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Supporting Governance Institutions for Adaptive Capacity to Environmental Change

APPENDICES

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Appendices

These appendices accompany the Final Report to the Asia-Pacific Network for Global Change Research:

Supporting Governance Institutions for Adaptive Capacity to Environmental Change | ARCP2013-24NSY-Fidelman

Case Study Report
on
Co-Management of Coastal Resources in Peam Krasaop Wildlife Sanctuary (PKWS), Cambodia

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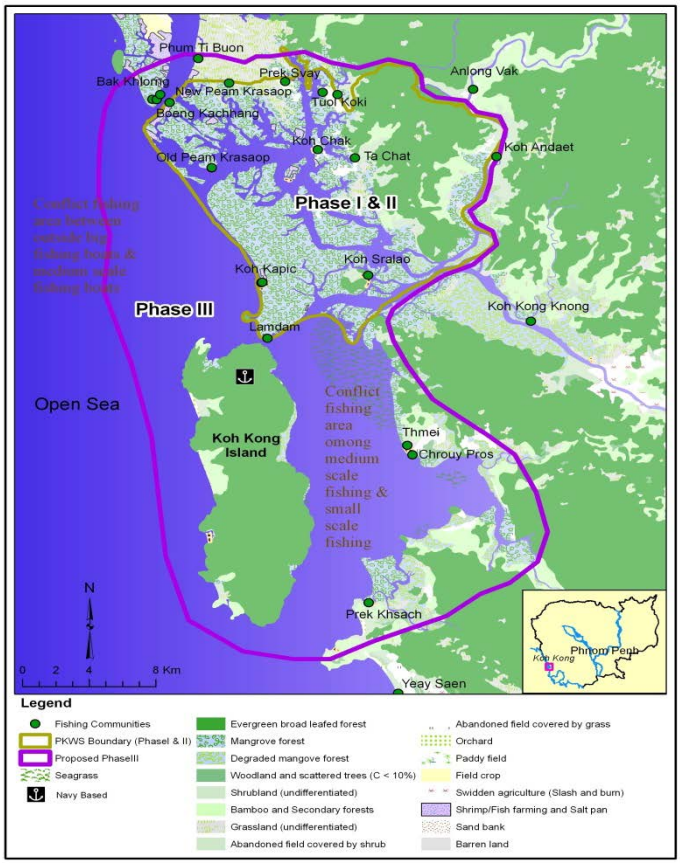
1. Introduction

Peam Krasaop Wildlife Sanctuary (PKWS), one of Cambodia Protected Areas covering 23,750 hectares of Southwestern province, Koh Kong, boasts a unique mangrove ecosystem (Varman, 1993). Ecological system of the area is mainly influenced by inter-tidal levels and water from highland areas in which the estuarine area is created by the intersection of freshwater and saltwater. Mangrove, coral reefs, and seagrass in the areas are home to a large number of aquatic and upland animals including fishes, mollusk, crustaceans, waterbirds, and mammals. The area provides the best remaining examples of mangrove forests in the Gulf of Thailand, as in many other areas have been cleared for intensive shrimp aquaculture, large-scale charcoal production, and other commercially driven purposes. Presently, more than 10,000 people settle in PKWS, and mainly depend on these abundant fisheries and mangrove resources for their livelihoods both subsistence and income generation.



Map of Cambodia Reflecting PKWS

Besides abundant mangrove and coastal resources, PKWS is well-known in the region, possibly the world, for its successful story in natural resource conservation and protection since early 2000s. Thanks to Community Based Natural Resource Management (CBNRM) and Co-management for the success through its innovative learning-by-doing, or participatory learning, approach in bringing all stakeholders to the table to learn, discuss, and propose possible solutions for dealing with resource issues. The approach was introduced by a local research team called Participatory Management of Mangrove Resources (PMMR) with support from international advisors of International Development Research Center (IDRC) in 1997 in attempt to solve resource depletion and conflicts, which prevailed in PKWS despite attempts made by inter-disciplinary provincial taskforce ranging from Koh Kong provincial authorities, administrative police, provincial Department of Agriculture, Fisheries, and Forestry in dealing with the issues. The approach was mainly selected for the fact that it gains global recognition and popularity for its success and effectiveness for managing natural resources and resolving conflicts through local participation, and it does provides positively tangible results after its implementation.

This study seeks to assess the extent to which the current resource management institutions, brought into by the CBNRM, in PKWS encourages institutional adaptive capacity. Drawing on Gupta et al. (2010), the study will assess adaptive capacity in terms of six broad dimensions; that is, the ability of institutions to: (1) encourage the involvement of a variety of

actors, perspectives, and solutions; (2) enable actors to continuously learn and improve their institutions; (3) allow and motivate stakeholders to self-organise, design and reform their institutions; (4) mobilise leadership qualities of social actors; (5) mobilise resources for decision-making and implementation; and (6) support principles of fair governance. Lessons from this study will be used as an example for natural resource management in other contexts.

Next section is the review of some of the key literature for this research including CBNRM and institution.

2. Literature Review

Community Based Natural Resource Management (CBNRM) is one of the popular contemporary approaches for managing natural resources. The origins of this approach dated back to the 19th and early 20th century, and the notion of the roles of the community in natural resource management has been shaped and reshaped over time by outsiders ranging from "colonial Governor-Generals, political advisors, European settlers, and more recently rural development consultants and academic writers" (Blaike, 2006; p. 1943). The contemporary CBNRM, which have generally been in use from the 1980s, is part of a larger response to demands for local needs and local participation, which is mainly based on the idea that state-centric and expert-generated solutions are not effective in dealing with complex human-ecosystem interaction, and importantly having direct contact and traditional knowledge of local ecology encourage local people to have greater interests in sustainably managing natural resources than the distant bureaucrats and corporations (Peet et al., 2011; Li, 2002; Blaike, 2006; Tyler, 2006; Tsing et al., 2005).

The approach was initially applied in developed countries, and then introduced to developing countries in Africa, Asia, and other small island nations under donors' pressures (Bene et al., 2009). The popularity of this approach is due to its promise to provide a wide range of benefits including livelihood improvement, sustainable use of resources, building closer state-community relationship, and social equity, to various groups from development agencies, conservation organization, government agencies, grassroots organizations, and local resource users (Armitage, 2005; Blaike, 2006; Tsing et al., 2005).

The approach relies heavily on local people. They are both researchers and key agents for change not only for environmental management, but also livelihood improvement (Tyler, 2006). Their knowledge and experiences are essential for making decision for access and use of natural resources, management plan development, and conflict resolutions, among others. With the approach, multiple stakeholders are brought to the table to discuss and work together in dealing with local needs and demands for environmental management and livelihoods. Throughout the process of participatory learning in the approach, multiple stakeholders ranging from local resource users, government agencies, private corporation, and scientists are able to find common ground to work and propose practical solutions to address local environmental challenges. Tyler (2006) states that CBNRM, or more specifically co-management, covers "spectrum of arrangements from formal legal agreements that are politically negotiated to informal pragmatic deals" (p. 3).

Even though the approach focuses on local people, government agencies remain the key actors (Tyler, 2006). Power devolution from the responsible state agencies to local people is

prerequisite to the approach to be implemented (Murphree, 2005; Pomeroy et al., 2007). A spectrum of power devolution varies depending on "the nature of the resource, the political context, the expertise and skills of participating organizations, and the degree of mutual trust" (Tyler, 2006, p. 21). On the one end, the communities are informed by the state agencies before actions are taken. On the other end, both parties the community and the state have equal partnerships under local control; legalized roles and powers. From the 1980s to early 2000s of introduction of co-management, a form of power sharing from the state to local resource users and local organizations for resource management has been noticed in 50 nations and up to 500,000 local organizations around the world (Agrawal, 2002 and Pretty, 2003 cited in Armitage, 2005).

Figure 1: Spectrum of power sharing for resource management quoted from Tyler, 2006)

After more than thirty years of its implementation, the definition of CBNRM remains vague. It means different things to different people ranging from policy makers, advocate, practitioners, and local people (Tsing et al, 2006). Its name are also differs depending on the nature of the contexts and projects, for instance community-based eco-tourism, community forestry, community protected areas, community based watershed management, and co-management of natural resources, among others. This case study will focus on communities, where co-management, one form of CBNRM, was applied and have been in place for almost two decades. The definition and the arrangement of co-management will be discussed later in the section.

Next is the brief literature of community, the sole focus of CBNRM approach.

- **Community**

The definition of community is broad. It can exist in a wide range of forms from academic to social, political, religious, corporate, media, internet, sport, entertainment, among others (Bourke, 2010; Tracy, 2009, Hallahan, 2005). The definition of the "community" for this

study will, however, limit itself to geographical based definition. It is defined as a set of social relations of diverse group of people with multiple interests occurring within a distinctly spatialized and geographical setting (Agrawal & Gibson, 1999; Bourke, 2010). People in the community "are tied together because they interact with one another and share common beliefs, values, and cultural artifacts of life—language, traditions, customs, mores, and so on" (Hallahan, 2005).

With the above definition, CBNRM aims to create a locally based institution to facilitate and regulate the processes in which these diverse actors interact in order to access, use, and control of resources in a clearly delineated territory (Agrawal and Gibson, 1999). It particularly seeks to solve the problems of exclusions and sustractability. Exclusion refers to "the ability to exclude people other than the members of a defined group" (Berkes, 2006, p. 3), whereas subtractability is "the ability of social groups to design a variety of mechanisms to regulate resource use among members. In many cases, resource users have been able to avoid Hardin's "Tragedy of the Commons" by devising rules for self-governance, monitoring mechanisms, and sanctions that rely neither on government control nor private property rights" (Berkes, 2006, p. 3). Numerous scholars try to provide conditions in which each community has to fulfill. For instance, Ostrom (1990) lists eight principles including (1) clearly defined boundary, (2) congruence between appropriation and provision rules and conditions, (3) collective arrangement, (4) monitoring, (5) graduated sanctions, (6) conflict resolution mechanism, (7) minimal recognition of rights to organize, and (8) nested enterprises. Agrawal (2001) expands the list with as many as 40 critical enabling conditions that may be important for the success of commons institutions. These conditions are, however, difficult to realize in real world situations, and problems of mismatch between these predefined conditions with local context are generally noticed (Bene et al, 2009; Berkes, 2006).

The below section is the brief literature review of institutions, which will be mainly referred to throughout the paper.

- **Institutions**

Institutions are defined in this study as "formal and informal rules, rule-making systems, and actor networks at all levels of human society (from local to global) that are set up to steer societies towards preventing, mitigating, and adapting to global and local environmental change" (Biermann et al. 2009). Tyler (2006) states that

"[t]he institutions of natural resource management reflect prevailing social and political processes – how do people interact, who holds power, and how can it be legitimately used. They may be based on legal and juridical procedures, on religious beliefs, or on traditional practices. Institutions are the mechanisms by which society define who can use the resource and who is excluded, and how access and benefits may be shared among right holders. They also can provide mechanisms to resolve conflicts, track resource quality and identify problems, take measures to improve resource quality, and enforce rules" (p. 10).

Institutional adaptive capacity refers to "…the inherent characteristics of institutions that empower social actors to respond to short and long-term impacts either through planned measures or through allowing and encouraging creative responses from society both ex ante and ex post. It encompasses:

- The characteristics of institutions (formal and informal; rules, norms and beliefs) that enable society (individuals, organizations and networks) to cope with climate change.
- The degree to which such institutions allow and encourage actors to change these institutions to cope with climate change." (Gupta et al. 2010).

3. Research Methodology

The research initially reviews secondary data and information from relevant sources in which the authors have worked to compile for more than a decade. Primary data was then collected in the field through participant observation, formal interview with key informants, and focus group discussion on institutional arrangement for natural resource management, local livelihoods, and major challenges and weaknesses of the existing institution. The table 1 below indicates research activities conducted from April – December 2014.

Table 1: Focus Group Discussion and Interview

Date	**Research Activities**	**No. of Meetings/ Interviews**
April 2014	Desk review	Phnom Penh
May 2014	Participant observation and information discussion with local people in Koh Kapic, Koh Sralao, Koh Kang, and Peam Krasoap (1 week in each community)	PKWS, Koh Kong
1st week June, 2014	Three Focus Group Discussions (FGD) in Koh Kapic with - Village Management Committees; - Fishers; and - Villagers (See annex 1 for what was discussed)	3 FDGs
2nd week June, 2014	Three Focus Group Discussions (FGD) in Koh Sralao with - Village Management Committees; - Fishers; and - Villagers (See annex 1 for what was discussed)	3 FDGs
3rd Week	Three Focus Group Discussions (FGD) in Koh Kang with - Village Management Committees; - Fishers; and - Villagers (See annex 1 for what was discussed)	3
4th Week June, 2014	Three Focus Group Discussions (FGD) in Koh Kang with - Village Management Committees; - Fishers; and - Villagers (See annex 1 for what was discussed)	3

July, 2014	Data transcription	
August – September, 2014	Interview with key informants (former Staff of Participatory Management of Coastal Resources, Deputy Director of Provincial Department of Environment; Deputy Director of Department of Agriculture, Fisheries, and Forestry; Deputy Director of Provincial Department of Women's Affairs; Director of Peam Krasoap Wildlife Sanctuary; and Former Manager of UNDP-GEF small grant; former representatives of village management committees; respected elders in the village)	50 people
October – December, 2014	Workshop review on final case study writing with local stakeholder in Koh Kong and sharing key lesson learned from the case study on co-management of coastal resources in PKWS and other consideration for future action	26 people

4. Peam Krasoap Wildlife Sanctuary and Local Livelihoods

Peam Krasoap Wildlife Sanctuary (PKWS) locating at Western Cambodia is one of Cambodia's 23 protected areas officially established by the Royal Decree on Creation and Designation of Protected Areas dated November 1, 1993 in which the National Ministry of Environment of Cambodia is given jurisdiction. The sanctuary covers an area of 23,705 hectares. It is one of the ten Cambodian Wildlife Sanctuaries and of six protected areas in Koh Kong province. This large Wildlife Sanctuary was created because of its unique ecological, cultural, social, educational, and aesthetical functions. Unique pristine mangrove ecosystem, estuarine areas, wetlands, seagrass, and coral reefs in the sanctuary are significant habitats, nursing and feeding grounds, and migratory routes for aquatic animals, small and large mammals, and migratory birds. Mangrove also plays crucial roles in protecting the coast against storm and subsidence. In addition the ecological functions, the sanctuary supports more than 10,000 people settling within 15 villages lying in six communes of three districts in its boundary. Mangrove serves various consumptive purposes including fishing ground, construction materials, food, and other non-timber forest products. Fishing is embedded in local livelihoods and cultural practices. Fisheries products from the sanctuary are sold to nearby town or as far as Thailand or Phnom Penh and other provinces of Cambodia. The sanctuary is also a destination for research and ecotourism for both local and distant visitors both national and international. The followings are the detail of livelihoods and institutional arrangements in the PKWS.

Table 2: The Human Population Settling Within PKWS Boundary

Name of the Area	2012	
	No. of Families	**No. of People**
Mondul Seima District	***704***	***3,061***
1. Commune: Baklong - Beong Kachhang village	139 139	555 555
2. Commune: Peam Krasoap - Peam Krasoap 1 village (Beong Kayak located in this village) - Peam Krasoap 2 village (Koh Kang located in this village)	291 151 140	1,307 688 619
3. Commune: Tuol Korki - Tuol Kokir Kraom village - Tuol Kokir Leu village - Ta Chat village - Koah Chak village	274 39 71 114 50	1,199 167 308 499 225
Koh Kong District	***894***	***4,092***
1. Commune: Koh Kapic - Phum Ti Muoy village - Phum Ti Pi village - Koh Sralao village	629 249 73 307	2,967 1,205 393 1,369
2. Commune: Ta Tai Krom - Koh Andet village - Anlongvat village	265 110 155	1,125 459 666
Smach Meanchey District	***663***	***3,065***
1. Commune: Steung Veng - Steung Veng village - Preak Svay village	663 471 192	3,065 2,246 819
Total	**2,261**	**10,218**

Source: National Institute of Statistics, 2012

***Note:** this is the official data in which permanent residents are registered. Short-term migrants are not counted.*

Local livelihoods are complex and diverse, and they vary depending on knowledge, skills, experiences, household wealth, seasonality, labour, market demand, education, culture, and religion, each household has. In PKWS there are plenty of livelihood options, but the most common activities are fishing including offshore, onshore, and mangrove-proximity fishing for fish, crab, squid, and shrimp. In addition to fishing, fisheries related activities including aquaculture, fisheries products traders, fisheries product processing, labour selling for crab peeling, off-shore fishing, and fishing-gear fixing are also part of ordinary life. The remaining activities are non-timber forest products (honey, mushroom) collection, fresh water sellers, groceries and coffee shops, and public servants (environmental rangers, local police, military, teachers), workers for eco-tourism, and labour selling for farming, boat driving, and waste

collection. The above livelihoods cannot be separated, as households have more than one livelihood activity.

This research will cover four communities lying within four villages out of the 15 villages in the entire sanctuary. The communities namely Koh Kapic, Koh Sralao, Koh Kang, and Peam Krasoap are chosen based on the prior experiences and availability of data of the authors. The following are the snapshots of the villages.

KOH KAPIC Community

Koh Kapic is a long established fishing village located in PKWS. Prior to the KR, this village was the administrative headquarters for the area. This small upland area is a now an abandoned coconut plantation for the fishing communities to settle. More than 90% of the people depend on fishing and fishing related-activities for their main livelihoods. There are around 328 families (1,630 people) live in this village. Despite abundance of lush, tall mangroves, and rich bio-diversity, Koh Kapic was registered as a Ramsar Site. It takes somewhere from one to three hours by boats from town center.

KOH SRALAO Community

Koh Sralao is another old fishing village located within PKWS. The majority of the villagers are newcomers, who were attracted by the economic incentives of the abundant mangrove and fisheries resources. Fishing and fisheries related-activities are the main livelihoods for most of the villagers. Currently, there are 299 families (1,282 people) inhabiting in the area. Koh Sralao is 2,600 m long (east to west) and 2 100 m wide (north to south); the highest elevation is 27 metres from sea level. Koh Sralao's terrain can be divided into upland and lowland sites. Lowland covers 65% of the total area of the village locating in the western part and it consists of tall grasses and abandoned rice fields. Highland extends around 35% of the total area. It is hilly and forested in which people do upland farming. The highland areas are also sources of water spring supplying water for villagers of Koh Sralao and nearby communities. A few rich households are able to buy lands and plants cash crops and fruit trees including banana, rubber, mangosteen, pineapple, jackfruits, potatoes, corn, rambutan, cashew, and custard apples. It takes from 30 minutes to two hours to access to the island depending on the means of transportation and weather condition.

KOH KANG Community (Located in PEAM KRASOAP 2)

Koh Kang is a newly established village found in early 1990s. It is under the all villagers are new settlers coming from other parts of Cambodia for economic incentives of the abundance resources, particularly for charcoal production. This village is located in the heart of the wildlife sanctuary. There are about 100 households living in the village depending on fisheries and green mussel aquaculture for their livelihoods. The village is closer to town compared to the above two communities. This makes it more convenient for villagers to access to health care, education, and economic opportunity, even though existing infrastructure are limited in the village.

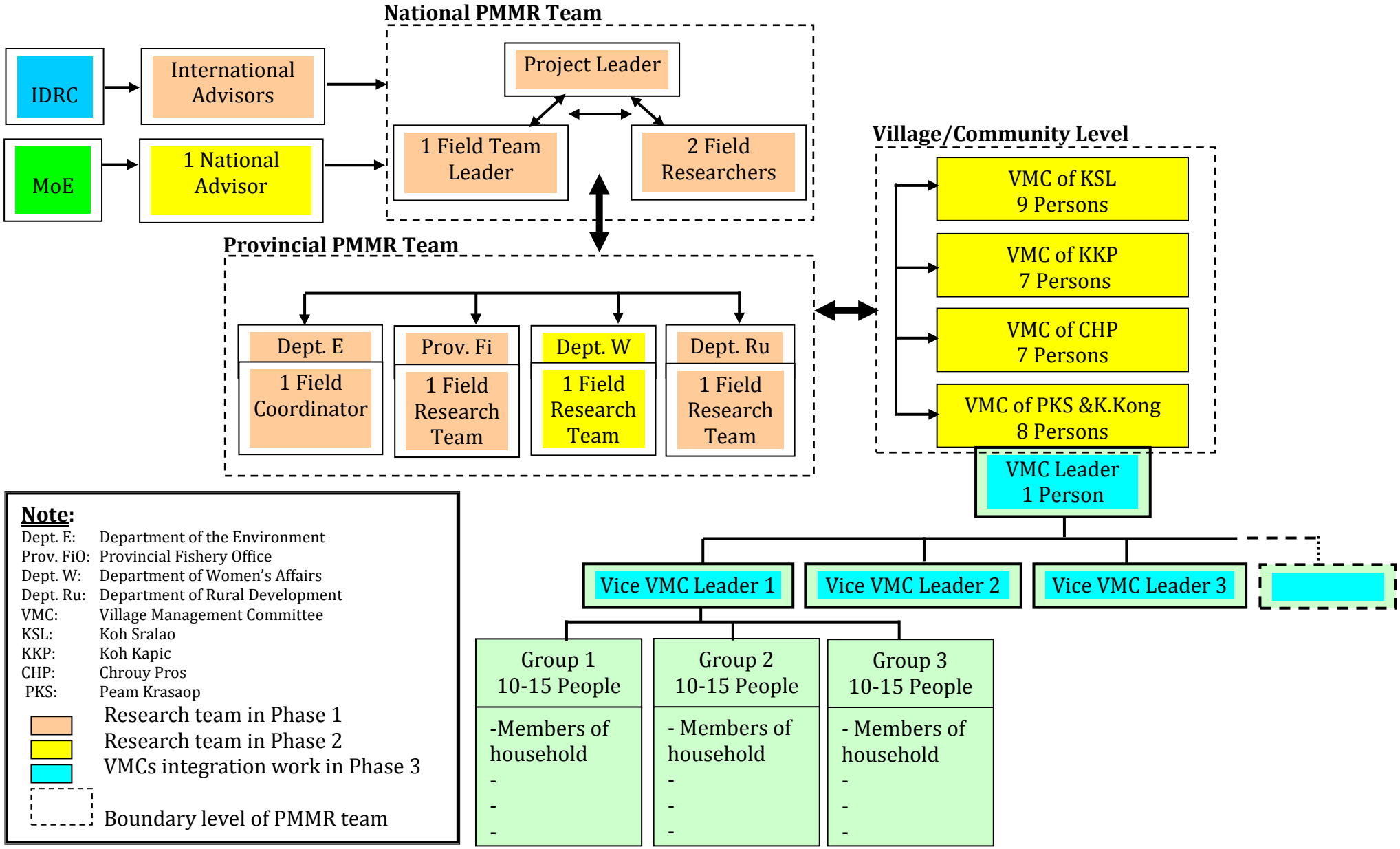
PEAM KRASOAP Community (Located in PEAM KRASAOP 1)

Beong Kayak is a new village relocated from Old Peam Krasaop One village in 2004. This village holds the strongest connections with Thailand. Many villagers continue to speak a mix of Thai and Khmer. The village is much better off compared to the above three villages, as it locates on land and easily accesses to Koh Kong via asphalt road. The establishment of community-based ecotourism makes it even better for the village to connect to town, the capital city, and Thailand. Thousands of tourists come visit mangrove ecotourism annually. Local livelihoods have shifted from totally fishing to more service oriented. While the majority of villagers spare their times from fishing to be boat drivers for tourists or motor taxi drivers, some people have shifted totally from fishing to service sectors.

All the above four villages have three communities for Natural Resource Management. Koh Kapic and Koh Sralao village have their own community, while Koh Kang and Beong Kayak forms into one community, known as Peam Krasoap, because of its geography. The communities established are new form of institution for natural resource management and products of an introduction of co-management in attempt to stop destructive mangrove and fisheries extraction. In early 1990s, natural resources, especially mangrove and fisheries were chaotically exploited. Mangrove was heavily cut for charcoal production and pole construction for domestic consumption and export to Thailand. In 1996, around 26,760 cubic metres of mangrove tree were used to produce 6,135 tonnes/year (PMMR, 2000). Fisheries resources declined because of unsustainable practices, water pollution from mangrove cut, and habitat destruction. Efforts made by technical departments were not successful, because of rent seeking and bribery taking embedded in the government command-control management approach.

Having noticed the dramatic decline of mangrove and fisheries resources and rising tensions among resource users, in 1998 the Participatory Management of Mangrove Resources (PMMR) later change to Participatory Management of Coastal Resources (PMCR), under technical and financial support from International Development Research Centre (IDRC), introduced Community-based natural resource management or co-management approach aiming to effectively sustainably manage and conserve natural resource through participatory learning or learning-by-doing. It comprises of public servants from national level, the Ministry of Environment and provincial levels, from various technical departments. The Ministry of Environment (MoE) is the lead institution followed by interdisciplinary team at provincial levels including Department of Environment, the Department of Fisheries, the Department of Rural Development and the Department of Women's Affairs. The team from national and provincial level then go facilitate and work with local authorities and local resource users. The following figure illustrates the structural arrangement of PMMR team and how they work.

Figure 2: PMMR Structural Arrangement for Action Research



A central tenet of this work was to promote the rights of, and to empower, local people, including fishers and commune leaders, in the sustainable management of the coastal environment. In particular, the PMMR team worked with local community and government agencies to improve their understanding of, love for, and desired to protect coastal resources through participatory action research. Skill development in effective planning, stewardship and management of coastal resources enable participants to practice more sustainable livelihoods. The core priorities that have oriented PMMR activities include:

- Sustainable use of coastal resources, especially the mangrove ecosystem
- Adaptive learning about both the CBNRM and the co-management concepts for community management plans
- Enhancing grassroots ownership of the resource management process
- Improving distribution of resources
- Diversifying local options to assist in securing sustainable livelihoods
- Encouraging powerless people and working towards a gender balance in all activities
- Promoting change in the legal and policy frameworks that affect CBCRM
- Sharing research lessons with both horizontal (other ministries and NGOs) and vertical (line departments) institutions.

In the beginning of PMMR, skills and knowledge of PMCR team as well as relevant stakeholders from national to local levels on approaches above were limited. Then, those key human resources had gradually improved through trainings (all project staff, and key persons in the communities), workshops, study tours, community natural resource protection establishment, environmental education and campaigns, mangrove forest replanting and maintenance, data collection, project monitoring and evaluation, and the implementation of pilot project for livelihood improvement, meetings with government institutions and NGOs, and other involvements. Through the project activities government relevant authorities were convinced and believe that collaboration among stakeholders is very important in environmental protection and conservation, and it can better solve existing problems. Moreover, there was an economic incentive for villagers to be involved in Community-Based Coastal Resources Management (CBCRM) initiatives – it is more efficient, as the government do not have sufficient human and financial resources to protect natural resources in a remote area. Furthermore, facilitation between different players or stakeholders had been integral to the work for resource management planning, mangrove replanting, sea-grass conservation and protection, waste management, alternative livelihoods development, micro credit initiative, providing a platform for fisheries conflict resolution, and coastal eco-tourism development, among others.

A process of 'community organizing' was then undertaken in each of the community. Villagers drafted their own resource management plans based on what and how they would like to manage resources with advice and/or assistance from technical institutions and local authorities. All the communities then managed to develop their regulation with official recognition from Koh Kong provincial governor and Minister of Environment in early 2000s. The recognition served as a legal basis for communities to enforce their rules within their own communities with restriction on resource users, from both within and outside the village on the do and don’t in the community boundary.

Had been hard working on the trainings and capacity building programmes, PMMR was able to discuss with the state responsible agencies and the new formed Village Management

Communities and its members on how to stop destructive mangrove extraction. The multi taskforce comprise of technical departments, military, police, and local people were formed. This was a new and changing institutional landscape, as local people and their indigenous knowledge became more welcomed by the technical departments after exposing and working together for a period of time. In the past, the state authority would not recognize indigenous knowledge and any involvement of local people, as there was a strong belief that the former were the only entity having scientific and technical knowledge credible for natural resource management. Technical departments and arm forces had more focuses on law enforcements, while the Village Management Committees and villagers play roles of an environmental activist disseminating knowledge on the value of mangrove, fishing habitat, and the environment in general, surveillance roles reporting to the taskforces about where charcoal kilns and illegal fishing took place, and participating in patrolling, confiscating, and destroying charcoal kilns and fishing gears.

The campaigns for cracking down charcoals kilns was soon after started and a number of illegal fishing gears were destroyed. The situation was tense at the start, as a number of villagers did not have alternative livelihood. Most of the new migrants did not know how to fish, while a number of others were accustom to illegal fishing practices. Under tremendous pressure of continuous law enforcement smashing their livelihoods, however, the charcoal producers and illegal fishers faced with restricted decision whether to stay and giving up their livelihood practice or migrate to other places. Some chose to stay, while other decided to return to their homeland and/or other places for new livelihood opportunity. After several years of law enforcement and participation from local communities, conservation and protection of mangrove have become norm in the area from earl 2000s, and large areas of mangrove has naturally grown and replanted.

The successes of PMMR derived from four important strategies as follows:

a. Capacity Building

The research process that the PMMR team undertook is complemented by continual facilitation and capacity building activities with the community members and all relevant levels of government. This process assists in building relationships between stakeholders, fostering a shared understanding of the community based coastal resource management approach, and building skills relevant to the successful creation and implementation of participatory management plans. Conducting workshops that include all levels of government to strengthen the government process and to enhance local understanding of legislative and policy frameworks that relate to resource management, and producing ongoing reports, reflection and internal analysis of team activities to ensure that there is constant growth in the team's capacity are some of activities PMMR applied.

b. Field Action and Learning

Participatory Research (PR) has proved successful in encouraging community cooperation and participation in data collection and the analysis of local issues. PR techniques enable villagers to work together to develop their own plans for resource management. Importantly, PR fosters strong relationships between relevant institutions, communities and researchers: it provides opportunities for everyone to learn from each other, compelling them to work together rather than alone. PR tools used throughout the PMMR work include mapping

exercises, seasonal calendars, problem trees, historical transects, oral histories, Venn diagrams and ranking exercises. These exercises have been carried out in workshops and large and small group meetings among individuals and in focus groups. This kind of research allows for a two-way transfer of knowledge in that it engages communities in discussions relevant to their environment, and enables them to rank their problems and to prioritize potential actions. Similarly, PR is closely linked with environmental education in which a participatory style is also used to teach people or to facilitate group discussions and workshops on environmental issues such as mangrove degradation; waste management and conflict within the fisheries sector. Community members have also undertaken study tours in Thailand and Sri Lanka that have focused on community-level discussions of resource management issues and potential solutions.

c. The Multi-Pronged Approach for the Multi-Stakeholder Landscape

To successfully implement community-based management over an open-access resource, cooperation, participation, and the support of all stakeholders are required. In order to garner these, horizontal and vertical links and relationships among all stakeholders must be encouraged. The PMMR team's approach is multi-pronged, whereby all activities are used to advance this process among all stakeholders. No activity is performed in isolation for a single party. For example, a mangrove replanting exercise in Koh Sralao village is used as an educational activity for the villagers, a study tour opportunity for high government officers to garner support, and provides the material for the creation of a learning module on mangrove replanting techniques for other interested communities.

d. Collaboration and Network Building Approaches

Throughout the history of the PMMR project, collaboration with the stakeholders and agencies in Koh Kong has been crucial to an integrated application of a CBNRM model that incorporates the diverse interests of the communities involved. Through a collaborative approach, robust networks are created that bolster community action with financial resources, verbal encouragement, expanded opportunities, technical expertise and supportive policies and legislation.

The PMMR team acts under the Ministry of the Environment in collaboration with a wide range of partners:

- National level - the Nature Conservation and Protection Department, Environmental Education Department, and Secretariat of the Director General
- Provincial level - the Departments of the Environment, of Fisheries, of Rural Development, and of Women's Affairs
- Local institutions - including commune councils, village chiefs, VMCs, and local community members
- Local agencies - including the Seila Program and Coastal Zone Management Project/Danida, then changes to Decentralization and Deconcentration Programme, the CBNRM Learning Initiative (which is now the CBNRM Learning Institute). Table 2 provide further information on the government and non-government projects/programmes.

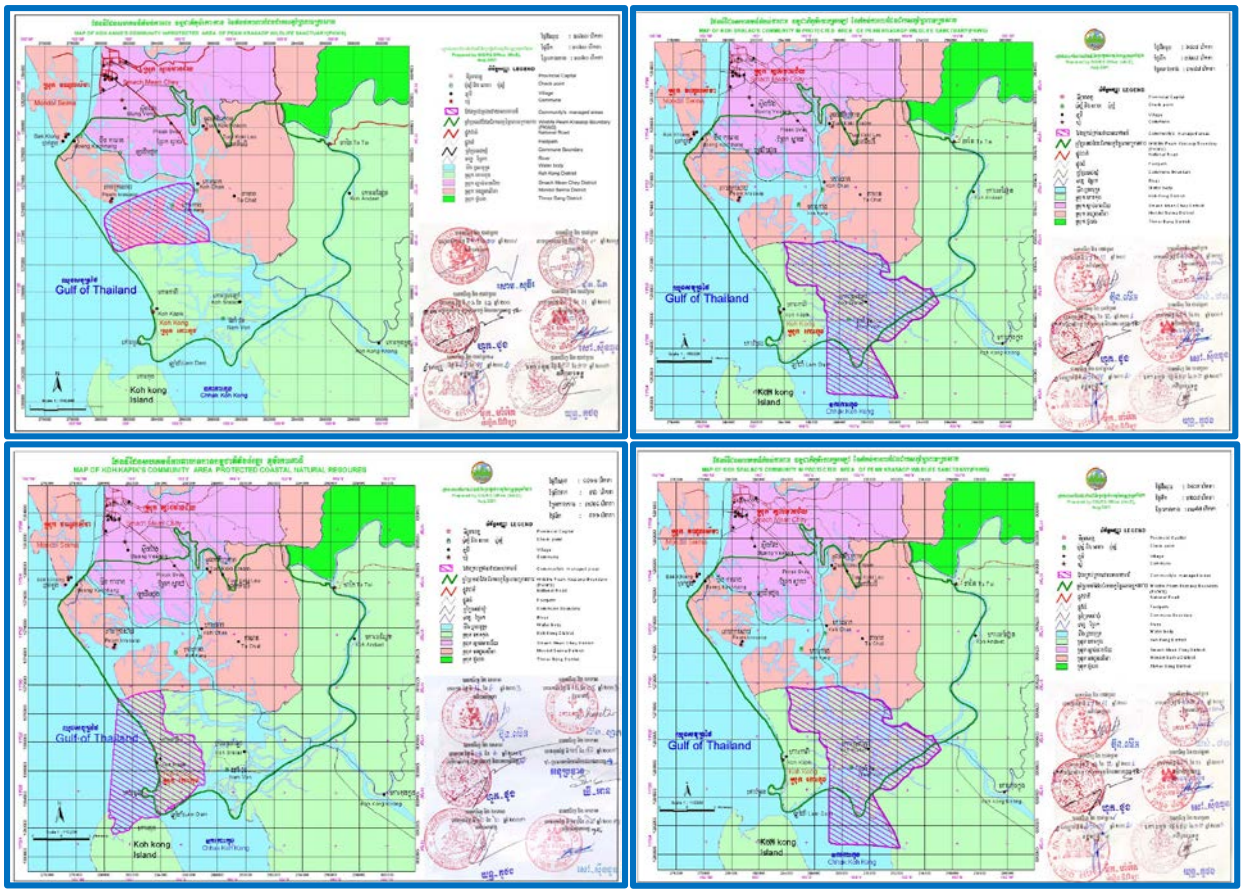
Other regional partners - including the Mangrove Action Project in Thailand, Learning Research Network (LeaRN) in the Philippines, and other NGOs.

Next section will be more discussion about the current institutional arrangement after the introduction of co-management.

Current Institutional Arrangement

The current institutional arrangement is the result of the introduction of co-management made by PMMR. It helps builds capacity of local villagers and local government agencies, and creates enabling environment for local villagers, local and provincial state agencies, and non-government organizations to work with one another. Over a period of time, power has gradually been devolved from the state to local people (locally known as community). Community in this context refers to *"a group of people settling in certain geographic locations binding together as a group to sustainably manage natural resources. The community are apolitical and do not get serve the interests of any political party and it follows state laws and policies"* (Koh Sralao Community's Regulation). The group is officially recognized by the provincial governor and minister of environment or it is known in Cambodian Law on Protected Areas as community protected areas. Community protected areas are responsible for sustainably managing their local resources whether forestry, fisheries, and/or other kinds of resources. Membership of the community is voluntary, and it may be comprised of villagers from one or more villages, but not all villagers are necessarily members of the community. In PKWS, several communities are established, and they are responsible for managing their local resources, and may help their neighboring communities upon request. The following map indicates a number of communities established in PKWS and territorial boundary.

Map of PKWS with Zoning



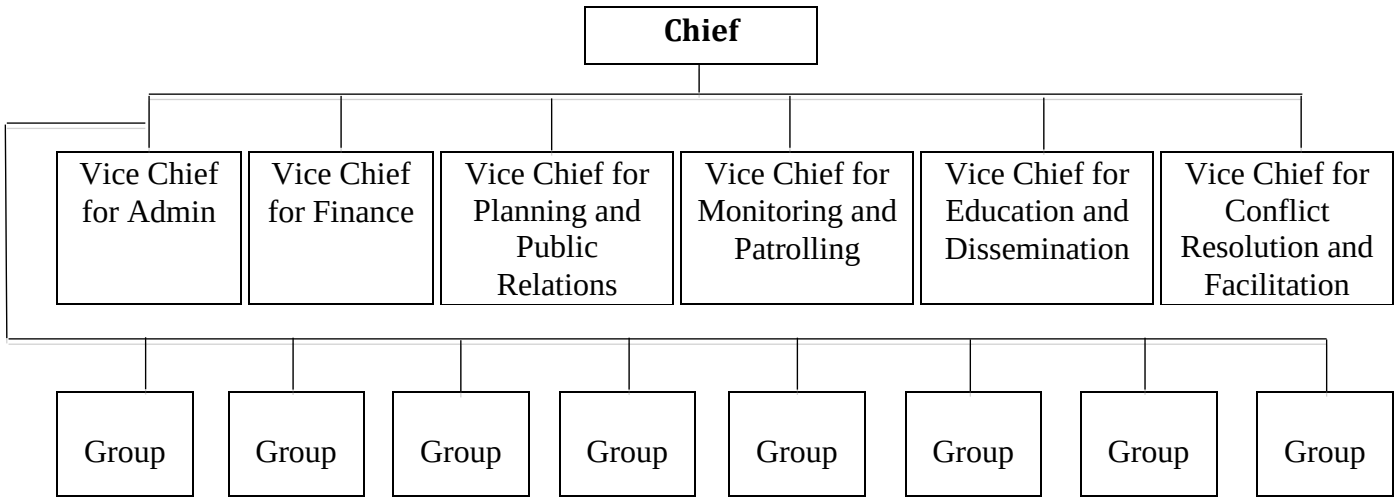
The followings are the direct translation of some of the articles in the regulation of Koh Sralao, one of the communities in PKWS.

Article 1: The community was established in order to (1) sustainably manage natural resources [namely flooded forests, fishes, shrimp, crabs, snails, seagrass, coral reefs, and wildlife (quote from article 2)] in PKWS, (2) improve local livelihoods, (3) participate in the enforcement and implementation of state policy on protection, conservation, and sustainable management of coastal resources, and (4) strengthening collaboration between villagers, local authorities, relevant state agencies, and local and international non-government organizations.

Article 7: The community has seven people in the Village Management Committees, who were elected by the community's members. A person who got the highest polls becomes the chief of the VMCs, and the rank of the vice chief follows the number of polls. The VMCs have the following roles and responsibilities including (1) checking and approving official requests related to community work, (2) liasing and facilitating with local authorities, relevant state agencies, and local and international non-government organizations, (3) educating and disseminating state laws and policies related to community management, (4) organizing meetings, (5) developing management plan, internal regulation, and guidelines for the community, (6) facilitating in head and vice head of operational group, and (7) issuing and claiming penalty charges from illegal acts.

Article 9: the chief of VMCs is responsible for overall management of community, while the other six vice chiefs are in charge of administration, finance, planning and public relations, monitoring and patrolling, education and dissemination, and conflict resolution and facilitation, and report to the chief. Under the VMCs, there are a number of groups responsible for supporting the above sectors. The head and vice head of each group are voted by group members under the facilitation of VMCs.

Figure 2 is the management structure in Koh Sralao Community



Article 15, when resource users are caught violating community's regulation, the VMC will take these actions (1) informing about local regulation and sign a contract for not repeating the mistakes; (2) issuing warning, and penalty charge depending on the acts, and (3) if the persons keep on repeating the mistakes, the VMCs will file the cases to technical departments for legal actions. The budget received from penalty will be paid 50% to the community's budget, and 50% for the law enforcement team.

The current co-management regime in PKWS operates both formal and informal arrangement. Initially, the actors interact and collaborate within the limit of its own jurisdiction. Ministry of Environment, for instance, has jurisdiction over natural resource management of PKWS assigned by the Royal Decree on Creation and Designation of Protected Areas dated November 1, 1993, while the local authority (commune councils and administrative police) is in charge of security and social orders. Then the community for natural resource management, the new actor, is also legalized with a formal recognition from the state agencies namely the Office of Koh Kong Provincial Governor, and the Ministry of Environment. There was also a case that VMCs helped patrol and enforce regulations on natural resource management for their neighbour community with assistance from administrative police of Koh Kapic commune. Then when the illegal fishers went into administrative boundary of another commune, the administrative police had to come back because they could not go beyond their administrative boundary, and the request for intervention from police of the crossed commune failed, as a request for collaboration from local police requires their supervisor's permission. The example also applies to environmental rangers. They can go patrol within PKWS, and going beyond that requires permission of the responsible authority of the other side. Some barriers for collaboration were removed before PMMR project ended in 2012, as the later had team with membership from line agencies to facilitate and bring all stakeholders to work together. Without the PMMR as a facilitator, the collaboration became more difficult.

Table 3: below provides lists of key actors involved in natural resource management in PKWS

No	Name of Institutions	Roles and Responsibilities
1.	Koh Sralao Natural Resource Management Committee with support from MoE	Joining with MoE for Sustainable management of natural resources. It is officially recognized by MoE and Provincial Authority
2.	Park ranger of GDANCP, MoE	Sustainable management, protection, and conservation of natural resources
3.	Provincial department of environment, MoE	Sustainable management and conservation of natural resources and environment
4.	Local authorities, both administration and police, under MoI	Ensuring social order, security, safety to all people
5.	National Committee for Sub-national Democratic Development, an inter-ministerial institution headed by Ministry of Interior	Ensuring democratic development through decentralization and deconcentration reform. Natural resource management is included.
6.	Ministry of Industry, Mines, and Energy (Committee for Sand Resource Management)	Issuing permit for sand-mining
7.	Ministry of Water Resources and Meteorology (Committee for Sand	Issuing permit for sand-mining

	Resource Management)	
8.	Fisheries Administration (FiA)	Sustainable management of fisheries resources, flooded forests, and mangrove (provide assistance when there is a request from MoE, as PKWS is beyond jurisdiction of FiA
9.	Department of Rural Development	Collaborating, and managing rural paths, rural water supply, primary health care; developing community and rural economy
10.	Department of Women Affairs	Promoting gender equality and empowerment of women
Non-State Organizations and Projects (1997-Present)		
11.	Participatory Management of Coastal Resources (PMCR or PMMR-Ministry of Environment /International Research Development Center)	Coastal resource conservation, especially on mangrove resources and livelihood improvement through participatory action research learning (1997-2012)
12.	Small Grant Programme (Global Environment Facility/United Nations Development Programme)	Coastal resource management and local development (2006-2013)
13.	International Union for Nature Conservation (IUCN)	Mangrove replantation, coastal conservation, livelihood improvement (2008-Present)
14.	Coastal Zone Management (CZM-MoE/Danida)	Coastal zone management, institutional capacity building, and local development (1997-2007)
15.	Coastal Adaptation and Resilience Planning (Multi-donors)	Building local capacity to adapt to climate change (2012-2014)
16.	Biodiversity Conservation Corridors Project (ADB)	Mangrove restoration, coastal resource conservation, and livelihood improvement (2011-Present)
17.	Save Cambodia Wildlife (SCW)	Coastal resource conservation and livelihood improvement (2009-2012)
18.	Support from Thailand Sufficiency Economy Policy	Inclusive local economic development (2007-2008)
19.	Seila Programme, which later shift to Decentralization and Deconcentration Programme	Good governance, local development, and natural resource management (2002-2007)
20.	OISCA International (Organization for Industrial, Cultural, and Advancement)	Mangrove replantation (2005-2006)
21.	Mangrove Action Project	Capacity building for mangrove management

		and restoration (2008-2014)
22.	American Friends Service Committee (AFSC)	Service, development, and peace programme (1997-2010)
23.	Fisheries Action Coalition Team (FACT)	Monitoring fisheries sectors through research and network building (2000-Present)

Even though existing institutions are required to operate within formal establishment, VMCs of each community is also utilizing their informal networks built by PMMR. Some VMCs, for instance, approach PMMR team at provincial level to provide technical advice on operation in the community and coordinate with local authority when tensions occurred. Some would call to PMMR team leader at national level when the problem cannot be solved at local and provincial level. For instance, in June 2014, VMCs from Koh Sralao called the PMMR team leader and reported about sand-mining company that came and dredged sand destroying fishing ground in the community without license, as the case was well known at local and provincial level, but no actions were taken. PMMR leader managed to report the case to the Minister of Environment and then accompanied the delegates of the Ministry of Environment to check at the site. Sand-mining was then stopped after the trip by MoE delegates.

Applying the six dimensions: diversity, learning capacity, autonomy, leadership, resources, and fair governance of Gupta et al.'s (2010) adaptive capacity framework, the PKWS current institution illustrates the followings:

- ***Diversity***

Table 3 above indicates high level of participation from different actors in natural resource management in PKWS. Diverse actors from national to local state agencies and non-state actors including local people and NGOs have continuously and actively participated in and/or taken responsibility for policy formulation, consultation, and implementation for management of PKWS. These diverse groups of people are able to keep check and balance of natural resource use. Villagers represented by Village Management Committees, for instance, meet with local authority, park rangers, and provincial department of environment on regular basis to discuss about the resource management or request for interventions when needed. In the case that provincial and local state agencies cannot help, intervention at national level would be sought, as national team also has regular visit to different communities to get update about changes and challenges of resource management at the sites. An informal connection, i.e. telephone call, also helps maintain relationship between local, provincial, and national level. An example is seen on the case of sand-mining in Koh Kong province by a private owner. There were efforts of communities in stopping sand-mining by sending petitions to the state responsible agencies in 2008, but it failed to get attention from the top national institutions. After eight years of operation, the impacts of sand-mining on local environment and livelihoods in the nearby communities were rampant and widely shared. Then when the sand-mining operators came and dredged sands inside the boundary of PKWS, the park authority and local communities were alarmed. They went visit the site of sand operation and tried to stop, but failed. They then reported the case to the department of environment, and at the same time contacted the PMMR

team leader at national level. With formal report from the PKWS authority and provincial department of environment along information from local communities, the PMMR team leader, who is also the Deputy Director General for Nature Conservation and Protection, was able to request for intervention from the Minister of Environment. A taskforce from Ministry of Environment comprised of an under-secretary of state, Deputy Director General for Nature Conservation and Protection, Director of Provincial Department of Environment, and Director of PKWS from Ministry of Environment was finally formed to investigate the case. Eventually, sand operation was stopped and withdrawn from the boundary of PKWS.

In addition, individual community has also been able to work local consultants and NGOs to develop project proposal seeking for funding from non-government organizations for local resources conservation. A number of projects on mangrove replantation, climate change adaptation, mangrove and coral reef conservation, coastal resource inventory, eco-tourisms, and other livelihoods related projects have been implemented under financial and technical support from local and international non-government organizations.

- ***Learning Capacity***

All the above actors involved in the management of PKWS have a great chance of learning. Starting with local villagers and park rangers, there has been countless awareness raising programmes, trainings, workshops, and study tours at local, provincial, national and regional level on environmental management, good governance, project management, livelihood improvement, coastal conservation, and mangrove inventory and restoration, among others provided. Hand-experiences in project proposal writing, implementing, and evaluating, along with attendance in conferences and workshops from local and national levels allows local people and park rangers to learn new knowledge and skills and to expose to different groups of people, and make their voices heard at various levels through presentation, debate, and knowledge sharing session. Learning does not happen only at local level. Provincial and national state institutions and non-government organizations also learn new skills in working with different groups with similar interests in managing natural resources. The system of learning remains in place after almost two decades of its kick-start.

- ***Autonomy***

The communities in PKWS have limited autonomy. In the 1990s, when CBNRM was introduced, state command and control approach was dominant, and many state institutions did not welcome the ideas of local participation. To public servants, local people were considered as ignorant and backward without scientific knowledge and capacity to manage their resources. Importantly, rather than sharing power with the later, the former wishes to hold absolute power in managing natural resources, which were considered as a source of financial support for institutional operation. Negotiation supported by important project staff both nationally and internationally for local participation in consultation, planning, and management of natural resource management was going on for years through various awareness raising programmes, meetings, workshops, project activities and among others, and the ideas was finally bought by the responsible agencies and local authority, and supporting legal documents including Sub-decree on Fisheries Community Management, Sub-decree on Forestry Community Management,

and Protected Areas Law specifying the role of local communities in natural resource management were produced. Having local people been recognized was successful step for the advocate of CBNRM and local people. Unfortunately, the advocate cannot push further for absolute local autonomy as practiced in many other countries.

In PKWS, same to places in Cambodia, even though the term "Community-Based" approach is widely used, co-management is actually been practice. Community has the role to propose management plan and project implementation, but needs approval and supervision from park authority and provincial department of environment with collaboration of local authority. Article 15 of the Koh Sralao community, for instance, allows community to fine illegal acts, but if those responsible repeatedly continue the acts, legal actions must be taken by the responsible agencies.

Co-management in PKWS, however, has no standard of application. It is selectively applied, and the extent to which local people are empowered and included in planning and decision-making process remains in question. Applying the spectrum of power of Goetze 2004 adapted by Tyler 2006 to the case of power sharing between the state and local people in PKWS shows that it is difficult to define the level of autonomy. The practice varies from *local control to informing*. Community has, for example, autonomy to manage budget generated from their activities, i.e. eco-tourism, donor funding, and fees from fining illegal acts, while cutting mangrove tree more than given quota needs permission from park rangers. In case of dealing with large-scale investment projects, for instance sand-mining, co-management was not even applied. Local communities were not even informed about the planning and decision made at national level. An example can be found in Koh Sralao, where sand-mining plays major roles in dividing local unity. Sand-mining detrimentally affects local environment and livelihoods, but most VMCs remained in silence because of threats and worry about personal security. One VMCs member was threatened for jail when he tried to bring local media in to broadcast about the impacts of sand-mining. In addition, rather than trying to stop sand-mining operation, local authorities namely local police, village chief, and head of commune councils went out and intimidated villagers, who dare to stand out and protest against such project. Sand-mining was going on up until the community was able to call the PMMR team leader, and delegate from MoE came and took action overriding local authority.

In addition, power struggle between local community and local authority in most of the communities interviewed is rampant. In Koh Sralao and Koh Kapic community, the head of commune council and village chief consider VMCs and its members as a rival, not co-manager. The formers accused VMCs committees for being inactive and failing to achieve its missions in environmental protection. The accusation aims to fail or downgrade what VMCs have achieved, so that they could nominate their own group of people to manage VMCs under their supervision. The action of the head of commune councils and village chief contradicts with the purpose of the establishment of the community, which aims to keep check and balance of the park ranger and commune councils, not to work under the instruction of the commune councils. Plus while pointing fingers at the VMCs, the head of the commune council and village chief are no better. Most of the informants describe them as corrupt officials threatening people to pay bribe when villagers ask for official letters. Another case in the Peam Krasoap community, the VMCs and head of commune councils were fighting over financial management and overall implementation. The chief of VMCs accused the head of the commune council for interfering

with financial management, particularly from eco-tourisms and donor funding, and implementation of the community, while the head said he has authority to know what is going on with the community, and can manage its resources, as community is one of the many projects run in his commune.

- **Leadership**

Level of leadership in PKWS varies from one community to another. Peam Krasoap community has a strong chief of VMCs with commitment working for betterment of the community. The chief and VMCs members have been through numerous trainings both at national and international level and been able to work as one of the key actor in the discussion and negotiation with other actors. The VMCs have received strong support from its members. Koh Sralao used to be one of the strong communities in PKWS. The momentum lost later on. The current chief and VMCs have knowledge and capacity to manage the community well, but the chief does not allow it to happen. The chief controls everything. None of the VMCs members know about financial management, and he rarely calls for a meeting with the VMCs. A community-wide meeting was never held within the last few years, and a few know who are the chief of VMCs and VMCs members. Some people take by surprise when they hear that the community still exists. A hundred percent of people are not happy with what the current VMCs are doing, and they ask for reelection. The mandate of the chief has come to an end, but he does not want to give up. In Koh Kapic, the case is even more severe than Koh Sralao. Only the chief of VMCs is there, but hard to find VMCs members. There is no activity for conservation or development programme at the moment. All people give up hope about the community.

- **Resources**

There are financial and human resources, and technical skills in Peam Krasoap and Koh Sralao. As mentioned above, people these two communities have been through numerous trainings, and they are capable of managing their local resources. They know, for example, how to do resource inventory or carbon measurement. In term of financial resources, Peam Krasoap has significant amount of budget from ecotourism and able to use the budget for local development, conservation, and poverty alleviation programme. For Koh Sralao, they have budget left by the UNDP/GEF-Small Grant Programme and small amount of money generated from ecotourism. In Koh Kapic, they do not have all the resources. The VMCs received trainings resigned, and only the chief continues to work. For financial resource, the chief mismanaged it, and all the money gone.

- **Fair Governance**

By the international standard of fair governance, the management system in PKWS is not fair. The chief is usually the one, who receives most of benefits. For example, the chief usually has more opportunities to attend national and international workshop or in the case of project implementation, the chief can decide who should be involved. The benefits flow less from the hierarchy from the chief to vice chief, VMCs members, group leaders, and then members. Even though the system is unfair, the level of unfairness is also different between communities. In

Peam Krasoap, the system of benefit sharing is better compared to those of Koh Sralao and Koh Kapic. The chief of the VMCs shares benefits to other members, even though he takes slightly more. For Koh Sralao and Koh Kapic, a large share goes to the chief and his/her close one. In addition, the system in Peam Krasoap is more responsive to society. There is a system for conflict resolution in place to help solve local problems. Additionally, the community also has budget allocated helping the poor in case of urgent need, i.e. food shortage. There is no such system in Koh Sralao and Koh Kapic.

5. Conclusion

This case study found in PKWS is flexible in that it depends on the needs of, the individual of community and each institution. Although, co-management of coastal resources being within the same area, the implementation may be different based on agreement and arrangement by lead actor in particular location. In addition, the cultural and traditional knowledge of stakeholders will affect the co-management implementation and local agreement. So, based on learning with all stakeholders on co-management of coastal resources in PKWS, Koh Kong, we will conclude that:

- Co-management is complex, involving multiple actors dedicated to enabling this process
- At the same time, it can be quite tasking for local villagers who have to deal with local dynamics but also work with multiple outsiders who all have slightly different ideas of what a VMC should do.
- Co-management processes may evolve in unintended ways, over time, and may not end up as fair and just as intended.
- Local leadership matters. When there is strong leadership that can engage a VMC and a village, there is a lot the VMC can do. When a leader is weak, it is easy for things to not work as well and for petty fighting to break out.
- It is particularly helpful if there is back-stopping support by someone within a government institution: time frames of donor funding, however, do not enable someone to be consistently involved in this manner.
- Marco-level challenges — sand mining in this case — are beyond the scope of the VMC to handle. This can be really frustrating since these kinds of activities profoundly impact local livelihoods.

References

Agrawal, A. (2002). Common resources and institutional sustainability (pp. 41–85) in E. Ostrom, T. Dietz, N. Dolˇsak, P. C. Stern, S. Stovich, E. U. Weber (eds.), *The drama of the commons*. Washington: National Academy Press.

Agrawal, R. & Gibson, C.C. (1999). Enchantment and disenchantment: The role of community in natural resource conservation. *World Development, 27(4),* 629-649.

Armitage, D. (2005). Adaptive capacity and community-based natural resource management, *Environmental Management, 35(6),* 703–715.

Berkes, F. (2006). From community-based resource management to complex systems: The scale issue and marine commons. *Ecology and Society, 11(1), 45*.

Bene, C. Baba, E.B.M.O., Raji, S.O.A., Malasha, I., Njaya, F., Andi, M.N., Russell, A. & Neiland, A. (2009). Power Struggle, Dispute and Alliance Over Local Resources: Analyzing 'Democratic' Decentralization of Natural Resources through the Lenses of Africa Inland Fisheries. *World Development*, 37(12), 1935–1950.

Blaike, P. (2006). Is small really beautiful? Community-based natural resource management in Malawi and Botswana. World Development, 34(11), 1942–1957.

Bourke, A.G. (2010). Community (172-176). In R. Hutchison. *Encyclopedia of Urban Studies*. Thousand Oaks: SAGE Publications, Inc.

Hallahan, K. (2005). Community and Community Building (172-175). In R.L. Heath. *Encyclopedia of Public Relations*. Thousand Oaks: SAGE Publications, Inc.

Li, T.M. (2002). Engaging simplifications: Community-based resource management, market processes and state agendas in upland Southeast Asia. *World Development, 30 (2),* 265–283.

Murphree, M.W. (2005). Congruent objectives, competing interests, and strategic compromise: concept and process of the evolution of Zimbawee's CAMPFIRE, 1984-1996 (pp. 92-105). In J.P. Brosius, A.L. Tsing, & C. Zerner (eds). *Communities and conservation: Histories and politics of community-based natural resource management.* Lanham: Altamira Press.

National Institute of Statistics (2012). *Commune Database,* Phnom Penh.

Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action.* Cambridge: Cambridge University Press.

Participatory Management of Mangrove Resources (PMMR), 2000. Two-years technical report. Phnom Penh.

Peet, R., Robbins, P. & Watts, M. J. (2011). Global nature (pp. 1-47). In R. Peet, P. Robbins, & M. J. Watts (eds.), *Global Political Ecology*. New York: Routledge.

Pomeroy, R., Parks, J., Pollnac, R., Campson, T., Genio, E., Marlessy, C., Holle, E., Pido, M., Nissapa, A., Boromthanarat S., & Hue, N.T. (2007). Fish wars: Conflict and collaboration in fisheries management in Southeast Asia. *Marine Policy, 31,* 645–656.

Pretty, J. 2003. Social capital and the collective management of resources. *Science 302(5652),* 1912–1914.

Sovanna, L. (2001). Regulation of Koh Sralao Community Protected Areas of Peam Krasoap Wildlife Sanctuary.

Tracy, K. (2009). Community (142-148). In S.W. Littlejohn & K.A. Foss. *Encyclopedia of Communication Theory*. Thousand Oaks: SAGE Publications, Inc.

Tsing, A.L, Brosius, J.P., & Zerner, C. (2005). Introduction: raising questions about communities and conservation (pp. 1-36). In J.P. Brosius, A.L. Tsing, & C. Zerner (eds). *Communities and conservation: histories and politics of community-based natural resource management.* Lanham: Altamira Press.

Tyler, S. (2006). *Commanagement of Natural Resources: local learning for poverty reduction*. Ottawa: International Development Research Center.

Varman, S. (1993). *Royal Decree on Protection of Natural Areas,* Phnom Penh. Cambodia.

Appendix 1: Questionnaires for Focus Group Discussion and Semi-Structure Interview

1. ***Focus Group Discussion with Village Management Committees (VMCs)***

   Start with self-introduction of the researcher and the purpose of the project, then ask people to introduce themselves.

   1.1. When was co-management approach introduced to the area? How?
   1.2. Why do you volunteer to work as a VMC?
   1.3. What benefits do you get?
   1.4. What challenges to you face personally?
   1.5. How often do you meet among yourself and community members?
   1.6. Is there much VMC turnover in the community (i.e. leaving VMC)?
   1.7. What are the key successes or major achievement of VMCs?
   1.8. What are the major challenges and weaknesses of VMCs?
   1.9. When problems arise, what are the mechanisms for solving the problems?
   1.10. What are the enabling factors for maintaining active participation of local villagers?
   1.11. What are you planning to do in the next 5-10 years time?
   1.12. What do you think of eco-tourism? Is it important?

2. ***Focus Group Discussion with local people***

   Start with self-introduction of the researcher and the purpose of the research, then ask people to introduce themselves.

   2.1. Do you know when did villagers start to work together as a community to manage natural resources?
   2.2. When did you participate? Why?
   2.3. What benefits have you received from community work?
   2.4. Have your role in natural resource management changed after creation of Village Management Committee standing as representative of local villager?
   2.5. Does community work live up with your expectation?
   2.6. What are the major achievements of the community?
   2.7. What are the weaknesses and challenges of the community?
   2.8. What should be done in order to sustain and make a better community?

3. ***Focus Discussion with Fishers***

Start with self-introduction of the researcher and the purpose of the project, then ask people to introduce themselves.

   3.1. What do people fish (i.e. crab, shrimp, fish)? where? for how long?
   3.2. How much per kilogramme of each fisheries product?
   3.3. What kind of species do people fish or collect in mangrove areas?
   3.4. Have you noticed any changes of fisheries resources you depend on for your livelihoods?
   3.5. What are the major challenges for your livelihoods?
   3.6. When conflicts related to natural resource management arise, what would you do?

4. Interview with key informants

4.1. How long you have you been involved in natural resource management? or how long have been living in the village?

4.2. Do you know how was community-based natural resource management (CBNRM) introduced to the area?

4.3. How is the current situation of local natural resource management compared to the last twenty years?

4.4. What are the key strengths and successes of the current management system?

4.5. What are the major challenges and weaknesses of natural resource management?

4.6. What should be done to ensure more effective and better natural resource management?

(Draft) Case study in Tam Giang lagoon, Vietnam

Truong Van Tuyen, Tong Thi Hai Hanh, and Truong Quang Dung

1. Introduction

The Tam Giang - Cau Hai Lagoon system is the biggest lagoon of South East Asia and is located along the North Central Coast of Vietnam. It spans over a wide area in the Thua Thien Hue province with about 70 km in length and 22,000 ha in area. The lagoon receives freshwater from numerous inland rivers such as O Lau, Bo, Huong and Truoi and connects with the Eastern sea through the Thuan An and Tu Hien estuaries. The exchange between freshwater and saltwater creates geographical and seasonal salinity fluctuations (Tôn Thất Pháp, Lê Văn Miên, & Lê Thị Nam Thuận, 2002) and consequently a typical biodiversity (Trương Văn Tuyển, 2010a) in the lagoon system. The lagoon plays the critical role in the social-economic development of Thua Thien Hue. Around 30% of the total population of Thua Thien Hue - 300,000 inhabitants - live in the 31 communes around the lagoon. One third of the inhabitants depend on lagoon resources for their livelihood through fishing and aquaculture.

Annually, however, the lagoon ecosystems as well as its residents are affected by natural as disturbances such as floods, storms and surge tides well as anthropocentric ones such as overpopulation, overexploitation, agricultural development that lead to environmental changes – biodiversity loss, fisheries resource degradation, climate change, …. These instabilities in turn contribute to large losses in fish catch; decline in aquaculture productivity and thus impoverishment in livelihood. Lagoon residents, especially fishers and aquaculturalists, usually experience the uncertainty and change. It is the continuously changing condition in which these people have to try to adapt and reduce its negative effects.

Among the environmental changes in the Tam Giang lagoon, fisheries resource degradation is seen as the most pressing problem. In response to the degradation, co-management have been built and adopted in early 2000s. Co-management is a sharing in terms of power and responsibility among the government and resource users in natural resource management. Co-management development has created new institutional arrangements toward a better fisheries resource management to deal with the fisheries degradation and livelihood impoverishment.

Adaptive capacity is defined as the potential, capacity or ability to adapt to the change and respond to disturbances (Armitage, 2005; Brooks, Neil Adger, & Mick Kelly, 2005; Dolan & Walker, 2003; Smit et al., 2001). Recent research indicates that the adaptive capacity depends crucially on institutions (A Agrawal, 2008; A. Agrawal & Perrin, 2009; Gupta et al., 2010; Jordan & O'Riordan, 1997). Understanding the characteristics of institutions that influence the adaptive capacity of rural households is crucial information for rural development policies to address pressing environmental changes. However, the number of scholars who put great effort as well as papers on the issue have still limited (Adger, 1999; A. Agrawal, 2010; Biermann, 2009; Gupta et al., 2010; Gupta et al., 2008; Horstmann, 2008; Rodima-Taylor, Olwig, & Chhetri, 2011).

Accordingly, this research has been designed to understand how and to what extent co-management institutions improve/constraint adaptive capacity. Applying the theoretical framework developed by Gupta et al (2010), the research assesses the ability of co-management institutions in stimulating adaptive capacity in six dimensions: diversity, learning capacity, room for autonomous change, leadership, availability of resources and fair governance.

2. Methods

**Desktop review:*

The reviews of various reports on the lagoon resource management provided a basic understanding about the fisheries co-management developed and operated in the Tam Giang lagoon including:

- CM process and main activities and area of operation
- Function/mandate of the co-management regime
- Key actors and stakeholders in the co-management regime
- Status of CM development and operation in the lagoon

**Key informant interviews and focus group discussions*:

Three communes were selected for the field study named Loc Binh, Vinh Giang and Vinh Phu. The fisheries co-management in these communes is among the ones having most clear shape because it has gone through a complete process of development and operation

Semi-structure interviews were taken with a total 20 key informants including researchers (5), fisheries officers (1 from province, 3 from districts, 3 from selected communes), environment/resource officer (1 from province); government officer (3 from selected communes), Fisheries Association officers (1 from province FA and 3 at selected Commune FA)

Focus group discussions were conducted at thee selected communes. These involved 12-15 participants who are the village FA officers and members. They also represent to the resource user groups such as mobile and fixed fishing gear groups.

Key question for key informant interviews and focus group discussion include:

- What are key activities in the whole process of fisheries co-management? Followed by an assessment of each activity
- Who take the key role and participate in development and operation of CM? Followed by a raking of stakeholders upon their roles/contributions to each activity
- What are key outcomes of CM in terms of livelihoods and responsive to the changes?
- What activities entail learning? Followed by discussions on who learnt, what type of learning/capacity, and what are the learning results?
- What activities support the autonomy in management? Followed by discussions on whose authority and in what way?

- What activities support the leadership development? followed by discussions on whose leadership and in what way?
- What activities mobilize the resources for management? Followed by discussions on whose resources and in what way?
- In what extent is CM perceived as legitimate, equal, and responsive and accountable?

3. Characterisation of the case study/co-management regime

Fishery resources in the Tam Giang lagoon are *de jure* state property but *de factor* common property. Fishing is the traditional livelihood activity of the inhabitants living around the Tam Giang lagoon and is practiced in an open access regime in the Tam Giang lagoon (Trương Văn Tuyển, 2002). The people practicing fishing are categorized into two groups, depending on their access to lagoon resources. These groups are called "Đại nghệ" ("large business") and "Tiểu nghệ" ("small business") or fixed fishers and mobile fishers respectively. Fixed fishers are considered rich when compared to the mobile fishers (Tôn Thất Pháp et al., 2002). They can afford high investment to set fixed fishing gears such as fish corrals and bottom nets at specific areas of the lagoon. Once their gears are set, they have exclusive right to the areas, which is then recognized by the local authorities. On the contrary, mobile fishers are normally the poor, they use mobile fishing gears (net, net-iron-frame trap (Lu)) which need a small amount of money to buy. The mobile fishers are free to choose their fishing ground based on the rule "first come, first serve", except the areas occupied by fix fishing gears.

Under the pressure of overpopulation and market economy, resource users compete each others to get highest fish catch leave management responsibility alone. The size of the two fisher groups has increased dramatically. Modern or even destructed fishing gears have been adopted to catch as much fish as possilbe. Fisheries resources have been faced overexploitation and degradation. However, laws/regulations launched by the authorities to manage and protect the resources work ineffectively or even do not work in the field. According to the statistic of Thua Thien Hue province, in three decades the fish catch reduced by a haft, from 4,500 tons in 1980 to 2,500 tons in 2007. The degradation has negatively impacted on the local people's livelihood, especially the one who mainly depend on fisheries for their income. Moreover, as the water surface area being occupied for fixed fishing expand considerably, it has reduced the access areas for mobile fishers and thus depleted their livelihood. Mobile fishers was put into a weak position.

Under this context, the introduction of aquaculture in 1980s has been seen as an optimal solutions to remedy fishery degradation and improve local livelihood. The lagoon shore has been privatised legally for building aquacultrual ponds. The development of aquaculture brought many positive changes to the lagoon livelihoods in terms of income and living standard. Based on criteria of the Ministry of Labour, Invalids and Social Affairs (MOLISA), the aquaculturalists living around Tam Giang lagoon were categorized as better-off households (Nguyễn Thị Thanh, 2002). The rise in income also resulted in improvements in health care and education (Tôn Thất Pháp et al., 2002). The area in the lagoon used for aquaculture increased swiftly, from 1,800 ha in 1999 to 3,200 ha in 2001 (Thua Thien Hue statistics, 2007). However, the expansion of aquaculture enterprises occurred unplanned and

led to environmental pollution and numerous diseases affecting the species bred in these enterprises. Together these problems have destructed aquacultural enterprises and led to an impoverishment of the livelihoods of aquaculturalists (Nguyễn Ngọc Phước & Trương Văn Tuyển, 2010). The unplanned and unregulated development has reduced the area of breeding ground and seaweed zone and produced enormous amount of effluent and thus have reduced reproductive capacity and development of natural aquatic animals. Moreover, it also caused the impoverishment of mobile fishers by spatially reducing their fishing ground (Trương Văn Tuyển, 2002). Income from fishing and aquaculture decreases significantly, more and more fishery household fall in to poor and debt (IMOLA, 2006). Impoverished livelihood couples with inequality in fisheries resource access lead to crucial conflicts among resource users.

Open access and uneffective management are the main reasons leading to natural resource degradation in the Tam Giang lagoon (Acheson, 2006; Njaya, (_); Tống Thị Hải Hạnh & Lê Văn Nam, 2010; Trương Văn Tuyển, 2010b). Toward a better management to improve and sustain the resource as well as local livelihood, the following problems need to be addressed (Trương Văn Tuyển, 2010b): (1) lack of detail zoning for sub-zones which have different use purpose; (2) none of management units is allocated detail right to manage the water surface (3) an absence of fishing regulations and property right holders who implement the regulations; (4) frequently conflicts among resource users due to the struggle for fishing ground; (5) the rapid development of fishers and destructed fishing gears and (6) an absence of management responsibility of the resouce users.

Accordingly, the Department of Rural Development and Extension, University of Hue Agricultural and Forestry carried out a project named Common Pool Resource Management (CPRM) (funded by IDRC). The project aimed to build pilot co-management to address the mentioned problems in the Tam Giang lagoon. Co-management is defined as a sharing in terms of power and management responsibility among the government and resource users (Truong Van Tuyen, Armitage, & Marschke, 2010). The sharing is presented through an allocation of fishing rights to resource user organization, for example Fisheries Association (FA).

In March 2009, fishing rights over the area of 1,113 ha were allocated to Giang Xuan FA (Vinh Giang commune, Phu Loc district, Thua Thien Hue province). This is the first case in Vietnam that fishing rights allocation is made to resource users' organization. The allocated area is seen as a lagoon management unit. FA comprising by resource users has strong legitimacy to practice management in this unit. The allocation of fishing rights to FA has officialized co-management operation between local government and fisheries association (Trương Văn Tuyển, 2010b).

3.1 The co-management process in Tam Giang lagoon

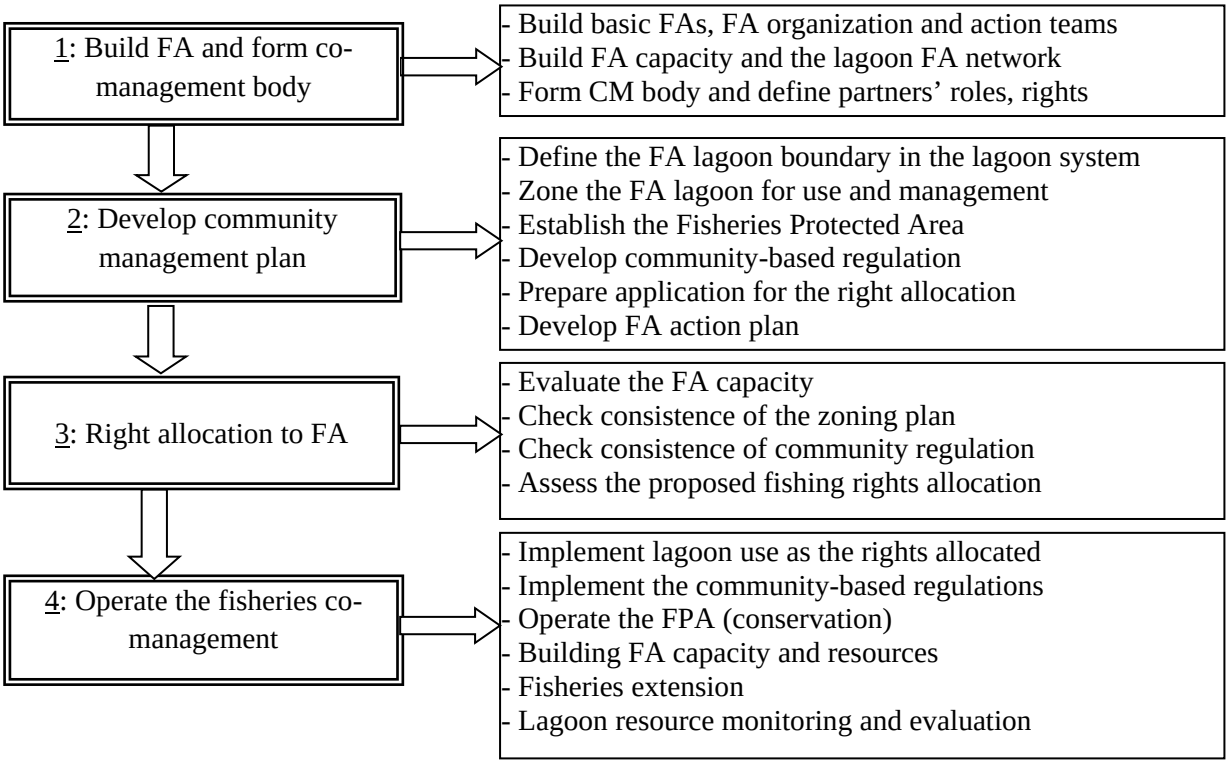
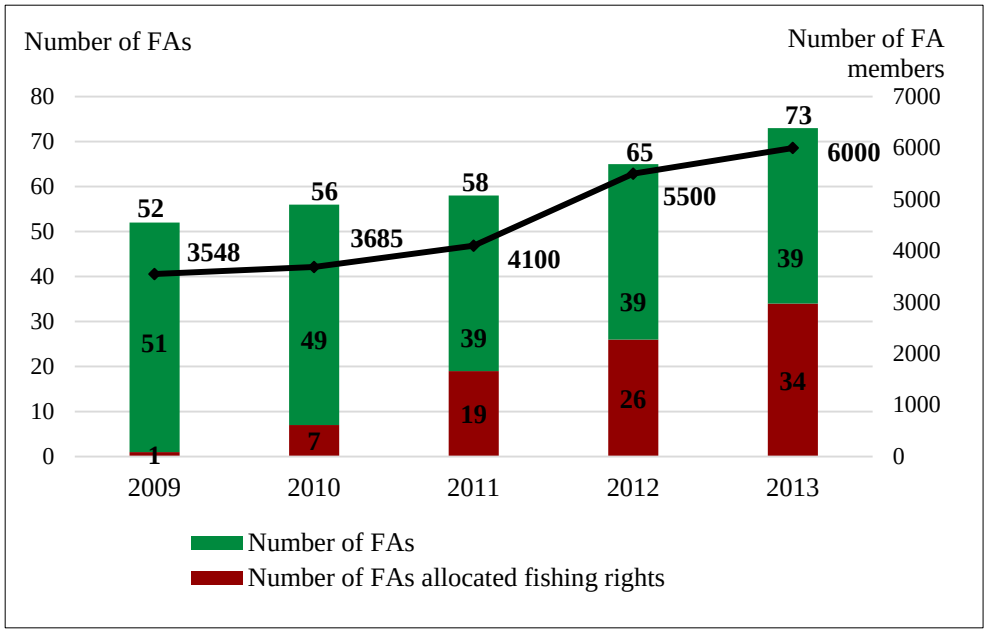


Figure 1: The co-management process in Tam Giang lagoon (Tuyen. TV, 2011)

3.2 The FA organization and FA network

Apart from CPRM funded by IDRC, co-management has been built and duplicated over the Tam Giang lagoon with supports in terms of finance and techniques of other international organizations and projects such as Integrated Management of Lagoon Activities (IMOLA) funded by the Italian and Vietnamese Government, Nordic Assistance to Vietnam (NAV). By 2014, 73 FA have been established over the lagoon (one commune has from one to three FAs (Takahashi & Van Duijn, 2012)), of which 34 FA has been allocated fishing rights.



(Source: Annual reports of Provincial Fisheries Association of Thua Thien Hue)

Figure 2: The development of Fisheries Associations and Fishing right allocation in Thua Thien Hue province

3.3 The community management plan, regulation and right allocation

Objectives of regulations

- To prohibit the use of destructive fishing gears (ex: use of electric devices);
- To stabilize the number of fishing households and the scale of fishing and aquaculture activities to a reasonable level; and,
- To carry out capture fisheries and aquaculture by planning sub-areas, time and target species.

Regulations on management of capture fisheries include:

- Regulations on fishing and management activities applied to sub-areas in line with the planning objectives (type of activities, for example, fixed fishing, mobile fishing, waterways and water transportation, operation duration and target species).
- Regulations on registration, management of fishing gears and fishing techniques (categories, quantities of fishing gears, mesh size, etc).
- Regulations on payable fees, fee collection and usage for activities of resources protection, conservation and management.
- Regulations on handling violation cases.
- Regulations on community-based conflict resolution in the protection, conservation, exploitation and management of fisheries in the area.

4. Characterisation of adaptive capacity and outcomes

Institutions stimulating adaptive capacity are the ones that (1) promote the involvement of a diversify of perspectives, actors and solutions; (2) encourage stakeholders to learn and improve their institutions; (3) stimulate stakeholders to make and implement decisions to adjust their behavior; (4) can to mobilize leadership; (5) have ability to mobilize resources for operating solutions; (6) support fair governance (Gupta et al., 2010). Therefore, in order to assess how co-management institutions enhance adaptive capacity, six dimensions including diversity of stakeholders, learning capacity, autonomy, leadership, resources and fair government need to be examined.

4.1. Diversity/variety of stakeholders

Diversify/variety refers to the involvement of different stakeholders in different sectors and levels in framing problems and formulating solutions. The more diverse stakeholders that institutions can mobilize, the higher adaptive capacity (Gupta et al., 2010). Co-management generally comprises two actors, namely the state (at different levels) and the community. These actors have different roles depending on their own competence levels. According to Hara (1998) and Karlsen (2001), the State should take overall responsibility for fishery management through providing legislation, enforcing institutional arrangements, supporting techniques and finance and monitoring co-management. In the context of Tam Giang lagoon, the co-management has involvement of government agencies such as People Committee, Department of agriculture and rural development (DARD) and Department of Natural resources and Environment (DONRE); community organizations such as Fishing Association (FA) and individual actors such as fixed and mobile gear fishers (Figure 1).

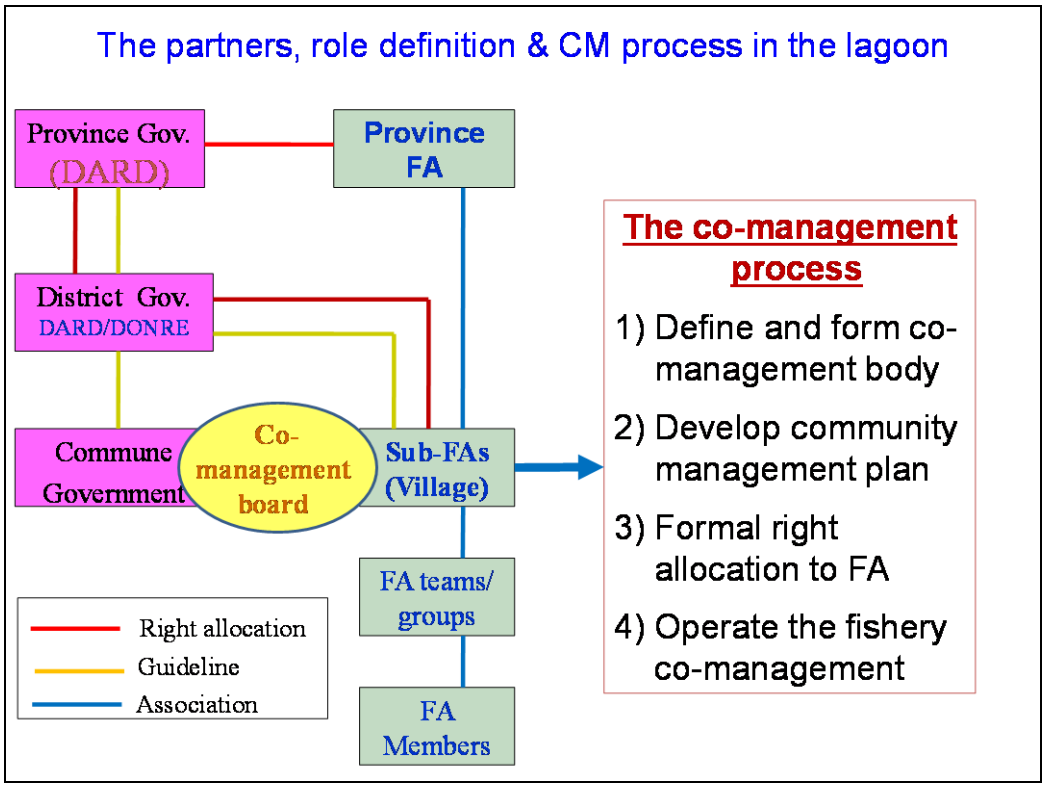


Figure 1: Co-management stakeholders and processes

The table 1 summarized co-management stakeholders in Tam Giang lagoon as well as their roles and performance. The central government has created a legal framework and decentralized to the provincial governments to make their own decisions and regulations toward co-management. The central government promulgated two crucial documents providing legislation for building co-management. Firstly, Fisheries Law released in 2003 indicates that:

> "*The Provincial People's Committees has responsibility to issue fisheries regulations for fishing grounds in rivers, lakes, lagoons and other natural waters under its jurisdiction in accordance with [the] guidance of the Ministry of Fisheries (now merged into the Ministry of Agricultural and Rural Development); organizes and promotes the local residents to take part in monitoring, detection and prosecution of any violations committed regarding to fisheries activities in fishing grounds"* (Article 15.3).

Secondly, Decision number 131/2004/QĐ-TTg promulgate by the Prime Minister has pointed out:

> *"… prove and enhance the role of fisheries community in management and protect fisheries resource and aquatic environment …"; " … building pilot fisheries co-management with the participation of the communities.."*

In line with the national documents and decentralization, the provincial People committee of Thua Thien Hue formulated legal instruments and regulations to enable co-management development. The province has launched a number of decisions, regulations and plans to encourage community participation in fisheries management, of which the decision number 3677/2004/QĐ-UB and decision number 4260/2005/QD-UB play a critical roles. The decision 3677/2004/QĐ-UB provides legitimacy for FA to manage fisheries resources.

> *"fisheries organizations under the Vietnamese Fisheries Associations are the key counterparts for the government to cooperative to manage fisheries activity and fisheries resources in the Tam Giang lagoon" (Article 1)*

The decision number 4260 decentralizes power and responsibility to the local entities: district government and Fisheries Association.

> *"… the district People Committees are decentralized to allocated fishing rights over water surface under their jurisdiction to fisheries organizations at village and commune levels …"*
>
> *"Fisheries Associations at the grassroots are empowered to manage a concrete water surface. FAs have responsibility to manage the allocated water area to both ensure their member benefit and conserve fisheries resource…"*

At the district level, with the supports of respective departments - Department of Agriculture and Rural Development (DARD) and Department of Natural resources and Environment (DONRE), the People Committee manages fisheries resource under its jurisdiction in respect with the provincial regulations and plans and make decision to allocate fishing rights to the FAs. DARD comprises several divisions, sub-departments and centres to

undertake missions related to agriculture, fisheries, forestry. Relating to fisheries, the Sub-department of Capture Fisheries and Resources Protection (SDCFRP) is in charge of fisheries exploitation and protection; the Sub-Department of Aquaculture (SDA) is in charge of aquaculture and aquatic animal health and Division of Planning and Finance is in charge of planning and budgeting for fisheries sector in specific and the DARD in general. DONRE is in charge of monitoring the lagoon environment, mapping, demarcating and verifying administrative boundaries.

At the local level, the commune People committee is responsible to undertake fisheries management activities under the guideline of the District. The People committee is the core governmental actor who cooperates with the resource users – Fisheries Association (FA) to implement co-management.

Table 1: Co-management stakeholders and their roles in Tam Giang lagoon

Groups of stakeholder	Stakeholders	Performance	Role
State	Province People Committee	Average	- Promulgate legal regulations to enable co-management
	District People Committee	Average	- Organize and promote the local residents to implement co-management - Decentralize rights of managing and exploiting water areas for local fisher organizations.
	District DARD	Well	- Administrate regional lagoon areas and aquatic resources. - Give people committee consultancy about decentralization plans.
	District DONRE	Average	- Consult people committee about the issue of right-of-land (water)-use certificates.
	Commune People Committee	Well	- Administrate the lagoon areas within commune - Plan and organize all aquaculture and fishery activities in the commune.
Community organization	Province FA	Well	- Co-ordinate activities of all village FAs in the province.
	Co-management	Poor	- Connect commune government with FAs.

	board		- Co-ordinate activities of village FAs in the commune.
	Village FA	Well	- Legally manage the allocated lagoon areas
Individual	Fixed gear fishers	Well	- Protect and exploit the lagoon areas allocated by communal people committee
	Mobile gear fishers	Average	- Approach and fish in mobile fishing areas.

In general, state actors in co-management in Tam Giang lagoon have worked well especially district DARD, commune People committee. District DARD provided remarkable annual budget for FAs to protect and maintain fishery breeding areas; regularly conducted surveillance and legally and technically assisted co-management implementation. Meanwhile, Commune People committee has given useful assistance to FAs to protect allocated lagoon areas especially in dealing with electricity fishing. The performance of other state actors such as province and district People committee and DONRE is at average level. According to Mr. Loi – Head of Loc Binh 1 FA, these actors enthusiastically assisted FAs especially in right allocation but sometime they did not complete well their roles. For instance, In Loc Binh 1 FA asked for helps from DONRE to position the lagoon in preparation for the allocation but they determined the wrong position to plant landmarks which narrowed the allocated areas by 15 ha. As a result, they had to pull up the landmarks and repositioned the lagoon that cost 4 million Vietnam Dong (1 million came from FA budget).

FA is a social-professional organization representing for the resource users to cooperate with the local government to implement management activities. According to Truong Van Tuyen (2011), FA is the most suitable community-based organization for building co-management because its mandates to involve the poor in fisheries sectors and have nationwide organizational network – Vietnamese Fisheries Association and Province Fisheries Associations (PFA). The provincial FA (found in 2003) works as a focal point for interaction with policy makers, provides legal support to establish grassroots FAs and enhance their capacity and has voice in decision-

Box 1: ***Converting electricity to net fishing in Loc Binh***

In Loc Binh commune, before the establishment of FA, there were 8 fishers who conducted electricity fishing. Communal government met huge difficulty in stopping them because they did not have enough resources to control a large area. However, when Loc Binh 1 FA were established, they were successfully transformed these fishers into net fishing with the combination of strict punishment, convincement and financial assistance to convert. In particular, the offenders often had to destroy the electricity gears and pay a fine of 300,000 VND. Besides, the FA also provided non-interest loans (150 million VND for 8 fishers) to help them buy net and other necessary to start a new job. As a result, Loc Binh 1 now is clean of electricity fishing.

making on the adoption of fishing gear.

FAs are allocated fishing rights over a concrete water area to have legislation to run co-management. The allocated water area is seen as a lagoon management unit. Within the unit, FAs has to develop and implement its own regulations and management plans to manage fishing activities in their allocated areas. Table 2 presented FA detail roles and the performance level of Giang Xuan FA – one of the best-working FAs. FA participated into most of fishing management activities on the allocated water areas with the role of chair organization. Particularly, they directly make decisions on regulating fishing activities (e.g. number of fishers, number of fishing gears, fishing season), preventing destructive (electricity) fishing, solving conflicts between fishers and collecting exploitation fee. Besides, they also cooperated with government agencies in detailed zoning of allocated areas, controlling size of fishing gear and net mesh and rearranging fixed fishing area.

Due to the participation of community, FAs have well completed their roles and became a key actor in co-management in Tam Giang lagoon. In there, the prevention of destructive fishing emerged as the highest achievement that majority of FAs completely eliminated electricity fishing on their allocated areas. The regular surveillance of FA members (local fishers) helped to faster detect committed fishers while community pressure forced them to shift the type of fishing. However, the control of size of net mesh was still a challenge for most of FAs. In regulation, the minimum mesh is 9 millimetres wide but in fact, a lot of fishers still use the 7 or even 5 millimetres. *"The reason was the asynchronous implementation of the control between communes"*, said Mr. Chu, a fisher from Loc Binh. If commune A strictly implemented the control but commune B – the neighbour did not; fishers in commune A would feel unfair because their income were reduced fast due to the failed competition with fishers from commune B who used smaller net. As a result, they would turn back to the use of small-mesh nets. In fact, Loc Binh FA had well controlled size of mesh with more than 70% of communal fisher who stopped using small-mesh nets in 2012. However, since 2013, fishers have been returning using small-mesh nets (7mm).

Table 2: The role of Giang Xuan FA in co-management

Criteria	FA role	Performance
Building fisheries regulations	A	2
Preparing application for fishing right allocation	B	1
Implementing patrolling to prevent destructive fishing and enhance regulation compliance	A	1
Demacating water boundaries of FA	B	1
Making a detail zoning plan in the allocated area	B	2
Implementing rule on size of fishing gear and mesh net	B	3
Implementing rule on fishing time	A	2
Implementing rule on fishing capacity (number of fishers, number of fishing gear)	A	2

Implementing user registration and collecting exploitation fee	A	2
Implementing rule on handing conflict and dealing with regulation violators	A	2
Implementing fixed fishing gear/fish corral rearrangement	B	1

(Source: Nguyễn Thị Dung, 2014)

Note: FA role: (A) chair, (B) cooperate; FA performance: (1) very well, (2) well and (3) not well

In order to facilitate the cooperation and provide a forum of coordination between local authorities and FA, the co-management board at the commune level has been established. The co-management board consists of a core group and an advisory board. The core group includes communal People committee representative, commune police, FA leaders and related mass organization leaders (woman union, farmer union, …). The advisory board consists of relevant technical agencies and department at both the provincial and district levels such as SAD, SDCFRP, DARD, DONRE AND PFA. *"The main task of a CMB was to handle the inter-FA issues within the boundaries of one commune such as movement of fishers, mobile fishing, illegal, unreported and unregulated (IUU) fishing, conflict between people from different FAs"* (Takahashi & Van Duijn, 2012).

Nevertheless, the board have poorly performed as rarely participating in co-management activities. In interviews with all Fishing Associations (Loc Binh, Vinh Phu and Vinh Giang), the heads said that they seldom received assistances (e.g. consultancy, advices, finance) from the board. According to Mr. Phuc, fishery staff of Phu Vang district, the reasons of this weakness belong to the lack of motivation, limited operation budget and frequently changing personnel. Board members were not paid for their works so they only participated into the board because of civic duty.

4.2. Learning capacity/activities that entail learning

A summary of the fisheries co-management activities and adaptive capacity

Co-management process and activity		**Entail learning**	**Support Autonomy**	**Develop Leadership**	**Promote Resources**	**Legitimate**	**Responsive, accountable**
Form CM	Establish FA, build FA organization and groups	x	x	x	x		x
	The FA networking activities with focal role of Province FA	x			x		
	Define FA lagoon boundary and demarcation	x	x		x		
	Form CM body and define partners' roles	x	x	x			x
Magt plan	Zoning plan for the FA lagoon area management	x	x		x		
	Establish the Fisheries Protected Area (FPA)	x	x				
	Develop community management regulation	x	x		x		x

	Prepare application for the fishing right allocation	x					
	Develop FA action plan	x					x
Right allocation	Assess the FA capacity						x
	Check consistence of the FA zoning plan					x	
	Check consistence of community regulation					x	
	Issue formal fishing rights to FA		x	x	x	x	
CM operation	Re-arrange the fixed gears and define mobile fishers as the rights allocated	x	x				
	Implement the community management regulations (net meshsize, ban destructive fishing, protect FPA...)	x	x				
	Implement conservation in the FPA (maintain nursery area)	x	x				
	Building FA resources (FA membership fee, management fee, communal resource use and service)	x	x	x			
	Building FA capacity and extension (FA meeting and training)	x					
	Lagoon resource monitoring and evaluation	x					x

Learning plays a critical role in dealing with environmental changes problems. Learning capacity can be explained as an ability of social actors to learn from past and current experiences/knowledge/institutions and improve or reformulate them. The higher learning capacity that institutions can make, the higher adaptive capacity (Gupta et al., 2010).

In the Tam Giang lagoon, co-management institutions enhance learning capacity of the stakeholders through implementing relevant activities such as (1) co-management formation, (2) co-management plan and (3) co-management operation. These activities offered opportunity for stakeholders to raise awareness, improve decision making capacity, enhance the ability to implement their legal rights and monitor other stakeholders' activities for a better fisheries resource management (table 3). This section is reserved to provide an insight into each activity and explain what happen as a result of learning.

Table 3: Co-management activities entailing learning capacity of stakeholders

Activities	No	Sub-Activities	Frequently	Obtained knowledge and capacity
Co-management formation	1	Build basic FAs, FA organization and groups	Once	Decision making on selecting FA board and head
	2	Organize workshops and build lagoon FA network	2-3 times/year	- Awareness of environmental and resource protection - Sustainable Aquaculture production - Credit management - Post-harvest storage

				- Safety on seas - Working groups amongst FAs
	3	Define the FA lagoon boundary in the lagoon	Once	Monitoring the boundary identification of government
	5	Form CM body and define partners' roles	Once	Understanding of roles of co-management stakeholders
	6	Zone the FA lagoon for use and management	Once	Reducing conflicts between fisher groups
Management plan	7	Establish the Fisheries Protected Area	Once	Sustainably maintaining lagoon resources
	8	Develop community management regulation	Once and adjust when needed	Making decisions on managing allocated lagoon
	9	Prepare application for the right allocation	Once	Talking to government on lagoon management
	10	Develop FA action plan	Once/year	Making decisions on managing allocated lagoon
	15	Implement lagoon use as the rights allocated	Many times/year	Implementing allocated right on the lagoon
Co-management operation	16	Implement the community-based regulations	Many times/year	
	20	Operate the FPA (conservation)	Many times/year	
	22	Lagoon resource monitoring and evaluation	Not yet	Monitoring effectiveness of co-management

a. Co-management formation

As FAs are identified as a key partner of the government in fisheries co-management, the formation of FAs is of great importance toward co-management operation. In the Tam Giang lagoon, FAs have been found based on the provincial decision – Decision number 4260/2005/QD-UB. In FA formation, The FA establishment and capacity building is a crucial step for identifying a right holder (collective right holder) for fisheries resources and creating an entity capable of managing rights (Truong Van Tuyen, 2011). A number of activities have been implemented for the FA establishment and capacity building such as organizing technical workshops, meetings with government and province FA and organize FA network. In addition, zoning the lagoon for use and management helped to calm the conflicts between users.

In there, technical workshops implementation was the most important activity in this initial stage to build fisher capacity and knowledge. The workshops were organized on average 2-3 times per annual by both government and NGOs such as IMOLA and Cross Red about awareness on environmental and lagoon resources protection, sustainable aquaculture to deal with environmental degradation, importance of FPA, livelihood improvement of smallholders in the lagoon, micro-credit management for smallholders, post-harvest

preservation and safety on lagoon. They attracted a lot of fishers because the topics were the concerns of almost local fishers. Fishers' attitude, perception and actions were considerably changed due to the workshops especially in environmental and lagoon resources protection. In all three studied sites, fishers now are awake to the importance of changing fishing methods to sustain lagoon resources.

> Mr. Khoai – head of Giang Xuan FA said: "*In my commune, fishing has changed deeply. Formerly, they mostly conducted mobile fishing without any control that caused serious damage to lagoon fish stock but in current, they have conducted more fixed fishing and aquaculture. In addition, instead of selling all-size fishes, fishers now only sell the big ones and grow the small ones to meet standard size*"

However, not all workshops worked well like the environment awareness raising. Some knowledge was hardly applied by fishers due to high requirement of perspective level (credit management) or financial ability (safety on lagoon) or both (post-harvest preservation). Therefore, fishers in Tam Giang lagoon still worked without lifejacket and selling caught fishes without preservation those risk their lives and reduced their income.

Beside workshops, meetings with province government, province FA and establishment of FA network provided opportunity for stakeholders learn from each other. The government had chances to understand expectation, requirements and constraints of FA in managing the lagoon to make appropriate policies while FA members can get information about new regulations and policies. For instance, through meetings, government realized that FAs were very effective in dealing with electricity fishing by use of community pressure so that they informally allowed FA to punish the offenders although in some cases the penalties (e.g. gear destruction) were illegal. In additions, The FA network brought a platform for FAs to talk and share experiences to each other so that they could work better. The meetings amongst FAs and with province FA and government have occurred annually through which they can learn how to deal with conflicts amongst FAs. In fact, according to Mr. Hien – Head of province FA, conflicts between village FAs (regularly on boundary dispute) were solved more effectively and smoothly by talking to each other, defining FA lagoon boundary under the co-ordination of province FA.

Table 4: Zoning plan in Vinh Giang commune

Sub-zone	Area (ha)	Current use status (2009)		Zoning plan and allocation of fishing rights		
		Fish corrals	Mobile fishers	Fish corrals	Mobile fishers	Additional designation
Fish corral	543	90	47	56	47	6 rows arranged by master plan
Water way	324		64		64	Max 80 Lu/HH
Navigation lanes	26		5			Max load of boat/ship is 10 tons
Open zone for capture and aquaculture area	50		7		7	

Breeding ground	40		7		4	No fishing between December to March
Seaweed habitat area	10		4			No fishing between December to June
Total	993	90	134	56	122	

(Source: (Truong Van Tuyen, 2011)

Note: *Lu* (called Lừ Trung Quốc) is the bottom steel frame traps. One unit has a length of 8-10 m and composes 15 traps: HH is household)

A detail zoning plan was made to solve the problem of unplanned or unfeasible planning of fisheries exploitation and management. The zoning had to meet the twin objectives: simultaneously to reduce exploitation capacity and maintain livelihood for fishers. Different sub-zones for different uses (for example, fish corral area, mobile fishing area, breeding ground, waterway,,…) have been zoned in detail in terms of area, capture capacity and time. FAs play an important role in undertaking this activity. The detail zoning plan played as a base for building management solutions. Table 4 showed an example of a detail zoning plan of Giang Xuan FA in Vinh Giang commune.

In order to create the feasibility of the zoning plan, the consensus among different stakeholders (authorities, resource users) is critical. Accordingly, the detailed zoning plan was made by conducting discussions and consultations with different stakeholders at varying levels (including fishing groups, and authorities at the village, commune and district level) in order to gain mutual agreement. Local experience and knowledge of lagoon use, current lagoon use and legal status (for example regulations, management plans launched by the authorities) were used through the discussion and consultations. In Vinh Giang commune, the number of fish corrals inserted in the plan was based on the number allocated to Vinh Giang by the Phu Loc DPC in the provincial master plan; the number of mobile fishers were identified for the plan was based on existing number of mobile fishing households in the allocated lagoon area. As a result of the community-based zoning plan, the conflicts between fixed and mobile fishers reduced remarkably from around 70 formerly to about 15 reported cases per year after FA establishment (in Vinh Giang). The violence in dealing with the conflicts also completely disappeared when fishers asked FA to be a referee.

b. Co-management plan

Activities in co-management planning such as development of community management regulation and FA annual action plan mostly built the capacity of stakeholders (especially FA) of making decisions on managing allocated lagoon. Under the guidelines of local authorities, FAs self-developed “Regulations on Fisheries Resource Exploitation and Protection” manage fishing activities and protect fisheries resources in the allocated water surface. Meetings were organized to create a room for discussion and regulation formulation in which FA members participated and gave their voices to build the regulations. In order to set up feasibility for the regulations, indigenous knowledge and experience have been used to meet two crucial requirements. First, the regulations had to be in line with the current laws. Second, the regulations had to harmonise and balance the benefits among different user

groups. The regulations were developed once but if necessary, FAs have rights to adjust them to fit real situations. Besides, FA member also had chances to learn by developing FA action plans annually. This has been a chance for FA members to learn from the past and make best decisions on exploiting and managing the lagoon.

As a result of a better participation of regional fishers into decision making, they have been more active in self-monitoring, controlling over-explosive fishing and protecting allocated water areas. For instance, according to Mr. Khoai – head of Giang Xuan FA, in previous time, fishers nearly did nothing in surveillance of lagoon areas to find out electricity fishing because they thought it was the duty of communal authorities to protect the lagoon. Nevertheless, after right allocation, most of arrested electricity fishers were by announcement of local fishers.

c. Co-management operation

The allocation of fishing rights to FA has formalized co-management between resource users and government. A number of activities were carried out for the operation, including: registering resource user, fishing gears and collecting fees, enhancing awareness and capacity for FA members, organizing water surface patrolling and managing conflict, reducing and rearranging fishing gears, protecting and conserving breeding ground, sea grass and sea weed areas and improving livelihood for FA members.

The operation of co-management provided opportunities for resource users to learn by doing. Through operation activities, they understood the critical status of fisheries resources and are aware of their responsibility in management to protect the resources. This change in awareness led to the change in action when they accepted and complied with regulations to protect resource for their own sake. Furthermore, being more directly involved in managing and protecting the allocated lagoon makes fishers more responsible in convincing others not to commit FA regulations. According to Mr. Thanh, head of lagoon protection team in Vinh Phu commune, because they better understood the difficulty of lagoon management, they tried to minimize the number of offenders.

4.3. Autonomy/authority to make and implement decisions

Autonomy refers to the ability of stakeholders to modify autonomously their behaviour to deal with the changes. According to Gupta et al (2010), institutions played as a critical role in providing rights for social actors – authorities and resource users – to make and implement decisions to response to environmental changes and thus enhance their adaptive capacity.

Co-management institutions enabled the government decentralize their power and responsibility to the resource users – FAs to manage fisheries resources. The empowerment was presented through promulgating laws and decisions such as Fisheries laws, Decision number 131/2004/QĐ-TTg, decision number 3677/2004/QĐ-UB and decision number 4260/2005/QD-UB, … (mentioned above).

Co-management transferred power though a hierarchy of decision making, from the top (central government) to the bottom (resource users) and thus gave user organizations – FAs autonomy in fisheries management (Jentoft, 2000). FAs had rights to make their

decisions to manage fishing activity and fisheries resources over the allocated areas. Each FA had its own bylaw depending on the social, economic and ecological characteristics and user's knowledge and experiences. However, FA bylaw had to be in line with the current laws, regulations and plans promulgated by the government at different level. For instance, the number of fixed fishing gears and their size which was allowed to set in the water area of Giang Xuan FA was compatible with to the number and size regulated by the province through provincial master plan and decisions. FA bylaw named The Regulations on Fisheries Resource Exploitation and Protection comprised following points:

- Criteria/conditions for fishing in allocated areas including maintenance of existing fishing households and allocation of fishing rights linked together with the responsibility to manage resources by conforming to agreed rules;
- Rules on the number and type of fishing gear, based on type of fishing or household group;
- Detailed rules on fishing activities and resources management in sub-zones;
- Rules on the fishing location, time and species;
- Rules on paying fees for protection of fisheries resources and environment;
- Rules on using inputs and funds for the protection of fisheries resources and environment;
- Rules on task assignment for carrying out patrols;
- Rules on handling conflict over fisheries exploitation and/or management; and
- Rules on dealing with regulation violators.
- Rules on participation in resources protection/ conservation and sharing benefit.

Despite of compliance with government regulations, the FA bylaw was not always fixed. It could be modified by the FA to fit into the field. For example, in 2009 Giang Xuan FA approved the regulation that prohibits fishing in the breeding ground from December to March (lunar calendar). However, as the FA recognized that fishing from December to March caused negative effects on the quality of fisheries resources and creates conflicts among FA member because of struggle for access so that the regulation was modified in 2012 – *"fishing is not allowed in the breeding ground for the whole year"*.

A challenge with co-management autonomy was from government agencies who formerly managed the fisheries resources as they worried that this institution reduced their power. Mr. Hien said: "*Co-management is receiving the careful consideration of administrators because they did not want to share their power with local people. Thus, they did not fully support the development of this institution yet."* Therefore, sometimes government regulation challenged FAs. For example, all interviewees agreed on the high effectiveness of FAs in ending electricity fishers but the government still did not give them the full right to handle electricity fishers. FAs only had formal rights to monitor, inspect the allocated areas in order to hinder electricity fishing but no right to arrest fishers, confiscate fishing gears or apply fines. The punishment had to be conducted by commune and district

DARD which required lots of time. As a result, it significantly reduced power of FAs in cope with offended fishers. However, FAs often dodged the law by using informal rights (community pressure) to punish offenders and they seemed to be more effective than formal ones. In communes which were successful in ending electricity fishing (e.g. Vinh Giang, Loc Binh, Vinh Ha), FAs often gave the punishments for offenders themselves. Particularly in Loc Binh 1 FA, captured electricity fishers had to "voluntarily" destroy their fishing gears and pay a fine as a nominal donation for FA. It was interesting that because the community agreed with this solution so that the offenders who are normally also villagers were totally convinced.

4.4. Leadership

Leadership plays critical role in respond to environmental challenges as "leadership is a driver for change, showing a direction and motivating others to follow" (Gupta et al., 2010). Institutions enhancing adaptive capacity are those that can mobilize leadership (Gupta et al., 2010).

Co-management institutions provided room for resource users to improve their leadership roles by direct involvement in assessing and planning FA activities and electing FA executive board. One congress is organized every three years amongst FA members to summarize activities in previous term, make the plan and select a FA executive board for next three years. Furthermore, FA members also have an annual meeting to summarize all FA activities within the year and contribute to next year plan. This democratic mechanism allows all FA members to give opinions about how they want to be led in lagoon management activities. FA executive board which often consists of experienced, responsible and prestigious fishers (in some cases, the FA chairperson was also village chief) represented resource users to:

- Facilitate FA members to make decisions about activities on allocated areas.
- Mobilise regulation compliance of resource users.
- Inform resource users about government policies and rules on lagoon management.
- Promote and organize technical workshops; and
- Put forward suggestions (of resource users) to higher levels (government).

4.5. Resources

Resources such as human, finance and technique are critical for making and implementing decisions to response to environmental changes. Adaptive capacity crucially depends on the extent to which institutions can generate resources for decision making and implementation (Gupta et al., 2010).

In term of financial resources, co-management institutions pave the way for FAs to earn money to operate and sustain their management from collecting fee, doing business and appealing donations. FAs have formulated annual membership fee for FA members and exploitation fee for all fishers who fished in their water areas. All resource users (FA members or non-FA members) who practice fishing in the allocated water areas have to pay exploitation fee. Table 5 showed an example of fee regulation developed by Loc Binh 2 FA. Beside fee, FAs were also benefited from capture of regulation-offended fishers by receiving

5% of total fines they paid to government. Furthermore, FA financial budget was also built up from business activities such as providing credit to fishers and selling seaweed which was well-developed in FPA. In Loc Binh, the credit provided to fishers by FA has earned tens of millions VND for FA per year (Box 2) meanwhile in Vinh Giang, the seaweed has earned from 4 to 5 million VND annually. The final source of FA finance was assistances from government, NGOs or (sometimes) individual. Some main funds from government and NGOs were for organizing ending-term congress, checking status of fixed gears rearrangement and patrolling the lagoon.

Box 2: The example of building financial resource in Loc Binh 1 FA

Loc Binh 1 FA was successful in setting up a joint-stock credit fund to lend FA members. Every member has rights to put money into this fund to earn an interest and to borrow money if necessary. Besides, non-FA members also are able to approach loans from this fund. The interest paid to shareholders was around 1.2%/month for the period from January to June and flexible depending on fishing activities on the lagoon for the remaining time. Meanwhile, the borrowers have to pay an interest of 2%/month. Most of borrowers aimed to buy fishing equipment (90%) and repair houses (10%). This model worked really well when it simultaneously helped fishers to be better equipped and earned money for FA operation. Therefore, they build up the amount of credit fund from 700 thousand in 2008 to 3.1 billion VND in 2014. In 2013, they paid a total of 270 million of interest for shareholders.

Human and technical resources were still challenges in co-management in Tam Giang lagoon. Regarding to human resources, the government is able to help resource users to deal with the resource degradation meanwhile the direct participation of the users has improved management effectiveness (Spelchan, Nicoll, & Hao, 2010). Human resource quality was also improved when FA executive boards often participated in training workshops and meetings with government. Therefore, the institution was effective in building up the human resource to manage the lagoon. However, the development of next generation was a challenge for almost FAs in Tam Giang lagoon when most of people who are working in executive boards are around 60 years old. Young people are not interested in working for the executive board because this kind of job has no salary. Mr. Loi said *"I think that the FA will disband soon because have no more people working for the executive board. I and other members of the board do this job simply because of our enthusiasm."* Another challenge for human resource development was the lack of participation of women into FA which caused gender inequity. Although there were female fishers who were fishing on the lagoon, they rarely joint FAs and participated in capacity building activities such as workshops and meetings. Therefore, their involvement in FA activities such as environmental protection was quite limited. To deal with these issues, Giang Xuan FA now is organizing exclusive training classes on environmental protection for female fishers (especially young ones) in the commune. About technical resource, co-management is promised to help FAs to well manage their allocated water areas with assistance from government. In Tam Giang, each commune in where a FPA was built received a boat for patrolling the allocated area especially the FPA. In fact, the combination between human efforts from FAs and equipment from

government has significantly increased the capacity to do surveillance on the lagoon that was greatly helpful in detecting electricity fishers and protecting FPAs.

Table 5: Example of user fee system of Loc Binh 2 FA

Fishing activities	Fee level (VND/year)	
	FA member	**Non-FA member**
Stake trap Good one Normal one	 300 000/trap 200 000/trap	Not permitted
Bottom net* Good one Normal one	 300 000/unit 200 000/unit	Not permitted
Stone FADs	2 000/m^2	Not permitted
Net-iron frame trap (Lu)	150 000/household	300 000/household**
Gill net	80 000/household	150 000/household
Incandescent gas-lamp	80 000/household	150 000/household
Line fishing		
Crab net		
Cage	20 000/unit	Not permitted

4.6. Fair governance

How co-management encourage fair governance is assessed based on four criteria: legitimacy, equity, responsiveness and accountability.

Legitimacy can be defined as “the acceptance and justification of shared rule by a community” and “the question of legitimacy concerns who is entitled to make rules and how authority itself is generated” (Bernstein, 2004). In respect to co-management in the Tam Giang lagoon, FAs were legally allocated fishing right over specific water areas and therefore they have rights to make rules/decisions to manage their areas. This meant that co-management provides FAs legitimacy for fisheries management. However, the level of legitimacy not only depends on the right to make decisions but also is determined by the rule compliance (Jentoft, 2000). The more compliance, the higher legitimate is. According to Truong Van Tuyen (2010) the percentage of resource users who obey the FA bylaw is considerable high. In Giang Xuan FA, fishers have highly respected the FA regulations, for example all fixed fishers have agreed to resize or move their fish corrals, majority of mobile fishers have reduced the number of gears to reach the regulations and none of fishers practice electricity fishing (Table 6).

Table 6: Compliance with fisheries regulations in Giang Xuan FA

Regulations	Compliance percentage (%)		
	Fish corrall	**Net-iron frame trap (Lu)**	**Net**
Rule on fishing time	100	90	95
Rule on fishing location	100	80	95
Rule on the numbers of fishing gears	100	65	95
Rule on the size of fishing gears	100	30	70

(Source: Nguyễn Thị Dung, 2014)

Equity refers to the extent to which institutions is considered to be fair to social actors. As mentioned, the open access regime in the Tam Giang lagoon increased the inequality among resource user groups (fixed fisher, mobile fisher and aquaculture farmers) in accessing to the fisheries resources. While fixed fishers and aquaculture farmers have expanded their access to the lagoon and had exclusive right to their fishing grounds or their ponds, mobile fishers became marginalized. However, the development of co-management have reduced the inequality gradually and thus improved equity. Co-management creates a forum for resource users, especially the mobile fishers give their voice for solutions. Through discussion, resource users understood the problem of inequality and got mutual agreement to act to solve it. Fixed fishing agreed to reduce the number and size of fish corrals to increase the open/free area for the mobile fishers. In Vinh Giang, after corral rearrangement, the fish corral area has decreased from 600 to 300 ha while the mobile zone has increased by 1.5 times from 400 to 600 ha. Moreover, as fixed fishers have good fishing ground compared to the mobile ones, they have to pay higher fee. Normally, fixed fishers have to pay on average of 300.000 VND per trap per year while mobile ones only have to pay half figure per household per year.

Responsiveness relates to the extent to which institutions respond to stakeholder problems/needs. The responsiveness of co-management institutions was relatively high due to the direct involvement of resource users. Table 7 summarized the key needs and problems of stakeholders (government and local resource users) in lagoon management and how co-management responded to them. To cope with the limited access of mobile fishers to the resources, co-management allocated fishing rights to fisher groups which increased their legitimate power to exploit the lagoon. Meanwhile, problems of impoverished fisher livelihood and depleted fish stock were solved by workshop organization and FPA operation respectively. The conflicts between fisher groups were also harmonized by the detail zoning of FA allocated water area. For government, they were also partly successful in managing the lagoon and increase the compliance of fishers with regulations by decentralizing the power to resource users.

Table 7: Stakeholder needs/problems and co-management responsiveness

Stakeholders	Needs/Problems	Co-management responsiveness
Resource users	(1) Access to fisheries resources of mobile fishers is limited (2) Fisheries resources are depleted (3) Livelihood is impoverished (4) Conflicts between mobile and fixed fishers, member and non-member of FA, inside and outside of commune.	(1) Allocating fishing rights to resource users (2) Operating FPAs (3) Workshops on sustainable livelihood (4) Building fisheries resource regulations and zoning FA lagoon
Government	Fisheries resources is unmanageable and law compliance of resource users is relatively low	Decentralizing power to resource users to encourage their participation in management

4.7. Outcomes/Success

4.7.1. Resource quality and lagoon environment improvement

The operation of co-management brought positive changes in fisheries management. Breeding grounds and seaweed which provide optimal conditions for aquatic animal reproduction have been protected. Besides, fishing pressure has been reduced through the rearrangement of fish corrals, reduction in number of fishing gears and effectively prohibited electricity fishing. As a result, fisheries resource as well as environment quality have been improved. Although there have been no official assessment on the changes of lagoon resource and environmental quality, the positive environmental effects has been experienced by the majority of resource users (table 8). Consequently, the increase of fish catch and aquaculture output volumes was noted in many communes on the lagoon (see example in Loc Binh commune in figure 2). The gradual increase of fish catch volume was the strongest proof for the improvement of resource and environmental quality. Beside the increasing fish catch, some typical aquatic species which had formerly lost due to overexploitation and poisonous environment reappeared such as “ong” fish, snapper and grouper. According to local fishers, these achievements resulted from application of co-management regime.

However, a challenge that resource users are facing with is the current climate change hazarding the quality of resource and environment. For example, the long-last sunny season in 2014 increased the salinity of the lagoon that impeded the development of high-value aquatic species such as shrimp. Beside, more salty water also destroyed their fishing equipment (e.g. net) faster. In most of FAs, they have no response to deal with these changes because it required high level strategies.

Table 8: Resource user awareness on the improvement of resource quality and lagoon environment

Criteria	**(%)**
Increase of water quality (cleaner)	88.9
Increase of water circulation	100
Increase in number of aquatic animal variety	11.1
Increase of fish size	0
Increase of fish catch	66.7
Increase of seaweed mass and seaweed areas (for fish reproduction and food)	66.7

(Source: Nguyễn Thị Dung, 2014)

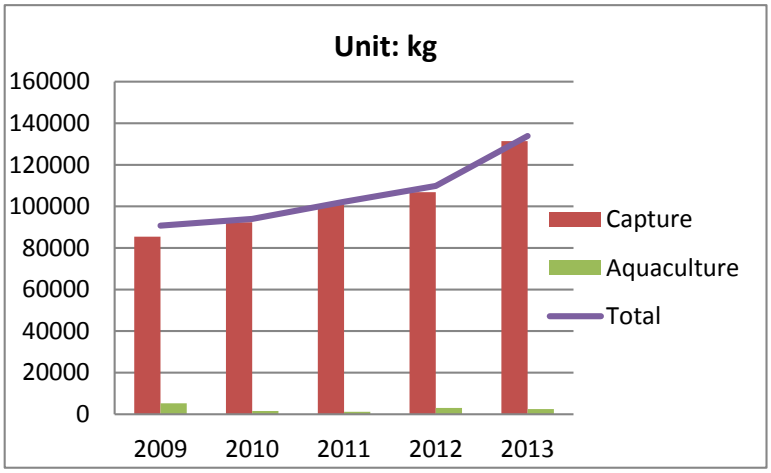


Figure 2: Annual aquatic output of Loc Binh commune

4.7.2. Livelihood improvement

The improvement in terms of resource quality and lagoon environment provides good condition for aquatic animals to reproduce and develop. Accordingly, fish catch per households showed an increased tendency (table 9). As a result, the number of profitable household rose considerably while the number of loss household reduced by zero. Average income from aquaculture escalates swiftly, from 3.96 million VND in 2008 to 35.49 million VND in 2013.

Table 9: Aquacultural production in Giang Xuan FA

Criteria	2008	2011	2012	2013
Shrimp yield/household (kg)	445.24	171.83	190.12	202.80
Crab yield/household (kg)	0	134.88	158.78	170.76
Fish yield/household (kg)	0	149.02	181.71	198.41
Number of profit household	24	36	40	41
Number of loss household	12	0	0	0
Number of break-even household	0	1	0	0
Average income/household (million VND)	3.96	29.16	30.80	35.49

Another improvement of fisher livelihood was the transformation into more sustainable formats. Beside the end of electricity fishing, fishers now are more organized in fishing and aquaculture. Fishers gave more respects to FPAs which ensured the sustainability of fish resource in the lagoon. They also switched to mixed aquaculture (raising many species within a pond) which was more environmental-friendly than the old format (mono shrimp culture).

5. Final Considerations

In short, co-management institution has performed a high adaptive capacity to climate change. It comprised the involvement of a wide range of stakeholders such as: government, social organizations and also resource users, furthermore, most of them have showed good performance especially FAs. FAs emerged as the key actors of the institution when assembled resource users and made them more responsible for lagoon management. It was a small weakness that co-management board did not fully complete their roles in connecting state and social actors. Co-management also provided several opportunities for resources to learn and significantly improved their awareness and capacity. The improvement of environmental awareness of resource users was considered as the largest achievement of co-management by both administrators and users themselves. Furthermore, in the operation of co-management, resource users could keep their learning by frequent meetings. Autonomy and leadership were improved through co-management when resource users received rights to make and implement decisions on management. They were able to regulate resource use rules, zoning the allocate resource areas, set up fee system and elect their representatives to talk to government. The institution also mobilised the financial, human and technical resources of actors. In there, the financial resource was the most impressed result when FAs had rights to collect fee and do business with allocated resource. The human resource was improved in both quantity and quality of people who involved in management. Nevertheless, they are facing the difficulty in building next generations for FAs because of lack of motivations for young people to participate. The mobilisation of financial resource was more significant in communes where FPAs were built than other areas. Co-management also performed fair governance in Tam Giang lagoon as people have equal rights and responsibility for exploiting

and managing the resources. As a result, this institution greatly improved the quality of lagoon environment and resources leading to an improvement on livelihoods of households living around.

References

Acheson, J. (2006). Institutional failure in resource management.

Adger, W. N. (1999). Social vulnerability to climate change and extremes in coastal Vietnam. *World Development, 27*(2), 249-269.

Agrawal, A. (2008). *The role of local institutions in adaptation to climate change.* Paper presented at the The Social Dimensions of Climate Change. The World Bank, Washington DC.

Agrawal, A. (2010). Local institutions and adaptation to climate change. *Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World. Washington DC, World Bank*, 173-198.

Agrawal, A., & Perrin, N. (2009). Climate adaptation, local institutions and rural livelihoods. *Adapting to climate change: thresholds, values, governance*, 350-367.

Armitage, D. (2005). Adaptive capacity and community-based natural resource management. *Environmental management, 35*(6), 703-715.

Biermann, M. (2009). The Role of Local NGOs in Anticipating and Responding to Climate Change: Pennsylvania, USA: Department of Geography, Pennsylvania State University. Available from: www. ehs. unu. edu/file/get/4106.

Brooks, N., Neil Adger, W., & Mick Kelly, P. (2005). The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. *Global Environmental Change, 15*(2), 151-163.

Dolan, A. H., & Walker, I. J. (2003). Understanding vulnerability of coastal communities to climate change related risks. *Coastal Research, SI 39*, ISSN 0749-0208. Brazil.

Gupta, J., Termeer, C., Klostermann, J., Meijerink, S., van den Brink, M., Jong, P., . . . Bergsma, E. (2010). The adaptive capacity wheel: a method to assess the inherent characteristics of institutions to enable the adaptive capacity of society. *Environmental Science & Policy, 13*(6), 459-471.

Gupta, J., Termeer, K., Klostermann, J., Meijerink, S., Brink, M. v. d., Jong, P., & Nooteboom, S. (2008). Institutions for Climate Change: A Method to assess the Inherent Characteristics of Institutions to enable the Adaptive Capacity of Society *Institute for Environmental Studies, Vrije Universiteit, Amsterdam*.

Horstmann, B. (2008). Framing adaptation to climate changd: a challenge for building institutions. *Discussion Paper*.

IMOLA. (2006). Socio-economic baseline survey of Hue lagoon. Part I - Survey report. *IMOLA PROJECT (Integrated management of lagoon activities).*

Jentoft, S. (2000). Legitimacy and disappointment in fisheries management. *Marine Policy, 24*(2), 141-148.

Jordan, A., & O'Riordan, T. (1997). Social institutions and climate change: applying cultural theory to practice. *CSERGE GEC WORKING PAPER*.

Nguyễn Ngọc Phước, & Trương Văn Tuyển. (2010). Quản lý nuôi trồng thủy sản bền vững dựa vào cộng đồng ở vùng đầm phá Tam Giang. *Phát triển đồng quản lý tài nguyên dùng chung ven biển miền Trung Việt Nam - Building co-management of common pool resources in coastal Central Vietnam. Nhà xuất bản Nông nghiệp*.

Nguyễn Thị Dung. (2014). Vai trò của chi hội nghề cá trong "đồng quản lý" thủy sản vùng đầm phá - nghiên cứu tại xã Vinh Giang, đầm Cầu Hai, Thừa Thiên Huế (The role of Fisheries Association in fisheries co-management in the Tam Giang lagoon - Case study in Vinh Giang commune, Thua Thien Hue province). *Luận văn tốt nghiệp Trường Đại học Nông Lâm Huế (Undergraduate thesis, Hue University of Agriculture and Forestry)*.

Nguyễn Thị Thanh. (2002). Gender roles in livelihood activities in Tan Duong village. *Lessons in resource management from the Tam Giang lagoon. Brzeski V.J; Newkirk G. F; Eds., The gioi publishers. Ha Noi.*

Njaya, F. ((_)). Governance Challenges of the Implementation of Fisheries Co-Management: Experiences from Malawi.

Rodima-Taylor, D., Olwig, M. F., & Chhetri, N. (2011). Adaptation as innovation, innovation as adaptation: An institutional approach to climate change. *Applied Geography*.

Smit, B., Pilifosova, O., Burton, I., Challenger, B., Huq, S., Klein, R., & Yohe, G. (2001). Adaptation to climate change in the context of sustainable development and equity. *Climate Change 2001: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change*, 879-906.

Spelchan, D. G., Nicoll, I. A., & Hao, N. T. P. (2010). Co-management/Shared Governance of Natural Resources and Protected Areas in Viet Nam. Proceedings of the National Workshop on Co-management Concept and Practice in Viet Nam.

Takahashi, B., & Van Duijn, A. P. (2012). Operationalizing fisheries co-management: Lessons learned from lagoon fisheries co-management in Thua Thien Hue Province, Vietnam. *FAO Regional Office for Asia and the Pacific, Bangkok. RAP Publication 2012/02, 131 pp*.

Thua Thien Hue statistics. (2007).

Tôn Thất Pháp, Lê Văn Miên, & Lê Thị Nam Thuận. (2002). Sustainable development of aquaculture in Tam Giang lagoon. *Lessons in resource management from the Tam Giang lagoon. Brzeski V.J; Newkirk G. F; Eds. The gioi publishers. Ha Noi.*

Tống Thị Hải Hạnh, & Lê Văn Nam. (2010). Quyền sử dụng tài nguyên đầm phá trong khai thác thủy sản xã Hương Phong, Thừa Thiên Huế (Property right regime over the lagoon resources in Huong Phong commune, Thua Thien Hue province). *Phát triển đồng quản lý tài nguyên dùng chung ven biển miền Trung Việt Nam - Building co-management of common pool resources in coastal Central Vietnam., Nhà xuất bản nông nghiệp (Agricultural publisher).*

Truong Van Tuyen. (2011). Exploring the development of common property regimes for sustainable development and poverty reduction in central coastal Vietnam. The final technical report to IDRC.

Trương Văn Tuyển. (2002). Dynamics of property rights in the Tam Giang lagoon. *Lessons in resource management from the Tam Giang lagoon. Brzeski V.J; Newkirk G. F; Eds. The gioi publishers. Ha Noi., The gioi publishers. Ha Noi.*

Trương Văn Tuyển. (2010a). Quản lý hệ sinh thái đất ngập nước ven biển miền Trung Việt Nam. *Phát triển đồng quản lý tài nguyên dùng chung ven biển miền Trung Việt Nam - Building co-management of common pool resources in coastal Central Vietnam., Nhà xuất bản Nông nghiệp*.

Trương Văn Tuyển. (2010b). Xây dựng mô hình đồng quản lý ở đầm phá Tam Giang - Cầu Hai thông qua trao quyền khai thác thủy sản cho hội nghề cá. *Phát triển đồng quản lý tài nguyên dùng chung ven biển miền Trung Việt Nam. Nhà xuất bản Nông nghiệp.*

Truong Van Tuyen, Armitage, D., & Marschke, M. (2010). Livelihoods and co-management in the Tam Giang lagoon, Vietnam. *Ocean & Coastal Management, 53*(7), 327-335.

Examining Institutional Adaptive Capacity to Environmental Change in Cambodia, Vietnam and Australia

(Draft) Case Study Report

Co-Management in South Australia

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2015

THE UNIVERSITY of ADELAIDE

Table of Contents

1.0 Project Summary

1.1. Examining Institutional Adaptive Capacity to Environmental Change in Cambodia, Vietnam and Australia

The capacity of societies to adapt to environmental change (e.g., overexploitation of natural resources, biodiversity loss, and climate change) can be constrained by conservative and reactive governance institutions (Gupta *et al.* 2010). Institutions are defined here as "*...formal and informal rules, rule-making systems, and actor networks at all levels of human society (from local to global) that are set up to steer societies towards preventing, mitigating, and adapting to global and local environmental change*" (Biermann *et al.* 2009). Therefore, institutions play a critical role in determining the capacity of societies – including resource users, community, government and industry – to adapt to environmental change. Responding to environmental change will require responsive and flexible institutions that facilitate adaptive capacity. This involves, enabling social actors to design new institutions and reform existing ones to better respond to the impact of a changing environment (Gupta *et al.* 2010). While it has been recognised that institutions play a critical role in determining a system's ability to adapt (Agrawal 2008; Engle and Lemos 2010; Lebel *et al.* 2006), there is still relatively limited efforts to assess the characteristics of institutions to enhance adaptive capacity of society (Gupta *et al.* 2010).

This study seeks to assess to what extent resource management institutions in Cambodia (mangrove co-management in Peam Krasop Wildlife Sanctuary), Vietnam (fisheries co-management in the Tam Giang lagoon), and Australia (Fisheries co-management in South Australia) encourage institutional adaptive capacity. Drawing on Gupta et al. (2010), this study will assess adaptive capacity in terms of six broad dimensions; that is, the ability of institutions to: (1) encourage the involvement of a variety of actors, perspectives, and solutions; (2) enable actors to continuously learn and improve their institutions; (3) allow and motivate stakeholders to self-organise, design and reform their institutions; (4) mobilise leadership qualities of social actors; (5) mobilise resources for decision-making and implementation; and (6) support principles of fair governance. Data will come from relevant documents, scoping and formal interviews and focus groups. Understanding the characteristics of institutions that enable adaptive capacity is paramount to improve success of natural resource management institutions in responding to pressing environment change issues. Lessons from this study will also be useful to other natural resource management contexts and beyond the countries studied.

1.2. Analytical framing

This study builds on the Adaptive Capacity Wheel (ACW) of Gupta et al. (2010), consisting of multiple dimensions and criteria used to assess institutional adaptive capacity to environmental change. The ACW is a useful heuristics to examine strengths and weakness of institutional capacity to adapt to environmental change (Grothmann *et al.* 2013).

Institutions are defined in this study as "*...formal and informal rules, rule-making systems, and actor networks at all levels of human society (from local to global) that are set up to steer societies towards preventing, mitigating, and adapting to global and local environmental change*" (Biermann *et al.* 2009).

Institutional adaptive capacity refers to *"…the inherent characteristics of institutions that empower social actors to respond to short and long-term impacts either through planned measures or through allowing and encouraging creative responses from society both ex ante and ex post. It encompasses:*

- *The characteristics of institutions (formal and informal; rules, norms and beliefs) that enable society (individuals, organizations and networks) to cope with climate change.*
- *The degree to which such institutions allow and encourage actors to change these institutions to cope with climate change."* (Gupta et al. 2010).

Assessing adaptive capacity: the adaptive capacity created by institutions can be assessed in terms of six broad dimensions: diversity, learning capacity, autonomy, leadership, resources, and fair governance (Gupta *et al.* 2010). Drawing on the ACW and related literature (e.g., Biggs *et al.* 2011; Dietz *et al.* 2003; Ostrom 2010), these dimensions are conceptualised in the context of this study as follow:

1. *Diversity*. Because environmental change problems are complex and unstructured, embedding diverse interests and perspectives, dealing with such problems requires multiple perspectives and solutions. This includes the participation of relevant stakeholders across different sectors and levels of governance in problem framing and formulation of solutions.

2. *Learning capacity*. Learning is critical for dealing with uncertainty, surprises and changes that characterise environmental change. There is an ongoing need to revise existing knowledge and understanding to enable adaptation. Learning allows actors to reformulate knowledge and understanding based on experiences. Adaptive institutions are therefore those that enable social actors to continuously learn and experiment to improve their institutions.

3. *Autonomy*. Social actors need to be able to autonomously review and adjust their institutions in response to environmental change. Adaptive institutions allow and motivate actors to self-organise, design and reform their institutions. Authority (legitimate or accepted forms of power) for decision-making and implementation is supported (or at least not challenged) by actors and other decision-making entities.

4. *Leadership* can be regarded as a driver for change when it points to a direction(s) and motivate others to follow. Institutions supporting adaptive capacity are those that can mobilise leadership qualities of social actors in the process of (re)designing institutions.

5. *Resources* are critical in generating incentives and reducing transaction costs for actors to engage in collective decision-making and action. Therefore, adaptive institutions have the capacity to mobilise resources (human, financial, technical) for making and implementing decisions (e.g., adaptation measures).

6. *Fair governance.* Institutions supporting adaptive capacity features fair governance, including legitimate institutions that are accepted and supported (legitimacy), considered to be fair (equity), responsive to society (responsiveness), and/or accountable to social actors (accountability).

2. 0 Methods

The dimensions of institutional adaptive capacity outlined above will guide data collection and analysis. Data will consist of multiple sources including relevant documents, interviews and focus groups – depending on the existing data/information for the case studies. Institutions (e.g., fisheries co-management in the Tam Giang lagoon and South Australia, mangrove co-management in PKWS Koh Kong) will be assessed against the adaptive capacity criteria (diversity, learning capacity, autonomy, leadership, resources, and fair governance) (Table 1; see also appendices A2).

Table 1: dimensions of institutional adaptive capacity and assessment criteria

Dimension	Definition	Assessment criteria
1. Diversity (variety)	Institutions encourage the involvement of a variety of actors, perspectives, and solutions	• Inclusive participation of relevant actors
2. Learning capacity	Institutions enable social actors to continuously learn and improve their institutions	• Activities that entail learning (e.g., meetings, decision-making, monitoring and enforcement etc.)
3. Autonomy	Institutions allow and motivate social actors to self-organise, design and reform their institutions. Authority (legitimate or accepted forms of power) is not challenged allowing actors to make and implement decisions	• Authority to make and implement decisions • Authority is not challenged by other decision-making entities
4. Leadership	Institutions mobilise leadership qualities of social actors	• Leadership
5. Resources	Institutions can mobilise resources (human, financial, technical) for making and implementing decisions (e.g., adaptation measures)	• Financial • Human • Technical
6. Fair governance	Institutions support principles of fair governance, such as legitimacy (there is public support for institutions), equity (institutions are considered to be fair), responsiveness (institutions are responsive to society), and/or accountability	• Legitimacy • Equity • Responsiveness

3. REVIEW OF FISHERIES CO-MANAGEMENT IN COMMONWEALTH AND SOUTH AUSTRALIA

3.1 Introduction

This review examines co-management approaches employed by the Federal and the State Governments of South Australia to manage their fisheries. It begins with a brief introduction to the history of fisheries management in Australia highlighting the major policy reforms in Commonwealth fisheries management strategies. Next, the legislative framework governing fisheries management in both the Commonwealth and the States are described. The third section focuses on the concept of fisheries co-management by examining the major factors that have contributed to its currency and adoption in Commonwealth fisheries management. Section four looks at the concept of fisheries co-management as it applies to the State of South Australia focussing particularly on the recently introduced co-management policy. Section five briefly

describes three major fisheries co-management projects that have been undertaken in Commonwealth. The section further assesses the overall performance of the co-management initiatives within the Commonwealth to ascertain the extent to which they have contributed to building the institutional capacity of industry stakeholders or resource users. The last section concludes on the basis of available evidence from the literature.

3.2 A Brief History of Fisheries Management in Australia

Historically, the responsibility for fisheries management has been shared between the Commonwealth and the State Governments since the Federation in 1901. This responsibility is enshrined under Section 51(x) of the Commonwealth Constitution. Before 1979, the responsibility for managing coastal fisheries up to 3 nautical miles(nm) from the lower-water mark was handled by the States whilst the Commonwealth was responsible for managing fisheries in waters beyond 3 nautical miles(i.e. from 3nm to 200nm)(Borthwick 2012). However, on June 29, 1979, Premiers Conference was held during which an agreement was completed between the Commonwealth and the State Governments for the settlement of contentious and complex offshore constitutional issues with respect to fisheries management. The outcome of this conference was the enactment of the Offshore Constitutional Settlement (OCS) by which the Commonwealth and the States developed complementary legislation to assign single jurisdiction for managing each Australian fishery (Borthwick 2012). As part of the OCS, the Commonwealth and the States agreed to adjust the existing fisheries management arrangements by passing management responsibility for particular fisheries exclusively to Commonwealth or to the adjacent States or for the Commonwealth and the States to jointly manage a fishery through a Joint Authority. Currently, there are three of such Joint Authorities involving the Commonwealth and the Northern Territory, Queensland, and Western Australia, all of which were established in 1995.

3.3 Legislative Framework for Commonwealth Fisheries Management

In 1991, a legislative framework governing the management of Commonwealth fisheries was established following a policy statement by the then Minister for Primary Industries and Energy titled "*New Directions for Commonwealth Fisheries Management in the 1990s*"(Borthwick 2012). This policy statement presaged the establishment of the Australian Fisheries Management Authority (AFMA) and set out the objectives and policy principles as well as

their implementation through administrative arrangements, management controls, cost recovery, environmental protection, and policy principles for recreational fishing. The emergent policies during this period were formalized in the 1991 Fisheries Administration Act (FAA) and Fisheries Management Act (FMA).

3.3.1 Fisheries Administration Act (FAA) 1991

The establishment of AFMA is provided for under this Act. Other provisions made under this Act include the following:

- Appointment of commissioners
- Engagement of staff and consultants
- Formation of Management Advisory Committees(MACs) for the purposes of fishery plan of management
- AFMA to develop and approve MACs to assist in the performance of its functions
- Establishment of a Fishing Industry Policy Council.

(Dwyer *et al*. 2008)

3.3.2 Fisheries Management Act (FMA) 1991

The legislative aspects of the fisheries management framework, according to Dwyer *et al.* (2008), are set under the FMA as follows:

- Regulation of fisheries
- Preparation of fisheries management plans
- Fish receival
- Determination of allowable catch
- Compliance and foreign fishing control
- Allocation and management of statutory fishing rights and other concessions
- Cooperation with the States and the Northern Territory.

3.3.3 Australian Fisheries Management Authority (AFMA)

As a statutory entity, AFMA is charged with the responsibility for making day-to-day decisions on fisheries management in Australia. To ensure its independence, this authority is at arm's length from the Minister responsible for fisheries. AFMA's operations and high-level decisions regarding fisheries management issues are overseen by an 8-member Board of Directors with the composition as follows: Chairperson, Government Directors, Managing Director, and 5 nominated Directors (Dwyer *et al*. 2008). The Minister responsible for fisheries appoints the Directors of the Board on the basis of skills and expertise in areas, such as resource management, commercial fishing, fisheries science, marine ecology, economics, government and business management (Dwyer *et al*. 2008). The Chairpersons and Government Director are directly appointed by the Minister while the Managing Director, who is charged with the day-to-day fisheries management, is nominated by the AFMA Board, with the approval of the Minister.

The fisheries management objectives of the AFMA are stipulated under Section 3 of the Australian Fisheries Management Act (Act no. 162 of 1991 as amended) as follows:

- Implementation of efficient and cost effective fisheries management on behalf of the Commonwealth
- Ensuring sustainable exploitation of fishing resources
- Ensuring maximization of the net economic returns from the management of fisheries
- To ensure accountability to the fishing industry and to the Australian community in management of fisheries resources
- Ensure achievement of cost recovery.(Dwyer *et al*. 2008).

The functions of AFMA are set out under Section 7 of the Fisheries Administration Act (FAA) as follows:

- Processing of licensing and entitlement transactions(excluding Torres Strait)
- Collection of license fees and management levies from foreign and local fishers to allow for cost recovery of licensing and management services
- Managing catch, effort and other data collected through its Logbook Program
- Providing professional observer services to domestic and foreign fishing vessels

- Advising Australian delegations in international fisheries forums
- Assessing each fishery on continuous basis
- Conducting research to fill significant gaps in knowledge
- Detecting and investigating illegal activities by both domestic and foreign fishing boats.

3.4 Defining the concept of fisheries co-management in Australia

In Australia, the constitutional authority over the regulation of harvesting is vested in both the Commonwealth and the States. As stated in the previous section, under the Offshore Constitutional Settlement (OCS), the States (and territories) have management responsibility from the lower-water mark to 3 nautical miles, and the Federal government manages from 3nautical miles to 200nm. The Australian Fisheries Research and Development Corporation (FRDC) national working group on fisheries co-management initiatives defined fisheries co-management as "*an arrangement in which responsibilities and obligations for sustainable fisheries management are negotiated, shared and delegated between government, fishers, and other interest groups and stakeholders. In the context of Australia, it means managing Australia's fisheries through partnership and delegation*" (FDRC 2008, p.1, italics added). In the view of FDRC, co-management should not be confused with community-based management in the sense that the latter is concerned about communities being involved in performing functions determined by the government or management agency, but not having the authority to decide about the management arrangement themselves. While the government or state agency agrees to share the responsibilities and obligations for fisheries management with resource user organization, it must be stated that the authority heavily remains with the government and its agencies. This is highlighted in an AFMA-funded research project dubbed "Co-management for Commonwealth Fisheries " in which co-management is defined as "the government or its agencies and the resource user organisation share ongoing responsibility for decision-making over some or all of the fisheries management decisions but this allocation of responsibility is not legally or constitutionally guaranteed. **This means that authority remains with the government and its agencies**" (AFMA 2008, p.4, emphasis mine)

In Australia, a number of distinct but interrelated factors have been identified to have contributed to the increased interest in co-management arrangements in fisheries management. AFRDC (2008) identifies the following factors as being responsible:

- Deficiencies in existing fisheries management
- Infectiveness of existing management regimes in responding quickly to changed circumstances and opportunities in the industry.
- Increasing management costs due to inability of existing management regimes to pass on costs to fishers.
- Reduced profitability of the commercial sector due to high operational costs
- Notwithstanding the increasing consultation offers by the existing management system, it still suffers from conflict and confrontation among fishers and other stakeholders.
- Increasing economic pressures on commercial and recreational fishing
- Desire to strengthen access rights for commercial and recreational fishers; and
- Growing recognition of the need to formally accommodate Aboriginal and Torres Strait Islander traditional fishing practices

In addition, other policy changes have been cited to have prompted changes in fisheries management in Australia. Among these are the release of the Australia's Ocean Policy; the introduction of the regional marine plans; enactment of the Commonwealth's Environmental Protection and Biodiversity Conservation Act; and changes in states fisheries legislations. Thus, in order to maximize economic, environmental and social outcomes from fisheries, interaction between managers and commercial, recreational and indigenous fishers through co-management arrangements is now considered the best management approach. Consequently, all fisheries management agencies in Australia have changed their management from a fully centralized system to the consultative model (Mazur 2010). Some have moved further to the collaborative model, examples of which are the Queensland Fisheries Management Authority (now defunct) and the Australian Fisheries Management Authority. Moreover, in South Australia, some fisheries, for instance, the Spencer Gulf Prawn Fishery, are managed in the collaborative phase, particularly in relation to the 'real-time' management of the fishery (Mazur 2010). Under these collaborative models, the nature of the functions, responsibilities and activities that the collaborative board undertakes as part of the fisheries management have been enshrined in legislation(FRDC 2008).

Promoters of fisheries co-management often make the case that the adoption of this management approach is likely to make significant improvements in the fishing industry in Australia. According to FRDC (2008) and Northwick (2012), adoption of co-management arrangement is likely to bring the following potential improvements to the stakeholders involved the fishing industry:

- Potential lowering of fisheries management cost as co-management reduces red-tape
- Promoting greater sense of empowerment, leadership and ability to set future directions.
- More flexible and adaptive management process
- Improved trust and working relationships among industry stakeholders
- Promoting a partnership approach to ensure implementation of sustainable management regimes.
- A more transparent and effective cost structure
- Efficient delivery of fisheries management services and functions
- Reduced necessity for political decision-making
- Greater scrutiny of legislative frameworks and regulatory controls
- Opportunity to enhance public perception of fishers
- Opportunity for building capacity and skills of stakeholders involved in fisheries management
- Greater ability to innovative and respond to industry development needs

Like other co-management practices in the developed world, a number of functions, activities and services are expected to be performed by industry stakeholders involved fisheries co-management in Australia. These functions and activities span from administration, compliance, research and development, monitoring and evaluation, management planning and policy, and communication and extension. However, the FRDC (2008) recognises that co-management is not about the Federal government delegating all responsibility for core functions in the fisheries management. According to FRDC (2008, p.3), the government is mandated to retain the following functions and activities:

- Policy development
- Enactment of legislation

- Establishment of sustainability performance indicators and controls
- Foreign and international fisheries matters
- Regional planning and development issues
- Powers to grant the initial authorizations to fish
- Compliance, investigation and prosecution powers.

4. Fisheries Co-management in South Australia

4.1. Management of Fisheries Resources in South Australia

The South Australian Government is the custodian and manager of the state's aquatic resources on behalf of the broader community and future generations. The state government is charged with this responsibility in order to ensure that all aquatic resources are "protected, managed and used in a manner that is consistent with the principles of ecologically sustainable development (ESD)", in fulfilment of the objectives of the Fisheries Management Act 2007(PIRSA 2012; PIRSA 2013). In South Australia, the responsibility for the management of fisheries is given specifically to the Department of Primary Industries and Regions, South Australia (PIRSA). The Fisheries Management Act 2007 establishes the Fisheries Council of South Australia (Fisheries Council) whose functions include the preparation of fishery management plans, advising the Minster on allocation issues, promoting the co-management of fisheries in South Australia, promote research, education and training in relation to fisheries and their management(Fisheries Council 2013; PIRSA 2013). These functions are set out under Section 16 of the Fisheries Management Act 2007. The Fisheries Council is established under Section 11 of the *Fisheries Management Act 2007* (the Act) and consists of not less than 10 members. Currently, the Council is composed of twelve members including the Director of Fisheries who is a member of the Council *ex officio.* The remaining members are appointed by the Governor, on the nomination of the Minister (Fisheries Council 2013)

Over the years, the overall management of South Australia's fishery resources has been undertaken in partnership and in consultation with the fishing industry and other key stakeholders in order to ensure the achievement of better fisheries management outcomes (PIRSA 2013). This consultative co-management arrangement was largely implemented

through Fisheries Management Committee (FMC) processes, as mandated by the former Fisheries Act 1982. Although, this management approach provided a platform to ensure engagement between industry and key stakeholders and ensured the achievement of good outcomes for South Australian fisheries, conflicts still persisted between the government, the industry and other key stakeholders (PIRSA 2013). Thus to avoid such conflicts in the fisheries management process, the South Australian Government has recognised the need for its fisheries managers and scientists to engage regularly with commercial, recreational and traditional fishers and other key actors and the general community that utilize or have a stake in fisheries resources in the State of South Australia. To this end, a fisheries co-management policy has been developed to regulate the management of fisheries resources in South Australia.

Fisheries management plans are developed periodically for each SA commercial fishery to assist in decision-making by government in managing South Australia's commercial fisheries in an ecologically sustainable and commercially efficient manner as enshrined in the Fisheries Management Act 2007. These plans also contain performance indicators and trigger points for review or action (PIRSA 2012). The fisheries management plans are developed by steering committees set up by the Council to ensure better engagement with relevant sectors during the development of such plans. These committees chaired by a member of the Council and include members from relevant industry groups, usually report to the Council at each meeting (Fisheries Council 2013)

4.1.1 Fisheries Co-management Policy in South Australia

In 2011, the Fisheries Council of South Australia established a Co-management Working Group to look how co-management might best be progressed in South Australia. The Council, working in partnership with PIRSA and the fishing industry, produced a draft Co-Management Policy which was released for targeted stakeholder consultation in 2012 with the final policy (i.e. Policy for the Co-management of Fisheries in South Australia) approved and published in 2013(Fisheries Council 2013). This policy proposes a framework for co-management of fisheries in South Australia. The policy adopts the working national definition developed by the Fisheries and Development Corporation (FRDC) in 2006. Like the Commonwealth co-management arrangement, the SA Government recognises that, in practice, co-management

exists in a continuum that commences with information exchange through consultation, develops into collaboration between managers, industry and key stakeholders and can under right conditions, progress to sharing responsibilities and formal delegation of management functions. In view of this co-management continuum, the SA Government adopts the staged approach to the implementation of its co-management policy in order to allow industry and key stakeholders to build their capacity over time and to allow for development of a government audit process to evaluate and ensure performance and success. To this end, the policy establishes clear criteria and guide posts, from which all stakeholders "can evaluate the costs and benefits and overall readiness of an industry or key stakeholder organization to move from one stage of the co-management continuum to the next" (PIRSA 2013, p. 5). In the context of the policy, the following stakeholders are recognised as having an interest in the sustainability and management SA fisheries resources:

- Recreational anglers
- Commercial fishers
- Aboriginal communities
- Conservationists
- Consumers of seafood; and
- Community members.

According to PIRSA (2013), the fisheries co-management policy aims at achieving the following objectives:

- To enhance ownership over decision making processes and fisheries management outcomes from industry and key actors to promote responsible fishing
- To promote greater sensitivity to socio-economic and ecological constraints
- To improve management outcomes through the utilization of local knowledge
- To promote collective ownership by user groups in decision making
- To increase compliance with regulations through peer pressure; and
- To ensure better monitoring, control and surveillance by fishers.

Overall, the above-stated policy objectives are in consonance with broader SA natural resource management goals. The policy makes a clear dichotomy between fisheries co-management and

other alternative fisheries management arrangements such as the community-based fisheries management that are already occurring in SA.

Currently, only a few fisheries in SA are managed through centralized government approach. These are mostly small-scale fisheries operating under Ministerial exemptions, exploratory or developmental arrangements and include some miscellaneous fisheries. The majority of fisheries are managed in the consultative phase of co-management involving the industry sector and/ or other relevant key actor groups (PIRSA 2013). However, a few fisheries such as the Spencer Gulf and Prawn Fishery are managed in the collaborative phase, especially in relation to the 'real-time' management of the fishery (Hollamby *et al* 2008). That notwithstanding, the goal of the policy is to move from centralized government decision making to greater industry and stakeholder collaboration on decision-making, sharing of responsibility/accountability and delegation of authority(PIRSA 2013).

The main functions considered for delegation under the policy include some fisheries admiration functions (i.e. administrative licencing), surveillance activities, research and development, scientific monitoring and assessment, operational management decision making in line with established management plans and harvest strategies, and communication and extension services(PIRSA 2013). However, it must be stated that SA government continues to retain some critical functions in the fisheries co-management process. These include policy development, development and review of management plans, enactment of legislation, initial creation of access rights and authority to fish, fisheries access and allocation issues, setting of Total Allowable Catch levels, investigation, enforcement and prosecution, storage of data, legislated fee setting, audit and compliance with contractual arrangements, foreign and international fisheries matters, as well as regional development matters (PIRSA 2013).

4.1.2 Contact base for commercial fisheries in SA

The following fisheries are licensed and commercially operate in South Australia.

Fishery	Contact details
Abalone Fishery	Dr Lianos Triantafillos (Fisheries Manager) Primary Industries and Regions South Australia Phone: (08) 8226 2961 Mobile: 0434 074 004 Email: lianos.triantafillos@sa.gov.au
Blue Crab Fishery	Keith Rowling Program Leader, Community Based Fisheries Phone: (08) 8226 1745 Mobile: 0437 675 573 Email: keith.rowling@sa.gov.au
Charter Boat Fishery	Keith Rowling Program Leader, Community Based Fisheries Phone: (08) 8226 1745 Mobile: 0437 675 573 Email: keith.rowling@sa.gov.au
Lakes and Coorong Fishery	Jonathan McPhail Inland Fisheries Management Officer Phone: (08) 8463 4418 Mobile: 0401 122 163 Email: Jonathan.McPhail@sa.gov.au
Lake Eyre Basin Fishery	Jonathan McPhail Inland Fisheries Management Officer Phone: (08) 8463 4418 Mobile: 0401 122 163 Email: jonathan.mcphail@sa.gov.au
Marine Scalefish Fishery	Michelle Besley PIRSA Fisheries Manager – Marine Scalefish Fishery Phone: (08) 8204 9986 Email: Michelle.Besley@sa.gov.au Nathan Bicknell Executive Officer Marine Fishers Association Phone: 7221 1961 Email: mfa.nathan@yahoo.com.au Mail: Post Office Box 2099, DC Port Adelaide SA 5015
Miscellaneous Fishery	PIRSA Fisheries and Aquaculture, Systems and Information Phone: (08) 8204 1370 Email: PIRSA.FisheriesLicensing@sa.gov.au Mark Ayliffe, Fishery Management Officer Phone: (08) 8226 2934
Gulf St Vincent Prawn Fishery	PIRSA Fisheries and Aquaculture Brad Milic, Prawn Fisheries Manager Phone: (08) 8204 9987

	SARDI Aquatic Sciences Associate Professor Tim Ward, Acting Subprogram Leader – Inshore Crustaceans Email: tim.ward@sa.gov.au Gulf St Vincent Prawn Fishery licence holders Neil MacDonald, Executive Officer Email: neil@nmac.com.au
Spencer Gulf and West Coast Prawn Fishery	PIRSA Fisheries and Aquaculture Brad Milic, Prawn Fisheries Manager Phone: (08) 8204 9987 SARDI Aquatic Sciences Associate Professor Tim Ward, Acting Subprogram Leader – Inshore Crustaceans Email: tim.ward@sa.gov.au Spencer Gulf and West Coast Prawn Fishermen's Association Simon Clark, Executive Officer Email: eo@prawnassociation.com.au
Rock Lobster Fishery	Fishery Manager: Annabel Jones Phone: 08 82262962 Email: Annabel.jones@sa.gov.au South Australian Rock Lobster Advisory Council Executive Officer, Justin Phillips Phone: (08) 8132 0257 Fax: (08) 8132 0161 Mobile: 0400 281 904 Email: justin@jp-consulting.com.au South Eastern Professional Fishermen's Association Inc Executive Officer, Justin Phillips Phone: (08) 8132 0257 Fax: (08) 8132 0161 Mobile: 0400 281 904 Email: justin@jp-consulting.com.au South Australian Northern Zone Rock Lobster Fishermen's Association Inc Executive Officer: Kyriakos Toumazos Mobile: 0402 466 758 Email:kyri.toumazos@hotmail.com
River Fishery	Jonathan McPhail Inland Fisheries Management Officer Phone: (08) 8463 4418 Mobile: 0401 122 163 Email: Jonathan.McPhail@sa.gov.au
Sardine Fishery	PIRSA Fisheries and Aquaculture Brad Milic, Fisheries Manager Phone: (08) 8204 9987 SARDI Aquatic Sciences Associate Professor Tim Ward, Wild Fisheries Program Leader Email: tim.ward@sa.gov.au

	South Australian Sardine Industry Association Paul Watson, Executive Officer Email: admin@sasardines.com.au

Source:http://www.pir.sa.gov.au/fisheries/commercial_fishing/commercial_fisheries(accessed on 20th July, 2014)

4.2. Fisheries Co-management Trials in Australia

The AFMA, as part of its investigation into the potential for applying co-management regimes in Australia fisheries, commenced a three-year Co-Management Programme (CMP) in 2008. This project was undertaken in partnership with the FRDC. The overarching goal of the programme was to allow the fishing industry to have the capacity and capability to play a greater role in fisheries management and administration (FRDC 2008). The trial programme was aimed at achieving the following specific outcomes (Mazur 2010):

- Reduced in complexity in fisheries management
- To simply fisheries management regulations
- To eliminate duplication and reduce red-tape
- To streamline business practices
- Reduction in real costs and not simply shift cost
- Increased industry stability
- To promote and maintain credibility with external stakeholders
- To improve industry/AFMA relationships.

Specifically, this programme involved three Commonwealth fisheries namely: Great Australian Bight Trawl Fishery (GABTF), Southern and Eastern Scalefish and Shark Fishery (SESSF) at the port of Lakes Entrance Cooperative Pty Ltd and Northern Prawn Fishery (NPF) respectively. It must be noted that different approaches to co-management were trialled in each of these fisheries. According to Mazur (2010, p.2), the implementation of CMP was underpinned by eight guiding principles:

1. Industry manages their business to meet their needs and obligations
2. AFMA sustainably manages fisheries resources and fishing practices, and does with confidence of the Australian community

3. Facilitate acceptance of change in approaches and attitudes within AFMA and of new responsibilities by industry
4. Mutual trust and respect between industry and AFMA
5. Functions that benefit industry and AFMA
6. Functions are generic and can be applied elsewhere
7. Functions are cost-effective and balanced against efficient delivery of services and AFMA's legislative objectives; and
8. Functions increase the accuracy and timeliness of information for decision-making.

4.2.1 Great Australian Bight Trawl Fishery (GABTF) co-management trial

This co-management trial was undertaken between 2009 and 2011 with the Great Australian Bight Fishing Industry Association (GABFIA). Specifically, this trial aimed at increasing industry's roles in fisheries management tasks (AFMA 2008). The main elements of the trial involved GABFIA making recommendations directly to AFMA in respect of operational and commercial matters in the fishery, such as total allowable catch, stock assessment and future research directions. Enhancement of fishery data collection and the development of a boat operating procedure manual were other elements of this trial (Mazur 2010). Although this trial has been completed, the GABFIA continues to work with AFMA under a co-management arrangement for their fishery.

4.2.2 Southern and Eastern Scalefish and Shark Fishery (SESSF) co-management trial

This trial was undertaken in May 2008 the Lakes Entrance Fishermen's Cooperative Society Limited (LEFCOL) and a number of individual Lakes Entrance fishers. The basis of this trial involved a range of simplified administrative practices between LEFCOL, Commonwealth fishers based in Lakes Entrance and AFMA. Specifically, the elements of this trial, according to AFMA (2008), revolved around the following fisheries management functions and activities:

- Transfer of some fisheries management responsibilities from AFMA to LEFCOL and the individual Southern and Eastern Scalefish and Shark operators. This included automated data transmission and data collection protocols
- Streamlining administrative processes
- Quota pooling

- Continuous reconciliation of catch against quota
- Industry self-regulated compliance functions.

4.2.3 Northern Prawn Fishery (NPF) co-management trial

This trial began in 2009 and it was in association with the industry group Northern Prawn Fishery Pyt Ltd (NPFI). The trial focussed on a range of fisheries management tasks that hitherto haven been handled by AFMA. The elements of the trial involved the NPFI taking on the following responsibilities in fisheries management:

- Management of some fishery data
- Management of the crew member observer programme
- Making recommendations directly to the AFMA on commercial and operational matters in the NPF (AFMA 2008).

This trial has been completed and evaluated using performance evaluation framework developed by the co-management steering committee. It must be noted that NPF currently continues to incorporate co-management principles into ongoing management of the fisheries

4.3 Assessment of fisheries co-management regimes in Australia

In spite of the shift in fisheries management arrangement, there are no known examples of fully extended self-management fisheries arrangements in place in Australia. Rogers (2009) argues that in spite of the shift in fisheries management arrangements, all co-management initiatives in Australia have tended to focus on modification to existing management plans for fisheries Rogers. Closely related to the above is the lack of an enabling legislation to allow for co-management in Commonwealth (AFMA 2008). Although the existence of an enabling legislation has been identified in the literature as an important pre-condition for successful implementation of fisheries co-management, it is only South Australia that has developed an enabling legislation to govern fisheries co-management arrangements.

The regulation of Commonwealth fisheries under different Acts and Agreements also means that there is both legislative overlap and conflict (AFMA 2008). Currently, Commonwealth fisheries are regulated under the Fisheries Management Act 1991, the Fisheries Administration Act 1991, OCS agreements and the Environment and Biodiversity Conservation Act 2000. Moreover, the current legislative framework mandates two Federal government departments (DAFF and DEW) and one Statutory Authority (AFMA) to manage Commonwealth fisheries. This arrangement has led to "blurring of responsibility for final decision-making and in some cases conflict between decision-making authorities" (AFMA 2008, pp.5). For instance, in a study to evaluate the feasibility of introducing greater co-management in Commonwealth fisheries, AFMA (2008) found limited co-management opportunities in the Great Australian Trawl Fishery (BABTF) and the Southern Bluefin Tuna fishery (SBTF). The AFMA attributed to this problem to uncertainties created by the interaction of the EPBC and Fisheries Management and Administration Acts. It was also found that many other Commonwealth fisheries do not meet most of the pre-conditions for implementation of co-management, such as industry association, clearly defined boundaries, strong leadership and professional capacity and that only a few have shown a strong interest in co-management (AFMA 2008).

Rogers (2009) has provided a favourable assessment on co-management regime at the Exmouth Prawn Fishery in W.A. Based on sustainable prawn catches and ongoing export permits approvals granted under the EPBC Acts, Rogers (2009) views the management of this fishery to be in good shape. In spite of the existence of this effective collaborative co-management arrangement between the Exmouth Prawn Fishery and the W.A Department of Fisheries for many years, Rogers (2009), however, maintains that there is still scope for greater devolution of fisheries functions to the industry consistent with administrative efficiency and cost effectiveness management. To address these observed weaknesses, Rogers recommends the need to further explore issues to self-management before implementation of co-management by embarking on legislative amendments required to the Fish Resources Management Act 1994. Rogers (2009) also makes a strong case to support further extension of co-management arrangements in the Exmouth Gulf Prawn Fishery on cost grounds. He estimates that savings of about $60,000 to $ 80,000 per year could be achieved if fishing industry assumes responsibilities for data entry and collection, field survey and in some aspects of compliance and management. He however provides a caveat that a business case for other W.A fisheries to progress to self-management is unlikely to be made on cost effectiveness alone as individual assessments of the business case for each fishery would be required.

An evaluative study conducted in 2010 to redress knowledge gap on appropriate programme evaluation for fisheries co-management trials in Australia produced mixed results. In this study, stakeholders' description of fisheries co-management and its actual and potential benefits varied significantly (Mazur 2010). In spite of these variations, the relationship aspect of co-management was emphasized by all stakeholders as important (Mazur 2010). In this assessment, the unsatisfactory nature of government-industry relations in fisheries management in Australia was consistently recognised by stakeholders interviewed. Regarding potential benefits of co-management, stakeholders cited increasing industry responsibility, reducing cost and improving efficiencies as critical reasons for co-management. In addition, the existence of certain social and institutional conditions was identified by stakeholders as essential pre-requisites for co-management. To this end, stakeholders recommended the need for a change of culture at AFMA and among external to one more trusting of the industry. Moreover, the inappropriateness on the part of industry to assume certain management tasks was also unanimously agreed to by stakeholders. Stakeholders maintained that assuming such tasks would conflict legislative specifications and or raise the concern of other stakeholders who are seeking stronger evidence that such arrangements would not compromise fishery or ecosystem health (Mazur 2010).

Kangas *et al* (2008) assessed co-management arrangements in the Exmouth Gulf Prawn Fishery and the Shark Bay Prawn Fishery and observed that the industry takes an active and proactive approach in management decision-making processes and implementation of changes through both formal and informal mechanisms. According to Kangas *et al*. (2008), the day-to-day operational management arrangements are carried out cooperatively between the Department of Fisheries and the two existing licensees in Exmouth Gulf and the Industry Association that represent all licensees in Shark Bay. There is also in existence the Trawl Management Advisory Committee (TMAC) whose membership comprises of representatives from community and conservation groups to ensure an open and broad consultative process. The TMAC provides broader stakeholder input into the higher-level policy issues.

In addition, the advice provided by the TMAC to the Minister means that there is cooperative management at the higher level. This comprehensive fisheries co-management plan and related

legislations, in the view of Kangas *et al* (2008), are performing well. However, in spite of the active and proactive approach of the industry in the management process, Kangas *et al* (2008) maintain that the co-management arrangements are still consultative or cooperative rather than collaborative since the day-to-day operational management of the fisheries is delegated to the Chief Executive Officer (CEO) of the Fisheries Department. Moreover, the inability of the management regime to ensure trawling efficiency evidenced by rising costs and falling prawn prices has been raised. To arrest declining profitability, Kangas *et al* (2008) have recommended the need for further management changes to help reduce catching costs.

In South Australia, the introduction of the Fisheries (Management Committee) Regulations 1995 paved the way for the Spencer Gulf and West Coast Prawn Fishermen's Association to play a formal role in co-management (Zacharin *et al* 2008). The establishment of Fisheries Management Committees (FMCs) for each South Australian commercial fishery enhanced the provision of advice to the Minster (Director of Fisheries) on issues concerning management of fishery. The FMC has an independent chair and comprises commercial fishers, Government policy manager, a fishery scientist and a recreational fishing representative. Thus, by creating the platforms for all stakeholders of South Australian fisheries to make input in to fisheries management, the co-management process in S.A has enabled the Spencer Gulf and West Coast Prawn Fishermen's Association to demonstrate its capacity to develop and implement management arrangements that ensure the ecologically and sustainable management of fisheries(Zacharin *et al* 2008) .

Moreover, the collaborative relationships developed between the industry and government in this particular fishery have enabled greater delegation of management responsibility to industry over time. This is evidenced by the fact that the Association has been involved in a number of operational management functions and activities, such as harvest strategy development and real-time management, capacity development within the organization, sound governance, decision-making arrangements and financial self-sufficiency (Zacharin *et al* 2008). However, like Exmouth Gulf Prawn Fishery and the Shark Bay Prawn Fishery, the Minister still retains the power to regain the control of the management of this fishery in South Australia. Under Section 10 of the Fisheries Management Act 2007, the Minister is empowered to delegate day-to-day management responsibilities of the resources to other entities to facilitate co-

management. This must occur in circumstances when a demonstrated track record of collaboration and trust exists between government and industry (PIRSA 2013)

5. SA Industry Perceptions of adaptive capacity and co-management

During the period of this project we conducted workshops attended by fisheries managers where we conducted interviews around what where the key aspects of and perceptions of co-management in South Australia. We guided respondents through questions that focused on obtaining insights about the determinants of adaptive capacity we are using as a conceptual frame. Key findings were as follows:

- Fishers think government does lip service to industry
- Rock lobster and abalone fisheries are stronger and moving more towards the delegate rather than consulted state
- Always going to be a range of views between and within the fisheries so this needs managing as part of achieving co-management
- Leadership within fisheries is crucial, without good leadership you cannot have co-management Adaptive capacity is about good leadership and you see in South Australia that where leadership, especially at community level is strong, os is co-management opportunity.
- Need commitment at senior level
- Communications are important to sector adaptive capacity, without good, transparent communications, you will have issues.
- Having clearly delineated lines of authority and control is crucial. Governance, effective governance at all levels is needed.
- Communications and clear lines of authority between Association members and staff such as Eos matters. Example of Charter oat Fishery used to highlight point here.
- Having sector involved in ways that enable it to ‘have the bigger picture’ is enabling and builds capacity. For example, Spencer Gulf Fisheries have benefited from committees which also have representatives from Conservation Council and other sectors in it, broadens their view and also expertise.
- Trust is important to building co-management, MSF used as an example where mistrust amongst members mean it is hard to get consensus, especially in relation to scepticism about the government intent.

- Co-management needs to be tailored for and within each fishery, not have some broad template. Something that suits and builds adaptive capacity of each one.
- There is a relationship between size of fishery and diversity within each fishery. Both need taking account of in co-management in practice.
- Recreational fishers in a fishery can upset balance of attempt to make co-management work. Better chance of co-management working if there are not many recreational interests to take into account.
- Data is very important - it helps social learning, and builds understanding of social license t operate. Pippy Fishery for example bought economic data into their decision making so they could learn from that and change what they were doing.
- Learning also assisted when fishers actually go out with the scientist. Being involved in the research helps build adaptive capacity, and helps build trust and relationships. This should be part of co-management. There is confusion between harvest strategy and management plans and this need clarifying – confusion in the fishery weakens capacity to build towards co-management. Shift in generations is affecting co-management.
- It's a different type of capacity Younger ones more likely to move towards co-management.
- Education about the utility and importance of resource itself would help build adaptive capacity and a move towards co-management. Many fishers still unclear about this matter.
- One strength in Australia is the fact we do have laws, compliance and enforcement regimes
- Codes of Practice work best in this context
- Co-management could be improved by: (i) building relationships, (ii) having two way conversations between government and industry , (iii) having future vison and strategy re future intent and (iv) good leadership and governance: "I think its about building relationships and with the organisations that are in place at the moment and recognising good governance structures. Working with those." (Respondent A November 2014).
- There was agreement that co-management I easy when the fisheries are doing well, so therefore there is a fundamental relationship between sustainable fisheries and co-management.

- Moreover, there was agreement that self interest dominated fisheries and that management could perhaps help build a bigger picture ”So to improve co-management, you’ve gotta get rid of that self interest and look at the broad picture-big picture across the fishery” (Respondent C 2014).

5.1 Summary of Findings according to Indicators for Institutional Adaptive Capacity

Dimension	Definition	Assessment criteria	South Australia	Enabling	Restraining
1. Diversity (variety)	Institutions encourage the involvement of a variety of actors, perspectives, and solutions	Inclusive participation of relevant actors	Committees and Fisheries Council enhance diversity, cross community membership	Enables cross community insights and discussions over contentious issues to occur, and thus problem solving	Creates conflict, members change, so corporate knowledge lost Can create 'wedge' politics
2. Learning capacity	Institutions enable social actors to continuously learn and improve their institutions	Activities that entail learning (e.g., meetings, decision-making, monitoring and enforcement etc.)	Strong learning capacity evinced Committees social media and web sites create learning opportunities within co-management	Enables heightened understanding of what co-management means Enables trials of EBM and MSP Has created some impetus for some groups such as the MSF to seek greater co-management and community based management involvement	Restrained by fact same people often get all the opportunities Learning constrained by other life pressures, where learning opportunities are not flexible
3. Autonomy	Institutions allow and motivate social actors to self-organise, design and reform their institutions. Authority (legitimate or accepted forms of power) is not challenged allowing actors to make and implement decisions	Authority to make and implement decisions Authority is not challenged by other decision-making entities	There are structures in place for this to occur – committees, harvest strategy plans, FRDC research program, fisheries management plans	Enables a voice for fishers Has created some employment	Constrained by sheer diversity of other acts/policies etc that guide fisheries management at multiple scales Sense of injustice occurs when fisheires are asked to do certain things but other sectors such as recreational

					are not subject to same, so this is perceived as compromising autonomy; short-term political cycle;
4. Leadership	Institutions mobilise leadership qualities of social actors	Leadership	Committees allow for appointment of Chairs and also there are institutional arrangements in place for each fishery that employ CEOs or Eos that take lead roles	Enables/builds capacity for leaders to speak for the fishery, advocate for co-management and to authorise trials of co-management	Need good leaders, opportunities here oftne lost when leaders move on, or are not mature
5. Resources	Institutions can mobilise resources (human, financial, technical) for making and implementing decisions (e.g., adaptation measures)	Financial Human Technical	Resources are explicitly available for some co-management; primarily human and technical, limited financial	Enables some trialling of co-management in a diversity of fisheries	Lack of certainty over ongoing funds for co-management, coupled with the need to tailor co-management to various fisheries, has meant some have given up or failed. Constrained also by fact resources tend to come from government, not industry
6. Fair governance	Institutions support principles of fair governance, such as legitimacy (there is public support for institutions), equity (institutions are considered to be fair), responsiveness (institutions	Legitimacy Equity Responsiveness	Some governance occurs, but is not necessarily or consciously supporting governance principles	Enabled by fact in SA fisheries regulations are quite explicit as are rules/operations for management of fisheries, so there is a two way effect.	If leader or group is not seen as strong or motivated this weakens perception of governance Dominance of informal governance means

	are responsive to society), and/or accountability			Enabled when the EOs of fisheries organisations are strong and judicious thus seen as legitimate Enabled by capacity of certain fisheries to employ/deploy social media to their advantage	hard to formalise principles of governance in practice Constrained also by social media or negativity in public sphere by ENGOs and others re legitimacy of certain fishers/fisheries

The above table highlights that for each of the indicators for institutional capacity, the case of South Australia shows a continuum of emerging to relatively strong capacity for each one. However, our analysis also identified two other points that need considering: (i) it is clear that due to the diversity of fisheries per se that are involved in the co-management trials, that each one has specific needs, strengths and weaknesses that need closer examination for the relationship between institutional adaptive capacity and co-management and (ii) there is a need to examine the extent to which *other* fisheries such as the recreational sector, plays a role.

6. Conclusions

In spite of the shift in policy from the centralized to collaborative approach in fisheries management, Australia is yet to adopt and implement comprehensive co-management models in its fisheries management. Currently, only a few fisheries have adopted and implemented collaborative co-management regimes with varying outcomes. Generally, a few of the fisheries have reported impressive outcomes as measured by their active involvement in fisheries management activities and functions. The responsibility for decision-making is yet to be fully delegated to fishers as power and authority still remain with the government or state agencies. To build the institutional capacity of fishers' organizations through co-management would therefore require delegation of more decision-making power from the government or its agencies to those organizations.

Australia is also yet to meet the most important pre-condition for implementing fisheries co-management (i.e. enactment of an enabling legislation). With the exception of South Australia, there is no enabling legislation to allow for the implementation of co-management in Commonwealth. Yet, there is evidence to suggest that the current legislative framework has not been particularly effective in promoting co-management arrangements as it has contributed to a blurring of responsibility for final decision-making and in some cases created conflict between decision-making authorities involved in Commonwealth fisheries management. The successful implementation of fisheries co-management would therefore require the

harmonization of existing regulations as well as the introduction of an enabling legislation for co-management arrangements to be entered into.

7. REFERENCES

1. AFMA (2008) **Co-management for Commonwealth Fisheries: Final Report.** File No. 05/0783
2. David Borthwick (2012)Review of Commonwealth Fisheries: Legislation, Policy and Management
3. Fisheries Council of South Australia Annual Report 2013/2013
4. Fisheries Research and Development Corporation (2008) *Co-management: Managing Australia's fisheries through partnership and delegation.* Report of the Fisheries Research and Development Corporation's national working group on the fisheries co-management initiative — project no. 2006/068)
5. M. Kangas, M., Sporer, E., O'Donoghue, S., and Hood,S. (2008) Co-management in the Exmouth Gulf Prawn Fishery with comparison to the Shark Bay Prawn Fishery, *In Townsend, R.; Shotton, R.; Uchida, H. (eds). Case studies in fisheries self-governance. FAO Fisheries Technical Paper*. No. 504. Rome, FAO. 2008. 451p.
6. Mazur, N. (2010) Evaluating Fisheries Co-management Trials: A Discussion Paper. Bureau of Rural Sciences, Canberra
7. Peter D. Dwyer, P.D, Tanya J. K, & Minnegal, M. (2008) Managing Shark Fishermen in Southern Australia: A Critique. Marine Policy 32 (2008) 263–273
8. PIRSA(2012) Economic indicators for the Commercial Fisheries in South Australia: Summary Report, 2010/2011.
9. Primary Industry and Regions SA (PIRSA) (2013) Policy for co-management of fisheries in South Australia. Government of South Australia.
10. Rogers, P.P. (2009) Co-management strategies for W.A. State Managed Fisheries using the Exmouth Gulf Prawn (Trawl) Fishery as a case study. Centre for Fish and Fisheries Research Murdoch University, Murdoch Western Australia 6150 ISBN: 978-0-86905-933-3
11. Zacharin, W., Dixon, C., and Smallridge, M.(2008) Towards self-management for the Western King Prawn Fishery in Spencer Gulf, South Australia, *In Townsend, R.;*

Shotton, R.; Uchida, H. (eds). Case studies in fisheries self-governance. *FAO Fisheries Technical Paper*. No. 504. Rome, FAO. 2008. 451p.

8. Appendix 1: Copies of interview schedules

PARTICIPANT CHARACTERISTICS

1. What organization do you represent?.....
2. Which of the following best describes your organization
   - ✓ Government [ ]
   - ✓ If government, please specify if Commonwealth, State, Local)
     Commonwealth [ ]
     State [ ]
     Local [ ]
   - ✓ Community group/NGO[ ]
   - ✓ Industry[ ]
   - ✓ If other, please specify……
     ……
3. Which of the following best describes your organization scale of operation?
   - ✓ Local(e.g. an individual town, district or local council area)[ ]
   - ✓ Regional(e.g. larger than local but smaller than state) [ ]
   - ✓ State(the whole of South Australia) [ ]
   - ✓ National [ ]
   - ✓ Other, please specify……
     …….
4. How long has your organization been involved in fisheries co-management in South Australia? ……..

STAKEHOLDERS AND THEIR ROLES IN FISHRIES CO-MANAGEMENT

1. What organizations, agencies and groups participate in SA fisheries co-management?
2. What are the roles of these organizations, agencies and groups in co-management?
3. How would you rate the role of these organizations, agencies and groups perform in supporting SA fisheries co-management?

- ✓ Very Poor[ ]
- ✓ Poor [ ]
- ✓ Average[ ]
- ✓ Well[ ]
- ✓ Very well[ ]

Please provide example(s)……
……

4. How does fisheries co-management in SA encourage the participation of variety of stakeholders, perspectives, and solutions in decision-making and implementation of its decision? Please provide example(s).

5. Which stakeholders should be participating in fisheries co-management but currently do not?

OUTCOMES OF FISHERIES CO-MANAGEMENT IN SOUTH AUSTRALIA

1. How has fisheries co-management contributed to building the adaptive capacity of stakeholders. Discussion to focus albeit not limited to the following areas. Please provide example(s)
    - ✓ Opportunity for learning and change(in behaviour, perception, attitude, actions etc.) among stakeholders
    - ✓ Autonomy/authority to make and implement decisions
    - ✓ Leadership mobilization among the community and stakeholders to fulfil their roles and delivering key outcomes
    - ✓ Resource mobilization(financial, human, information/knowledge) to fulfil roles and deliver key outcomes
    - ✓ Fair governance(e.g. legitimacy, equity or fairness, responsibility and accountability)
2. How has co-management contributed to improvements in the fishing industry and quality of coastal and marine resources/environment?
3. How has fisheries co-management helped the fishing industry respond to change(environmental, socio-economic, and political)

FUTURE OF FISHERIES CO-MANAGEMENT IN SOUTH AUSTRALIA

- ✓ What needs to happen so as to further improve fisheries co-management in South Australia?