control dykes and salinity control projects in coastal areas have greatly enlarged suitable cropping areas. Once the infrastructure was put in place, technological developments have then played a key role to increasing production. For example, although already available in the 1970s, the high yielding rice varieties only started to be effectively used after improvements in irrigation, drainage and flood control were implemented on a large scale. These improvements in water management, the implementation of technical advances and policy reforms supported the delta's rice production to increase from 4.5 million tons in 1976 to 24.6 million tons in 2012 of which 8 million was for export. The Mekong Delta has been critical for the development of Vietnam and also for regional food security. It produces 50% of Vietnam's rice (90% for export) and 70% of its aquaculture products.

Over the last two decades, following the national trend, the economic structure of the delta has been changing with a growing industrial and services sector. However, agriculture remains the most important economic sector in the delta today. Agricultural land accounts for 64.3%, forestry land 7.4%, homestead land 6.5%, and special-use land 3.1% of the total land area of the delta (GSO, 2014).

However, over the last decade, a number of natural and anthropogenic changes are placing significant development pressures on the Mekong Delta. Intensified production over the last 3 decades has taken its toll on the natural resources and environments of the Delta. Rice yields have begun to decline as rice growing land is depleted of sediments. Underground aquifers have reduced their recharge rates because seasonal flood plains are lost to high dyke building for the third rice crop (IUCN, 2012). Between 2001 and 2011, the Long Xuyen Quadrangle lost approx 40% of its flood area to high dyke building (ICEM, 2015). In coastal areas, mangroves, which are important for aquaculture and fisheries livelihoods as well as storm and erosion protection, have been lost due to the encroachment of shrimp farms.

Furthermore, climate change is expected to further threaten lives, livelihoods and assets in the Mekong Delta. Coastal populations in the Mekong Delta have been identified as being especially vulnerable to the impacts of climate change, including sea-level rise and the projected increase in tropical cyclone intensity. Rice yields in the Mekong Delta are expected to decline from 6-12% due to resulting inundation and salinity intrusion, while aquaculture production will also be affected.

Socio-economic stresses are also apparent. Under stress from multiple economic and environmental pressures and risks, small-scale farmers increasingly have difficulties securing a minimum level of

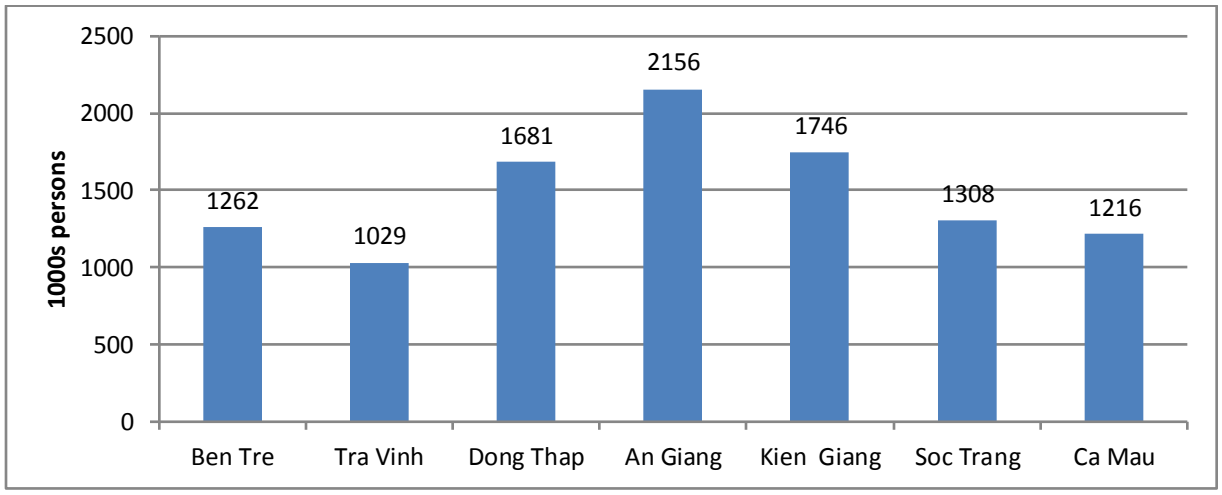
profitability and a stable livelihood base (World Bank, 2014). Rising inequalities, high incidences of landlessness, and labor migration, notably into urban areas, are among the most significant consequences. At the same time, the Delta's secondary and tertiary sectors are presently unable to sufficiently absorb the former agricultural labor force. As a result, outmigration is increasing, most importantly to Ho Chi Minh City and its neighboring provinces and growing inequality is apparent. While both the poverty rate and income inequality in the Mekong Delta is lower than the national average, the gap between the poor and rich has been growing over the last decade in the Mekong Delta. The gap between the lowest income quintile and the highest income quintile in 2004 was 6.7 times and this had grown to 7.7 times by 2012.

2.2 GENERAL SOCIAL CONTEXT: REGION AND PROVINCE

2.2.1 POPULATION AND POPULATION GROWTH RATES

The population of the Mekong Delta was approximately 17.5 million, or 19% of the Vietnamese population in 2014. Amongst the project provinces, the highest populations are found in the predominantly rice growing provinces of the Mekong Delta, An Giang, Dong Thap and Kien Giang (see 2.2.9).

Figure 2. Population by province (Source: GSO, 2014)



The population growth rate has been relatively stable since 2010. Growth rates in the 7 provinces range between 0.1% (Soc Trang) and 0.6% (Kien Giang). These relatively low and stable growth rates appear to be the result of the relatively higher natural rate of population increase (between 5 to 11%) being counteracted by the high net migration rates (between -5 and -16 %) in the same provinces (see 2.2.3).

Figure 3. Population growth rate by province (Source: GSO, 2014)

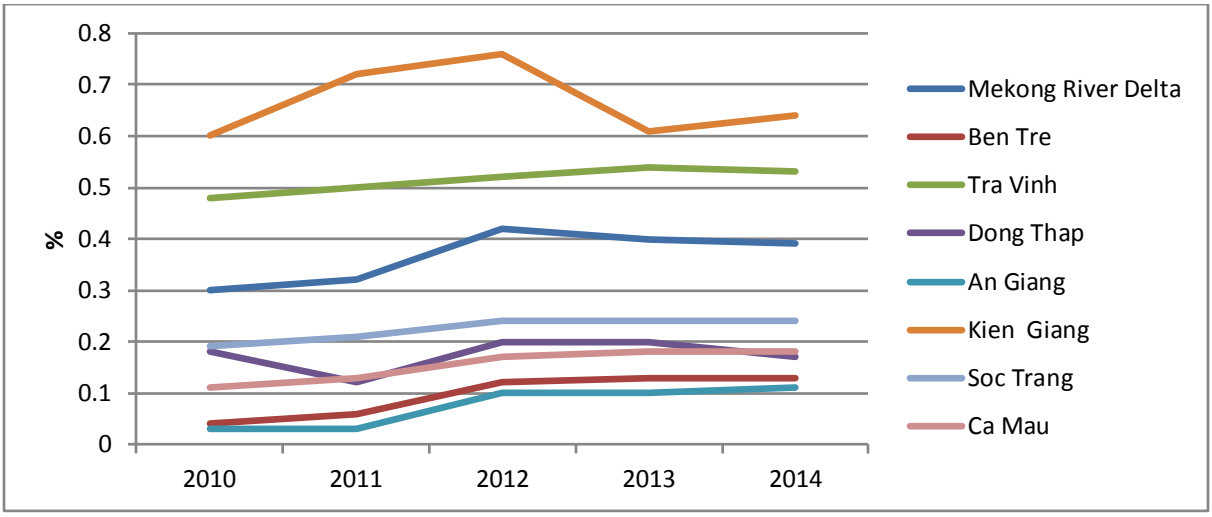
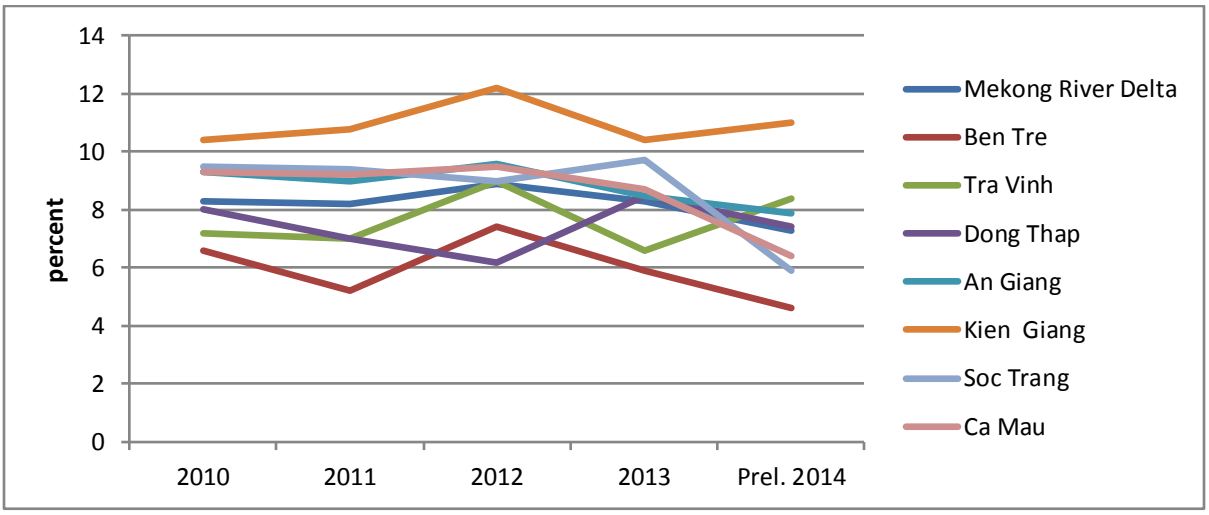


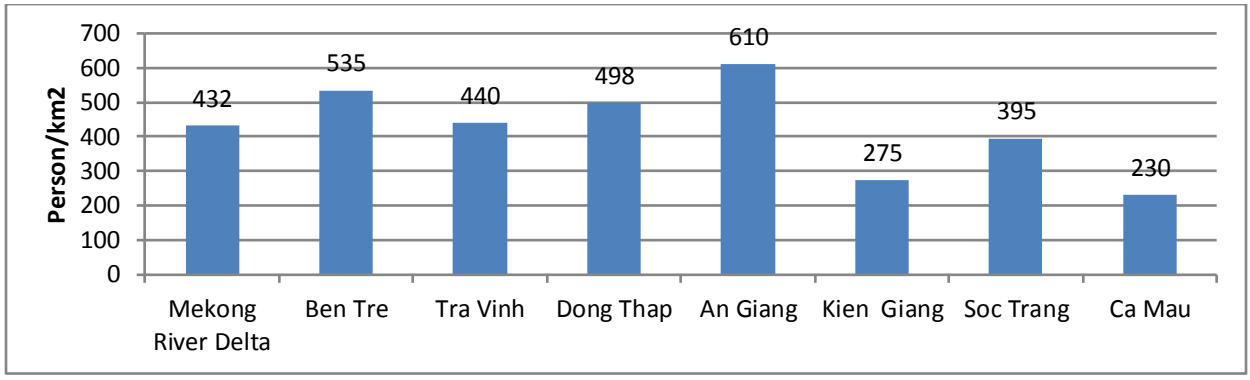
Figure 4. Population natural rate of increase by province (Source: GSO, 2014)



2.2.2 POPULATION DENSITY OF PROVINCES

The average population density of the Mekong Delta in 2014 was approximately 432 persons/km2. Amongst the project provinces, An Giang Province has the highest population density with 610 persons/km2, followed by Ben Tre, Dong Thap and Tra Vinh, all of whom are slightly denser than the Mekong Delta average. The provinces with lower population densities than the Mekong Delta average are Soc Trang, Kien Giang and Ca Mau, the latter having the lowest density at 230 persons/km2 – Ca Mau has the largest tracts of mangrove forests (over in the Mekong Delta which explains the low population density.

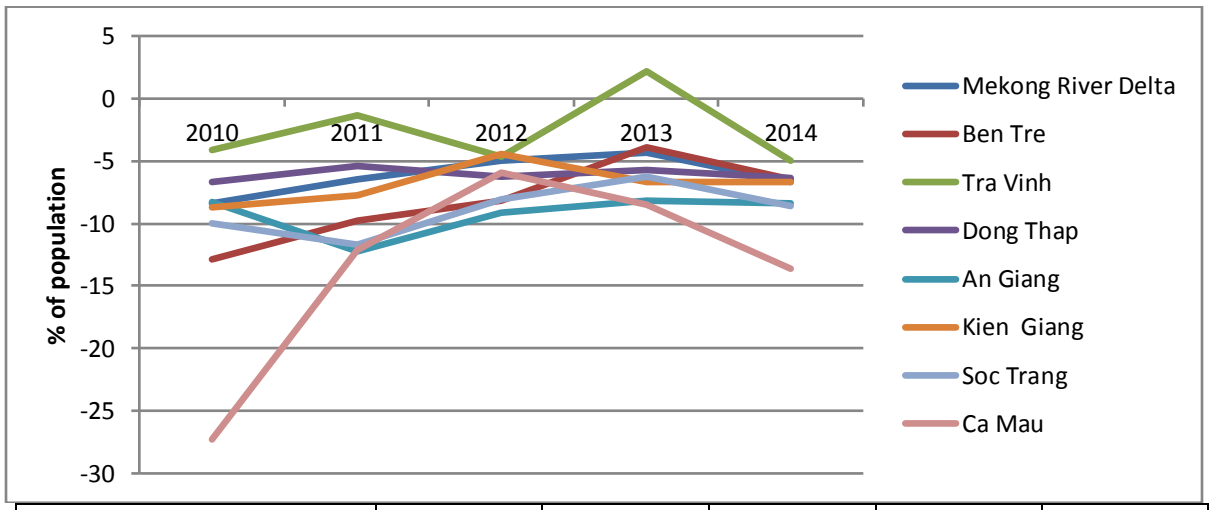
Figure 5. Population density by province (Source: GSO, 2014)



2.2.3 MIGRATION IN AND OUT OF PROVINCES

Over the last 5 years, the project provinces have consistently experienced a net outward migration of their populations. In 2014 the Mekong Delta average was - 6.7%. The net migration rates of the project provinces range between -5% for Tra Vinh and -13.6% for Ca Mau.

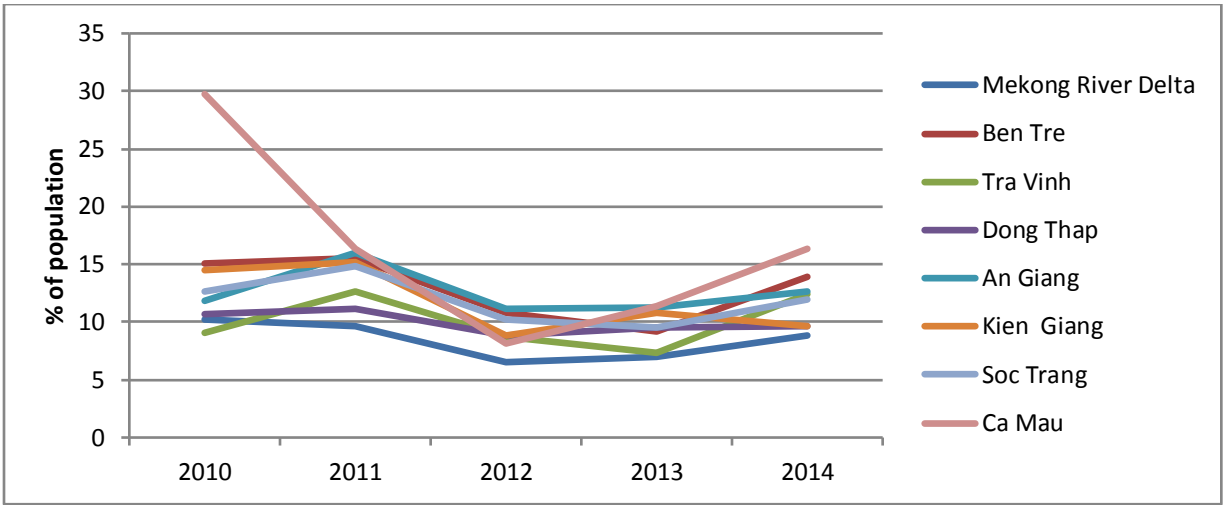
Figure 6. Net-migration trend and rate by provinces (Source: GSO, 2014)



	2010	2011	2012	2013	2014
Mekong River Delta	-8.4	-6.5	-5	-4.3	-6.7
Ben Tre	-12.9	-9.8	-8.2	-3.9	-6.5
Tra Vinh	-4.1	-1.3	-4.7	2.2	-5
Dong Thap	-6.7	-5.4	-6.3	-5.7	-6.4
An Giang	-8.3	-12.2	-9.1	-8.2	-8.4
Kien Giang	-8.7	-7.8	-4.4	-6.7	-6.7
Soc Trang	-10	-11.7	-8.1	-6.3	-8.6
Ca Mau	-27.3	-12.1	-5.9	-8.5	-13.6

The outward migration trend appears to have increased slightly in all the Provinces since 2012 after a slight decline between 2011 and 2012.

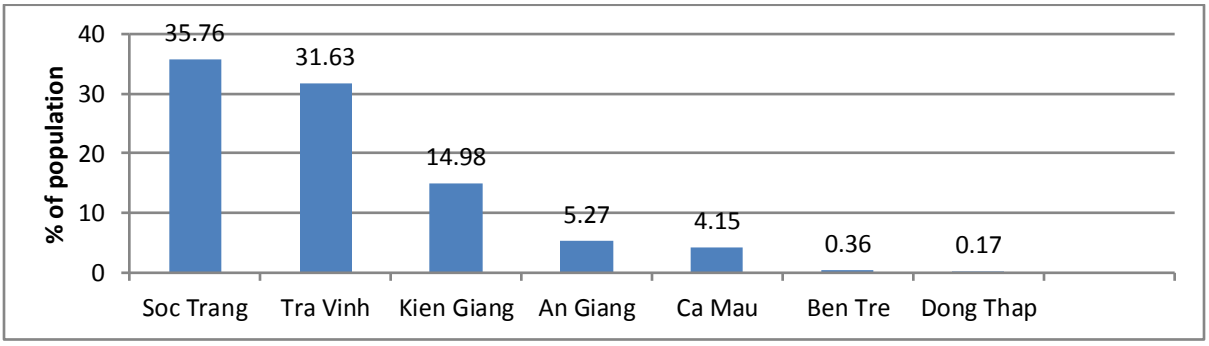
Figure 7. Out migration trend by province (Source: GSO, 2014)



2.2.4 ETHNICITY

The distribution of ethnic minorities is unevenly distributed across the Mekong Delta Provinces. Within the project provinces, Soc Trang, Tra Vinh and Kien Giang have by far the largest populations of ethnic minorities. An Giang and Ca Mau have relatively small populations and Ben Tre and Dong Thap have negligible populations. In the Mekong Delta, 93% of the population belong to the Kinh mainstream Vietnamese group and 7% are ethnic minorities including Chinese, Cham, and Khmer. The Khmer in the Delta is the largest ethnic group with a total population of 1.26 million (GSO population census, 2012).

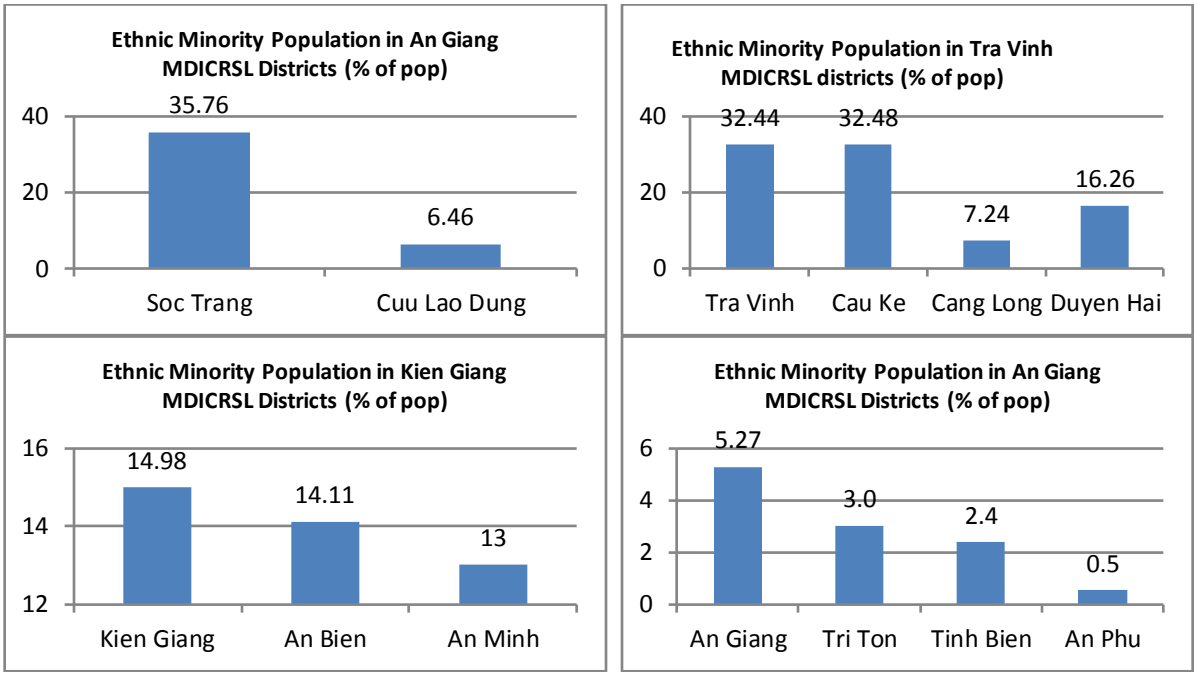
Figure 8. Ethnic minority population by province (Source: Provincial Statistical Yearbooks, 2014)



The distribution of ethnic minority populations within the Provinces is similarly unevenly distributed. In general, considering the provinces with the largest populations of ethnic minorities – Soc Trang, Tra Vinh, Kien Giang, An Giang and Ca Mau - the project areas (Districts) within these Provinces have a lower proportion of ethnic minorities in comparison to the Provincial proportions.

Random household surveys in sub-project communes indicate even lower proportions of ethnic minority households in all sub-project areas. The household data suggests that this is most likely indicative of the intermarriage between the ethnic minority population and the Kinh. These families often do not identify themselves as ethnic minorities and have taken on Kinh names.

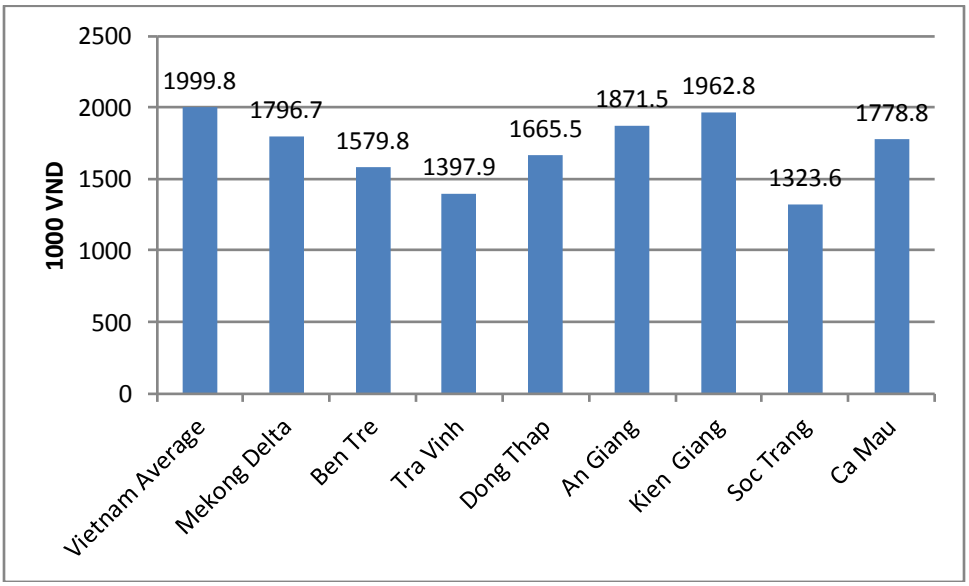
Figure 9. Ethnic minority distributions in project provinces with significant ethnic minority populations (Sources: Provincial Statistical Yearbooks, 2014, District Statistical Yearbooks, 2014)



2.2.5 INCOME AND INCOME DISTRIBUTION

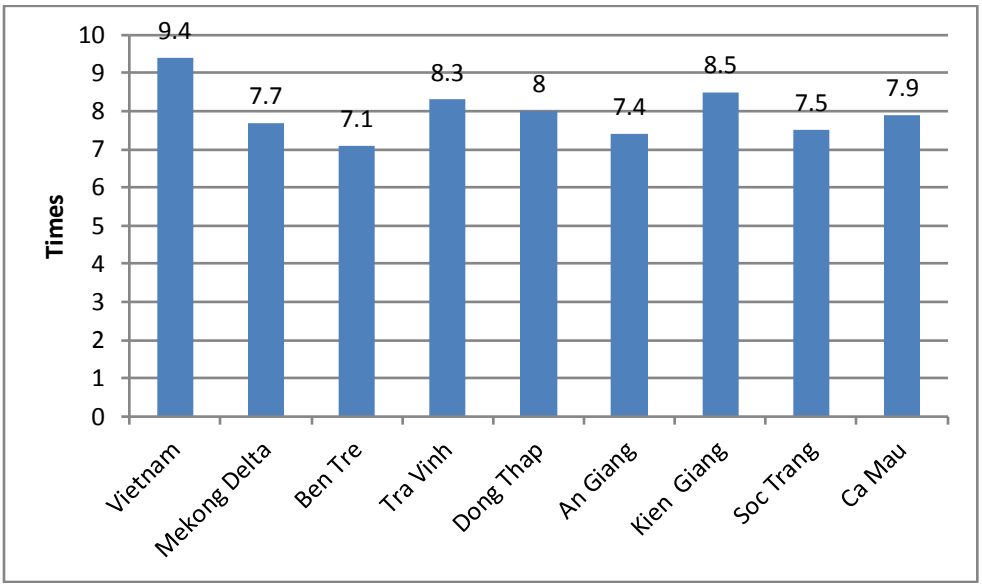
Monthly income per capita data reveals that Mekong Delta citizens earn 1.8 million VND/mth which is lower than the national average of almost 2 million VND/mth in 2012. Amongst the project provinces, Tra Vinh and Soc Trang have the lowest incomes at approximately 1.3 million VND/mth, while incomes in An Giang and Kien Giang are relatively high at 1.9 million VND/mth, which is close to the national average.

Figure 10. Monthly income per capita by province (Source: GSO, 2014)



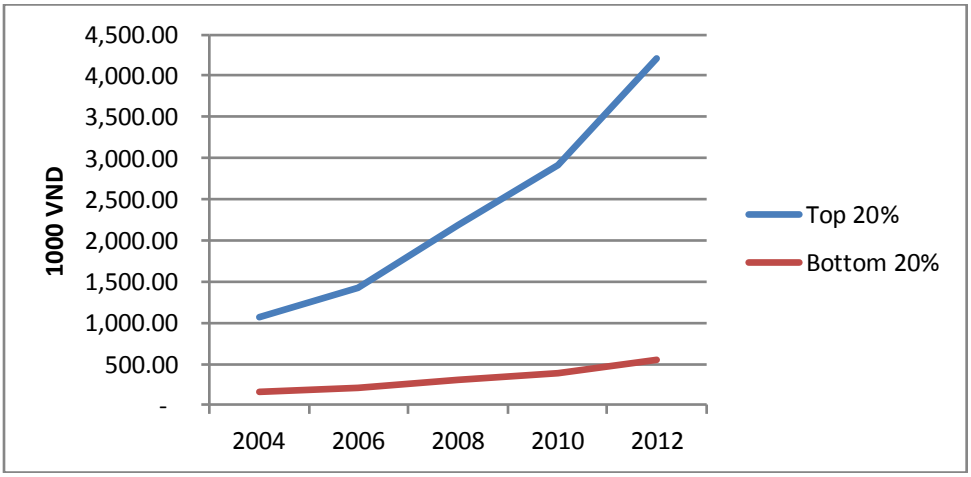
The data on the distribution of income between the highest and lowest quintiles of income earners shows that income inequality in the Mekong Delta is lower than the national level. The difference between the highest and lowest income earners in the Mekong Delta is 7.7 times, while it is 9.4 times nationally. Amongst the project provinces, Tra Vinh, Dong Thap, Kien Giang and Ca Mau have higher income inequality than the Mekong Delta average, but lower levels than the national level.

Figure 11. Income difference between highest and lowest quintile of per capita income (Source: GSO, 2014)



While income inequality in the Mekong Delta is lower than the national average, the gap between the poor and rich has been growing over the last decade in the Mekong Delta. The gap between the lowest income quintile and the highest income quintile in 2004 was 6.7 times and this had grown to 7.7 times by 2012.

Figure 12. The growing gap in monthly incomes in the Mekong Delta (Source: GSO, 2014).



2.2.6 POVERTY IN PROVINCES

Between 2006 and 2012, the poverty rate in the Mekong Delta has consistently declined (from 13.5% in 2006 to 10.1% in 2012) and been lower than the national average (Table 4). In 2012, the average poverty rate in the Mekong Delta was 10.1% while the national average was 11.1%. Amongst the project provinces, Ben Tre, Tra Vinh, Dong Thap, and Soc Trang have consistently had higher levels of poverty than the Mekong Delta average. Of these four Provinces, Soc Trang has the highest rate of poverty with 19% in 2012. The provinces with a lower rate of poverty than the Mekong Delta average are An Giang, Kien Giang, and Ca Mau with Kien Giang having the lowest rate at 6.6%

Table 4. Poverty rate (%) by province (Source: GSO, 2014)

	2006	2008	2010	2012
Vietnam	15.5	13.4	14.2	11.1
Mekong River Delta	13.5	11.4	12.6	10.1
Ben Tre	16.2	14.2	15.4	12.9
Tra Vinh	21.8	19	23.2	18.3
Dong Thap	12.1	10.6	14.4	11.6
An Giang	9.7	8.5	9.2	7.1
Kien Giang	10.8	9.3	9.3	6.6
Soc Trang	19.5	17.9	22.1	19
Ca Mau	14	12.7	12.3	7.8

GSO Note: Poverty rate is calculated by monthly average income per capital of household. Before 2002: 1998: 149 thousand dongs; 2002: 160 thousand dongs; In 2004, 2006, 2008, it is measured by the Government's poverty line for 2006-2010 period, considering inflation adjustment as follows: 2004: 170 thousand dongs for rural area, 220 thousand dongs for urban area, 2006: 200 thousand dongs for rural area, 260 thousand dongs for urban area, 2008: 290 thousand dongs for rural area, 370 thousand dongs for urban area; In 2010, it is measured by the Government's poverty line for 2011-2015 period as follows: 2010: 400 thousand dongs for rural area and 500 thousand dongs for urban area, 2011: 480 thousand dongs for rural area and 600 thousand dongs for urban area; 2012: 530 thousand dongs for rural area and 660 thousand dongs for urban area; 2013: 570 thousand dongs for rural area and 710 thousand dongs for urban area; 2014: 605 thousand dongs for rural area and 750 thousand dongs for urban area.

2.2.7 EMPLOYMENT

Employment data shows that the proportion of the employed population in Vietnam and the Mekong Delta over the last 5 years has been relatively stable with very little growth - within a 2% band between lows and highs. Employment rates in the project provinces are similarly stable with at least 3 provinces, Ben Tre, Tra Vinh, and Dong Thap exceeding the Mekong Delta and national rate (Table 5).

Table 5. Employment rate (%) by province (Source: GSO, 2014)

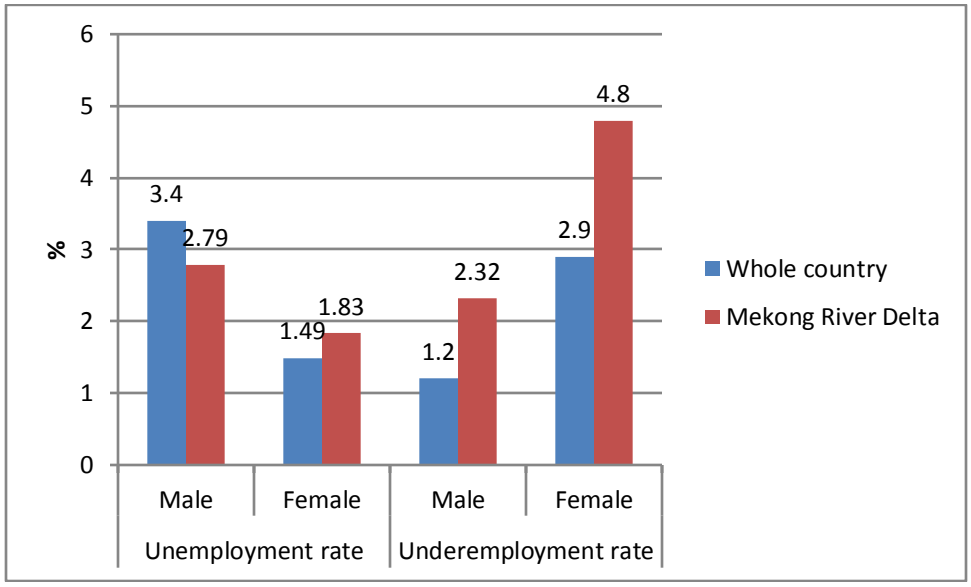
	2010	2011	2012	2013	2014
Vietnam	56.4	57.3	57.9	58.2	58.1
Mekong River Delta	56.7	57.6	58.4	57.8	57.7
Ben Tre	61.1	60.8	60.4	60.6	63.6
Tra Vinh	56.2	58.9	58.1	58	58.5
Dong Thap	56.9	58.2	57.7	57.2	59.1
An Giang	56.2	59.2	59.4	57.8	55.3
Kien Giang	55.2	57.3	58.9	55.7	56.8
Soc Trang	56.7	55.8	55.9	54.1	52.4
Ca Mau	54.1	55	56.6	55.6	56.4

2.2.8 GENDER ISSUES

Women's opportunities for employment in rural Mekong Delta, although better than men, are below the national average. The data reveals that 1.83% of women who register for employment are not able to find work compared to the national average of 1.49% for women.

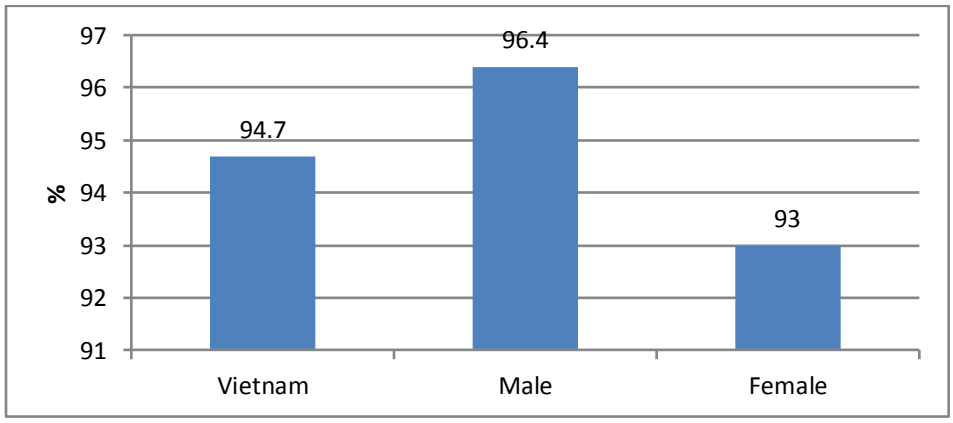
Women fare much worse than men in terms of underemployment, reflecting the part-time nature of many women's work as they combine with home duties. The data shows that 4.8% of women registering for work are underemployed compared to 2.9% of men.

Figure 13. Rural unemployment and underemployment in the Mekong Delta by gender



For women in the Mekong Delta, literacy is a significant issue. Literacy is closely linked to poverty and is an important indicator of social vulnerability. Poor literacy reduces access to information and services. The data on literacy shows that only 93 % of women in the Mekong Delta are literate which is lower than for men at 96.4% and the national average of 94.7% for both men and women.

Figure 14. Literacy rate in Vietnam, and Mekong Delta by gender (Source: GSO, 2014)



2.2.9 LAND USE PATTERNS AND AGRICULTURE

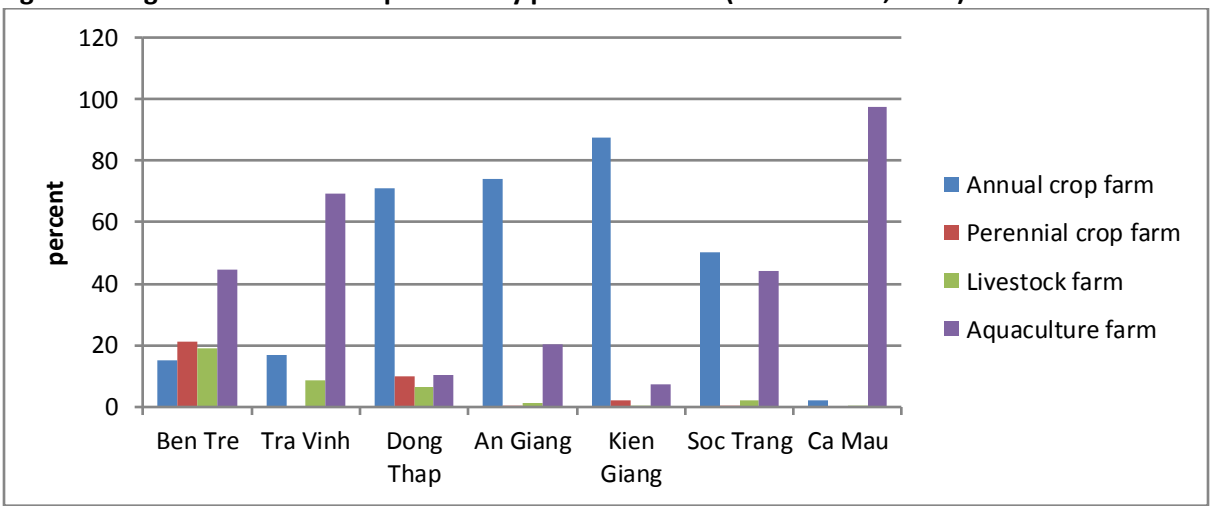
The land use patterns show that the largest areas of annual crop land (predominantly rice) are located in Dong Thap, An Giang, Kien Giang, and Soc Trang.

The other significant land use is for aquaculture. Not surprisingly, the largest areas of aquaculture land, in descending order, are found in the coastal provinces of Ca Mau, Tra Vinh, Soc Trang, and Ben Tre.

The data for Tra Vinh is missing data for perennial crop land which would be a significant land use in the province which has large tracts of land for horticulture – fruit and vegetable growing including coconuts.

The GSO data for 2013 and 2014 have significant omissions and cannot be used for comparison.

Figure 15. Agricultural land use patterns by province - 2012 (Source: GSO, 2012)



2.3 VULNERABLE POPULATIONS IN THE MEKONG DELTA

2.3.1 RURAL LANDLESS AND LAND-POOR

The landless

There are several possible causes of rural landlessness in the Mekong Delta. A young family, starting out from a poor parent family very likely inherits no or little land from their parents. Family catastrophes such as serious illnesses of family members or sudden loss of the family breadwinners and successive failures of crops may result in the family selling land to take care of immediate needs and/or to pay debts.

With limited resources, they are unable to diversify their income and have to rely on earnings from hired labor and exploiting natural resources for livelihoods. However, in the past 20 years, inequality among the rural population in the delta has been increasing with the process of agricultural, mainly rice, intensification. For example, according to the Dong Thap Statistical Yearbook 2013, the gap between the highest income quintile and the lowest income quintile was more than nine times that

in 2010, and more than seven times in 2012 in which the lowest quintile were earning 527,000 VND per month and the highest income quintile earning 3,845,000 VND per month. In 2015, the minimum wage for rural areas is 2.150.000 VND per month[3]. Those on the lowest quintile are not able to achieve the minimum wage because of under-employment.

In the rural delta, the key natural capitals are land, water, and fishery resources. The landless are the losers in the process of rice intensification as they do not benefit from the increased income of the added rice crops, and lose natural resources such as wild capture fisheries and wild edible plants that they could rely on before for subsistence and supplementary income.

With the declining natural resource base, the landless group has become more reliant on earnings from hired labor, which is unstable, seasonal, and declining. Employment opportunities for agricultural manual works have declined in the process of agriculture intensification and mechanization. Most of the rice farming work today are done by machines—afforded by better off farmers.

Besides, the landless also do not have access to credit as they do not have land use certificates to use as collateral for obtaining credit. The lack of financial capital prevents them from improving their productivity and carrying out income generation activities.

The landless poor also have low levels of educational attainment. This prevents them from acquiring and applying new skills. Children of the poor also have poor access to schooling, especially to high school level, away from home. Children of the poor often have to be involved in work to earn a living for the family.

Although not earning directly from land, the poor who work as hired laborers are affected indirectly by adverse impacts of climate change as employment opportunities shrink when land holding farmers are affected.

In the coastal area, poor coastal fishers and farmers living in areas without good access to social services and essential infrastructures are vulnerable to seasonal weather and storms, and subject to health risks and the security of their homes. Without large boats and equipment, the coastal poor rely on fishing near shore with simple gear. Poor coastal fishers in Ben Tre province reported that due to hotter temperatures in the dry season, fish move further out to sea, out of reach of poor fishers.

The land-poor

Today, an average farming family of five members owning under one hectare of rice land can be considered land-poor as the family cannot survive on the income from rice farming alone - be it double cropping or triple cropping. The data in table 6 shows that the total profit per one hectare of triple rice cropping is 34.7 million VND a year. Assuming an average-sized family has five members, the daily income per capita is 19,270 VND or less than US$1.00 per person per day. This partly explains the out migration trend from the delta.

[3] Effective from 1 Jan to 31 Dec 2015, by Decree 103/2014/ND-CP issued by the Prime Minister of Vietnam

Table 6. Income and profits from rice cropping in Dong Thap province in 2014 (Source: Dong Thap DARD)

		First crop (Winter-Spring)	Second crop (Summer-Autumn)	Third Crop (Autumn-Winter)
Total cost	VND	22,850,450	21,480,610	22,750,340
Yield	kg/ha	7,050	5,731	5,363
Unit cost	VND/Kg	3,241	3,748	4,242
Price	VND	5,500	5,400	6,000
Income	VND	38,775,000	30,974,400	32,178,000
Profit	**VND**	**15,924,550**	**9,493,790**	**9,427,660**

Besides the meagre income from rice farming, the land poor have to rely on selling labor and resorting to natural resources and thus are subject to the same vulnerabilities faced by the landless.

2.3.2 ETHNIC MINORITIES

Poverty and vulnerability in the Mekong Delta has a strong ethnic dimension as shown by the data in the Table 7.

Table 7. Poverty index, Mekong Delta (Source: Poverty Profile, GSO, 2014)

	2010			2012		
Ethnicity of household head	Poverty head count	Poverty gap	Poverty severity	Poverty head count	Poverty gap	Poverty severity
Kinh and Chinese groups	12.9	2.7	0.9	9.9	1.9	0.6
Others Group	66.3	24.3	11.3	59.2	19.2	8.2

The data in the table show that the poverty rate, poverty gap, and poverty severity of the Kinh and Chinese group, combined, are much lower than those of the group comprising the other ethnicities, mainly Khmer. In the Mekong Delta, 93% of the population belong to the Kinh mainstream Vietnamese group and 7% are ethnic minorities including Chinese, Cham, and Khmer. The Khmer in the Delta is the largest ethnic group with a total population of 1.26 million (GSO population census, 2012). The Khmer group lives along the coast and border areas in Kien Giang, An Giang, Tra Vinh, Bac Lieu, Soc Trang, and Ca Mau. Livelihoods of the Khmer in the delta are agriculture, animal husbandry, handicraft making, and fishing. The Chinese, totaling about 300,000, live mainly in provincial urban areas and engage in trade. The Cham group, with a total population of about 13,000, live mainly in the border areas in An Giang province. Their livelihoods comprise agriculture and handicraft making, especially producing fabrics and silks. Among the three groups, the Khmer is the poorest and most vulnerable group, followed by the Cham while the Chinese have an equal standing with the Kinh.

According to Baulch *et al* (cited. in Garschagen, M. et al, 2012), the Khmer live in marginal areas along the coast and the border areas where the soils are either saline or acidic or both saline and acidic. These are usually remote places with limited access to infrastructure. Living near the coast, they are vulnerable to typhoons and storms. The poverty rate amongst the 1.26 million Khmer people in the Delta – being by far the largest minority group – has decreased at a slower pace than amongst the Kinh majority and the ethnic Chinese and was around 20% above the national average around the turn of the century.

According to Vo Van Sen et al (2011), one of the biggest livelihood issues of the Khmer in the Delta is landlessness. The landlessness incidence is high among Khmer households in the Mekong Delta and differs between localities. For example, in 2002 in Vinh Hai commune, Vinh Chau district, Soc Trang province, 32.12% of the Khmer households were landless and in the saline area the incidence was 58%.

The low level of educational attainment among the Khmer also makes it difficult for them to apply new skills. Nguyen Quoc Nghi and Bui Van Trinh (2011) conducted a survey on 90 households in Tra Vinh and found that the education attainment among the Khmer was low, as shown in Table 8.

Table 8. Education attainment among the Khmer and the Cham in the Mekong Delta (Source: Nguyen Quoc Nghi and Bui Van Trinh, 2011)

Education level	Khmer	
	Household Head	Laborer
Illiterate	16.9	13.3
Elementary	45.8	32.0
Secondary	35.6	33.3
High School	1.7	16.7
College	0	4.7

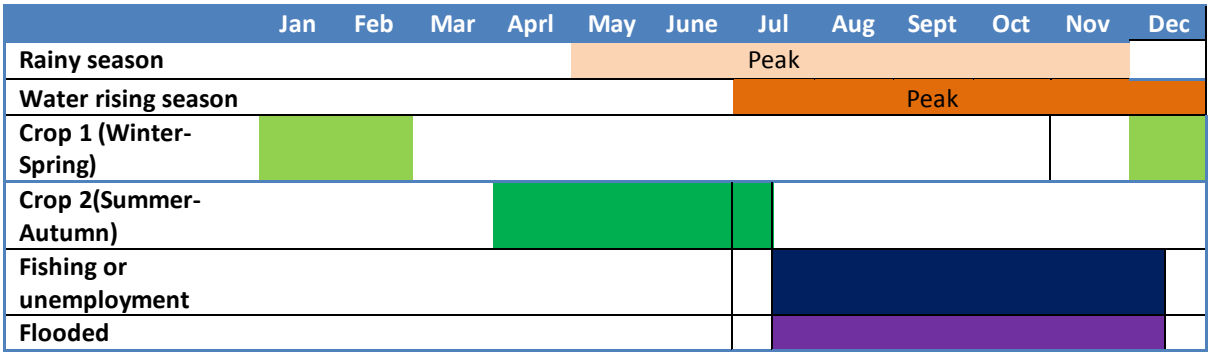
2.4 CURRENT LIVELIHOOD MODELS

2.4.1 CURRENT LIVELIHOOD MODELS IN THE UPPER DELTA

DOUBLE RICE CROPPING

In the double rice cropping system, the first crop (the Winter-Spring crop) is from December to end of February. After about a 4-week break, the second crop, (the Summer-Autumn crop, alternatively Spring-Summer) starts in early April and is harvested in the middle of July. In this system, land plots are also surrounded by dykes, with low ones at about 2 meters from the ground that allow floodwater to flow into the floodplain field after the harvest of the second crop. In the past, the second crop usually ended in August, so the low dykes became known as August Dykes. The land is let lie fallow and inundated for almost the entire flood season. At end of November, when the water level recedes and the surface of the low dykes is exposed, farmers pump water out of their land plots to sow the Winter-Spring crop.

Table 9. Seasonal calendar of double rice cropping outside dykes



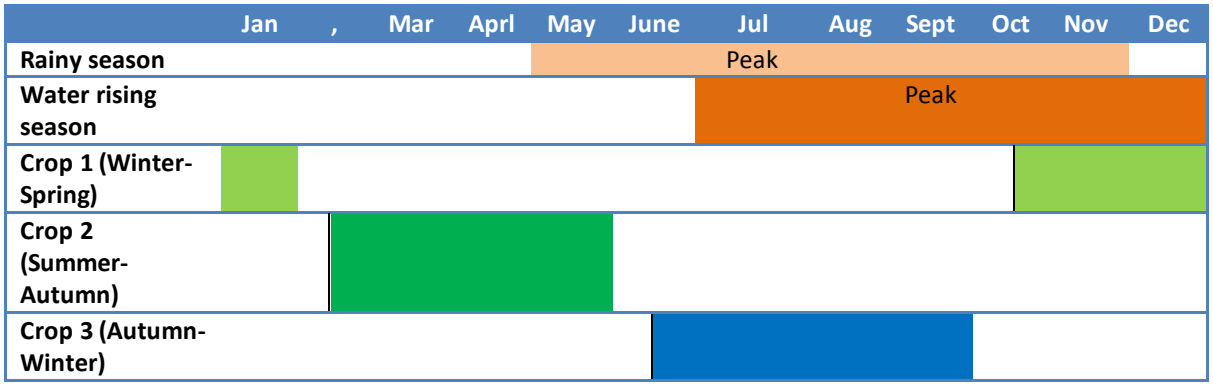
In this system, the field receives nutrient-rich sediments from the Mekong floodwater to replenish the soil. As floodwater overtops the low dykes, it flows in a sheet-flow regime, effective for flushing out toxins from the previous crops from the field. The sediments help reduce the use and cost of fertilizers and pesticides for the next crops, as the sediments act as natural fertilizers. Also in this system, rice stems tend to be stronger and less subject to diseases and pest attacks. The flooded field during the flood season is used for fishing for home consumption by the better off and for income by the poor or landless. Fishery resources in the flood season are considered common property and everyone has free access to it. This setting has socio-economic implications in enabling the poor and landless to make a living. In this cropping system, water is pumped out from the field during the early part of the first crop (Winter-Spring crop) and pumped in after that at 2-week intervals. During the second crop (Summer-Autumn crop), water is pumped in at every 2 week intervals as well. Water shortages and hot temperatures are the main issues with this crop.

This system has several drawbacks. Each farming household has to arrange water pumping on their own, something that is relatively inconvenient compared to the triple cropping system where large electric pump stations take care of irrigation for the entire large field inside a polder. The timing of crops in this cropping system needs to be flexible depending on floodwater fluctuations, especially at the start of the Winter-Spring crop, which has to wait for water to recede in order to pump water out of the field. The roads that are not heightened might be inundated at this time of the flood season, hindering transportation activities. The land is typically inundated annually, so households cannot develop fruit tree orchards behind their houses. When not protected by high dykes, farmers either build their houses on stilts or dig a pond and use the soil to build a high mound for the foundation of the house. Household aquaculture fish ponds require high dykes around them to protect from flooding.

TRIPLE RICE CROPPING

The actual timing of the crops varies several weeks from one place to another and from year to year. To visualize this calendar, the following table presents a typical schedule for the triple cropping system.

Table 10. Seasonal calendar of My Quy commune, Thap Muoi district, An Giang Province



As shown in the Table 10 above, the timing of the three crops is as follows:

Crop 1 (Winter-Spring). In the second half of October, when water starts receding, farmers pump rainwater out of the polders to prepare the land and to sow seeds for the Winter-Spring crop.
Crop 2 (Summer-Autumn). After the harvest of the first crop in January, there is a break time of about 2 weeks before the second crop is sown. During this crop, water has to be pumped in from the

surrounding canals into the field for an average seven times, at 2-week internals. The second crop is harvested at the end of May.

Crop 3 (Autumn-Winter). After a 2 week break, in mid-June the third crop is sown to be harvested at the end of September, coinciding with the peak of the annual flood. During this crop, rainwater also has to be pumped out of the field for an average 7 times, at 2-week intervals. Towards the end of the crop, the risk of dyke breakage and leakage increases with the rise of the water level. In Thap Muoi district, after the harvest of the third crop, water is released into the field until there is a layer of standing water about 60cm in low lying parts for about 20 days before it gets pumped out for planting the next crop. The higher grounds are, however, not flooded. In Tan Hoi commune, Hong Ngu Township, no water is released into the field.

In the triple rice-cropping system, the break times between two crops is very short, lasting for only 2 weeks. Farmers have to burn or plough over to bury the stubble from the previous crop. The short break time does not allow the buried stubble to decompose. As floodwater is kept out of the polders at all times, sediments and the attached nutrients do not enter the field to replenish the soils. According to local pump operators, little sediment can enter the fields through water pumping because during the "sediment season" (the flood season), water is mainly pumped out from the field. Water is pumped in only during the dry season when there is little sediment in the water.

In terms of labor, a land-owning farmer today practicing triple rice cropping within polders has to do so very little physical work, as most of the necessary heavy tasks from ploughing, pumping, harvesting, trashing, and transporting are done by machines. Transporting rice in the field out to the dykes can also be done by tractor or buffalo cart. For each polder, there is a pump station built and operated by a private investor from either within or outside the community. The owner of the pump station is also the main caretaker of the dyke as he has a strong stake in case the dyke breaks. Farmers today do not have to dry their rice before selling. Buyers come to the dykes and buy fresh rice from them. It must be noted that care should be taken when comparing yield today in fresh rice with past data of yield in dry rice. Weeding work, done mostly be women, is limited or even not necessary at times, as weeds are largely controlled by herbicides (which contribute to water pollution). Other petty tasks are hired out to the landless laborers in the community. However, the petty tasks provide little employment to the laborers as it takes only one to two person-days of work for a hectare of land. The work tasks that require labor are land preparation, sowing, fertilizer broadcasting, compensation planting, and chemical spraying.

In the triple rice cropping system, farmers sow seeds at the same time, advised by the commune agriculture officials, and harvest their crop at about the same time. This means that the demand for labor at the harvest seasons is very high for a short period. While the local poor laborers do not have enough employment during the year, during this time they cannot provide enough labor to meet the high demand. In Thap Muoi district, farmers explained that they hire large organized groups of laborers from other provinces, such as from Thot Not district in Can Tho, to work during the short labor-demand seasons like the sowing and harvesting times. This practice takes away employment opportunities from the landless locals in the communities and forces them to migrate out to the industrial zones. The middle-aged and elderly laborers who stay behind are left with little opportunity for petty agriculture employment tasks.

The typical setting of a polderized area is described as follows. A polder ranging from several hundred to several thousand hectares in size is usually in a rectangular shape with 4 dykes and associated canals on the sides, one or two of which are newly built or heightened from existing low dykes (August dykes), and the other one or two are heightened from existing rural roads in front of houses by a canal or river. The newly built ones are typically scarcely or not inhabited at all. Behind each house, there is usually a stretch of land 150-200 meters to the back used for fruit tree gardening, animal husbandry,

pond aquaculture purposes, and family burial grounds. In Thap Muoi district, with a long history of triple cropping inside the polders, the homestead system has adapted to the no-flood conditions. Houses, graves, animal pens, fish ponds are built low on the ground. A proposal for periodic floodwater release into the polders will be met with resistance from the majority of land holders who fear damages to their properties.

FLOATING RICE

Floating rice used to be a main staple food crop in the Plain of Reeds and Long Xuyen Quadrangle. The area of floating rice dwindled rapidly after 1975 due to the rapid expansion and intensification of short-term, high yield rice. From 0.5 million hectares before 1975, in 2012 the extent of floating rice shrank to about 60 ha in An Giang and some small areas in Dong Thap. The diversity of floating rice variety has also reduced from five to a single remaining variety at present. The 60 hectares in Vinh Phuoc commune, Tri Ton district, An Giang, the main place where floating rice is still being cultivated is an acidic low-lying area that is not suitable for short-term, high-yield rice. Research on floating rice farming system is being carried out by the Research Center for Rural Development (RCRD), An Giang University for restoration purposes.

According to RCRD (2014), soil in the floating rice field is softer and less heavy than the surrounding soils as it contains more organic material. In the 2014 flood season, the researchers found 49 plant species and 35 fish species, mainly white migratory fish, many of which are of high commercial value. The results show that floating rice field is rich in biodiversity.

The main reason for the disappearance of floating rice is its low yield and the long growth duration. A floating rice crop lasts for 6 months which is twice as long as the duration of common rice fetching a yield of 2.5-3.0 tons/ha, half of that of common rice.

In Vinh Phuoc commune, Tri Ton district, An Giang Province, the economic outcome for floating rice farming can be higher than that of triple rice cropping if floating rice is combined with other crops such as using the straws from floating rice for planting Allium chinense. Similar conclusions on the financial advantages of combining floating rice with other cash crops were documented in a GIZ study (2014).

The challenge with floating rice is to secure a reliable market for the organic floating rice-based products (rice and Allium chinense). As a result, the current total production of floating rice is small at about 100 tons annually, and branding has been a challenge. An Giang provincial authorities plan to expand the area of floating rice to 500 hectares by 2020. Dong Thap province is also interested in restoring floating rice in the province.

Presently, the private Ecofarm Company and the state run Vinafood 2 Company have a stated commitment to buy all floating rice from farmers at the price of 12,000 VND/kg, which is about 2.5 times that of normal rice.

GIANT FRESHWATER SHRIMP

Giant freshwater shrimp are raised in the floodplain fields that are without dykes or with low dykes during the flood season. Farmers consider shrimp aquaculture highly profitable, almost 3 times that from the flood season crop of rice, but at the same time risky. It requires a large investment to buy

seed, feed, and building low dykes, which poorer households cannot afford. The profit fluctuates greatly with the market price from year to year and depends on the quality of seed and price of inputs. The yield of shrimp depends on the behavior of the floodwater. High floodwater saves farmers on the cost of feed, as shrimp can derive food from the floodwater. The length of the flood season is of crucial importance to shrimp yield. If floodwaters recede early, there is not enough time for shrimp to mature (5 months is required).

A closed low dyke system is required for retaining water at the end of the flood season. For shrimp farmers, the longer the inundation period the better as rice farmers want to pump water out to sow the next rice crop right after the floodwater recedes in order to expose the dykes. Although shrimp aquaculture is being encouraged by provincial and local authorities as an alternative to triple rice cropping, farmers still hesitate due to the risk and because of the large capital required for building the enclosing low dyke system (for retaining water) as well as buying seed and feed.

In Binh Thanh commune, Hong Ngu Township, for example, the total area under shrimp aquaculture shrank from 91 hectares in 2014 to 71 hectares in 2015. According to Dong Thap Department of Fisheries, the total area of giant freshwater shrimp aquaculture in Dong Thap in 2014 was 1,100 hectares, producing 1,700 tons of shrimp.

Aquacultured shrimp are fed with manufactured pellets and wild captured fish and snail. Farmers indicate that at present, there is no observable water pollution caused by effluent from shrimp aquaculture yet, as the area under shrimp aquaculture is small and floodwater can still flow freely during peak time. But they warned that scaling up might cause pollution in the future. At the end of the flood season when water levels are lower and the floodwater flow is weak, disease outbreaks can occur as water becomes polluted with the accumulated residues of feed and waste from shrimp farming. Shrimp aquaculture land plots downstream of other plots can be affected by the ones located upstream.

2.4.2 CURRENT LIVELIHOOD MODELS IN THE ESTUARIES AND CA MAU PENINSULA

SHRIMP AQUACULTURE

There are several brackish-water shrimp aquaculture models, namely, Extensive Shrimp Farming, Improved Extensive Shrimp Farming, Intensive Shrimp Farming, and Mangrove-Shrimp that can be differentiated as follows:

i) Extensive Shrimp Farming. This farming system relies entirely on natural feed. The shrimp seeds are recruited entirely from the wild, thus the stocking density is low. The area of the shrimp farm is typically is large.

Advantage: This system is low cost, without spending on seeds and feeds. The size of the grown shrimp is bigger than in other farming systems and so the shrimps can fetch better prices. The labor requirement is also low as not much care is required. The growth period of the shrimps is short as the recruited shrimps from the wild are already grown up.

Disadvantage: the yield and profit per unit of land is low. The land area must be large enough to make significant income while land price is increasing.

ii) Improved Extensive Shrimp Farming: This farming system is based on the extensive farming system with additional shrimp stocking at low density (0.5-2 shrimps/m^2) and additional feeds on weekly basis.

Advantage: This system has low cost. Seeds can be partly recruited from the wild. The sizes of grownup shrimps are also larger than intensive shrimps and thus fetch better prices.

Disadvantage: as in extensive system, the profit from this system is also low. A large piece of land is required.

iii) Semi-Intensive: This system applies fertilizers to create natural feeds. Additional feeds such as rice bran and rice are required. The stocking density in this case (10-15 shrimps/m^2) is higher than in the extensive system. A medium sized piece of land (2000-5000m^2) can be used in this system.

Advantage: the pond is constructed with complete dykes and is small in size, this it is easier to manage. The sizes of grown-up shrimps in this system are also large, fetching high prices. The cost is also low as stocking density is lower than in the intensive system while natural feeds can also be used.

Disadvantage: The yield is lower than in the intensive system.

iv) Intensive Shrimp Farming: This shrimp farming system relies entirely on added feeds (pellets and fresh feeds). The stocking density is high at 15-30 shrimps/m^2. The pond size ranges 1000-10,000m^2, optimally at 5000m^2.
Advantage: The pond is constructed so water supply and drainage can actively be controlled.
Disadvantage: The sizes of grown up shrimps in this system are small (30-35 shrimps per kilogram), fetching lower prices than shrimps from other systems. The cost is high, thus the profit margin is lower than in other systems. The system carries a high risk of failure from disease if water management is sub-optimal.

v) Mangrove-Shrimp: This system is a mixture of shrimp and mangrove forest where forest area accounts for 30% to 70% of the land area.
Advantage: the environment is near natural. The mangroves take up organic pollution from the shrimp. The sizes of mature shrimps are large, fetching good prices. This system is considered the most sustainable system.
Disadvantage: The yield is relatively low per unit of land.

Over the last decade organic shrimp certification has been introduced into the mangrove-shrimp system in Ca Mau. At present, Ca Mau has approximately 10,000 ha of organically certified mangrove-shrimp or ecological shrimp farming area.
Advantage: Increases farmer incentives to invest in a minimum of 50 % of tree cover on their farms. The incentive is provided by the international shrimp market that is willing to pay a 5 to 10 % premium for organically certified shrimp. Furthermore, international certification has the significant advantage of introducing the only feasible form of Payment for Forest Environmental Services (PFES) for aquaculture users of mangrove ecosystem services. The first PFES pilot regulation was approved under the Ca Mau Provincial Peoples Committee (PPC) Decision 111/QD-UBND dated 22/1/2016.

The requirements to obtain certification are:

- Forest area must be at least a certain percentage of the area of the land plot depending on the types of certificate (e.g., Natureland Certificate: 40% as a starting point moving to 50% within 2 years);
- The farming procedures must follow the standards guidelines;
- Post larvae must be sourced from a certified hatchery;

- The environment must be better protected. Specifically, animal pens and cages and sanitation facilities must meet standards; records of farming activities must be kept; supporting documents proving origin of products must be kept; storage and preservation facilities must be available for storage of harvest.

ALTERNATING RICE AND BRACKISH WATER SHRIMP

The brackish water alternating rice-shrimp system includes one crop of saline tolerant rice alternating with one crop of brackish water shrimp (commonly black tiger) per year has been practiced in the Mekong Delta since the early 1990s. It is commonly practiced in Ca Mau, Bac Lieu, Soc Trang, Tra Vinh, Ben Tre and Kien Giang. The typical calendar of the system is shown below.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Shrimp												
Flushing salinity												
Rice cultivation (fish can be added to the rice field)												

The site for the alternating shrimp-rice farming system must have a pH above 5.5, salinity ranging between 8 and 20ppt, good water supply and drainage, and unpolluted input water. The soil must be kept moist at all times, especially during breaks in between the crops to avoid oxidation of the potentially acidic soil.

A poldered dyke system is required for the land plot with the top of the dyke about 0.5 meters higher than the annual flood peak. The canal parallel to and inside the polder dyke is 3-4 meter wide, 1.2 meters deep. A nursery pond and the main pond should be about 40% of the area of the land plot.

In this alternating rice-shrimp system, natural feeds account for a large part of the nutrients of the shrimp, so fertilizers must be applied during the first 10-15 days to color the water to foster algal growth to create a source of feed for the shrimp. During the second month, industrial feeds are added twice per day. Technical knowledge is very important for the success of shrimp farming. After 4 months, when the shrimps reach the size of 30-35 shrimps per kilogram, they can be harvested by draining all water out from the land.

The alternating shrimp-rice farming system is widely claimed to be an effective adaptation to salinity intrusion and sea level rise (Renaud *et al*, forthcoming; Nhan *et al*, 2014; Nhan *et al*, 2015). The rice and the shrimp support each other in that the shrimp farming add nutrients to the soil while the rice helps cleanse the environment for the next shrimp crop. The rice varieties suitable for this farming system are those tolerant to acidity and salinity such as OM 9915, OM 9916, OM 9921, OM 10636, OM 9577-1, OM 9584-4, MTL 580 and MTL 689.

3. SOCIO-ECONOMIC AND VULNERABILITY ASSESSMENTS OF ADAPTATION MODELS

Two broad categories of adaptation models have been proposed within Components 2, 3 and 4. The first adaptation category, which are proposed under Component 2, are flood-related adaptation models that are designed to increase the flood retention area of the upper delta region while at the same time ensuring more sustainable livelihoods by profiting from benefits of the floods. The second regional adaptation category consists of adaptation models that are based on brackish water aquaculture. These models are assumed to be more resilient to increasing salinity levels (Component 3) and/or better able to protect coastal areas from climate change impacts (Component 4).

In the following sections, the findings of the livelihood and social vulnerability field assessments are synthesized and summarized under the two broad regional adaptation categories of flood-related models and brackish water aquaculture models.

3.1 SOCIO-ECONOMIC AND VULNERABILITY ASSESSMENT OF FLOOD-RELATED COMMUNITY ADAPTATION MODELS

It should be noted that the flood season in 2015 has been an extremely low flood year. Media reports[4] quoting government and academic sources have reported flood levels that are 0.4 to 0.6 m lower than levels at the same time last year, also a low flood year, or a 30 to 35% reduction. Compared to the last high flood year which occurred in 2011, this represents a 1.2 to 2 m lower flood height.

The community consultations have revealed a heightened awareness of the risks of low floods as lower productivity and losses have been realized from existing flood-based livelihoods based on shrimp and floating rice in particular, making communities more risk averse to these models. This poses a challenge to obtain community support for the transition as high dykes supporting the third rice crop are being perceived to have a lower risk profile.

The losses suffered from the low flood suggest that these livelihoods need to rely on low dykes to control water levels that are necessary for shrimp and floating rice production in order to reduce the risks from flood variability and so encourage community adoption.

It should also be noted that the livelihood investment proposals from Dong Thap and An Giang include numerous additional livelihoods beyond those that facilitate a flood-season alternative to the third rice crop which is the intended focus of the investments. As such, it is beyond the scope of this report to provide detailed analysis on these other livelihoods such as eco-tourism, etc. However, some analysis is provided in the unpublished sub-project field reports.

3.1.1 PROPOSED FLOOD-RELATED ADAPTATION MODELS

FROM TRIPLE RICE TO RICE-AQUACULTURE (SP1, SP2 – AN GIANG; SP3 – DONG THAP)

In both Dong Thap and An Giang Province, government representatives have indicated that there is currently little support from farmers that are currently doing triple rice cropping to convert to other models involving flood retention. This situation was confirmed by the focus group discussions with

[4] http://tuoitrenews.vn/society/30924/no-flood-without-money-for-farmers-in-southern-vietnam

triple-crop rice farmers. The extremely low flood this year and damages incurred from shrimp farming serves to increase the risk perceptions of triple-crop farmers.

A recent study of triple rice cropping in Dong Thap (IUCN, 2015) found continuing strong support for triple rice cropping despite declining incomes and being aware of the negative impacts of triple rice cropping in the long-run. The majority of surveyed farmers indicated that they still prefer high dykes for triple rice cropping because they obtain: (i) better income compared to alternatives; (ii) better roads; (iii) a flood-free living environment where they can have a home garden with fruit orchard, fish pond, and burial ground; (v) low flood trend in recent years; and (vi) fishery resources have already declined.

FROM DOUBLE RICE TO RICE-AQUACULTURE (SP1, SP2 – AN GIANG; SP3 – DONG THAP)

Adaptation Model 1: Winter-Spring rice crop + flooded field for Giant Freshwater Shrimp extensive aquaculture.

In this proposed adaptation model, only one crop of rice, the Winter-Spring crop, is planted from November to March. The land is free after the harvest of the rice crop for storing flood and extensive shrimp aquaculture. This system employs low dykes and nets for shrimp that allows flood water to enter the flood plain in the flood season. This model is proposed for both Dong Thap and An Giang.

Adaptation Model 2: Cash Crops + Floating Rice and Giant Freshwater Shrimp in the flood season.

In this proposed adaptation model, a cash crop is planted from December to March. After the harvest of the cash crop, a floating rice crop is planted from April to November. From July to November, Giant Freshwater Shrimp is added to the floating rice field as an additional income generating livelihood. This system also employs low dykes and nets for shrimp that allow flood water to enter the field in the flood season. This model is only being proposed in An Giang Province, but could be considered for Dong Thap as well.

Adaptation Model 3: Cash Crops + Floating Rice and Capture Fisheries.

The proposed adaptation model is similar to model 2. The only difference is that model 3 does not involve additional stocking of Giant Freshwater Shrimp but recruiting fishery resources from the flood water. This model is only being proposed in An Giang, but could be considered for Dong Thap as well.

Adaptation Model 4: Winter-Spring rice crop + 2 crops of fodder + Flooded field for capture Fisheries.

In this proposed adaptation model, the Winter-Spring rice crop is planted from November to March. After the harvest of the rice crop, 2 crops of fodder for cow raising are planted from April to end of June. From the beginning of July to end of October, the land is free of crops to take in flood water and associated sediments and fishery resources. This model is only being proposed for An Giang but could also be considered for Dong Thap.

3.1.2 CLIMATE CHANGE VULNERABILITIES (SP1, SP2 – AN GIANG; SP3 – DONG THAP)

The following matrix provides a rapid assessment of future climate vulnerabilities of the key existing and proposed livelihoods based on assumed trends of climate changes derived from the Provincial Climate Change Action Plans of Dong Thap and An Giang:

- Higher max, min, and average temperatures, especially in the dry season.
- Wetter wet season, drier dry season.
- Increased flooding as a result of wetter wet season in the upstream part of the Mekong Basin, mainly from the left-bank of the Mekong in Laos and the central highland.
- Unpredictability such as prolonged rains and droughts in the wet season and off-season rains in the dry season.

		Temperature	Precipitation	Flooding	Unpredictability
		Increased max, min, and mean temperatures, especially in the dry season	Wetter wet season Drier dry season	Increase depth of flooding and frequency of deep flooding	Prolonged rains and droughts in the wet season Off-season rains in the dry season
	Autumn-Winter rice inside high dykes (3rd crop)	Abnormal hot periods during rainy season might cause heat stress.	Prolonged rain events in the wet season flood the field inside the dykes, resulting in high costs of discharge pumping or crop failure.	Increased risk of dyke breaks and crop loss	
	Capture fisheries	In low flood years, water becomes too hot for fish to enter survive in the floodplain in the flood season.	Insignificant impact	More habitat for fish	Low floods might occur, affecting fishery resources
	Floating rice (An Giang only)	Young rice planted in the dry season can be affected by heat.	Insignificant impact	Better conditions for floating rice	Low floods resulting in a short flood season and early flood recession can result in crop losses or low yields and quality
	Extensive shrimp farming	In low flood years, water become too hot for the shrimps to survive	Insignificant impact.	Better conditions for flood season shrimp farming.	Low floods might occur, affecting the shrimp

Low flood and abnormal weather conditions: After the high flood in 2000, flood peak has been on a declining trend since 2001, except for the high flood in 2011 which was about 20cm lower than that of 2000. Low flood levels and short duration of the flood season has been observed since after 2011. The flood in 2015 was an extremely low flood.

The implications of low flood levels and early recession of flood water is that they affect shrimp growth because there is insufficient water depth and time for the shrimp to grow. The focus group meetings reported that in the last 2 years, shrimp yield in Tam Nong District (Dong Thap Province) was low and the shrimp do not reach commercial size and consequently fetch low prices. Where there are low dykes, water can be retained inside and additional water can be pumped in to maintain water levels and prolong the inundation period. However, the quality of pumped water is not the same as that of flood water as pumped water contains water with low oxygen levels, less nutrients and plankton. This increases the cost of production and lowers total yield.

Similar results are being experienced with the floating rice production in An Giang Province (presently restricted to less than 100 ha in Tri Ton District).

Higher ambient temperatures and abnormal weather conditions: Farmers in the focus groups also reported that they have experience hotter temperatures and longer hot periods. Together with the low flood level, the hot temperatures render water too hot for the shrimp in the field. Water needs to be pumped in to maintain a minimum of 1 meter depth of standing water on the field for the survival and growth of the shrimps.

3.1.3 ENVIRONMENTAL THREATS (SP1, SP2 – AN GIANG; SP3 – DONG THAP)

Water pollution: Shrimp farmers in the Dong Thap focus group reported two main sources of water pollution as a concern. They are from semi-intensive fish aquaculture ponds and rice agriculture. There are existing semi-intensive fish aquaculture ponds (catfish and snake-head) in upstream areas of the proposed shrimp farming area in Tam Nong district. The aquaculture started in An Long commune, near the Tien River and has gradually expanded eastward to Phu Tho commune. Shrimp farmers observed that water has been increasingly polluted with effluents from the semi-intensive fish aquaculture ponds since 2013, especially in the dry season when the ponds are dredged and the waste mud from the ponds bottoms are dumped directly into the canals. Agro-chemicals such as snail control chemicals and pesticides are also reportedly causing water pollution. According to the shrimp farmers, these two sources of pollution are impacting on the productivity of their shrimp aquaculture.

Poor quality flood waters coming from over the Cambodian border are a reported concern in An Phu District (An Giang Province). The issue requires investigation in the feasibility studies for this location. Farmers in Vinh Loi commune have reported dark colored and odorous flood water that they referred to as “aged water” which is brought in with the flood for about a one month period from October to November at the peak time of the flood season. Farmers reported fish, snail, and shrimp kills with the presence of the water. Farmers think this could be a serious threat to the proposed flood season shrimp farming.

Presently wastewater discharges from flood season shrimp fields is not thought to be a significant problem by farmers and local officials alike. However, with the future expansion to 30,000 hectares of shrimp as proposed in Dong Thap, wastewater discharges from shrimp farms will cause serious water pollution if an effective management plan is not developed.

3.1.4 BASIC FINANCIAL ANALYSIS OF FLOOD RELATED ADAPTATION MODELS (SP1, SP2 – AN GIANG; SP3 – DONG THAP)

The focus of this section is on the proposed flood season crops. It is beyond the scope of this study to present a financial analysis of every proposed supplemental livelihood, eg. ecotourism, cow raising, etc.

For some flood season models such as the combined floating rice and freshwater shrimp, there is no data available because the model has never been tried before.

RICE FARMING (DOUBLE AND TRIPLE RICE CROPPING)

Double rice cropping produces annual profits of approximately 32.5 million VND/ha (Table 11). The first crop which is grown immediately after the floods recede is the more valuable and higher yielding

crop because of the benefits it derives from flood sediments which reduce input costs and increases yields.

Table 11. Financial data for double rice cropping system (Source: Farmer focus group – Dong Thap).

	Unit	Crop 1	Crop 2
Total investment and production cost	VND/ha/year	19,870,000	22,390,000
Yield	Kg/ha	7,300	6,300
Selling price	VND/kg	5,500	5,400
Total revenue	VND/ha/year	40,700,000	34,020,000
Profit	**VND/ha/year**	**20,830,000**	**11,630,000**

Triple rice cropping produces annual profits of approximately 37.8 million VND/ha (Table 12). While the first crop is the more valuable and higher yielding crop out of the 3 crops, it is notable that the yield is slightly reduced and input costs slightly higher in comparison with the double-cropping system since the crop does not benefit from flood sediments because of the third crop.

Table 12. Financial data for triple rice cropping system (Source: Official data from Thap Muoi District DARD)

	Unit	First crop	Second crop	Third crop
Total investment cost	VND/ha/year	21,520,810	24,376,850	21,830,540
Yield	Kg/ha	7,200	6,200	5,400
Selling price	VND/Kg	5,500	5,400	6,000
Total revenue	VND/ha/year	39,600,000	33,480,000	32,400,000
Profit	**VND/ha/year**	**18,079,190**	**9,103,150**	**10,569,460**

FLOATING RICE

The annual profit from a flood season floating rice crop is between 24.5 million VND/ha and 55 million VND/ha (Note that data in Table 13 is for 0.1 ha). This is comparable to the profits from a year of intensive rice cropping which is approximately 37.8 million VND/ha.

Planting an additional cash crop during the dry season (cassava, Allium chinense, or red chilly) results in profits above that for triple rice cropping in all cases. The option of planting Allium chinense provides the highest profit. However, this option requires technical knowledge, a high level of investment, and is risky.

Table 13. Financial data of floating rice systems per 1,000m² (0.1 hectares) (Source: RCRD, 2015)

	Cho Moi	Tan Long	Vinh Phuoc
Only floating rice			
Total cost (VND)	670,000	600,000	630,000
Yield (Kg)	300	300	240-260
Selling price (VND/Kg)	10,000-16,000	10,000-16,000	12,000-16,000
Sale of straw and rice stubble (VND)	200,000-300,000	200,000-300,000	200,000-300,000

Total revenue (VND)	3,200,000-5,100,000	3,200,000-5,100,000	3,080,000-4,460,000
Profit (VND)	**3,133,000-4,430,000**	**3,140,000-5,500,000**	**2,450,000-3,830,000**
Additonal Cassava crop			
Total cost (VND)	1,800,000	N/A	1,800,000
Total revenue (VND)	3,800,000-5,000,000	N/A	3,800,000-5,000,000
Profit (VND)	**2,000,000-3,000,000**	**N/A**	**2,000,000-3,000,000**
Additional Allium chinense crop			
Total cost (VND)	14,000,000	14,000,000	14,000,000
Total revenue (VND)	35,000,000-37,000,000	35,000,000-37,000,000	35,000,000-37,000,000
Profit (VND)	**21,000,000-23,000,000**	**21,000,000-23,000,000**	**21,000,000-23,000,000**
Additional Chilly crop			
Total cost (VND)		14,407,692	
Total revenue (VND)		28,945,000	
Profit	**N/A**	**14,437,308**	**N/A**

In Vinh Phuoc commune (Tri Ton District, An Giang Province), some farmers have tried floating rice before but failed due to low floods. However, farmers believe that floating rice can be more competitive than double rice cropping because the second crop (Summer-Autumn crop) in double rice cropping is less profitable. If water levels can be controlled, farmers believe that floating rice with a cash crop, plus the capture fishery value, is more profitable than double rice cropping.

GIANT FRESHWATER SHRIMP

Giant freshwater shrimp produces profits of approximately 32.7 million VND/ha per crop (Table 14). Combined with the winter-spring rice crop which produces a profit of 20.8 million VND/ha, a rice-freshwater shrimp crop system produces a combined annual profit of 53.5 million VND/ha. This is approximately 1.4 times the 37.8 million VND/ha profits generated from triple rice cropping.

Table 14. Financial data for giant freshwater shrimp aquaculture in Dong Thap (Source: Dong Thap Department of Fishery, DARD, 2013)

No	District	Selling Price (VND/kg)	Total cost (mil. VND)	Yield (ton/ha)	Revenue (mil. VND/ha)	Profit (mil. VND/ha)
1	Tan Hong	113.636	75	0,66	102,30	27,30
2	Hong Ngu town	132.479	155	1,17	187,20	32,20
3	Hong Ngu district	125.455	138	1,10	165,00	27,00
4	Tam Nong	139.844	179	1,28	217,60	38,60
5	Thanh Binh	128.000	128	1.00	155,00	27,00
6	Cao Lanh	129.032	160	1,24	198,40	38,40
7	Lap Vo	131.126	198	1,51	241,60	43,60
8	Lai Vung	133.333	140	1,05	170,10	30,10
10	Thap Muoi	130.000	130	1.00	160,00	30,00
	Average	**129.212**	**145**	**1,29**	**177**	**32,69**

It should however be noted that the experience with giant freshwater shrimp has not been risk free. According to a 2013 Department of Fisheries report from Tam Nong District, 70% of the shrimp farming households in Tam Nong district made a loss in 2012. The remaining broke even or made a low profit because the shrimp growing period had to be prolonged by 1.5 months compared to previous years. The causes of the loss, according to the report, were:

- Poor quality shrimp seeds from unknown sources resulting in high mortality rates.

- The shrimp raising period was prolonged to 8-8.5 months (instead of 4-5 months) due to lack of buyers, during the waiting time, many shrimps died or grew large chelate leggs that cause shrimp's weight loss and low yield (1.0-1.2 tons/ha).
- Increased cost of feeds while prices of shrimp were lowered (100,000 VND/kg which was much lower compared to 165,000-170,000 VND/kg in 2011).
- Water quality management of the shrimp field was limited.
- Costs of inputs such as industrial pellets, medicines, labor, and other materials increased significantly.
- Too high stocking densities resulting in high investment capital of up to 200 million VND/ha.
- Late arrival of the flood water as well as low flood levels resulted in poor growth of the shrimps.

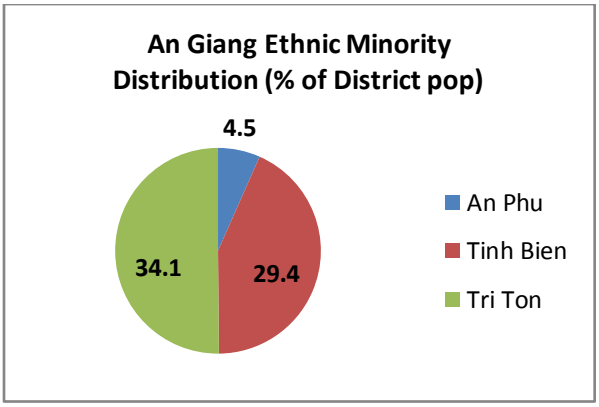
The production decline has continued into 2014 and is likely to be worse in 2015. In 2014, only 60% of the shrimp farming households in Tam Nong made a profit. Similar reasons to the 2013 season were reported for the low profits and losses.

3.1.5 SOCIAL ISSUES IN FLOOD RELATED ADAPTATION MODELS

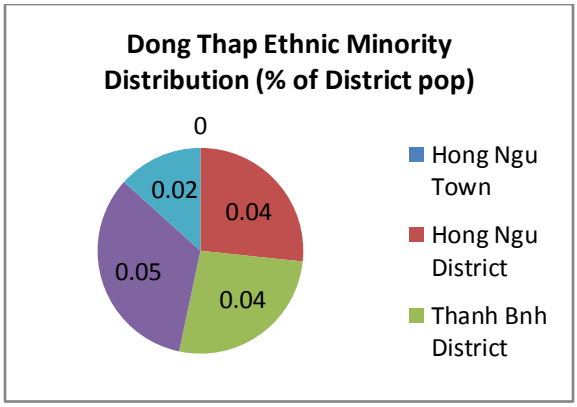
ETHNICITY (SP1, SP2 – AN GIANG; SP3 – DONG THAP)

The An Giang 2 sub-project area, including Tinh Bien and part of Tri Ton District, consists of a relatively large population of ethnic Khmers, and a very small population of Cham in Tri Ton. The An Giang 1 sub-project area consisting of An Phu District has a very small population of ethnic Hoa (or ethnic Chinese).

By contrast, Dong Thap has a very small population of ethnic minorities in the project area.



Source: District Socio Economic Report, 2014



Source: District Socio Economic Report, 2014

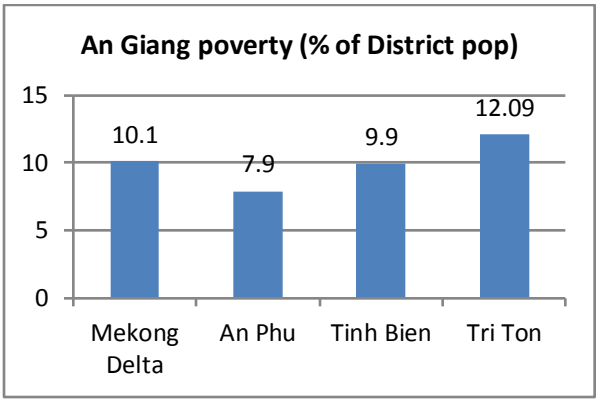
In An Giang and in Dong Thap, the ethnic Khmer, Cham and Hoa have largely inter-married with Kinh and are largely integrated into the wider land holding Kinh communities. There are no segregated ethnic communities or villages in the area.

Their integration and inter-marriage with the Kinh community has led to Vietnamese language being widely used in the area, and the need for project communication to be done in other ethnic languages is unnecessary.

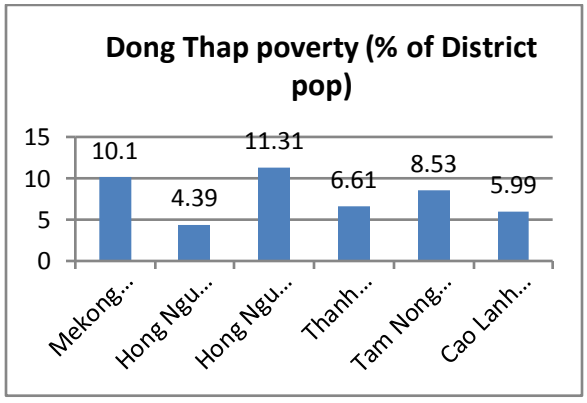
POVERTY AND LANDLESSNESS (SP1, SP2 – AN GIANG; SP3 – DONG THAP)

In An Giang, Tri Ton and Tinh Bien Districts have relative high rates of poverty which corresponds with the high proportions of ethnic minorities living there. The poverty rate in Tri Ton is higher than the average Mekong Delta rate. Livelihood investment priority could be directed to the Tri Ton area to create employment opportunities for the poor. The proposed cash cropping + floating rice/capture fisheries adaptation model would be the preferred option for this area as it has the most potential to create jobs during the cash cropping season.

On average, the poverty rate in Dong Thap is lower than the Mekong Delta average with Hong Ngu town having the lowest rate which would be expected for a rural town. Here Hong Ngu District which has a higher rate of poverty than the Mekong Delta average should receive livelihood investment priority.



Source: District Socio Economic Report, 2014



Source: District Socio Economic Report, 2014

In general, there is a close link between poverty and landlessness in the area. Most of the poor focus group participants indicated that they were either landless or land poor. To survive, the landless participants work as paid laborers on fish and shrimp farms, rice farms, tending cash crops, or work in services such as small-holder trading or transporting goods by motorbike. The declining wild capture fishery is no longer an attractive proposition for many poor.

According to the Dong Thap Statistical Yearbook 2013, income inequality has been steadily growing. The gap between the highest income quintile and the lowest income quintile was more than nine times that in 2010, and more than seven times in 2012 in which the lowest quintile were earning 527,000 VND per month, and the highest income quintile earning 3,845,000 VND per month. In 2015, the minimum wage for rural areas is 2.150.000 VND per month[5]. Those on the lowest quintile are not able to achieve the minimum wage because of under-employment.

[5] Effective from 1 Jan to 31 Dec 2015, by Decree 103/2014/ND-CP issued by the Prime Minister of Vietnam

Reasons of poverty in the project area that were cited by focus group participants include the lack of productive land, lack of employment opportunities, lack of job skills, having too many children, lack of capital/access to funds and local credit.

EMPLOYMENT (SP1, SP2 – AN GIANG; SP3 – DONG THAP)

Underemployment is a problem for the landless and poor in both An Giang and Dong Thap, affecting both men and women. The demand for labor in rice production has been declining over many years because of mechanization in which, many previous tasks such as harvesting have been taken over by machines.

Heavy use of herbicides has also eliminated the need for hand-weeding, reducing work opportunities for poor landless women in particular.

Compared to 10 years ago, the length of an average working day has dropped around 40 to 50 % (focus group participants).

The decline in the capture fishery in both An Giang and Dong Thap has also reduced the income that the poor and landless could derive from capture fisheries. The high dyke building that took place through the 2000s leading to the loss of 42 % or 1,100 km2 of the former flood plains in the Long Xuyen Quadrangle (ICEM, 2015) exemplifies the large loss of fish habitat, which have been compounded by overfishing and environmental factors such as the low flood trend and heavy agrochemical use.

Out- migration is the common strategy to address the reduction/decline of existing employment opportunities in the area that arise because livelihoods that are reliant on environmental/climate factors have become unreliable. While no official data on outmigration in the project area is available, focus group participants reported a range of situations under which the poor have migrated out of the area.

The addition of flood season aquaculture in Dong Thap and An Giang to double-rice cropping livelihoods will result in marginal increases in labor demand as there will be an additional flood season crop where there was none previously. However, labor demand (eg. installing, maintaining and monitoring nets, harvesting, transportation) will be marginal because of the extensive nature of the aquaculture. This marginal increase will also be needed to offset the potential loss of fishing grounds for the poor. During the flood season, the flooded fields are considered open access areas for fishing. The erection of aquaculture nets for shrimp and fish around the bunds of farms will reduce the amount of open access area that can be exploited by the poor.

SOCIAL STRUCTURES AND COOPERATIVES TO SUPPORT LIVELIHOODS, AND CREDIT ACCESS (SP1, SP2 – AN GIANG; SP3 – DONG THAP)

In Dong Thap, the Women's Union (WU) and Farmer's Union (FU) are active in the project area. While the Women's Union membership is open to all women, poor women in particular are attracted to the Women's Union because can access various poverty reduction, micro-credit, income generation, job creation, and women's health initiatives of the Women's Union. The WU has also been running training workshops raising awareness in climate change and environmental protection, focusing on

sustainable wild/natural fish catching by avoiding destructive fishing (such as not using small mesh fishing net or electric devices, etc.), etc.[6].

In contrast, the Farmer's Union attracts only land holding men who are able to make practical use of the agricultural extension training courses that are run by the FU. Poor and landless households are generally excluded from this opportunity to gain new knowledge.

The FU is also active in encouraging and facilitating the formation of self-help groups. Dong Thap, the project area included, has a reputation for having strong self-help groups, usually consisting of better off households, borne out of the solidarity that emerges when confronted with natural disasters such as floods. The project area has numerous self help groups in which members gather savings in cash and use it as a financial source for each member to build a new house. Due to this cooperation, many can achieve access a solid house confronting with flood, strong wind and heavy rain.

Other activities that self-help groups are active with include: (i) pumping and drying rice fields, hiring combine harvesters; (ii) sharing labor or sharing information on the demand for laborers; (iii) hiring laborers to harvest/catch snake-head fish, and collecting cash to jointly buy fish nets and boats, and then sharing the work to harvest fish at the fish ponds as a collaborative group[7].

There is also a very strong presence of formal cooperatives (*Hop Tac Xa*) in the project area. Just in Tam Nong District alone, there are 38 active cooperatives, including 32 farming and 6 non-farming cooperatives. The services that these cooperatives provide include: pumping water for irrigation; discharging water to dry rice fields; buying and spreading fertilizer and pesticides; selling harvests; providing internal micro credit; seeding fields; and providing safe water supply for domestic use, etc. At present, there are a total of 7,677 members in 32 registered cooperatives. In 2014, the total revenue from 29 of the 32 cooperatives was 43,380 million VND, with net profits amounting to 7,308 million VND. Key success factors include: gaining economies of scale in production; reducing production costs; increasing net profits, etc.[8]

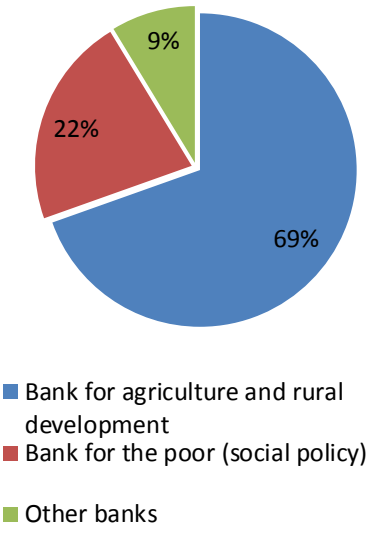
Apart from the credit that is available to members of the self help groups and cooperatives, credit is available in the project area in the form of micro-credit for the poor from the Women's Union, and the Social Policy Bank, though these are often limited. General credit for agricultural investments such as buying seed and inputs is available from the Bank for Agriculture and Rural Development (Agribank), but this is restricted to land holders since they need land use right certificates to borrow from Agribank.

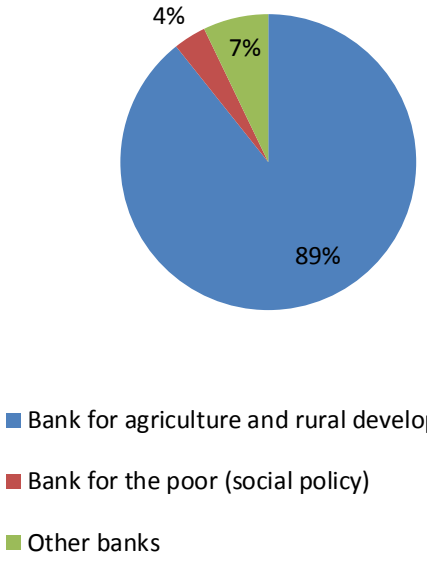
Credit sources in Dong Thap **Credit sources in An Giang (An Phu)**

[6] Focus Group Discussion, Women Group, Phu Tho commune, Tam Nong district, Dong Thap province, 14 October 2015

[7] In depth interview in Phu Tho B hamlet on 13 October 2015

[8] Special report of Tam Nong district's Steering Committee for the development of Cooperative, Collective Economy, led by the District Communist Party, dated May 2015.

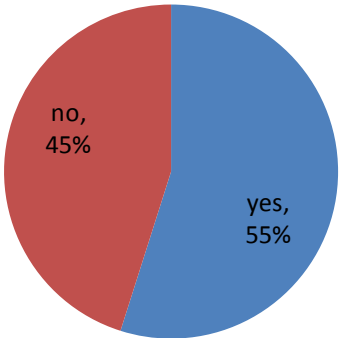




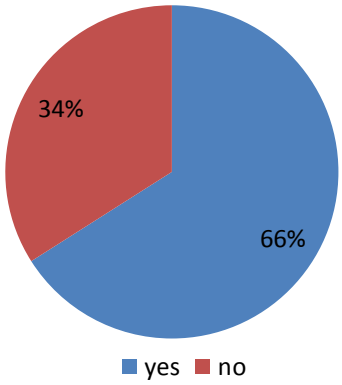
The strong presence of the WU and FU, self-help groups and cooperatives suggests that there are strong community structures and cultures present that will ensure a collective approach to upscale the flood-based adaptation models.

However, the household survey data in both Dong Thap and An Giang, 50% or more of households are indebted and have indicated that they would have difficulty in investing in new livelihoods.

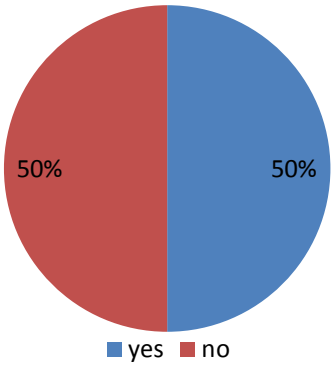
Households with debt in An Phu District, An Giang



Households with debt in Tinh Bien District, An Giang

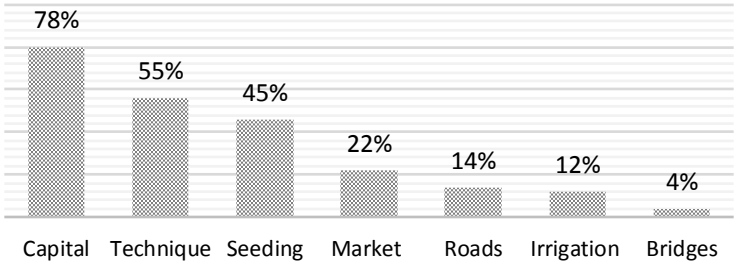


Households with debt in Dong Thap

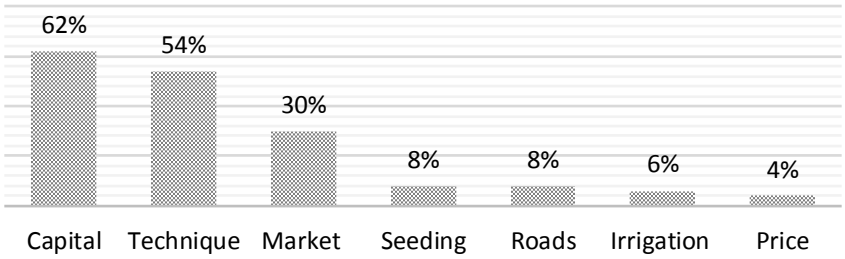


The household survey data also indicates that in both Dong Thap and An Giang, the highest priority support required by farmers to make the livelihood transition is investment capital followed by technical knowledge.

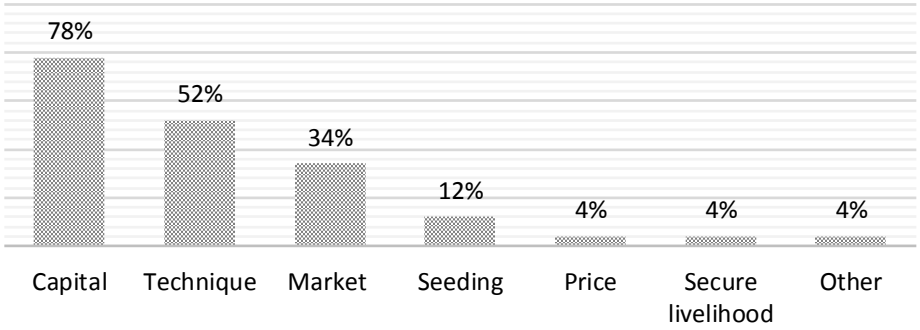
Farmer request for support to make livelihood transition in An Phu District, An Giang Province



Farmer request for support to make livelihood transition in Tinh Bien District, An Giang Province



Farmer request for support to make livelihood transition in Dong Thap Province



CULTURAL HERITAGE (SP1, SP2 – AN GIANG; SP3 – DONG THAP)

There were no concerns over the loss of cultural heritage in both Dong Thap and An Giang as a result of the proposed livelihood changes. In double rice cropping areas, ancestral graves have never been built on flooded land or if they have, they are built on raised platforms to keep them above flood water.

In long established triple cropping areas, ancestral graves are present within the high dykes. However, since these areas are presently not being targeted by the project, there is no issue at present regarding the need to compensate for their relocation. If the project at a later stage implements flood-based livelihoods that replace the third rice crop, the relocation of graves will be an issue.

No other types of cultural heritage like places of worship or cultural practices were identified as being of concern.

3.2 SOCIO-ECONOMIC AND VULNERABILITY ASSESSMENT OF BRACKISH WATER COMMUNITY ADAPTATION MODELS

3.2.1 PROPOSED BRACKISH WATER ADAPTATION MODELS

The proposed brackish water adaptation models consist of:

- Alternating rice-shrimp system (SP5 - Ben Tre)
- Double rice cropping to alternating rice-shrimp system (SP9 - Kien Giang)
- Mangrove-shrimp to organically certified mangrove-shrimp (SP8 - Ca Mau, SP4 & SP5 - Ben Tre, SP6 - Tra Vinh)
- Sugarcane to intensive shrimp (SP7 - Soc Trang)

Of the 4 proposed major livelihood investments, the Ben Tre (Thanh Phu) proposed investment in alternating rice-shrimp represent support for the status quo, with proposed sluice gate infrastructure offering better control over the fresh water and saline water transitions between the wet and dry seasons. It should be recognized that there is considerable literature that advocates alternating rice-shrimp systems as a well adapted and sustainable system to seasonal salinity changes in the Mekong Delta (Renaud et al, forthcoming; Nhan et al, 2014; Nhan et al, 2015). However, in comparison with intensive rice and intensive shrimp, the lack of investment in the system has meant that both rice and shrimp production remains sub-optimal.

Although the investment in the mangrove-shrimp systems in Ca Mau, Tra Vinh and Ben Tre through organic certification, does not appear to be a livelihood transition since farm practice remains largely the same, it is in effect an investment in coastal protection. It does this by increasing farmer incentives to invest in increasing mangrove cover from as low as 30 % to a minimum of 50 % of tree cover on their farms. By doing this, the initiative is designed to increase the density of mangroves that protect the coastlines of Ca Mau, Tra Vinh and Ben Tre from storms and sea level rise (SLR).

ALTERNATING RICE-SHRIMP SYSTEM (SP5 - BEN TRE)

Wet season rice (with Giant Freshwater Shrimp)

Farmers in Ben Tre plant one crop of rice a year during the rainy season from June to December. In the past, long duration (160 days) rice varieties were most common until medium-duration varieties

were encouraged by the government in recent years. At present about 85% of the rice area has been shifted to medium-duration rice (120 days). Rice cultivation here is pesticide-free because fresh giant shrimp is farmed in the rice field during the wet season together with the rice crop and black tiger shrimp is farmed during the saline water season. There is opportunity here to develop organic branding to increase value.

- In July, after the final harvest of the brackish water shrimp crop when the surrounding river and canal water has turned fresh, farmers take in and release river water twice to flush out the salinity.
- After that rice seeds are broadcast or rice stems are transplanted from a nursery.
- Recently, giant freshwater shrimp is stocked in the rice field at the time of sowing or 5-10 days before. Shrimp use both the ring trench and the rice field as habitat and feeding grounds. Shrimp stocking density is at 10,000-20,000 shrimps per hectare or 1-2 juveniles/m^2. The shrimp are fed with cassava and rice, and are harvested at the time of the rice harvest at the end of the wet season.

Dry season shrimp (Black Tiger Shrimp)

Typical steps of brackish water extensive shrimp farming in this area include:

- Pond dredging in January after the rice harvest in December to maintain pond depth of at least one meter. Farmers have to be careful in areas with acid sulphate soils not to go too deep or they will uncover the pyrite layer – below one meter of depth depending on location. This dredged material is piled on to the bunds where it oxidizes. Rains then leach the acidity into the ponds reducing pH levels and affecting shrimp productivity.
- Major pond dredging is conducted every 3 years when mud accumulation begins to reduce the pond depth. High sediment accumulation occurs because river water is exchanged on a regular basis to maintain water quality in the ponds. The ponds act as sediment traps. In coastal locations with high sediment loads, these sediments can amount to as much as 5 cm per year. In low elevation areas, this is an important factor in the context of SLR.
- Minor sediment dredging is done using siphon pumps on a yearly basis. The dredged materials are released into the river. The dredged materials from extensive shrimp farms are not toxic to aquatic life.
- Treat the pond with Derris (a plant extract toxic to fish) to eliminate fish.
- Saline water intake. Treat water with lime at 10 bags (50kg/bag)/ha. Apply NPK fertilizer to promote algae growth to provide feed for juvenile shrimp.
- Shrimp stocking 10 days after water treatment at 60,000-100,000 shrimp juveniles per hectare (0.8 ha of effective water surface). Cost of shrimp juvenile is 30 VND/shrimp.
- Feeding: Shrimp are fed with home-made feed comprising rice bran and small shrimp and crab.
- Harvest. The shrimps are harvested after 4 months by discharging all the pond water.

Table 15. Cropping calendar for Thanh Phu District, Ben Tre.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Hot temperatures	X	X	xx	Xx	x						x	x
Rain						x	xx	xx	X	x		
High tides									xx	xx	x	x
Long-duration rice						x	x	x	X	x	x	
Medium-duration rice						x	x	x	x			
Short-duration rice									x	x	x	

Giant Freshwater Shrimp						x	x	x	x	x	x	x
Black tiger shrimp	First	X	x	x	2nd	x	x	x				

DOUBLE RICE CROPPING TO ALTERNATING RICE-SHRIMP SYSTEM (SP9 - KIEN GIANG)

The focus of the brackish water adaptation model in An Bien and An Minh District is to shift the current double rice cropping in Zone 2 (and year-round improved extensive shrimp farming in zone 3) to an alternating rice-shrimp farming system. The proposed farming system (alternating rice-shrimp) is believed to be more sustainable because:

- Better adapted to increasing salinity levels and a shorter freshwater season than double rice cropping;
- More profitable than double-rice cropping;
- The alternating system reduces the risk of shrimp disease that is present in improved-extensive systems by interrupting the presence of disease vectors in the ponds;
- The rice crop helps cleanse the field environment for the next shrimp crop by absorbing the residues from the previous shrimp crop;
- The organic matter from the remaining rice stumps provide nutrients directly for the shrimp and other species such as worms, small snails, and algae that are feed for the shrimp.

It should be noted that the alternating rice-shrimp system has been present in this location for over 30 years and farmers have adapted the system to local conditions. However, increasingly unpredictable rainfall and salinity levels have led to losses in both rice and shrimp production. Some adjustments with the seasonal calendar are possible (ARCC project), but climate extremes make the system sub-optimal. It is in this context that the sub-project proposes the construction of sluices to control salinity levels.

Note that the proposed sluices have a dual purpose. Projections for a 30 cm SLR indicate that the area will be totally flooded (Kien Giang Provincial Climate Change Action Plan). Current flooding in the area takes place only during the spring tide season in September and October.

The key features of the operation of the proposed sluice gates are:

Time	Gates operation	Purpose
6-month dry season	Opened	Take saline water in for shrimp farming
When salinity is too high	Closed	Maintain appropriate salinity levels for shrimp
Rainy season	closed	For flood control during the spring tides in Sept and Oct. Keep fresh water for rice farming. Besides precipitation, additional freshwater can be taken in from Xeo Ro canal.

Table 16. Seasonal calendar for An Bien and An Minh

Topic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Brackish water							x	x	x	x		
Saline water	x	xx	xx	xx							x	x
Rainy season					x	x	x	x	x	x		
Spring tides									x	x		
Rice								x	x	x	x	
Shrimp	x	x	x	x	x	x					x	x

MANGROVE-SHRIMP TO ORGANICALLY CERTIFIED MANGROVE-SHRIMP (SP8 - CA MAU)

The sub-project objective of up-scaling organically certified mangrove-shrimp in Ca Mau is to simultaneously achieve a coastal protection outcome through a market driven sustainable livelihood. It does this by increasing farmer incentives to invest in increasing mangrove cover to a minimum of 50 % of tree cover on their farms.

The incentive is provided by the international shrimp market that is willing to pay a 5 to 10 % premium for organically certified shrimp. There are now 3 major shrimp processors that are certified. These are Canimex, Seanamico, and Minh Phu. The main international certification standard that is being used is Natureland[9], a major European organic standards farmer association.

At present, Ca Mau has approximately 10,000 ha of organically certified mangrove-shrimp or ecological shrimp farming area. Under the sub-project, the province aims to expand this area to 70,000 ha. The shrimp farming practice and natural conditions in the area already certified and the remaining area that is not yet certified are similar. The requirements for the remaining uncertified area to meet standards for certification are:

- Forest area must be at least a certain percentage of the area of the land plot depending on the types of certificate (e.g., Natureland Certificate: 40% as a starting point moving to 50% within 2 years);
- The farming procedures must follow the standards guidelines;
- Post larvae must be sourced from a certified hatchery;
- The environment must be better protected. Specifically, animal pens and cages and sanitation facilities must meet standards; records of farming activities must be kept; supporting documents proving origin of products must be kept; storage and preservation facilities must be available for storage of harvest.

Table 17. Seasonal calendar of mangrove shrimp farming system

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
Dry, hot season	X	x	x	X							x	x
Rainy season					x	x	x	x	x	x		
High tide									x	x	x	
Mangrove-shrimp farming	x	x	x	x	x	x	x	x	x	x	x	x

- Stocking of post larva takes place between October and November when salinity levels are relatively low. To be organically certified, post larva must be sourced from a certified hatchery;
- After 3-4 months, between February and March shrimp can be harvested by filtering water released through the sluice gates which have bag nets attached to collect shrimp. Harvesting will continue for the remaining crop cycle on a monthly basis. Harvesting of the full crop ends between July and August before a new cycle begins.
- After the first harvest, farmers will re-stock every 1.5 – 2 months to compensate for the harvested shrimp. In this way, stocking and harvesting take place all year round.
- Farmers stock between 20,000 and 100,000 shrimp per hectare depending on the availability of capital. On the average, the stocking density is about 4-5 shrimps/m^2.

[9] http://www.naturland.de/en/certification.html

- The shrimp ponds also contain naturally recruited fish and crabs, and a diversity of other aquatic species which adds to the farm income.

SUGARCANE TO INTENSIVE SHRIMP (SP7 - SOC TRANG)

The key associated livelihoods of different zones of Cuu Lao Dung Island are:

- The Upper Part (Zone 1): freshwater fruits and cash crops (staus quo).
- The Middle Part (Zone 2): sugar cane and cash crops (status quo).
- The Lower Part (Zone 3): Intensive shrimp farming, sugar cane, cash crops.
- River and Coastal Waters Part: freshwater, brackish water, coastal water, off-shore capture fisheries and clam management.

The brackish water adaptation model is focused on Zone 3 where the aim is to convert land which is used for sugar cane growing to intensive shrimp. In Zone 1 and 2, the cropping systems remain largely as they are presently. Sugar cane, while tolerant of mildly saline soils, cannot tolerate highly saline soils or inundation when floods occur. Much of island is below the high tide level and floods during the spring tide season (Sept to Dec) particularly when it coincides with high Mekong river flows such as that which occurred in the 2011 flood event. Major flooding and crop losses occurred in the 2011 flood season (obtaining estimated cost of damages from District).

The proposed dyke and sluice building that are a major cost of the project are designed to protect the island against flooding.

The sub-project proposes to transition 5,000 ha of sugar cane growing area to intensive and semi-intensive shrimp farming in Zone 3 to adapt to salinity.

Sugar cane

- The cost of transporting sugar cane from the field out is high (18,000,000 VND/ha). A sugar cane plantation needs to be near a water course to facilitate the transportation of harvested sugar cane by boat.
- Farmers are aware of the coming TPP (Transpacific Partnership) and think that the future of sugar cane of the island is not bright as sugar cane produced in the delta is not competitive compared to other countries. Farmers explained that the only reason that farmers cling on to sugar cane is that there is not many other choices. Other cash crops, in their opinion, are less profitable than sugar cane. Shifting to shrimp farming is desired but it requires a large amount of financial capital.
- A major constraint with sugar cane is the need to irrigate with freshwater. Year round intensive growing of sugarcane means that farmers have to pump ground water during the dry season when salinity levels are too high in the canals and river. This has serious consequences for land subsidence on an island where elevation is already below the high tide mark.

Intensive/semi-intensive shrimp farming

- Local farmer experience indicates that shrimp farming in the area has been extremely risky because of poor water quality control and the presence of disease.
- A water treatment pond is critical for storing water to compensate for evaporation and leakage during the dry season and for treatment of intake water before pumping into the

shrimp pond. This requires that a shrimp farmer has extra land available besides the shrimp ponds.

- Farmers support the idea that shrimp farming needs to be restricted to a zoned area designated for shrimp farming with supporting infrastructure such as a reliable power supply, etc.
- Shrimp farmers reported that they want to or already have shifted from black tiger shrimp to white-legged shrimp because the techniques for raising black tiger shrimp is more complicated and the crop cycle is longer than the white-legged shrimp.
- White-legged shrimp, however, is also subject to disease, requires more oxygen, and more chemical inputs than the black tiger shrimp.
- Shrimp ponds have to be abandoned or rehabilitated after approximately 10 years as the nutrients in the soils have been depleted and the level of toxicity in the soil is too high.

3.2.2 CLIMATE CHANGE VULNERABILITIES

ALTERNATING RICE-SHRIMP SYSTEMS (SP5 - BEN TRE)

The following matrix provides a rapid assessment of future climate vulnerabilities of the rice-shrimp system in Ben Tre based on assumed trends of climate changes derived from the Provincial Climate Change Action Plans of Ben Tre:

- By 2020 with a projected SRL of 12cm, approximately 10% of the area of Ba Tri District will be inundated.
- Seasonal and annual temperatures will increase for all time horizons.
- Total dry season (December-May) rainfall will decrease.
- Wet season rainfall will increase particularly between October-November.
- Salinity will increase and vary depending on Mekong flows, winds in the dry season, and tides in the east sea and will become serious in 2050.

	temperature	rainfall	salinity/sea level rise/flooding	unpredictability
Extensive shrimp	Increased organic decomposition rate resulting in fouling water and lowering D.O.	Salinity will be more diluted. Availability of saline water for shrimp farming in the wet season will be less available.	More saline water area available for saline water aquaculture such as shrimp farming	Sudden drop of water salinity of surface water Sudden increase of water turbidity and drop of D.O Sudden drop of water pH due to acidity washed down from embankments.
Rice (June-Sept or June-December)	Thermal stress when T>35^{0}c affecting root structures and seedlings.	Heavy rains during flowering period reduces yield	Without sluice gates, rice will be affected by salinity. Losses were incurred this year. Increased risk of dyke/bund failures because of SLR in low elevation area	

DOUBLE RICE CROPPING TO ALTERNATING RICE-SHRIMP SYSTEM (SP9 - KIEN GIANG)

The following matrix provides a rapid assessment of future climate vulnerabilities of the rice-shrimp system in Kien Giang based on assumed trends of climate changes derived from the Provincial Climate Change Action Plans for Kien Giang:

- Increased max temperature, especially during the dry season
- Reduced total annual rainfall
- Increased rainfall in the rainy season
- Reduced rainfall in the dry season
- Shorter dry season
- Longer wet season.
- Off-season rain in the dry season
- Prolonged heavy rain periods followed by prolonged drought periods in the rainy season

	Temperature	Precipitation	Flooding/drought	Unpredictability
Rice in the wet season	High temperatures shorten vegetative growth period of rice, lowering yield.			Prolonged rain periods during flowering and grain formation stages affect rice yield
Extensive shrimp in the dry season	Increased salinity through increased evaporation. Freshwater is needed to maintain appropriate salinity levels for shrimp. Stratified water column, the surface might be too hot for shrimps. Sufficient depth of water needs to be maintained.	Increased salinity through reduced rainfall in the dry season. Freshwater is needed to maintain appropriate salinity levels for shrimp		Sudden dilution of salinity when heavy off-season rain events occur might shock the shrimps. Off-season rains wash down acidity from the canal banks, toxic to shrimps.

MANGROVE-SHRIMP TO ORGANICALLY CERTIFIED MANGROVE-SHRIMP (SP8 - CA MAU)

The following matrix provides a rapid assessment of future climate vulnerabilities of the mangrove shrimp system based on assumed trends of climate change derived from the Provincial Climate Change Action Plans for Ca Mau:

- Increasing ambient temperature, especially max temperature and number of hot days.
- Wetter and shorter wet season
- Drier and longer dry season
- Increased sea level
- Unpredictable weather conditions (off-season rains; prolonged rain periods followed by prolonged drought periods)

	Temperature	Precipitation	Flooding	Unpredictability
Mangrove shrimp	Increased temperature will make surface water	Drier and longer dry season will increase	Increased high tides with increased sea level will increase risk	Off-season rains washing down acidity

	hot, increased salinity through increased evaporation. However, this system is less vulnerable than other systems without forest coverage that provides shade to cool the ponds.	salinity affecting the shrimps.	of breaking bunds of shrimp farms causing shrimps to escape. However, sediment accumulation in the ponds may counteract sea level rise.	from canal banks and bunds. Prolonged rains followed by prolonged drought periods will create more transitions that render shrimp more susceptible to disease.

SUGAR CANE TO INTENSIVE SHRIMP (SP7 - SOC TRANG)

The sub-project proposal highlights the following key climate change projections for Soc Trang.

Parameter	Trend	Projections for Soc Trang
Temperature	Increase	The average annual temperature increase by 0.4°C by 2020, 0.6^{0}C and 2^{0}c by 2100
Annual rainfall	Increase	Annual rainfall increase by 0.3% by 2020, 0.4% by 2030.
Dry season rainfall	Decrease	Decrease by 0.8-2.9% by 2020 and 1.2-4.3% by 2030.
Wet season rainfall	increase	Increase by 0.6-3.1% by 2020 and 0.8-1.6% by 2030.
Sea level rise	Increase	Increase 30cm by 2050 causing inudation of 80.436 ha in Soc Trang province.
Saline intrusion	increase	Further inland

The following matrix provides a rapid analysis of impacts of projected climate change on the key livelihood investments in Cu Lao Dung.

	Temperature	Precipitation	Sea level rise	Saline intrusion
Sugar cane	High temperatures during the planting season in the dry season will affect growth of sugar cane.	Wetter wet season cause risk of flooding, affecting sugar cane. Drier dry season will cause water shortage for irrigation. This is already a problem and widespread pumping of underground freshwater is already normal practice	Sugar cane will no longer be suitable on the island in the medium term (2030)	Sugar cane will no longer be suitable on the island in the medium term (2030)
Intensive shrimp	Pond water becomes too hot for shrimp. This requires maintenance of sufficient depth in the pond by pumping water in from canals.	Intense wet season rain events will cause sudden drop of salinity and shock the shrimps. Drier dry season will increase evaporation and salinity in the ponds, requiring freshwater to be pumped in to compensate. This will cause increased use of ground water, leading to further depletion of	More saline habitat for shrimp farming further up in the island (zone 1 and 2). Increased risk of dyke breaks and crop loss. Low sediment trapping capacity of ponds. Water is taken in once per crop season (3 to 4 mths)	More saline habitat for shrimp farming further up in the island (zone 1 and 2).

		ground water resources.		

The major risk with the shift to intensive shrimp is the risk that high ambient temperatures and drier dry seasons will force farmers to pump underground water to cool or dilute the ponds. There is no solution to this if the required freshwater is not available in the canals and river during the dry season.

3.2.3 ENVIRONMENTAL ISSUES

ALTERNATING RICE-SHRIMP SYSTEMS (SP6 - BEN TRE)

Disease from intensive shrimp aquaculture can impact on the alternating rice-shrimp system (and mangrove-shrimp systems). At present, the area of intensive shrimp farming in Thanh Phu District is small, but growing as socio-economic levels of farmers improve and they are willing to invest and take risk. Disease transfer between intensive shrimp farms and mangrove shrimp systems in Ba Tri have also been a significant problem rendering the latter mangrove-shrimp systems less sustainable. Without proper zoning for intensive shrimp in both Thanh Phu and Ba Tri, controlling effluents from intensive shrimp farming is a challenge although regulations are in place and the government offers free treatment of ponds when disease appear. If the shrimp are older than one month when they become infected, it is common practice for shrimp farmers to avoid notifying authorities and instead try to salvage their investment by releasing water to harvest the shrimp to sell.

DOUBLE RICE CROPPING TO ALTERNATING RICE-SHRIMP SYSTEM (SP9 - KIEN GIANG)

Shifting Zone 3 from current year round improved extensive shrimp farming to alternating rice-shrimp will be challenging and may not be feasible. The area has experienced year round salinity for 20 years. When converting this area to an alternating rice-shrimp system, it may take 5 years, according to local farmers, to desalinize the soils so that the rice crop can be grown. The conversion will also be met with resistance from year-round shrimp farmers in this zone as they'll lose income from one crop of shrimp while rice is not possible for the first 5 years.

Sluice gate discharge impacts: there are several periods when the sluice gates are closed including: (i) in the dry season when salinity is too high the sluice gates are closed so that freshwater from Cai Lon River in the north can be taken in through the canal system to maintain suitable salinity level for the shrimp, and (ii) in the rainy season from June onward, the sluice gates are closed to keep freshwater for rice farming. When the gates are opened, the water released through the sluice gates carries accumulated agro-chemicals which can be detrimental to the coastal and mangrove ecosystems. In other similar environments such as the Ba Tri (Ben Tre) coastal mudflats that are downstream of rice growing salinity control sluices (Ba Lai Sluice Gate), significant levels of persistent organic pollutants (POPs) with short half-lives have been detected in the coastal sediments of long term monitoring plots (USGS, 2013). These POPs are derived from pesticide use in rice growing. Similar agro-chemical effluent discharges from behind the proposed salinity control sluices in An Bien and An Minh, Kien Giang, may possibly impact the near-shore blood cockle farms. These possible effects need careful consideration in the environmental impact assessment.

SUGAR CANE TO INTENSIVE SHRIMP (SP7 - SOC TRANG)

Increased use of groundwater, for sugar cane irrigation and for shrimp farming in the dry season, or for any other reasons, will increase land subsidence. There are presently no studies available on the sustainability of present agricultural ground water extraction and its relationship to land subsidence. The issue should be flagged for further study in the feasibility and environmental impact study for the project.

Furthermore, land subsidence is likely being exasperated by the current and proposed raising of the ring dyke and sluices which will prevent further sediment deposition on the island. As more Mekong dams are built on the Mekong, especially in the Lower Mekong Basin, the sediment budget of the Mekong coming to the river mouth will be reduced to ¾ of the 160 million tons/year annual budget. The expansion of the island due to sediment accretion will be halted and it can be expected that bank erosion will become more serious after the Mekong dams are built.

Farmers in the focus group have reported that the groundwater resource is being depleted. During the dry season between February and March, the water table is very low because of widespread pumping at that time. They perceived that the water table has dropped about 20 meters over the past 20 years. The required depth of a tube well increased from 75 meter before to 120 meters to reach freshwater. All domestic water uses on the island rely on ground water as surface water from the river is no longer suitable for domestic use due to pollution from aquaculture ponds. Groundwater is also used for irrigation of cash crops during the dry season. Domestic water users reported that at certain times of the day when irrigation is going on using electric pumps, they cannot get water for domestic uses. They also reported that before the tube well pumps could be operated by hand but now electric pumps are required to obtain water from the wells.

The effluent discharge from a 5,000 ha shrimp farming zone will need to be designed with extensive water treatment facilities including land for treatment ponds and be strictly regulated through an environmental management plan. Effluent discharge should not exit in areas with important coastal aquaculture such as the white clam breeding grounds and coastal mangroves which are breeding grounds for one of the richest coastal fishery in the Mekong Delta.

3.2.4 BASIC FINANCIAL ANALYSIS OF BRACKISH WATER ADAPTATION MODELS

ALTERNATING RICE-SHRIMP SYSTEMS (SP5 - BEN TRE)

The alternating rice-shrimp systems in Ben Tre consist of two models. The first is a conventional model based on one rice crop in the wet season, and one brackish water shrimp crop in the dry season. This system produces total annual profits of approximately 102 million VND/ha, of which 96% comes from shrimp (Table 18).

Table 18. Financial data on conventional alternating rice-shrimp system in Ben Tre (Source: DARD, Thanh Phu District)

	Units	Rice-shrimp

		Shrimp (Black Tiger)	Rice
Investment cost	million VND/ha/year	22	30
Production cost	VND/kg/year	22,000	7,500
Yield	Kg/ha/year	1,000	4,000
Selling price	VND/Kg	120,000	6,600
Total revenue	million VND/ha/year	120	26.4
Profit	million VND/ha/year	98	3.6

The second 'enhanced' model integrates the culture of the giant freshwater shrimp into the wet season rice crop as an additional income generating crop. The annual profits from this model are approximately 144 million VND/ha (see Table 19), or approximately 1.4 times the profit of the conventional model.

Table 19. Financial data on 'enhanced' alternating rice-shrimp system in Ben Tre (Source: DARD, Thanh Phu District)

	Units	Rice-shrimp	
		Shrimp (Black Tiger + Giant Freshwater)	**Rice**
Investment cost	million VND/ha/year	20	30
Production cost	VND/kg/year	25,000	7,500
Yield	Kg/ha/year	800	4,000
Selling price	VND/Kg	200,000	6,600
Total revenue	million VND/ha/year	160	26.4
Profit	million VND/ha/year	140	3.6

The rice productivity in this system is much lower than the double rice cropping systems in Dong Thap and An Giang because the salt tolerant varieties used in coastal rice growing areas produce much lower yields than the high yield varieties. High yield varieties produce between 6,000 and 7,000 kg/ha in comparison to the 4,000 kg/ha in Ben Tre.

DOUBLE RICE CROPPING TO ALTERNATING RICE-SHRIMP SYSTEM (SP9 - KIEN GIANG)

Double rice cropping in Kien Giang generates an annual profit of approximately 10 million VND/ha. The productivity of the rice ranges between 4,500 kg/ha for the first crop (dry season salinity affected) and 5,250 kg/ha for the second crop which is higher than the productivity in Ben Tre (Table 20).

Table 20. Financial data on double rice cropping system (Source: An Bien District DARD)

	Units	Double Rice Cropping	
		Rice (first crop)	**Rice (second crop)**
Investment cost	million VND/ha/year	19.89	15.7
Production cost	VND/kg/year	4,420	2,990
Yield	Kg/ha/year	4,500	5,250
Selling price	VND/Kg	5,000	4,400
Total revenue	million VND/ha/year	22.5	23.1
Profit	million VND/ha/year	2.61	7.4

The alternating rice-shrimp system in Kien Giang generates an annual profit of approximately 28 million VND/ha (Table 21) which is well below that being achieved in Ben Tre where annual profits are 102 million VND/ha to 144 million VND/ha for the enhanced giant freshwater shrimp model. This suggests that the rice-shrimp system in Kien Giang is under-developed and/or in sub-optimal conditions by comparison to the systems in Ben Tre which benefit from the estuarine conditions.

The transition from double rice cropping to a rice-shrimp system will almost triple the profits of the transition farmers which makes the transition economically attractive.

Table 21. Financial data on alternating rice-shrimp system (Source: An Bien District DARD)

	Units	Rice-shrimp	
		Shrimp (Black Tiger)	**Rice**
Investment cost	million VND/ha/year	46.64	19.890
Production cost	VND/kg/year	103,000	4,420
Yield	Kg/ha/year	450	4,500
Selling price	VND/Kg	160,000	5,000
Total revenue	million VND/ha/year	72	22.5
Profit	million VND/ha/year	25.36	2.61

MANGROVE-SHRIMP TO ORGANICALLY CERTIFIED MANGROVE-SHRIMP (SP8 - CA MAU, SP4 & SP5 - BEN TRE AND SP6 - TRA VINH)

Non-certified mangrove shrimp systems in Ca Mau generate annual profits of approximately 38 million VND/ha. By obtaining organic certification, similar farms are able to increase profits by between 7 and 10 million VND/ha, representing a 20 to 26 % increase respectively (Table 22).

Table 22. Financial data from mangrove-shrimp systems in Ca Mau (Source: Tuan *et al*, 2013)

	Units	Mangrove-Shrimp System	
		Non-Certified	**Organically Certified [2]**
Total cost	million VND/ha/year	31	27-31
Yield	Kg/ha/year	464	462-563
Total revenue [1]	million VND/ha/year	69	72-80
Profit	million VND/ha/year	38	45-48

1. Incomes from mangrove-shrimp systems consist of not only black tiger shrimp but include crab and other types of lower value shrimp. However, majority of the farm revenue is derived from sales in black tiger shrimp (62% to 65%).
2. Two sets of data for certified shrimp are provided. The first is sourced from Ngoc Hien District and the second from Nam Can District in Ca Mau.

In Ben Tre Province, annual profits from non-certified mangrove-shrimp systems are approximately 32 million VND/ha. In Tra Vinh Province, profits from non-certified mangrove-shrimp systems are approximately 21 million VND/ha (Table 23). The production yields and profits in both Ben Tre and Tra Vinh are lower than that for Ca Mau reflecting the relatively under-developed nature of mangrove-shrimp systems in Ben Tre and Tra Vinh. In particular, high quality shrimp seed is more readily available in Ca Mau.

Table 23. Financial data from mangrove-shrimp systems in Ben Tre and Tra Vinh (Source: Ha *et al*, 2013)

	Units	Mangrove-Shrimp System	
		Ben Tre	**Tra Vinh**
Total cost	million VND/ha/year	15	17
Yield	Kg/ha/year	195	129
Total revenue	million VND/ha/year	47	38
Profit	million VND/ha/year	32	21

Organically certified mangrove-shrimp is not yet present in Ben Tre and Tra Vinh so no data is available for comparison. However, increases of approximately 20%, which is the lower end of the Ca Mau experience, could be expected by introducing organically certified shrimp into Ben Tre and Tra Vinh which makes its introduction an attractive proposition.

SUGAR CANE TO INTENSIVE SHRIMP (SP7 - SOC TRANG)

Sugar cane growing on Cuu Lao Dung produces annual profits of approximately 28 million VND/ha (see Table 24).

Table 24. Financial data from sugar cane growers in Cuu Lao Dung (Source: Farmer focus group, 2015)

	Units	Sugarcane
Total investment and production cost	million VND/ha	104
Yields	thousand Kg/ha	120
Selling price	VND/Kg	1100
Revenue	million VND/ha	132
Profit	million VND/ha	28

In comparison, the annual profits from intensive shrimp farming is approximately 398 million VND/ha (see Table 25).

Table 25. Financial data for intensive/semi-intensive shrimp farming system (Source: Soc Trang DARD, 2015)

	Units	Black Tiger Shrimp
Total investment and production cost	million VND/ha	252
Yields	Kg/ha	3250
Selling price (average)	VND/Kg	200,000
Revenue	million VND/ha	650
Profit	million VND/ha	398

However, intensive shrimp farming profits can vary considerably from year to year because of volatile market prices and disease outbreaks. Farmers in the focus group reported selling prices that have varied between 170 and 400 thousand VND/ha over the last few years, and annual profits that have varied between 35 and 587 million VND/ha.

However, even in a poor year, the profits surpass that possible from sugarcane which returns just 28 million VND/ha in profits making the transition economically attractive.

In terms of market access, the livelihood transition makes an important assumption that the future production and supply from the large shrimp farming zone on Cu Lao Dung Island will be taken care

of by existing processing and trading agro-businesses in the province. This assumption should be thoroughly examined. The market price volatility suggests that the market could be sensitive to over-supply.

3.2.5 SOCIAL ISSUES IN BRACKISH WATER ADAPTATION MODELS

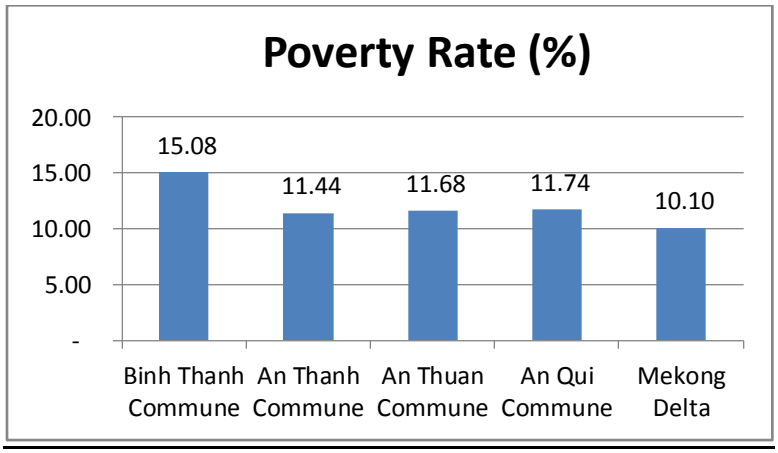
ALTERNATING RICE-SHRIMP SYSTEMS (SP5 - BEN TRE)

Ethnicity

Ethnicity is not an issue in Ben Tre as it has one of the lowest populations of ethnic minorities in the Mekong Delta. Ethnic minorities make up just 0.36% of the population of Ben Tre.

Poverty and Landlessness

The poverty rate in the 4 sub-project communes in Thanh Phu District is relatively high compared to the Mekong Delta average. In particular, Binh Thanh Commune appears to have a very high poverty rate at 15.08 %. The main reason focus group participants identified as a cause for the high rate is generational landlessness. Data on landless people is not available for the District, but appears to be closely correlated with the poverty rate.



Source: District Socio Economic Report, 2014

A concern expressed during the focus group consultations is that because the project is focused on assisting land-holding alternating rice-shrimp farmers where no additional labor will be required, the poor do not benefit from the project. The project proposal does not contain any assistance for livelihoods that the poor could benefit from. Cow raising is a popular livelihood for the poor in this area and can be done through collective groups (see below).

Gender

The major reported issue related to women's inequality in the area is illiteracy amongst women which hinders their capacity to earn higher off-farm incomes. This may be related to the low female school attendance rates in the District.

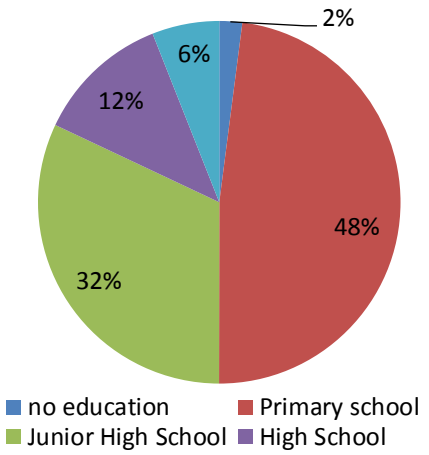
With the focus on improving the existing alternating rice-shrimp system, there is no major change in gender workloads expected.

Data from the household surveys suggest that the level of education in the area is very low with 48% of all surveyed household heads having only a primary education. Of this sample, 77% of the household heads who are women had only a primary school education

Employment

The other reason for poverty in the area cited by focus group participants is the lack of opportunity for employment. The District is relatively remote from Ben Tre City, so apart from on-farm labour which is limited because the dominant rice-shrimp livelihood in the area provides relatively little employment, there is little other opportunity locally. The out-migration rate reported by focus group participants is relatively high with 3 out of 10 families said to be leaving to work in industrial zones (no official data available).

Education level of household heads in Thanh Phu District



Social Structures and Cooperatives to support Livelihoods, and Credit Access

There are no formal cooperatives in the 4 project communes, however there are a number of collective groups (*To Hop Tac*) in the area that are involved in:

- An aquaculture group with 20 members in An Phu Village. Members can access credit guaranteed by the Farmer's Union to invest in 'safe' shrimp (no use of antibiotics or low quality antibiotics);
- A cow raising group with 10 poor members in An Thoi Village. This group collectively borrows money (about 10 – 20 million VND) from Social Policy Bank without collateral to buy good quality cows and are provided with technical training by the Farmer's Union.
- Two rice growing groups with 20 members per group in An Ninh and An Hue Village. Members plant the same rice type without the use of pesticide and less than 50% of fertilizers to invest in 'safe' rice. They also collect a large quantity of rice and sell together to middlemen from other provinces.
- A cash cropping group growing "rau diep ca" (*Houttuynia cordata)* established in 2013 with 13 members.
- A 'safe' rice growing group established in 2014 with 15 members. Members collectively buy seedlings from the same source, sign contracts with the Ben Tre Food Company and collect bulk quantities of rice according to demand. The Farmer's Union with assistance of extension officers provide training on safe rice growing for the members.
- Two fishing groups (8 members per group) were created in 2014 and 2015 respectively. The members pooled resources to collectively own a big boat to do near shore fishing

Sources of micro-credit in the area include the Bank for Social Policy and the Women's Union who has an annual fund of 9 billion VND to support poor and near poor households, students or failed merchants.

Self-help groups are also functioning in the area in which members contribute 50,000 – 100,000 VND per month to the group funds and on-lend to members who are in difficult circumstances.

Cultural Heritage

No significant impacts on cultural heritage were identified since there are no significant changes to livelihoods in this sub-project.

Social Impact from Infrastructure

While focus group participants agree on the need for the new dykes and sluices to protect the area against flooding from the spring tides, and salinity intrusion (impact on rice), concerns have been raised regarding the design of new sluice gates on the canals and waterways which would impact on water transportation in the area. The design of the sluice gates need to allow boats to be able to pass through, and the closure of the sluice gates need to be minimized. Sluice closures to protect against high tides would be of intermittent short durations (2 times per month, 3-4 days per time), however, closures to protect against salinity would be of much longer duration running over weeks to months. Although the gates can be opened for short periods at this time (when water levels inside and outside the sluice gate equalize) to allow boats to enter and exit, this will cost time for boats who have to wait in line for the gate openings. The sluices are to be operated by a provincial state company, the Ben Tre Water Works Operation Company. There will need to be close consultation and communication with the community on sluice closures and operational schedules.

There are households living outside of the dykes and they will be impacted by the dyke rebuilding. The numbers are not known, but the local government is aware that the situation needs to be assessed in terms of resettlement and compensation needs.

DOUBLE RICE CROPPING TO ALTERNATING RICE-SHRIMP SYSTEM (SP9 - KIEN GIANG)

Ethnicity

There is a significant ethnic minority population in An Bien District of about 14.11 % of the population. This is made up largely of Khmers (11.75%) and a very small Hoa (2.36%) population. This is higher that the Mekong Delta average of 10.1%.

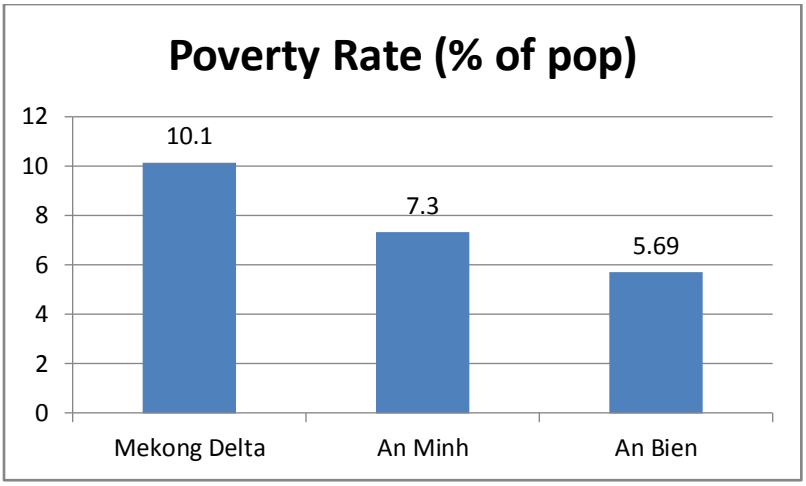
According to focus group participants, the ethnic Khmer have largely integrated into the Kinh community and have inter-married with the Kinh.

However, this group makes up a large proportion of the poor and landless, and work as hired laborers on the rice and aquaculture farms as well as collecting natural aquatic resources to sell to aquaculture farmers as feed stock for shrimp.

Language is not an issue and because the Khmer have integrated into the Kinh community, they are able to communicate in Vietnamese.

Poverty and Landlessness

The official poverty rate for the 2 Districts of An Minh and An Bien are lower than the Mekong Delta average. An Bien is significantly low which does not appear to correspond with the presence of a relatively large group of Khmer in An Bien. Near-poor focus group participants suggest that the rate may be artificially low because of their experiences with the way the District has categorised people who are not able to borrow from the Social Policy Bank as non-poor.



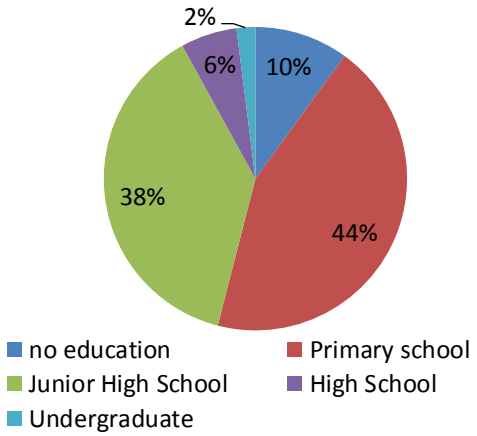
Source: District Socio Economic Report, 2014

Gender

The out-migration rate is reportedly high (15.2% for Kien Giang in 2011 – no District data available) in the area as declining job opportunities push people to move to industrial zones. According to focus group participants, family separations have resulted in a high divorce rate amongst families in the area (about 50% of families with at least one member migrating). The household survey data reveals that the number of women-headed households in the sub-project area is a relatively high 16% of sampled households.

Participants also reported that illiteracy, particularly with women, may also be an issue in the area. Illiteracy makes it difficult for them to access information and to learn new skills. Many have not heard about climate change or do not know about credit programs, how to write an application to obtain credit and where to ask for credit. Six out of 8 women in the focus group, who are between age 30 and 60, are illiterate and just have primary school education. These women work as unskilled workers and have low paid and unstable jobs like guarding cockle farms.

Educational levels in An Bien



The dropout rate from secondary school in the area was reported to be quite high because the area is quite remote with few roads (high reliance on river transportation) and schools are quite distant (over 20 kms in some areas)

The relatively high illiteracy rate should be taken into consideration when the project is consulting the community in written form, and when training is being delivered particularly if beneficiaries are poor or near poor.

Employment

Employment opportunities in the area are very limited because of its remote location and poor road infrastructure. There are no large industrial zones in the two Districts. This has resulted in a high out-migration rate (15.2% for Kien Giang in 2011 – no District data available). Focus group participants

report that 8 out of every 10 families have at had least one member who has migrated to cities and industrial zones such as Binh Duong, Ho Chi Minh City, and Dong Nai.

The shift from double rice cropping to alternating rice-shrimp is not expected to have a significant effect on employment opportunities as both predominantly make use of household labor for farm work.

Social Structures and Cooperatives to support Livelihoods, and Credit Access

There does not appear to be a strong presence of formal cooperatives in the 2 Districts. Indeed, one aquaculture production cooperative is in the process of being dissolved at present.

However, there appears to be a considerable number of collective/self help groups operating in the area. As of October 2015, according to District officials, there were 157 collective/self-help groups, including:

- 130 collective groups working in aquaculture production
- 13 collective groups working in fisheries
- 8 collective groups working in livestock raising
- 2 collective groups working in carpentry

The Women's Union also appears to be active in the area having facilitated the establishment of various self help groups and clubs for women, specifically targeting the poor. This includes:

- 17 savings and credit self-help/solidarity groups of 300 women, each group composed of around 20 members. The groups can use the savings to fund member needs.
- 41 clubs working on specific issues such as: 'women helping women to escape poverty' clubs, happy family campaign clubs, safe transportation/driving clubs, Khmer women clubs, '5 No, 3 Clean' club involving around 1312 members.

The experience with collective and self help groups in the project area, and their relative success (as reported by District officials), suggest that collective action in sub-project interventions should focus on the use of collective groups rather than cooperatives.

Cultural Heritage

No significant impacts on cultural heritage were identified as a result of moving from double rice cropping to alternating rice-shrimp.

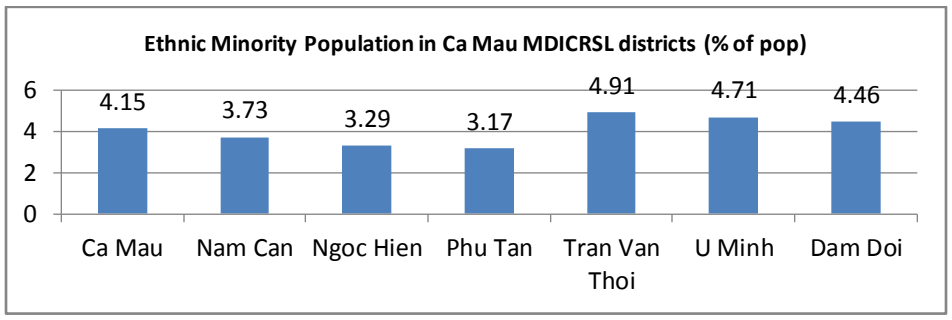
Social Impact from Infrastructure

The major issue related to the proposed infrastructure relates to the daily navigation by the local community in and out of the Quoc Phong dykes. Presently boats of various sizes move through the open dyke to access the coastal fisheries (both large scale and poor fishers), access the blood cockle raising mud flats, and to travel to other coastal locations. Depending on how the sluices will be built and operated, these canal users will be impacted during and after construction. Although the gates can be opened temporarily (when water levels inside and outside the slice gate equalize) for boats to move in and out when the sluices are used for salinity protection, it will cost time as boats will have to be lined up waiting for the gates to be opened. The operational plan for the sluice gates suggests that they may be closed for short periods during the spring tide season from September to October when flooding can occur and for longer durations in the dry season when salinity levels are high in order to protect the rice crops. There will need to be close consultation and communication with the community on sluice closures and operational schedules.

MANGROVE-SHRIMP TO ORGANICALLY CERTIFIED MANGROVE-SHRIMP (SP8 - CA MAU, SP4 & SP5 - BEN TRE AND SP6 - TRA VINH)

Ethnicity

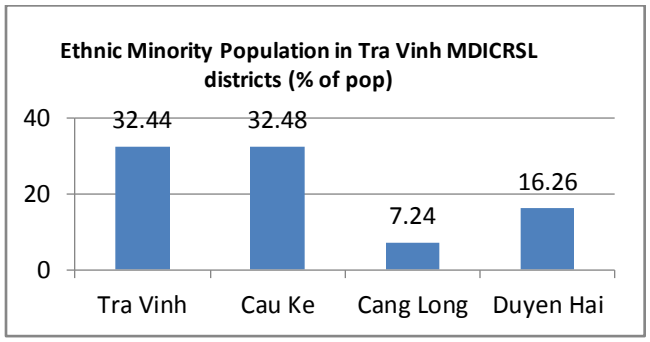
Ca Mau has a relatively low ethnic minority population, making up just 4.15 % of its population. Within the proposed project area for certified mangrove shrimp, Nam Can, Ngoc Hien and Dam Doi have ethnic minority populations of 3.73, 3.29 and 4.46 % respectively.



Source: Provincial Ethnicity Board of Ca Mau, 2015.

As indicated previously, the ethnic minority population in Ben Tre is just 0.36% of the population.

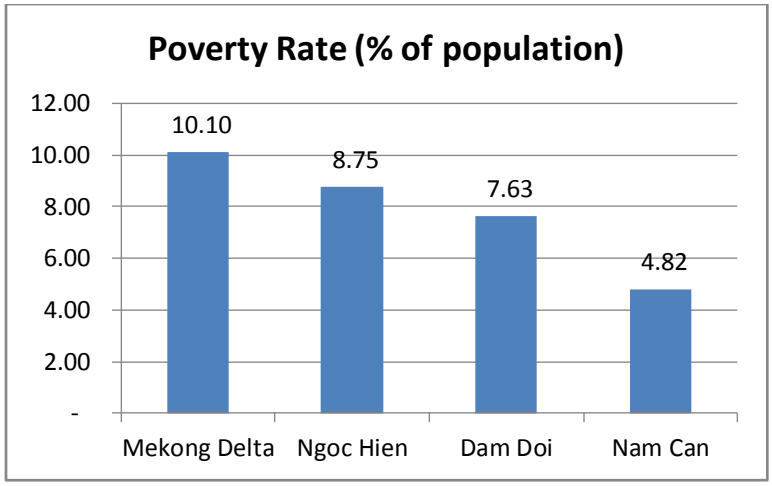
Tra Vinh has a significant ethnic minority population. However, Duyen Hai District where mangrove-shrimp investments are proposed has a relatively lower population of ethnic minorities with 16.26 % compared to the provincial population of 32.33%.



Source: Provincial Ethnicity Board of Ca Mau, 2015.

Poverty and Landlessness

The poverty rates in all 3 Districts are lower than the Mekong Delta average. Of the 3, Ngoc Hien which is a large mangrove dominated area is the remotest with poor road infrastructure. It is separated from the mainland by the Cua Lon River, which would explain it's relatively higher poverty rate. Most households here also do not have land use right certificates, instead they are provided with household forest protection contracts to protect allocated forest area (considered their farm) while being able to do shrimp aquaculture on the same piece of land. By contrast, Nam Can is serviced by a provincial road and the District town is a major river transportation port and service area. Dam Doi is a little more remote, and in both cases, farmers here have land use rights.



Source: District Socio Economic Reports, 2014

Focus group participants have indicated that most of the poor in the area are landless people without any productive land, ie. they are not mangrove shrimp farmers. Many live on eroding land along the Cua Lon River where the proposed river dyke is to be built.

Other reasons for poverty in the area include a high illiteracy rate and poor education. The remote locations leads to a high drop-out rate as schools are far away and can only be accessed with relatively expensive river transportation. Underemployment and high birth rates are also reported as reasons.

The sub-project investment in organic certification is not expected to increase employment opportunities for the poor since there is no significant change in farming practice or labor demands from the status quo.

Gender

There are no significant gender issues associated with the project as the livelihood model does not significantly change on-farm practice.

Employment

The employment opportunities for poor laborers provided by mangrove shrimp systems are not significant. The low intensity of production and small scale harvesting at regular intervals during the year means that farmers can rely on themselves or the labor available within their households. Heavy tasks such as dredging and tree harvesting (at end of 12 to 15 year tree growing cycle) are done by pumps and excavators.

Social Structures and Cooperatives to support Livelihoods, and Credit Access

There are no formal cooperatives supporting the mangrove-shrimp communities. Traditionally, farmers here have worked individually as their farms are often remote and there is little community structure.

However, the SNV/IUCN Mangroves and Market project which has been introducing organic shrimp certification in Ngoc Hien has supported the establishment of informal farmer groups to enable farmers to receive training, information, and to negotiate contracts for certified shrimp with the shrimp processing companies.

The Ca Mau sub-project proposal proposes the formation of formal farmer cooperatives. While this may be fine in theory, and may provide more bargaining power to farmers, it is an ambitious objective given that there is the lack of farmer experience and familiarity with cooperatives in the area. A preferred approach may be to utilize the use of less formal collective groups which would build on the SNV/IUCN experience of using farmer groups as a starting point.

Cultural Heritage

No impact on cultural heritage has been identified by the focus group participants.

Social Impact from Infrastructure

The construction and reinforcement of the river dyke along the Cua Lon River (Ca Mau Province) is expected to have a major impact on poor households. Most of the poor live along the eroding river banks without land use rights. The Province is aware of the potential impact which will require compensation (for home, not land) or resettlement.

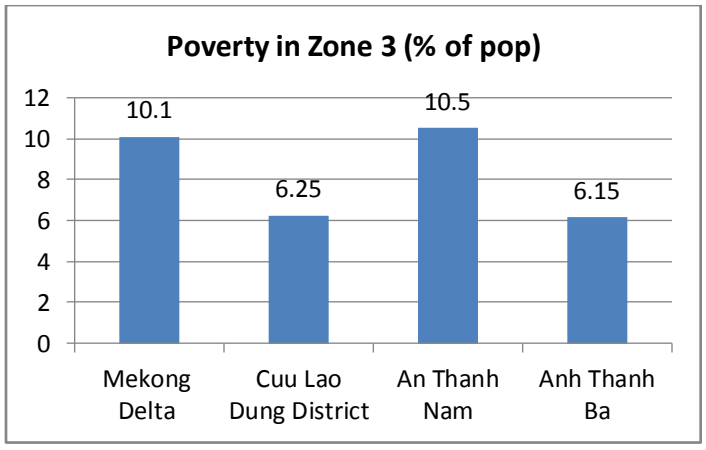
SUGAR CANE TO INTENSIVE SHRIMP (SP7 - SOC TRANG)

Ethnicity

According to the latest District Socio-Economic Report from Cuu Lao Dung, ethnic minorities make up 6.46 % of the total population, all of whom are Khmer. The Kinh here have integrated into the wider Kinh community through intermarriage. As a result, language is not an issue in project communications.

Poverty and Landlessness

The poverty rate on Cuu Lao Dung Island is 6.25% which is lower than the Mekong Delta and Soc Trang average. Out of the 2 communes in Zone 3, An Thanh Nam has a relatively higher rate of poverty. It is not clear why this might be so, but An Thanh Nam has the largest tract of mangroves on Cuu Lao Dung which would draw larger numbers of poor and landless households to live nearby so they can exploit aquatic resources in the forests.



Source: District Socio Economic Reports, 2014

The focus group consultations suggest that poverty here is generational and closely linked to landlessness. Declining coastal aquatic resources have been declining over the years which make it difficult for poor households that are reliant on natural resources as their only source of income to break the poverty cycle.

Employment

Poor, landless people in the area have relied on the following livelihoods for income:

- Near shore fishing with small boats, however fishing stocks have been declining steadily which makes it increasingly difficult to make a living from fishing
- Hired labor on sugarcane, vegetable, and shrimp farms

Table 26 outlines some of the differences between sugar cane growing and shrimp aquaculture, and types of work for male and female hired laborers.

Table 26. Labor distribution and demand (Source: Focus Group Interviews)

	Tasks		Hired labor demand
	Men	Women	
Sugarcane growing	• Tilling land • Applying fertilizer • Harvesting	• Trimming leaves • Caring for the sugarcane roots • Weeding	High
Intensive shrimp	• Pond preparation • Operating machinery like aerators • Monitoring shrimp • Guarding against theft	Women are not hired because superstition holds that it brings bad luck	Low

The tasks unskilled women do in sugar cane growing are lighter than that for men. They are not employed at all in intensive shrimp aquaculture because of superstitious beliefs that women will bring bad luck to the shrimp crop.

While men are hired as laborers on intensive shrimp farms, younger, better educated and trusted persons (relatives) are preferred as laborers because of the relatively high value and risky nature of the investment. This often excludes poor local men from employment on intensive shrimp farms.

The implication of converting from sugarcane to intensive shrimp is that it will lead to a reduction in employment opportunities for both poor women and men in the locality.

While the project does not propose any additional livelihood activities that would benefit the poor, the area appears to have many other sources of assistance for poor (see below).

Social Structures and Cooperatives to support Livelihoods and Credit Access

Both the Farmers Union and Women's Union are active in the District with initiatives in a range of areas including employment generation, income improvement, vocational training opportunities, training in household financial management and loan management, etc.

A number of significant donor and INGO micro-credit schemes are still operational in the District including a CIDSE and Oxfam.

GIZ has also been active in the area providing vocational training for poor women so as to take the pressure of coastal natural resources including the mangroves. This training has included post-harvesting of corn, processing the juice of the Mangrove Apple (trái bần) fruit, and producing grass/straw brooms for sale.

Cultural Heritage

No cultural heritage issues were identified out of the focus group consultations.

Social Impact from Infrastructure

Infrastructure building impacts come from two activities. The first involves the widening of the main arterial road that connects the bottom of the island (Zone 3) to the bridge with the mainland at the upper end of the island. This will involve households living along the road to be compensated or resettled depending on their land size. The second involves the raising of the coastal ring dyke and sluices on the canals, both of which are being built for flood protection. Households living along or outside the dyke and sluice gate construction land will also need to be compensated or resettled. At the time of the focus group discussions, the provincial and District government did not know how many affected people would result from the construction.

As with the Kien Giang and Ben Tre sluice gate proposals, there are local concerns regarding river transportation in and out of the island if the sluice gates are closed for long periods of time. The gates can be opened on the turn of the tide to temporarily let boast in and out, however, boats will need to wait in line for these sluice gate openings. There will need to be close consultation and communication with the community on sluice closures and operational schedules.

4. RECOMMENDATIONS

4.1 ADDRESSING CLIMATE AND ENVIRONMENTAL VULNERABILITIES

4.1.1 STRUCTURAL WORKS TO SUPPORT LIVELIHOODS

Recommendation: Utilize the expertise of agricultural and aquaculture specialists to optimize the structural works supporting livelihood models

The livelihood adaptations in Dong Thap and An Giang require the assistance of agricultural and aquaculture specialists to assist with the optimization of the structural components such as dykes to ensure respective water quantity and quality needs are met. For example, low floods affect both water availability and water quality. Water availability is important for floating rice and aquaculture, and water quality is important for aquaculture. Not addressing these issues risks crop losses, lower and inconsistent quality produce, and lower market confidence. In floating rice systems, both the rate at which the flood rises, and the time at which it recedes is important. To address the rate of the flood rise, operational changes with upstream flood control could be made. To address early flood recession in areas where there are no low dykes (eg. some areas in Tri Ton District, An Giang province), or the low dykes are not at an optimal level (An Phu and Tri Ton District in An Giang Province), low dykes need to be built or raised slightly to an optimal height to ensure floating rice has time to mature.

Similar adjustments may be required for the giant freshwater shrimp aquaculture farms. Here, flood depth and duration are both critically important. Besides the low dykes that help retain water, a pumping system is also important to enable water to be pumped during a low flood year in order to

maintain a minimum water depth (nominally 1 meter) to avoid water being overheated and causing stress in the shrimp crop. A strategy to avoid losses is not to farm shrimp during a low flood year, but it is not easy to know if the coming flood season is going to be low or not before farmers invest in seeds and land preparation, etc. A pumping system can help in case farmers have already invested in a new crop when the flood level is low but only to recover the investment for the crop. Little to no profit can be expected in such cases as pumped water is poor in nutrients and oxygen causing increased production cost (pumping, feed, disease) and decreased revenue (slow shrimp growth and shrimps do not reach commercial sizes to fetch optimal prices).

Ensuring that structural component design can better control the water availability and quality needs of the respective livelihood models will be critical to reducing farmers' climate/environmental risks. Can Tho University will have the aquaculture expertise and An Giang University has considerable research and development experience with floating rice to provide advice on optimizing the structural designs of the dykes with regards to crop water requirements.

4.1.2 WATER QUALITY AND ZONING/LAND USE PLANNING

Recommendation: Conduct water quality studies for aquaculture models

Water quality issues need to be addressed particularly in models that involve aquaculture (both fresh and brackish water) if the livelihoods are to be sustainable. Many of the sub-project areas are in sub-optimal areas in terms of water quality and water control infrastructure. In An Phu, An Giang, farmers have reported flows of poor quality water coming from over the Cambodian border during the October to November flood peak over many years. Because there is presently no aquaculture in the area, the issue has never been investigated. The proposed introduction of aquaculture in this area may not be feasible if the significance and source of these low quality flows are not understood and addressed. Until the problem is addressed, floating rice based investments without aquaculture can be an option. In Dong Thap, current giant freshwater shrimp farming and productivity is being impacted by upstream effluent discharges from intensive catfish and snakehead farms.

Recommendation: Revise Land Use Plans in Ba Tri District

In Ba Tri, the land use plans in this area should be revised with the multi-disciplinary assistance of agricultural, aquaculture and forestry (mangrove-shrimp) specialists. The conflicting coastal land use and canals between the sea dyke and District Road 16 makes water quality management extremely difficult. The land use changes and water infrastructure must take into account the future conversion of the intensive rice growing area behind District Road 16 and how effluent – rice agrochemicals in the short term, aquaculture effluent in the long term – will be discharged into downstream areas.

Recommendation: Assess the possible impacts of effluent discharges on aquaculture from behind coastal salinity sluice gates

The possible negative externalities of persistent organic pollutants (POPs) discharges from behind sluice gates that are designed for salinity control (Kien Giang) should be investigated in the EIA and a monitoring program put in place as a part of the Environmental and Social Management Plan (ESMP).

4.1.5 GROUNDWATER EXTRACTION AND LAND SUBSIDENCE

Recommendation: Conduct studies on groundwater extraction and land subsidence in Cuu Lao Dung

Before the livelihood investments are made, a study should be conducted to understand whether sugar cane, even in the short term is sustainable. The continuance of sugar cane growing in Zone 2

and Zone 3 of Cuu Lao Dung (Soc Trang Province) is a major concern. Current practice with sugar cane growing and horticulture relies on widespread pumping of groundwater to irrigate the crop during the dry season. Furthermore, all of the island's domestic water is sourced from pumped ground water. This combination is unsustainable, as it will lead to continued land subsidence which renders any new investment in the ring dyke a temporary measure. There are presently no known studies of the extent of ground water use and land subsidence on Cuu Lao Dung. The scope of the study should also include a study on whether the transition to intensive shrimp is the optimal choice in terms of heading off land subsidence and SLR. Other land uses such as mangrove shrimp are able to trap sediments by as much as 20 cm per year and may be more optimal from a climate adaptation perspective. By contrast, intensive shrimp farms trap very little inorganic sediment.

4.3 ADDRESSING SOCIAL VULNERABILITY

4.2.1 FARMER WILLINGNESS TO ADOPT LIVELIHOOD ADAPTATION MODELS

Recommendation: Locate pilot livelihood demonstrations near successful models in order to change farmer's risk perceptions

Triple rice crop and double-rice crop farmers, as well as floating rice farmers perceive the failure risks of flood-based livelihoods as relatively high. Similarly, coastal intensive rice growing farmers (eg. Ba Tri) also perceive the risks of intensive shrimp as relatively high in comparison to intensive rice growing. Farmers and local government officials alike have acknowledged that rice farmers are reluctant to adopt risky aquaculture models in particular. In areas such as Tam Nong District (Dong Thap Province) where there has been mixed experiences with giant freshwater shrimp (approx 50% of groups doing shrimp incurred financial losses in 2014), perceptions amongst farmers who have not yet tried the models are derived from their neighbors' experience. Therefore, pilot demonstrations should be located in areas around the successful shrimp farming groups where it is more likely that farmer perceptions are more positive. Farmer to farmer exchanges of knowledge and experience would also be more likely to occur, and easier to facilitate. Neighboring farmers should be provided with financial and economic analysis of the demonstrations once the pilots are demonstrated to be financially beneficial. Scaling-up should branch out from these areas. The same approach could also be used in the floating rice areas in An Giang as well as in the intensive rice growing communities in Ba Tri (Ben Tre Province).

4.2.2 ADDRESSING MARKET RISKS

Recommendation: Reduce the risk of over-supply by working with agribusinesses on a staged incremental approach

Livelihood implementations should take a staged approach to up-scaling so markets can be tested and agribusinesses have time to expand their markets or find new markets incrementally. The proposed (long term) size of investment is significant: potentially 30,000 ha in Dong Thap; 40,000 ha in An Giang; and 70,000 ha in Ca Mau. There is risk of over-supply. The project needs to consider a number of market related risks. Some markets, such as floating rice, are relatively small and undeveloped. There is limited domestic demand so need to expand overseas markets. Other markets, such as brackish water and freshwater shrimp, have large fluctuations in market prices that are related to supply and

demand. The respective agribusiness interests must be consulted on the proposed scale of investments and production, and on the scale of start-up. Agribusinesses, by their nature, have good knowledge of existing and potential markets. Depending on location, there will be some tension/tradeoff here between the need to demonstrate at compartment scale rather than sub-compartment level to avoid conflicts of interest over water management, and the agribusiness' current demand for production.

4.2.3 DIVERSITY OF AND WITHIN ADAPTATION MODELS

Recommendation: Increase the diversity of adaptation models

In some sub-projects the proposed livelihood options are relatively narrow and there is some scope, with expert advice, to increase the number of models over time. For example, the floating rice based models in An Giang may be feasible in Dong Thap. Likewise, models such as lotus growing from Dong Thap may be feasible in An Giang.

Recommendation: Share and transfer lessons and experience between sub-project areas

Sharing lessons and experience between sub-projects could also help increase diversification**.** For example, the brackish water rice-shrimp models in Ben Tre simultaneously aquaculture giant freshwater shrimp and fish together with the wet season rice crop (using the ring trench typically found in brackish water rice-shrimp systems). These models could be adopted in the Kien Giang brackish water rice-shrimp systems - which have relatively low productivity - to diversify production and increase income.

Recommendation: Developing organic products to diversify markets

Organic certification, clean production standards (eg. VietGAP), and product branding should be supported to help open up and diversify markets. Many of the proposed sub-projects are organic in nature (floating rice, mangrove shrimp), or largely agro-chemical free (brackish water rice-shrimp). Again, the approach here is to involve the agribusinesses with interests in organic or clean production from an early stage. An Giang, with GIZ assistance, is presently working on organic branding for floating rice products into the European market. In Thanh Phu District, Ben Tre, small scale clean rice and clean shrimp production is increasing the value of production from the brackish water rice-shrimp system. These clean production systems could be similarly developed in the Kien Giang rice-shrimp system. Organic shrimp certification can be expanded to other mangrove-shrimp systems such as in Ben Tre and Tra Vinh.

4.2.4 FARMER SUPPORT

Recommendation: Use farmer cooperatives or collective groups to implement livelihood adaptation models

The use of farmer cooperatives or collective groups to implement the livelihood adaptations should form the basis of the livelihood implementation strategy for the sub—projects. Forming new cooperatives, or implementing through existing cooperatives, will help to instill farmer confidence through collective risk sharing, particularly with risk-averse farmers that are unwilling to adopt the new adaptation models. Cooperatives can play an important role in helping farmers to manage production, post-harvest, and market risks. For example, the cooperative can bulk buy high quality seed at discount prices which an individual farmer may not have the knowledge or financial capacity

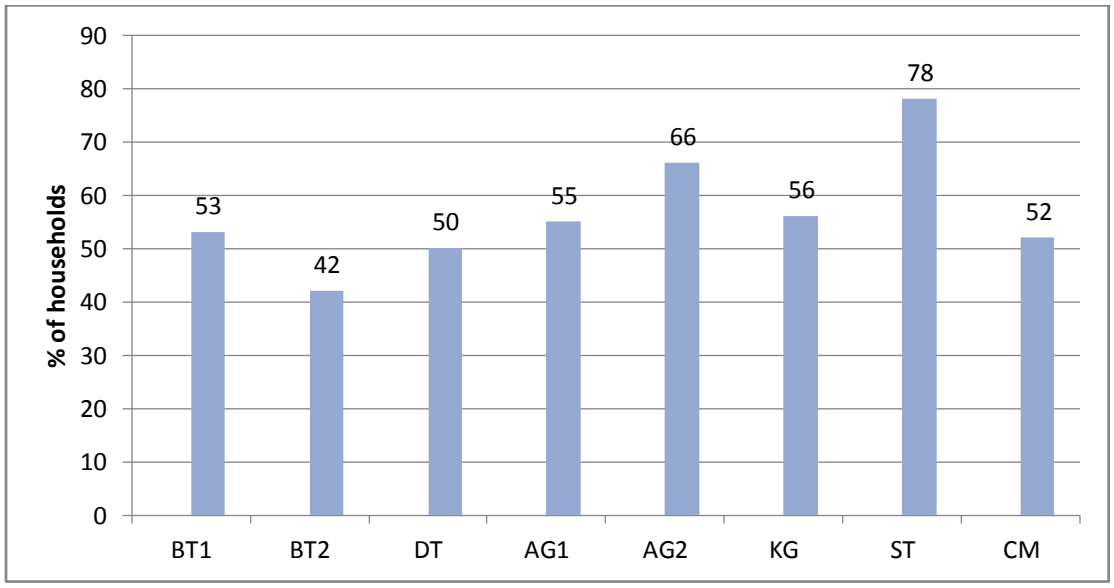
to do so. Post harvest risks can be reduced by sharing post harvest equipment such as refrigeration for aquaculture products which would not be available to individual farmers. Market risks can be better managed through better access to market prices, collective bargaining, bulk/contract selling, etc.

The choice on whether to use a cooperative or a collective group should be based on local farmer experience, familiarity and support for the institutional form, and more importantly whether the higher operational costs of a cooperative can be justified by the particular livelihood investment. For example, flood-related livelihoods such as rice-aquaculture in Dong Thap and An Giang, and intensive shrimp in Soc Trang would justify the use of the cooperative form because of the relatively high levels of inputs and economies of scale in relation to operational costs. On the other hand, collective groups would be the preferred institutional form to support the brackish water rice-shrimp systems in Kien Giang and Ben Tre (Thanh Phu), and mangrove-shrimp systems in Ca Mau, Tra Vinh and Ben Tre since the systems use relatively low inputs.

Recommendation: Start-up capital needs to be provided to fund the livelihood investments

The project, provincial government and/or agribusiness company with an interest in the products should seed the start-up capital for a cooperative (either an existing cooperative or a new one) to invest in the livelihood models. There are high levels of indebtedness at all the sub-project sites and without such seed funding, it will be difficult for farmers to capitalize the start-up of the new livelihoods by themselves. They also risk further indebtedness if they were to fail. In areas like An Phu, where there is little experience with the proposed livelihood models, the failure risk can be moderate. Access to credit will also be difficult for indebted farmers. The levels of indebtedness range from 42% at Ba Tri (Ben Tre Province), to a high of 78% at Cuu Lao Dung (Soc Trang Province). This indebtedness does not appear to be restricted to just poor households as the proportions of poor that make up the household samples are low. Cross all of the sub-projects, capital for investment was the highest priority support requested by farmers.

Figure17. Household indebtedness at project areas by province (Source: Household surveys)



A careful analysis of risk sharing between stakeholders needs to be undertaken to ensure that farmers do not carry the bulk of risks.

Recommendation: Hire aquaculture and agriculture specialists to support cooperatives/collective groups

Technical training (farming techniques) and development support for extension agencies and the cooperatives/collective groups and their agribusiness partners (where they lack the technical capacity) should be provided by aquaculture and agricultural specialists from universities (Can Tho, An Giang) and other organizations like GIZ (floating rice), IUCN/SNV (organic shrimp). At the farmer level, technical training should be combined with farmer to farmer exchanges (between pilot areas and successful farmers) as a strategy to facilitate the transfer of knowledge and experience. This can overcome the limitations of more formal technical training particularly where low levels of literacy exist. Just as important, the approach helps to transfer attitudes and confidence from successful farmers to inexperienced farmers.

Recommendation: Mass organizations should play a central role in supporting farmers

Mass organisations, in particular the Farmers Union and Women's Union, should play a central role in supporting farmers and cooperatives to mobilize, organize extension training, facilitating farmer to farmer exchanges, monitor model performance, etc.

Recommendation: Encourage agribusinesses to establish hatcheries capable of producing high quality aquaculture seed as close as possible to the sub-project sites

The availability and affordability of high quality aquaculture seed (both freshwater and brackish water) is a critical factor in almost all sub-project areas. Individual farmers try to economize by buying cheaper low quality seed. The result predictably is crop losses from disease. Ca Mau has proposed support for hatcheries to support the expansion of organically certified shrimp. Other provinces should also ensure that high quality hatcheries are available to support the aquaculture based livelihoods. The relatively large scale of the livelihood investments should provide the incentive for hatchery businesses to invest.

Recommendation: Develop predictive decision support tools that can provide farmers with early warning of droughts and floods

The intense El Nino this year has highlighted the need to develop predictive tools that could help inform farmers on what crops they should be investing in. Australia and the US have long utilized the use the Southern Oscillation Index (SOI)[10] as a predictive tool that can forewarn farmers of the onset of an El Nino by up to 3 to 6 months.

A number of environmental monitoring initiatives were proposed in Component 1. Developing predictive and real time tools such as that outlined above will assist in reducing farmers' vulnerability to current and future climate variability. These could be very useful practical demonstrations if the initiatives were integrated into the livelihood components of the MDICRSL.

4.2.5 POVERTY AND LANDLESSNESS

The growing gap between the better off and poor in the Mekong Delta (see Figure 11) suggests that general economic development and economic growth has not been able to arrest growing inequality. Because the MDICRSL aims to support and facilitate land-use change, the direct beneficiaries of the project are land holders. Agricultural mechanization, particularly in rice, and declining capture fisheries has already hit the poor hard. The project will result in negative impacts on employment

[10] http://www.bom.gov.au/climate/current/soi2.shtml

opportunities for the poor and likely increase inequality unless the project pro-actively provides opportunities for the poor.

Recommendation: Livelihood support for the landless in the sub-project areas should be established or extended from existing development programs

None of the sub-project proposals propose livelihoods that are suitable for the landless or land poor. In areas with high levels of poverty the provincial proposals should consider adding pro-poor livelihoods. For the land poor, cash crops such as chilli, gourds, livestock, etc. could be delivered through readily available micro-credit programs in all project areas (Women's Union, Social Policy Bank, International donors). The Women's Union should have the key role in supporting the poor by facilitating access to micro-credit, and/or managing a project specific micro-credit fund. However, making micro-credit available for the poor is often problematic. Inability to access micro-credit schemes often exists because of previous failures to repay loans because of poor household financial skills. The Women's Union should provide household financial management skill training as a mandatory requirement to access the micro-credit scheme.

Recommendation: Encourage agribusiness (particularly vertically integrated companies) companies to extend their value chains to create employment opportunities for the poor

Agribusiness cooperation with the cooperatives/farmers could be made conditional on fulfilling this requirement, and reserving jobs for the poor. The Province may like to consider tax concessions in order to attract the agribusiness investment. With affirmative action, poor households should be provided preferential access to jobs created by the value chain. To be successful, vocational training support must accompany this approach to ensure the poor have the requisite skills.

4.2.6 PUBLIC CONSULTATION AND PARTICIPATION

Recommendation: The project should implement a number of additional public consultations

The following consultations are required in addition to those already mandated to be conducted for safeguards (i.e. resettlement & environment).

Type of consultation	Where	Who with	When
Livelihood model acceptance	DT, AG, KG, CM, ST, Ba Tri-BT	Beneficiary farmers	Before implementation
Waterway Transportation – sluice gate design and operational schedules	KG, ST, BT, TV	Waterway users including fishing fleets	FS
Micro-credit livelihood options and design	All locations	Poor	FS

More specifically, the public consultations and community participation initiatives should take into account the following recommendations related to literacy levels and women's needs.

Recommendation: Project communications must be supplemented by verbal communications

Project implementation at a community level should not rely solely on written documents/communications (eg. for compensation, technical training, etc.). In most of the sub-

project areas, particularly where target beneficiaries are located in relatively remote areas - making schooling difficult (Ca Mau, Kien Giang, Soc Trang) – the level of education is very low and there are relatively high levels of illiteracy, particularly amongst women. The content of documents and communications must be supplemented by face-to-face verbal communications. This requirement is now mandatory under Decree No. 18/2015/ND-CP which updates the regulations for conducting environmental protection plans, strategic environmental assessments, and environmental impact assessments.

Language barriers with ethnic minority groups at sub-project sites do not appear to be an issue as they are largely integrated into the Kinh community through inter-marriage. However, as with the general community, literacy is a problem that affects this group.

Recommendation: Extension training programs should ensure that they are done in a manner and time that allows women to adequately tend to their domestic duties, ie. childcare, meal preparations, etc. This is particularly important in areas where there are relatively high numbers of women headed households (eg. 16% in Kien Giang / 18% in Thanh Phu and 14% in Ba Tri, Ben Tre province). Training programs should not start too early in the morning or encroach into times when child care or meal preparations are required.

4.2.7 SLUICE GATES AND WATERWAY TRANSPORTATION

Recommendation: Sluice gate designs need to ensure that boats can move in and out optimally

In areas with heavy traffic, for example fishing communities (Kien Giang, Soc Trang, Ba Tri-Ben Tre), the gates should be wide enough to enable fishing fleets to be moved in or out within the period of time that the gates can stay open in that location. In the case of Soc Trang, sugar cane which is currently transported out by boat, may be transported by road once the main arterial road is widened as it will be cheaper.

Recommendation: An operational schedule for proposed sluice gates should be developed with community input

The management agency responsible for the sluice gate operations needs to design an operational schedule with the community that details the exact opening and closing schedules for the gates so that the community is able to plan its use of the waterway and minimize the impact of lost time and fuel while waiting for the gates to open. Fishing boats often have very specific times in the day when they move in and out of the gates. The operations of the proposed sluice gates in Kien Giang, Soc Trang, and Ben Tre will involve closures for flood and salinity control. Closures for flood control are usually for short durations in the spring tide season between Sept and Dec depending on location. Closures for salinity control can be much longer, lasting for several months during the dry season. In both cases, the gates can be opened temporarily for boats to move in and out when water levels inside and outside the sluice gate equalizes. The period of opening may be between one and two hours depending on location.

5. RSA IMPLEMENTATION PLAN

The following table consists of the implementation plan for the recommendations outlined in Section 4 of this RSA.

Recommendation	Actions required	When	Where	Responsible agency	Budget Source and Budget
4.1.1 Structural Works to Support Livelihoods					
Request the expertise of agricultural and aquaculture specialists to optimize the structural works supporting livelihood models	Acquire agricultural and aquaculture experts in respective FS teams to provide analysis and solutions	Feasibility study	SP3, Dong Thap SP1 & SP2, An Giang SP7, Soc Trang	Provincial Project Preparation Team and MARD FS Consultants	Preparation budget Budget estimate not available at present
4.1.2 Water Quality and Zoning/Land Use Plans					
Conduct water quality studies for aquaculture models	Design water quality sampling surveys and studies for new aquaculture livelihoods. Monitor water quality during implementation.	During implementation	SP3 – Dong Thap SP2 – An Giang	Dong Thap Provincial PMU An Giang Provincial PMU	Sub-project budget Budget estimate currently being prepared

Revise Land Use Plans in Ba Tri District	Revise land use plans Redesign water management plans in area	During implementation	SP4 – Ben Tre	Ben Tre Provincial PMU	Sub-project budget Budget estimate currently being prepared
Assess the possible impacts of effluent discharges from behind salinity control sluice gates on coastal aquaculture	Assess the level of POPs in current canal discharges. Estimate POP discharge concentrations and significance resulting from sluice closures.	EIA/ESMP	SP9 – Kien Giang	MARD ESIA Consultants	Preparation budget Budget estimate not available at present
4.1.3 Groundwater extraction and land subsidence					
Conduct studies on groundwater extraction and land subsidence in Cuu Lao Dung	Design analytical and long monitoring studies. Conduct studies and long term monitoring.	During implementation	SP7 – Soc Trang	Soc Trang Provincial PMU	Sub-project budget Budget estimate currently being prepared
4.2.1 Farmer Willingness to Adopt Livelihood Adaptation Models					

Locate pilot livelihood demonstrations near successful models in order to change farmer's perceptions	FS studies consider locations of sites for first investments carefully.	Feasibility study	SP1 & SP2 - An Giang SP3 – Dong Thap SP4 – Ben Tre	Provincial Project Preparation Team and MARD FS Consultants	Preparation budget
4.2.2 Addressing Market Risks					
Reduce the risk of over-supply by working with agribusinesses on a staged incremental approach	Obtain advice and input from agribusinesses on scale of investment.	Feasibility study/During implementation	SP1 & SP2 - An Giang SP3 – Dong Thap SP4 & SP5 – Ben Tre (eco-shrimp) SP6 – Tra Vinh (eco-shrimp) SP8 – Ca Mau	Provincial Project Preparation Team and MARD FS Consultants	Preparation budget Budget estimate not available at present
4.2.3 Diversity of and Within Adaptation Models					

Increase the diversity of adaptation models	Obtain advice from agriculture and aquaculture experts Incorporate advice into FS studies	Feasibility study	All sub-projects	Provincial Project Preparation Team and MARD FS Consultants	Preparation budget
Share and transfer lessons and experience between sub-projects	Obtain advice from agriculture and aquaculture experts Incorporate advice into FS studies	Feasibility study	All sub-projects	Provincial Project Preparation Team and MARD FS Consultants	Preparation budget
Developing organic products to diversify markets	Obtain advice from agriculture and aquaculture experts Incorporate advice into FS studies	Feasibility study	All sub-projects	Provincial Project Preparation Team and MARD FS Consultants	Preparation budget
4.2.4 Farmer Support					
Use farmer cooperatives or collective groups to implement livelihood adaptation models	Establish cooperatives	During implementation	All sub-projects	Provincial PMUs	Sub-project budget Budget estimate currently being prepared

Start-up capital needs to be provided to fund the livelihood investments	Provide cooperatives with start-up capital	During implementation	All sub-projects	Provincial PMUs Agribusiness	Sub-project budget Budget estimate currently being prepared
Hire aquaculture and agriculture specialists to support cooperatives/collective groups	Hire aquaculture and agriculture specialists to provide technical support during implementation	During implementation	All sub-projects	Provincial PMUs	Sub-project budget Budget estimate currently being prepared
Mass organizations should play a central role in supporting farmers	Assign mass-organisations specified support roles during the project	During implementation	All sub-projects	Provincial PMUs	Sub-project budget Budget estimate currently being prepared
Encourage agribusinesses to establish hatcheries capable of producing high quality aquaculture seed as close as possible to the sub-project sites	Invite agribusinesses to invest (or expand existing investments) in Province	During implementation	All sub-projects	Provincial PMUs Agribusiness	Sub-project budget Budget estimate currently being prepared
Develop predictive decision support tools that can provide farmers with early warning of droughts and floods	Hire consultants to assist in developing decision support tools for early warning systems	During implementation	All sub-projects	MoNRE	MDICRSL Component 1 Sub-project: Establishing a Mekong Delta

					Decision Support System = US$3 million
4.2.5 Poverty and Landlessness					
Livelihood support for the landless in the sub-project areas should be established or extended from existing development programs	Develop or increase number of micro-credit programs for landless households with capital sourced from Bank for Social Policy	During implementation	All sub-projects	Provincial PMUs	Bank for Social Policy
Encourage agribusiness (particularly vertically integrated companies) companies to extend their value chains to create employment opportunities for the poor	Invite agribusinesses to invest in value chains	During implementation	All sub-projects	Provincial PMUs	Agribusinesses
4.2.6 Public Consultations and Participation					
Project communications must be supplemented by verbal communications	SIA consultants ensure that project communications include verbal communication processes in the ESMP.	ESMP, During implementation	All sub-projects	Provincial Project Preparation Team and MARD SIA Consultants	Preparation budget

Extension training programs should ensure that they are done in a manner and time that allows women to adequately tend to their domestic duties, ie. childcare, meal preparations, etc.	SIA consultants ensure that the design of project extension training programs cater to the needs of women in the ESMP.	ESMP, During implementation	All sub-projects	Provincial Project Preparation Team and MARD SIA Consultants	Preparation budget
4.2.7 Sluice Gates and Waterway Transportation					
Sluice gate designs need to ensure that boats can move in and out optimally	FS and SIA consultants to ensure that appropriate designs are selected for the engineering and FS	Feasibility Study, SIA	SP4 & SP5 – Ben Tre SP6 – Tra Vinh SP7 – Soc Trang SP9 – Kien Giang	Provincial Project Preparation Teams and MARD FS/SIA consultants	Preparation budget
An operational schedule for proposed sluice gates should be developed with community input	Affected community to be consulted on draft operational schedule for sluice gates. Final operational schedule incorporating feedback to be made publicly available to the community.	During implementation	SP4 & SP5 – Ben Tre SP6 – Tra Vinh SP7 – Soc Trang SP9 – Kien Gian	Provincial PMUs	Sub-project budget Budget estimate currently being prepared

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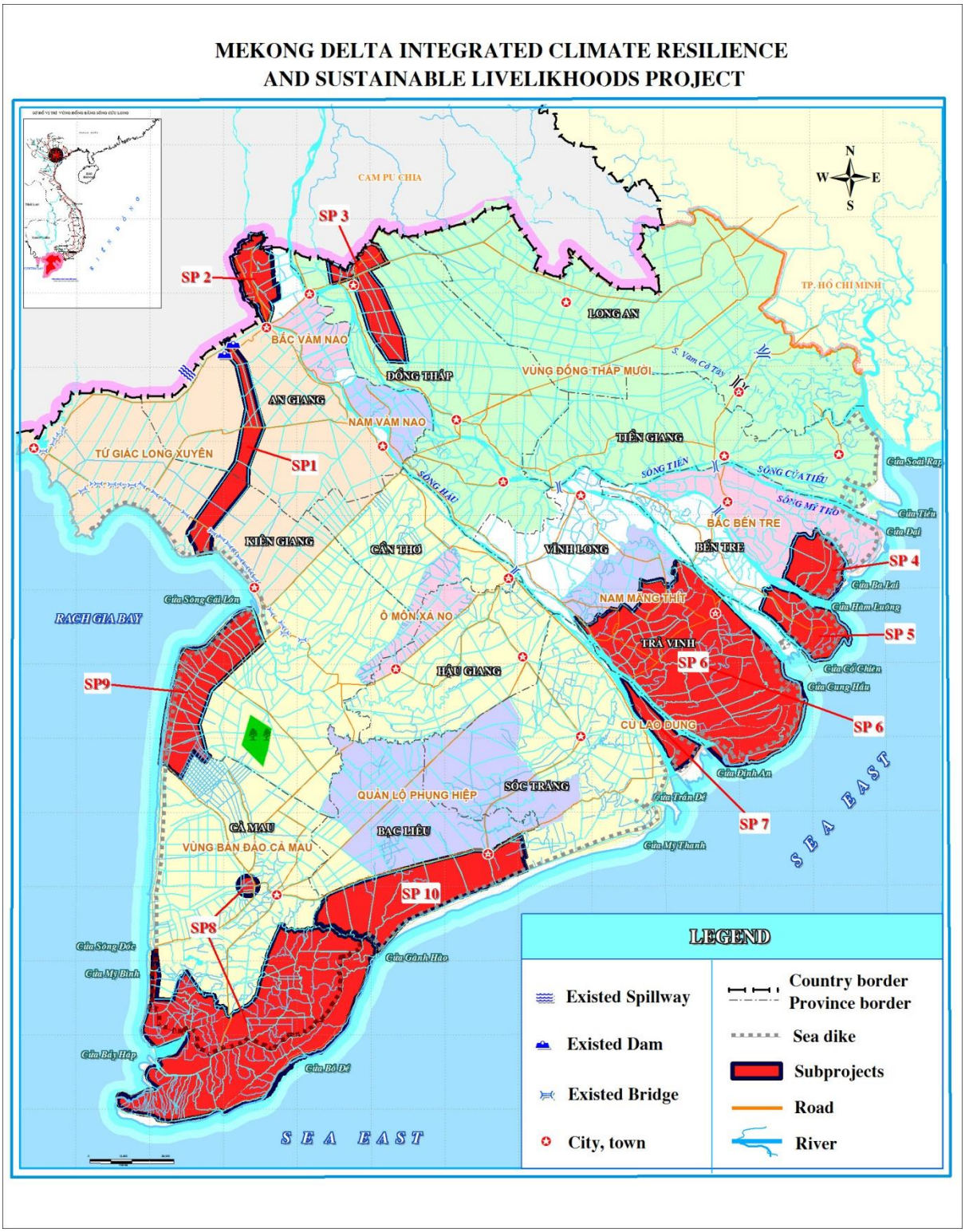
ANNEX 1. SUB-PROJECT SUMMARIES



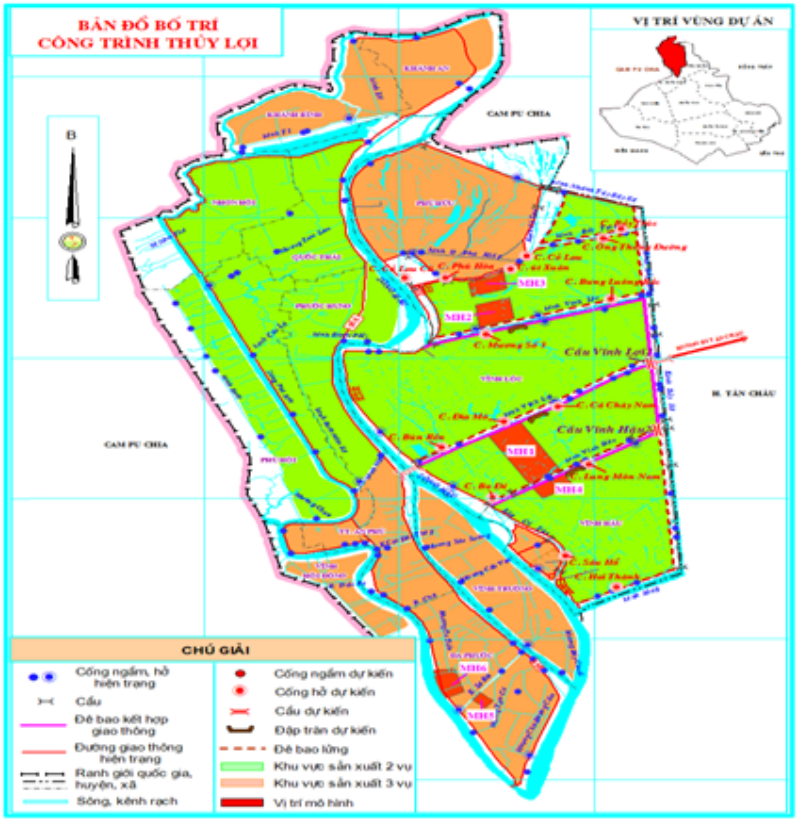
Sub-Project 1 (SP1)

Project impact area	Timeframe	Cost estimate	Planning
An Giang/Kien Giang - Long Xuyen Quadrangle	2015-2018	USD 39.6 mln (VND 890.000.000.000)	Sep 2015: pre FS (in progress) Feb 2016: draft FS After negotiation: final FS

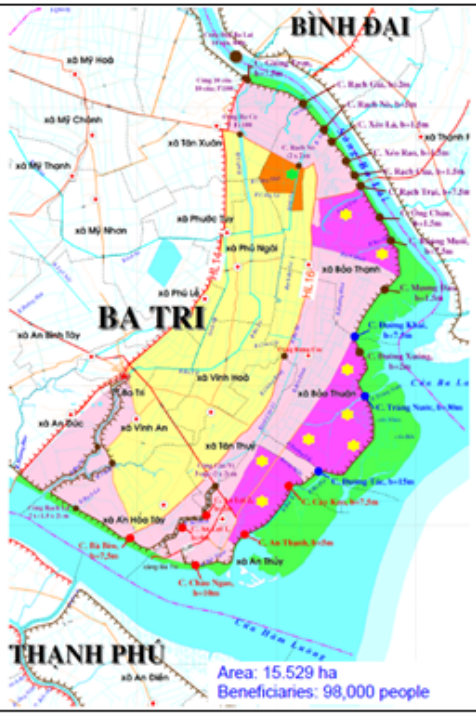
Map	Key objectives
	• Increase the result of water management for agriculture production, changing the structure of trees, cattle, livelihood, restore, rebuild and prevent the aquaculture stably; manage and protect environment and prevent the forest fire. • Building the system of exiting the flood, dyke and items to increase the ability to exit the flood for Long Xuyen quadrangular and Cuu Long river delta to reduce the pressure of flood on the aquaculture production, urban area and citizen in the area (take the dyke to the duty as the regulation of the government); • Building the understructure to suit to the production form for agriculture development with various aims, changing the structure of plants, cattle, environment protection, create the life earning for the citizen, making the condition to exploit the advantage of high-level water season contributing in the social economic development, protecting the national defense, rural development and improving the life of the citizen. • Make condition, to be the basic for arrange the production in the area of dyke so as to the increasing income of the production does not affect the exit and management of flood and combine the small area to the big one with the area from 3.000 ha to 10.000 ha with the total area about 40.000ha to manage the water in large area.

Sub-Project 2 (SP2)

Project Impact Area	Timeframe	Cost estimate	Planning
An Giang/An Phu in the front area of the Hau river	2015-2018	USD 24.0 mln (VND 545.195.895.000)	Sep 2015: pre FS (in progress) Nov 2015: draft FS Before negotiation: final FS

Map	Key objectives
	***Key objectives of the subproject*** - Building and modifying the infrastructure to allow for more beneficial flooding (flood retention and flood exit system), exploiting the advantage of high-level water season for agricultural production; - Offering new agricultural/aquaculture cropping alternatives; - Providing livelihoods support measures to farmers so they have alternatives to the wet season rice crop, including aquaculture. ***Key proposed activities/investments of the subproject*** *Structural measures* - Construction of 60.89 km of embankments to facilitate water retention and floating rice cultivation during the flood season while at the same time preventing recurring yearly damages that need to be repaired by local farmers. - Construction of 15 sluice gates. *Non-structural measures* - Development of 4 pilot areas for alternative farming systems.

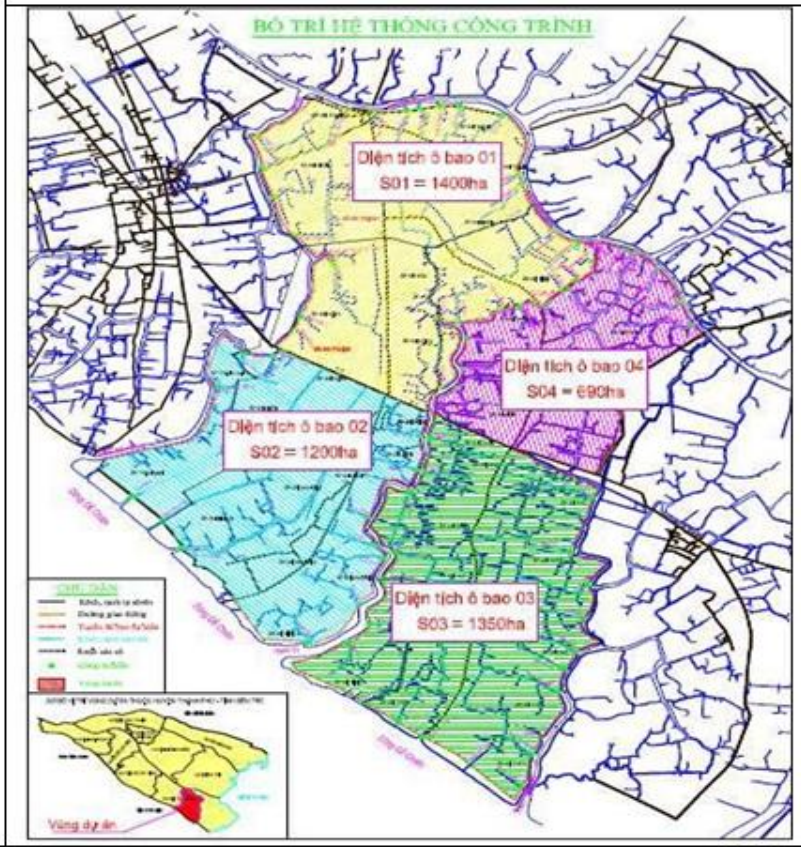
Sub-Project 3 (SP3)			
Project impact area	Timeframe	Cost estimate	Planning
Dong Thap/Hong Ngu district, Hong Ngu town, Tam Nong district, Thanh Binh district, Thap Muoi district, Cao Lanh district	2015-2021	USD 33.5mln (VND 761.151.000.000)	Sep 2015: pre FS (in progress) Feb 2016: draft FS After negotiation: final FS
Map		Key objectives	
		• Actively regulate freshwater resources and control flood to enhance the added value of agricultural production, freshwater aquaculture for northern flooded districts, towns of Dong Thap province. Specifically: • Build infrastructure systems appropriate for production models serving multi-purpose agricultural production development, restructure crop plants, protect environment and create livelihoods for the people, create conditions to exploit the advantages of the flood season such as: feeding wild fish, shrimp and other aquatic species in flood season; contributing to economic and social development, rural development and improving the lives of people. • The long-term goal of the project is to put the heavily diked areas of 3 rice-crop production in the areas adjacent to the project into more effective other production forms (such breeding natural fish, exploiting aquatic plants, freshwater fish, blue crayfish), store and discharge flood waters to return drainage corridors to the river • Together with other investors such as VnSAT, KRC, etc, rural development of flood areas towards modernization in accordance with the goals of building new countryside, the agricultural section restructuring program is to increase commodity value chain in order to contribute to improving livelihoods of the people in flooded areas.	

Sub-project 4 (SP4)			
Project impact area	Timeframe	Cost estimate	Planning
Ben Tre/Ba Tri Ba district coastal communes: Tan Xuan, Bao Thanh, Bao Thuan, Tan Thuy, An Thuy, An Hoa Tay	2015-2018	USD 25.1 mln (VND 564.000.000.000)	Sep 2015: pre FS (in progress) Nov 2015: draft FS Before negotiation: final FS
Map		Key objectives	
		The primary objective of this subproject is to address the challenges related to salinity intrusion, sustainable and improved livelihoods for communities living in the coastal zone of Ba Tri district, Ben Tre Province. Key objectives: • Constructing coastal defenses consisting of combinations of compacted earth embankments and coastal mangrove belts; • Modifying water and agricultural infrastructure along the coastal zone to allow flexibility for sustainable aquaculture activities and adapt to changing salinity levels; Supporting farmers in to transition (where suitable) to more sustainable brackish water activities such as mangrove-shrimp, rice-shrimp, and other aquaculture activities; and • Supporting climate smart agriculture by facilitating water use efficiency in the dry season.	

Sub-Project 5 (SP5)

Project impact area	Timeframe	Cost estimate	Planning
Ben Tre/Thanh Phu	2015-2021	USD 34.6 mln (VND777.348.058.500)	Sep 2015: pre FS (in progress) Feb 2016: draft FS After negotiation: final FS

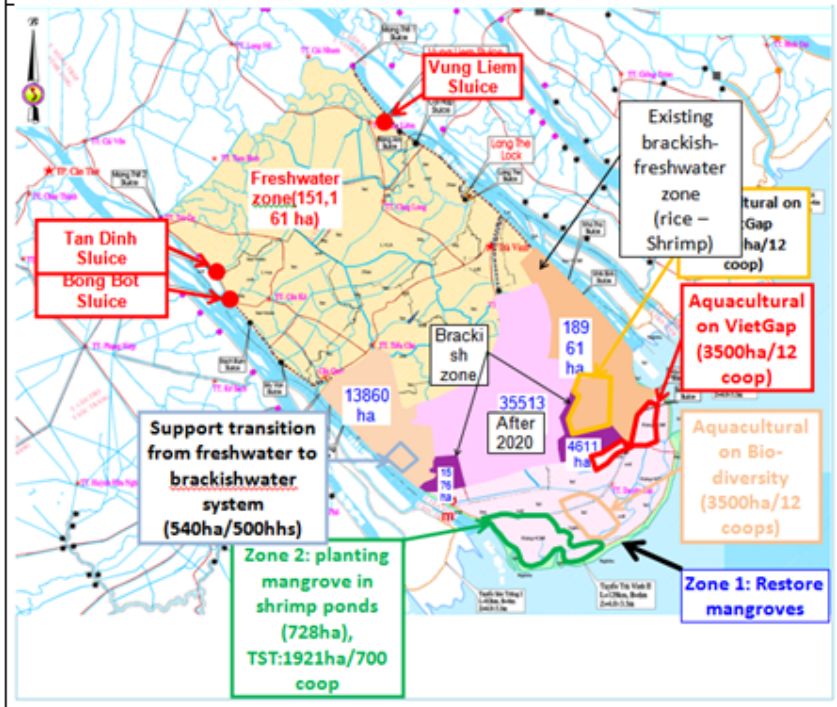
Map



Key objectives

- Stable livelihoods, improve living conditions for local communities, contributing to sustainable development strong project area in terms of climate change, based on promoting the advantages synthesis of the Mekong Delta, strengthening information systems, interdisciplinary collaboration, interregional investment and little regret.
- Adapting harmony with the change of freshwater - brackish, ensure source water areas and diversification of cropping pattern of rice production - to make shrimp livelihoods, improve community life.
- Improve the ability to adapt to saltwater intrusion, sea level rise, restore native ecosystems and diversification of agricultural production models aquaculture industry and the people along the coast.
- Model rotation of rice production form-lobster as the basis for the neighborhood on the province and the Mekong Delta region have similar conditions to convert production.
- To contribute to the construction and development of infrastructure in irrigation, transportation, transport links local communication with the existing transportation system to facilitate socio economic development

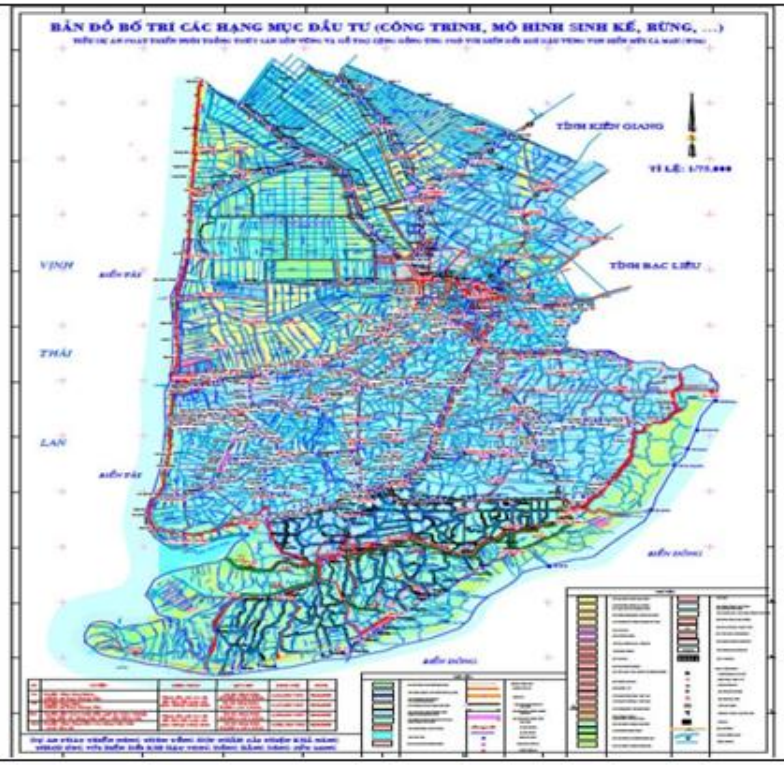
Sub-Project 6 (SP6)			
Project impact area	Timeframe	Cost estimate	Planning
Tra Vinh/Vinh Long	2015-2018	USD 47.5 mln (VND1.068.460.000.000)	Sep 2015: pre FS (in progress) Nov 2015: draft FS Before negotiation: final FS
Map		Key objectives	



The subproject area is divided into 3 zones with the following objectives:

- *Zone 2 - Improving sustainability of brackish water aquaculture.* To improve stability and efficicieny of brackish water aquaculture production through reducing losses due to high tides, improving water quality and extension, establishing farmer organizations and promoting GAP.
- *Zone 3a - Downstream area with frequent brackish water intrusion.* To build capacity and necessary steps for gradual transition to brackish water economy.
- *Zone 3b - Upstream area, fruit trees, freshwater.* This area has saline intrusion a few months a year and caused huge losses for fruit trees. Since income from fruit trees is still high and farmers are not ready for brackish water economy, farmers want the project to help them prevent saline intrusion until their fruit trees are no longer economically viable. It is assessed that it would take a couple of decade for this area to transition to brackish water economy.

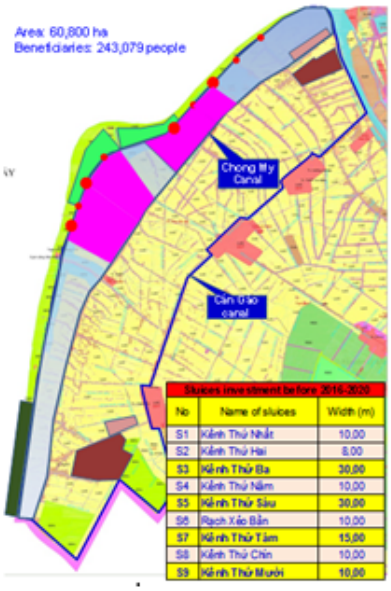
Sub-Project 7 (SP7)			
Project impact area	Timeframe	Cost estimate	Planning
Soc Trang/Cu Lao Dung	2015-2019	USD 44.0 mln (VND 989.203.317.000)	Sep 2015: pre FS (in progress) Feb 2016: draft FS After negotiation: final FS
Map		Key objectives	
		• To strengthen coastal protection, restoration ecology protection security for the population, economy, society at risk of the sea level rise and the adverse impacts of climate change. • Serve restructuring production from sugarcane, vegetables in conditions appropriate to the area of climate change focus aquaculture. • Develop model for regional water supply aquaculture towards centralized water supply system separate to provide a model for sustainable aquaculture, reduce damage to a minimum, ensuring students Design for people. • Contribute to the improvement of the ecological environment in the region, combined serve flood control flood prevention in the district of Cu Lao Dung, Soc Trang. • To contribute to the construction and development of infrastructure in irrigation, transport, local transport connections with the existing transportation system to facilitate economic and social development, especially economic development and marine rescue service and rescue in disasters occurring in the area, the region, in line with economic development planning social, defense and security.	

Sub-Project 8 (SP8)			
Project impact area	Timeframe	Cost estimate	Planning
Ca Mau / Ca Mau/ Ngoc Hien, Nam Can, Dam Doi, Phu Tan, Tran Van Thoi districts	2015-2020	USD 19.6mln	Sep 2015: pre FS (in progress) Nov 2015: draft FS Before negotiation: final FS
Map		Key objectives	
		• Eco Forest and Shrimp farming in Southern Ca Mau • Approve international and national certificates • Support vital infrastructure for people in area for sustainable livelihoods (sanitation, embankments to protect sea level rise combined with local transportation roads) • Mangrove restoration and protection	

Sub-Project 9 (SP9)

Project impact area	Timeframe	Cost estimate	Planning
Kien Giang (An Bien, An Minh)	2015-2018	USD 38.4 mln (VND 863.821.512.000)	Sep 2015: pre FS (in progress) Nov 2015: draft FS Before negotiation: final FS

Map



KIEN GIANG: Project indicators

	Legend	Baseline	Project target			
			ha	HHs	Model	Coop
A. ZONE 1: Mangrove belt (6,669 ha)			1,500	100	2	1
1. Mangrove planting along coast line		200 ha	150			
2. Mangrove planting (250ha) in blood cockle system		50 ha	1,200	100	2	1
3. Coastal dike (revetment)		Upgrade of 10 km coastal dike to prevent coastal erosion				
A. ZONE 2: Brackish water (54,131 ha)			7,500	6,500	30	15
1. Biosecurity of aquaculture		20 ha	5,000	5,000	20	10
2. Rice-shrimp		None	2,000	1,000	8	4
3. Rice-shrimp-prawn		None	500	500	2	1
4. Sluice gates		Construct 9 additional sluice gates to prevent high tide				

Sluices investment before 2016-2020

No	Name of sluices	Width (m)
S1	Kênh Thứ Nhất	10,00
S2	Kênh Thứ Hai	8,00
S3	Kênh Thứ Ba	30,00
S4	Kênh Thứ Năm	10,00
S5	Kênh Thứ Sáu	30,00
S6	Rạch Xẻo Bần	10,00
S7	Kênh Thứ Tám	15,00
S8	Kênh Thứ Chín	10,00
S9	Kênh Thứ Mười	10,00

Key objectives

- Construction/ rehabilitation of coastal defenses consisting of combinations of compacted earth embankments and coastal mangrove belts;
- Modification of water control infrastructure along the coastal zone to allow flexibility for sustainable aquaculture activities;
- Support to farmers to practice more sustainable brackish water activities such as shrimp–rice/prawn, mangrove-shrimp and other aquaculture livelihoods;
- Supporting climate smart agriculture by facilitating water use efficiency.

ANNEX 2: FOCUS GROUP INTERVIEW GUIDE

Provincial and District level department representatives

***Objective of the meeting*:** To obtain an overview and update of the sub-project design, in particular the livelihood investments.

Note: Data collected from these interviews were cross-checked and supplemented with that provided in the sub-project feasibility study.

Sample questions:

- What is the Province's socio-economic development objectives for the sub-project locations?
- What are the major elements of the Province's strategy to adapt to climate change?
- What specific climate change effects is the sub-project trying to address?
- What are the current land use plans in the project location and what changes are anticipated in the future?
- Are there any major changes in the sub-project design and if so, what are they? Why were the changes required?
- Have the project impact boundaries and number of project beneficiaries been changed?
- Are the proposed engineering works and livelihood transitions in line with current land use plans, or do the land use plans need to be changed?
- What are the poverty levels and trends in the project area? Are there any government programs in the project area to support poor households?
- In the case of resettlement, How will households livelihoods be restored and maintained?
- Is there illegal HH/ HH with no title on land in the subprojects areas (i.e. along canals);

Community participants and Commune government

***Objective of the meeting*:** To obtain an understanding of a sample community's livelihood and social vulnerabilities to climate change and proposed infrastructure, as well as their capacity to adapt to new livelihoods and/or to cope with proposed infrastructure developments.

Sample questions:

The full-day meeting will be opened by the commune government representative who will provide a brief introduction on the objectives of the sub-project.

1. Climate vulnerability (objective of questions is to understand vulnerabilities to CC with a focus on livelihoods):

- What climate trends have been noticed in the area over the last 10 years?
- What sorts of impacts have these had on livelihoods, crops, cropping calendars, incomes, household water supplies, etc.?
- What could be the climate vulnerabilities of proposed livelihood replacements?

2. Adaptation capacity (objective of questions is to understand community's adaptation capacity to CC and other shocks):

- How have you been responding to changes in the weather/climate?
- Have there been any other examples of changes in the community that have forced you to change your way of life (eg. household water supply)?
- What resources (financial, natural, social) have you utilised to help you to adapt (livelihoods and ways of life)?
- What challenges have you faced in trying to adapt to change?

- Did you receive support for adaptation to change? What type of support and from whom?

3. Socio-economic (objective of questions is to estimate the household financial benefits from existing livelihoods and to compare with proposed new livelihoods or livelihood improvements):

- What are the current livelihoods in the area? What are the incomes from these livelihoods?
- What sorts of livelihoods would you like to do in the future? Why?
- What are the projected incomes of replacement livelihoods?
- What are the general conditions/availability of public infrastructure in the locality, eg. roads, water supply, electricity, irrigation, etc.
- What is the general availability of credit in the project area? Is it easily accessible? If not, why not?

4. Infrastructure (objective of the questions is to understand how the proposed infrastructure will improve or constrain livelihoods and ways of life)

- Will the proposed infrastructure developments (roads, sluices, dykes, etc.) improve or constrain transportation and access to markets, schools, clinics, etc? What impact will this have on livelihoods (existing and new)?
- Will the proposed infrastructure developments (sluices, dykes) improve or constrain water supplies and quality for livelihoods and household water supply? What impact will this have on livelihoods (existing and new)?

5. Social-cultural (objective of questions is to understand the social vulnerabilities that exist which may assist or constrain the ability of households to adapt to change):

- What is the ethnic makeup of the project area and what proportion are project beneficiaries?
- Are there any specific issues related to ethnicity that constrains ethnic minority households from investing in livelihoods?
- Is there landless HH in the area and what are their sources of income? Is there a correlation between landless and ethnicity?
- How will women's roles change between current livelihoods and the proposed replacement livelihoods?
- Are there any specific issues in the community that constrain women from investing in livelihoods?
- What are the reasons for poverty in the project area?
- What sort of cultural heritage could be impacted by the project? Eg. flooding of ancestral graves, places of worship, community conservation areas, etc. What can be done to mitigate/compensate for the impacts?

6. Community social structures (objective of questions is to understand the community structures that exist which may assist or constrain the ability of households to adapt to change):

- What are relations like between ethnic groups in the project area? Are they integrated into the general community, or do they live in isolated ethnic groups? Is there a need for communication in another language than Vietnamese?
- What is the participation rate (% of population) in the various mass organisations?
- Are there any savings and credit groups in the area? Who runs these groups? How many members do they have?
- Are there any cooperatives/associations in the area? What do they do and how many members do they have?

7. Community recommendations for adaptation support (objective of these questions is to obtain community recommendations/ideas that can be incorporated into the design of the project which will assist with the transition to new livelihoods or improved livelihoods, as well as to mitigate the impacts from proposed infrastructure):

- Does the community have any recommendations on the type of support that is required to enable change/mitigate impacts from livelihood changes (eg. forming cooperatives, etc)?
- Does the community have any recommendations on how proposed infrastructure (eg. sluices) should be operated?
- What are the affected people's opinions on the proposed need for resettlement (ST1, AG2)? What are the affected people's opinions on the proposed resettlement areas? How can livelihoods be restored after the resettlement?

ANNEX 3. HOUSEHOLD SURVEY QUESTIONNAIRE

A1a. Name of answerer: ……

A2a. Are your the head of this household? (specified in the Registered family record)

1. Yes 2. No

A3a. Where was the head of HH born?

1. In this locality? 2. Come from other place? When? ……

A4a. What is the ethnic identity of the head of HH?

A5a. Hamlet/village ……

A6a. Commune ……

A7a. District ……

A8a. Province ……

A9a. Date of interview: date month year

A10a. Name of interviewer:

A11a. Name of supervisor:

A12a. Level of living conditions per commune's criteria

1. Rich	2. Fairly rich	3. Medium	4. Poor	5. Very poor, hungry

A13a. Code of this questionnaires?

Project	Province	District	Commune	HH

A. GENERAL INFORMATION ABOUT YOUR HOUSEHOLD

A1. Information about your household member

Ref	1.1. Sex 1. male 2. female	1.2. Year of birth	1.3. Marital status	1.4. Education level (highest)	Job				1.9. Place of work (main job)	1.10. Distance from house to work place (km) (main job)
					1.5 Main job (>50% time for this job) (specify)	1.6 Working status of main job	1.7 Sideline (secondary job)	1.8 Working status of sideline		
1										
2										
3										
4										
5										
6										
7										
8										

1.3. Marital status	1.4. Education level	1.5 Main job & 1.7 Sideline	1.6 & 1.8 Working status of main job and sideline	1.9. Place of work (main job)	1.10. Distance from house to work place (km)
1. Single 2. Married 3. Divorced 4. Separated 5. Widow/ widower *98. KTH, Below 18 years old*	0. Never go to school 1. Primary school 2. Secondary school 3. Tertiary school 4. College/university or higher level *98. KTH, Below 6 years old*	1. Agriculture (cultivation, husbandry) 2. Forestry (planting, caring, protecting, exploiting forests) 3. Catching aqua-products 4. Aquaculture (shrimp, crab, fish, etc.) 5. Trade, services 6. Government officers, staffs 7. Workers 8. Commune/village officers 9. handicraft men 10. Hire-labour 11. Other jobs (specify) 12. Pupil/student 13. Not to work because of retired/old/weak 14. Jobless, no employment, not learning *98. KTH, Below 6 years old*	1. Steady 2. Non steady 3. No idea *98. KTH, person in code 12, 13, 14 and 98 in Item 1.6 & 1.8*	1. At home 2. In commune 3. Outside the commune but within the district 4. Outside the district 5. No fixed place *98. KTH, person in code 12, 13, 14 and 98 in Item 1.6*	*98. KTH, person in code 1 in item 1.10 and code 12, 13, 14 and 98 in Item 1.6.* 99. If working in a non-fixed place.

A2. Since 2011, are there any people in your family of labour age that changed his/her main jobs?

1. Yes (clearly state job and code in table below) 2. No (**move to B1**)

Series No. in list of HHs	Main job in 2011	Main job in 2012	Main job in 2013	Main job in 2014	Main job in 2015

A3. Why did he/she change the main job (*select one or more than one appropriate options*)

1. loss of land
2. change living place
3. New job is more suitable
4. new job is better paid.
5. have economically convenient location (trading, production, etc.)
6. others (specify): ……..

B. ASSETS

Land

B1. Does your family have any land?

1. Yes. 2. No (**move to B3**)

B2. How do you use your land (excluding resident land)?

Ref	Type of land	1.1. Agricultural land		1.2. Forest land		1.3. Pond, surface land		Total land holdings
		Nrs. of Cong (1 cong = 1000m^2)	Present land use*	Nrs. of Cong (1 cong = 1000m^2)	Present land use*	Nrs. of Cong (1 cong = 1000m^2)	Present land use*	
1	Land given by parents							
2	Land allocated/lease							
3	Land hired or lease							

4	Land purchased from other							
5	Land reclaimed							
6	Other							
	Total							

** Code of land-use: 1. under cultivation 2. bare land 3. Semi cultivated and left bare*

4. for lease 5. mortgage

B3. Do you obtain Land-use rights for the land you have?

1. Yes. When? 2. No

B4. Since 2010, have your family sold any land (including resident land) to others?

1. Yes. How many 'Cong'… 2. No (**move to B6**)

B5. What do you spend the money gained by selling land? (*Select appropriate options*).

1. Daily expenses
2. Purchasing furniture
3. Building, repairing house
4. Investing in trade, services, non-agricultural production
5. Paying debts
6. Investing in agriculture, forest, aquaculture?
7. Investing in education of the children
8. Depositing in bank as savings
9. Distributing to children or others
10. Other (specify)

B6. Since 2000, have your family bought any land (including resident land) from others?

1. Yes. How many 'Cong'… 2. No (**move to B8**)

B7. How do you use on that land? (*Select appropriate options*).

1. Build workshop
2. Using in trade, services
3. Build house
4. Build house for rent
5. Cultivating, husbandry (livestock, aquaculture)
6. Forest planting
7. Other (specify

Houses and living conditions

B8. Which grade does your house belong to? *Select appropriate options*).

1. Permanent house, one or more than one storied
2. Semi-permanent house (brick wall, tile roof)
3. Temporary house (thatched, tent)
4. Other (specify)

B9. How large is your resident land (how many square meters?) ……. m^2

Of which: Main house: ……. m^2

Kitchen, store, temporary house: ……. m^2

Yard, garden, pond: ……. m^2

Other: ……. m^2

B10. Where do you get water from for drinking and washing in dry season and in rain season (*select 1 main water sources)*?

		In dry season	In rain season
10.1.	Water for drinking		
10.2.	Water for washing		

Code of water source:

1. Family –scale tap water
2. Public tap water
3. Dug well, drill well, earth well
4. Tank of rain water
5. Lake, pond, river, canal, stream
6. Other source:

B11. Which type of latrine does your family use? (*select 1 option*)

1. Have no private latrine
2. Toilet with septic or semi-septic tank
3. Double-tank composite toilet
4. Simple latrine (dug a hole in garden)
5. Latrine built over pond, river, stream, canal
6. Other (specify)

B12. At present, which type of the energy does your family use to light (*select 1 option)*

1. Gasoline
4. Battery, generator, mini-hydropower

2. Gas

5. Other type of energy (specify)

3. National gridline

Long-term assets

B13. What type of long-term assets does your family have (*only count for usable assets)*?

Ref	Type of assets	Quantity	Ref	Type of assets	Quantity
1	Expensive furniture		9	Washing machine	
2	Fridge		10	Hot-water tank	
3	Electric fan		11	Motorbike	
4	Black and white, color TV		12	Computer	
5	Radio cassette		13	Gas-table	
6	VCD/video		14	Sewing machine	
7	Megaphone		15	Electric rice cook	
8	Telephone		16	Microwave oven	

Ref	Production means	Quantity	Ref	Production means	Quantity
1	Truck		6	Motorized pesticide sprayer	
2	Pump machine		7	Electric generator	
3	Motorized rice husking machine		8	Fish net	
4	Milling machine		9	Vehicle	
5	Grinding machine for animal feed		10	Motor boat	

C. PRODUCTION ACTIVITIES

Cultivation

C1. In the last 12 months, have you cultivated on your land?

1. Yes (fill in table below) 2. No

Ref	Main crops	a. Cultivated area in last 12 months (Cong)	b. Production gained in last 12 months
1	Rice		Kg
2	Maze, potato, cassava		Kg
3	Vegetables		Kg
4	Beans (all kinds)		Kg
5	Sugarcane		Kg
6	Fruit-trees (coconut, pineapple, mango, jack-fruit, grapefruit, longan, etc.)		Kg
7	Fish		Kg
8	Shrimp		Kg
9	Forest/Mangroves		Tones
10	Others (specify)		Kg

Husbandry

C2. In the last 12 months, has your family raised livestock or poultry?

1. Yes 2. No

Ref	Type of animals	Quantity (head)
1	Cow, buffalo	
2	Horse	
3	Goat	
4	Pig	
5	Chicken, ducks, grooves,	

6	Other (specify)	

C3. In the last 12 months, has your family practiced in fishing?

1. Yes 2. No (**move to question C5**)

C4. How many kilograms of products has your family caught in the last 12 months?

Ref	**Products**	**Quantity (kg)**
1	Fish	
2	Shrimp	
3	Other aqua products: (trionychid turtle, crab, etc.)	

C5. In the last 12 months, has your family practiced in aquaculture?

1. Yes 2. No (**move to question C7**)

C6. How many kilograms of products has your family harvested in the last 12 months?

Ref	**Products**	**Quantity (kg)**
1	Fish	
2	Shrimp	
3	Other aqua products: (trionychid turtle, crab, etc.)	

Forestry

C7. How many hectare of forest does your family have?

1. Natural forest: ha 3. Caring forest: ha

2. Planted forest: ha 4. Protecting forest: ha

C8. What are main types of plants in your forest? ……..

C9. In the last 12 months, what benefits has your family gained from the forest?

0. No benefits 3. Rubber latex

1. Timber 4. Forest products as food

3. Firewood 5. Other benefits (specify). ……

C15. How long is the distance from your house to your furthest forest? ……. Km.

Handicrafts

C16. In the last 12 months, are there any people in your family practice handicrafts?

1. Yes 2. No (**move to question D1**)

If yes, how many people in your family involve in handicraft? (record number of people in the following tables responding to the activities) …….. people

Ref	Type of handicrafts	Of which labours are:		
		a. male	b. Female	c. Children (10-14 years old)
1	Manufacturing building materials			
2	Building worker, brick layer			
3	Timber processing, carpenter.			
4	Ceramic, glass, porcelain			
5	Bamboo, rattan knitting			
6	Knitting (cloth, carpet, mate)			
7	Garment			
8	Metallic works			
9	Food and foodstuff processing			
10	Leather (tanning)			
11	Other jobs (specify)			

D. IRRIGATION AND DRAINAGE SCHEME

D1. What kind of water sources do you use for irrigating in dry season? (*Select 1 main water source)*

0. No source

1. Water from canal system runs to field gravity

2. Water from canal system pumps to field

3. Water from river, pond, lake, stream

4. Water from dug/drilled wells

5. Other source (specify)

D2. In your opinion, how sufficient is the water supplied from the present irrigation scheme in the commune in dry season?

1. Abundant 2. Sufficient 3. Insufficient 4. Lack seriously 5. No idea

D3. If the newly developed irrigation scheme supplies sufficient irrigation water in dry season, what do you plan to do?

1. Aquaculture

2. Extending cultivated land

3. Intensifying crops

4. Raise livestock, poultry

5. Other (specify)

D4. In your opinion, what type of management of irrigation scheme below is the most effective?

1. *Commune or water-use cooperative-based management (commune or cooperative signs contract for water supply with the irrigation and drainage management company).*
2. *Water user group-based management (a group of HHs who use water from the irrigation canal serving in a certain area shall sign the contract for water supply directly with the irrigation and drainage management company).*
3. *All irrigation and drainage infrastructures shall be managed by the irrigation and drainage management company.*

E. CREDIT

E1. At present, does your family borrow on interest?

1. Yes. How much is the credit in VND? 2. No (**move to question E4**)

In credit is in gold or US dollars, exchange rate: 850,000 VND = 1 'chi', 1 USD = 15,900 VND

E2. What does your family use the credit for?

1. Agriculture production (rice, vegetable, upland crops)

2. Horticulture

3. Husbandry

4. Aquaculture (farming, catching)

5. Forestry (planting)

6. Non-agricultural production

7. Procuring long-term use furniture

8. Daily expenses

9. Health treatment

10. Other purpose (specify)

E3. Who do you borrow from? And how much is the monthly interest rate?

Ref	Fund sources	Interest rate (monthly) (%)
1	Relatives, close friends, neighbors	
2	Usurer	
3	People's credit fund, Credit cooperative	
4	Bank for agriculture and rural development	
5	Bank for the poor (social policy)	
6	Other banks	
7	Development programs (e.g. Job promotion program 120, etc.)	
8	Poverty reduction and hunger elimination	
9	Women's unions, other associations, etc.	
10	Other (specify)	

E4. Why doesn't your family borrow in the last 12 months? (*select 1 option)*

1. No need
2. Need, but do not know where to borrow
3. Need, but no fund source available
4. Want to borrow but do not have enough conditions to borrow (specify).
5. Other reason (specify).

F. INCOMES AND EXPENSES

F1. Please, specify your incomes in the last 12 months from the various sources below?

Ref	Income sources	Income (VND)	Compared with the last 2 years, how is your income change? 1. Higher, 2 Similar, 3. Lower, 4. No answer
1	Farming rice		

2	Vegetables and upland crop		
3	Fruit-trees (orange, jack-fruit, coconut, etc.)		
4	Industrial crops (sugarcane, pepper, cashew, rubber, coffee, etc.)		
5	Husbandry (animal, poultry)		
6	Aquaculture		
7	Fish catching		
8	Hire-labour		
9	Salary, retired salary		
10	Handicrafts		
11	Forestry (planting, caring, protecting)		
12	Other (specify)		
	Total		

F2. How much are your expenses in the last month in each category?

Ref	Expense item	Amount (VND)	Ref	Expense item	Amount (VND)
1	Rice		6	Traveling cost	
2	Daily food		7	Education fee for children	
3	Fuel		8	Health examination, treatment	
4	Electricity		9	Tip for wedding, funeral, etc.	
5	Domestic water cost		10	Other …	
				Total	

F3. Does the income of your family afford such expenses?

1. Surplus 2. Sufficient 3. Lightly insufficient 4. Serious shortages

G SOCIAL ACTIVITIES

G1. Which association do you or any member of your family participate? (*>=14 years)* ***If nobody participates, move to question G2.***

Ref	Order number in list of HHs	Association participated	Benefits gained from participating in such association?			
			Association 1	Association 2	Association 3	Association 4
1						
2						
3						
4						
5						

Code of association:

1. Women's union
2. Youth's union
3. Veteran's association
4. Farmers' association
5. Aged people's association
6. Horticulture's association
7. Religious group
8. Communist party
9. Other association (specify)
10. No participating in any association or union.

Code of benefits obtained:

1. Advice, spiritual, motional benefit
2. Material, money support
3. Social interchange
4. Obtaining credit
5. Learn to earn money

G2. At present, who do you usually ask for help when you are in trouble or need?

1. Parents
2. Brothers and sisters
3. Children
4. Relatives
5. Neighbors
6. Friends
7. Local government, association at working place
8. Local government, association at living place
9. No need from others
10. Others (specify)

H. OVERALL ASSESSMENT

H1. In your opinion, what aspects have been changed in your locality in the last 5 years?

Ref	Factor	1. Better	2. Similar	3. Worse	4. No idea
1	Infrastructures (electricity, road, school, clinic, water supply and sewage, communication)	①	②	③	④
2	Transportation services	①	②	③	④
3	Agricultural extension	①	②	③	④
4	Employment opportunity	①	②	③	④
5	Ability to access to credit	①	②	③	④
6	Income and living conditions	①	②	③	④
7	Irrigation and drainage system (canal)	①	②	③	④
8	Natural benefits (fish, shrimp, etc.)	①	②	③	④
9	Sanitation and environment	①	②	③	④
10	Other (specify)	①	②	③	④

H2. What areas do you want the government to invest in in the coming years? (*Select 3 options in priority order, 1 is the first priority*)

Ref	Area	Priority
1	Roads	
2	Irrigation and drainage system	
3	Electric supply	
4	Bridges	
5	Domestic water supply	
6	Sewage	
7	School	
8	Kindergarten, pre-school	
9	Clinic, healthcare center	
10	Agricultural extension	
11	Recreation and entertainment	
12	Other (specify)	

I. FARMER ECONOMIC PERCEPTION

I1. In your opinion, how is your HH farming livelihood in the last 5 year (including cultivation, husbandry/livestock and aquaculture)?

Ref	Factor	1. Better	2. Similar	3. Worse	4. No idea
1	Selling price on farm	①	②	③	④
2	Selling price at the market/food processor	①	②	③	④
3	Purchasing system and distribution of farming products	①	②	③	④
4	Farming profit	①	②	③	④
5	Market demand on organic/biological products	①	②	③	④
6	Other (specify)	①	②	③	④

I2. Considering agriculture and aquaculture, how are the farming conditions in the last 5 years?

Ref	Item	1. Better	2. Similar	3. Worse	4. No idea
1	Farming technique	①	②	③	④
2	Seed/Fingerling source	①	②	③	④
3	Farming material source (agrochemical, feeding, etc.)	①	②	③	④
4	Farming equipment (mechanism)	①	②	③	④
5	Seasonal labour source	①	②	③	④

J. RISK PERCEPTION

J1. In your opinion, how are the biophysical conditions to facilitate farming practices in recent years? (check out the event occurred only at your local)?

Ref	Event	1. Better	2. Similar	3. Worse	4. No idea
1	Rainfall, tropical storm	①	②	③	④
2	Drought	①	②	③	④
3	High temperature	①	②	③	④
4	Monsoon wind	①	②	③	④
5	Pests and diseases	①	②	③	④
6	Annual (upstream) flood	①	②	③	④
7	Saline intrusion	①	②	③	④
8	Water quality	①	②	③	④
9	Groundwater level	①	②	③	④
10	Soil fertile	①	②	③	④

J2. Regarding your HH main farming practice, what type of risks occurs more often?

1. Yield risk (loss of yield caused by natural events or diseases, etc.)

2. Market risk (loss of price, price squeeze, etc.)

3. Both but Yield risk is higher

4. Both but Market risk is higher

5. No idea

K. FARMER ATTITUDES

	Question	1. Yes	2. No	3. No answer
K1	Do you know that intensive production on the same farming practice would degrade the soil quality?	①	②	③
K2	Do you know that intensive production on the same farming practice would deplete the fresh water source?	①	②	③
K3 *	Do you know that mangrove forest plays an important role to protect coastal land from erosion?	①	②	③
K4	Would you think that maintaining your current farming practice will not affect the natural environment?	①	②	③
K5	Would you think that your future livelihood will be sustainable if you keep chasing the current farming practice?	①	②	③
K6	Would you think if applying any transition on farming practice, your livelihood will be more sustainable? (e.g. reduce number of crops, technology application, or transform to another farming pattern)	①	②	③

* applied in Ca Mau only

K7.The following table indicate several current livelihood and transition livelihood accordingly. Please choose the one applied to your HH current situation and check out your opinion about its transition trend.

	Current landuse/ livelihood*	Transition or enhanced landuse/livelihood	1. No interest	2. Interest	3. Want to change	4. Will change	Reason why?
Dong Thap	3 rice crops / 2 rice crops	Rice-aquaculture (fish and shrimp) Lotus	①	②	③	④	
An Giang	3 rice crops / 2 rice crops	Rice-aquaculture (fish and shrimp)	①	②	③	④	
An Giang	3 rice crops / 2 rice crops	Floating rice	①	②	③	④	
Ben Tre	3 rice crops / 2 rice crops	Intensive shrimp	①	②	③	④	
Ben Tre	Rice-shrimp	Rice-shrimp	①	②	③	④	
Soc Trang	Sugarcane	Intensive shrimp	①	②	③	④	
Ca Mau	Mangrove-shrimp	Organically certified mangrove-shrimp	①	②	③	④	
Kien Giang	Rice-shrimp	Rice-shrimp	①	②	③	④	

**only choose which applied to your HH*

K8. Beside the suggested transition, do you have any other option to sustain your farming livelihood? Please specify and give the reason.

……
……

K9. If you do not want to follow the suggested transition, what would you do?

1. Try my best to maintain the current farming system

2. Land for sale/for lease/leave empty, looking for non-farm job, or job elsewhere if necessary

98. no answer because agree to change

L. PERCEIVED FARMER ABILITY

L1. Do you think your HH can afford to change to the transition indicated in the previous question?

1.No 2.Low 3.Medium 4.Medium high 5.High

L2. Please indicate your HH ability in terms of the following sectors:

	Low	*Medium*	*High*
Financial Ability			
1. Self-capital	①	②	③
2. State-owned credit	①	②	③
Technical Ability			
3. Farming techniques and skills	①	②	③
4. Availability of seed/fingerling source and farming material			
5. Suitability of edaphic conditions (soil, elevation, weather)	①	②	③
6. Availability of irrigation system	①	②	③
7. Access to electricity	①	②	③
8. Convenience in transporting harvested products	①	②	③
9. Availability in mechanism	①	②	③
10. Access to farming-related information and news via Tivi	①	②	③
11. Access to farming-related information and news via newspaper, radio			
12. Access to farming-related information and news via Internet, mobile SMS			
Institutional Ability			
13. Probability to cooperate with family, relatives	①	②	③
14. Probability to cooperate with neighbors, friends, acquaintances	①	②	③
15. Availability of agricultural extension	①	②	③
16. Connections with traders	①	②	③
17. Connections with dealers of farming material	①	②	③

L3. What and how should the government do to support your HH towards the suggested transition for a sustainable livelihood?

……

……

ANNEX 4. PHOTOS OF FOCUS GROUP MEETINGS

Photo 1. Field team interviews with Provincial and District level agencies in Kien Giang, 3 November 2015.

Photo 2. Field team focus group interviews with community in Kien Giang, 4 November 2015.

Photo 3. Field team interviews with Provincial and District level agencies in Ca Mau, 6 November 2015.

Photo 4. Field team focus group interviews with community in Ca Mau, 7 November 2015.

Photo 5. Field team focus group interviews with women's group in Ca Mau, 7 November 2015.

Photo 6. Field team focus group interviews with community in Thanh Phu District, Ben Tre, 11 November 2015.

Photo 7. Field team focus group interviews with community in Ba Tri District, Ben Tre, 12 November 2015.