Asia-Pacific Network for Sustainable Forest Management and Rehabilitation

PROJECT PROPOSAL

Integrated planning and practices for mangrove management associated with agriculture and aquaculture in Myanmar

The University of Queensland, Australia

April 2017

Project title	Integrated planning and practices for mangrove management associated with agriculture and aquaculture in Myanmar
Supervisory agency	Forest Department of Myanmar & Department of Agriculture and Water Resources, Australia
Executing agency	The University of Queensland, Australia
Implementation partner(s)	Key implementation partners are Watershed Management Division, Myanmar
Implementation duration: April/2017to March/2019, 36 months]	

Target area(s)(project locations and context)

The target areas in Myanmar are the communities and forests in Pyindaye Mangrove Forest Reserve, Amar town. The town area is 98,419 ha and has population of over 100,000 people in 16,000 households. The Pyindaye Mangrove Forest Reserve (PMFR) is approximately 180,000 acres (44,479 ha)[1]. People living in PMFR have livelihoods that heavily depend on mangrove forests, crops and aquaculture on land converted from mangrove. Mangrove forests contribute about 25 % of the income of households, the highest ratio compared to other income sources. There is no electricity in PMFR, under-developed infrastructure and the average family income is only 69,400 Kyat (56.7 USD) per month. Many families are landless. The community lacksland suitable for cropping and aquaculture, thus land conversion, extraction of timber and firewood are the major causes of mangrove deforestation and degradation in the areas[2]. The most prominent cause of recent deforestation is conversion from mangrove to aquaculture ponds.

The first trials for mangrove reforestation in the Ayeyarwady delta were conducted in the late 1970s by Forestry Department of Myanmar but this attempt was not successful. More recently with support from Action for Mangrove Reforestation (ACTMANG, Japan),a mangrove reforestation project was conducted in Pyindaye township by the Forest Resource Environment Development and Conservation Association, Myanmar(FREDA) and ACTMANG. In 10 years (1999 – 2008) a total of 1,289.2 hectares were reforested. The JICA project's "Integrated Mangrove Rehabilitation and Management Project through Community Participation in the Ayeyarwady Delta" was conducted from 2017 – 2013. The project piloted silvicultural practices and introduced a community forestry framework for mangrove forest management in the region. However, Community Forestry activities will not automatically lead to improvement of income levels of communities. Therefore, the project's objective of mangrove sustainable management and poverty alleviation were difficult to achieve in 3 years after the project's completion[3]. The Myanmar Forest Department and the Worldview International Foundation have been successful in planting several hundreds of hectares of mangrove in the project region. However, recent surveys have also revealed large areas of mangrove forest in the Pyindaye region have been lost or degraded, suggesting forest losses are still exceeding gains due to reforestation[2].

Despite a range of reforestation and community forestry activities in the region there is still a critical need to improve sustainable livelihoods within the communities, which can be facilitated through mangrove forest restoration and improvement in mangrove forest management.

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[1] Ten yeas in Pyindaye – Restoration of mangrove ecosystems and community development, Ayeyarwady delta, Myanmar (1999 – 2008). FREDA / ACTMANG

[2] Assessing different land use pattern and livelihood of the local people in the mangrove area (Case study in Pyapon township). Forest Department, Leaflet No. 29. Chaw Chaw Sein et al. 2015

[3] Terminal evaluation. Project "Integrated Mangrove Rehabilitation and Management Project through Community Participation in the Ayeyarwady Delta". (link: http://www.jica.go.jp/project/english/myanmar/0601872/news/general/121207.html)

Total budget(USD)	APFNetgrant(USD)	Conouterpart contribution(USD) (in cash and in-kind)
564,570	**327,170**	**237,400** in which 191,400 is contribution in kind cash contribution from UQ: 45,000 cash contribution from farm owners: 1,000

Project description:

Loss and degradation of mangrove forests leads to reduced ecosystem services to communities and increased exposure to climate change factors, particularly to sea level rise and associated coastal erosion (Duarte et al. 2013). The proposed project areas is highly exposed to climate change and is undergoing unsustainable development. The target area in Myanmar is the communities and forests in Pyindaye Mangrove Forest Reserve (PMFR) which covers over 120,000 acres and includes the Amar sub-township with over 100,000 inhabitants. People living in PMFR have livelihoods that heavily depend on mangrove forests, crops and aquaculture on land converted from mangrove forests. Mangrove forests contribute about 25 % of the income of households, the highest ratio compared to other income sources. However, many families are landless. The community lacks land suitable for cropping and aquaculture, thus land conversion, extraction of timber and firewood are the major causes of mangrove deforestation and degradation in the areas.

This project will review existing issues and problems in typical mangrove landscapes within this most important delta of Myanmar. We will propose planning and practice for restoration and management of mangrove forests and associated aquaculture and agriculture in the project's target landscapes. It will be participatory project, using integrated approaches and international best practices for micro-planning and implementation of mangrove forest management and rehabilitation. The project has two major goals: (i) build capacity for restoration and sustainable management of mangrove forests in project's region in the Irrawaddy delta in Myanmar; (ii) contribute to livelihood improvement and sustainable development through enhancing aquaculture and agriculture associated and compatible with mangrove forests within the project area.

The projects objectives are:

- investigate key issues associated with mangrove conversion and degradation
- conduct participatory micro-planning for mangrove management in associated with agriculture and aquaculture development
- apply best practices in mangrove restoration and management and aquaculture in mangrove forests in the project area
- enhance policy development capacity to facilitate design and implementation of mangrove restoration and management
- contribute to sustainable livelihood and community development within the project area

The expected outputs of the project are:

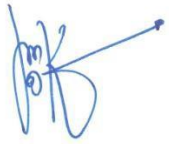
Output 1. Integrated micro-planning approaches for sustainable mangrove management in associated with agriculture and aquaculture production in the selected landscapes
Output 2. Implementations of the plans developed by the community and undertake the establishment of pilot models for demonstration of best practices in the host country.
Output 3. Capacity building and expertise exchange
Output 4: Improvement of ecosystem services, local livelihoods and project's scientific outputs

To achieve the expected outputs key project's activities are proposed as below:

- Biophysical surveys and collection of socio-economic information for planning and assessment of local capacity and needs.
- Participatory micro-planning for mangrove restoration and management integrated with agriculture and aquaculture
- Establishment of co-management and benefit-sharing mechanisms for local communities and forest management bodies at project sites
- Establishment of mangrove restoration and aquaculture demonstration models by local communities and technical staff. We plan a total 71 ha of a pilot model to be established in Myanmar (05 ha of mangrove restoration and66 ha of mangrove restoration in conjunction with aquaculture production).
- Design a monitoring and evaluation framework and implement the framework
- Development and publication of 10 leaflets, 10 guidelines, handbooks/manuals on technical aspects of projects and 02 international publications. 09 training courses and 02 international workshops will be conducted for sharing knowledge and building capacity.
- Harvesting of aquaculture products, marketing and sale

Project sustainability after expiry of donor's funding:

- Increased and diversified income from harvesting mangrove forest products (short term aquaculture and non-timber products and long term timber products) to reduce the pressure to convert forests to unsustainable aquaculture and agriculture.
- Capacity of local technical staff at different bodies and communities will be strengthened through training, extension and learning by doing processes. This allows transfer of project methods and outputs to other communities and regions
- Co-management and benefit sharing regulations to increase management effectiveness and long-term sustainable mangrove management associated with aquaculture and agriculture.
- Contribution of project to an increase in carbon sequestration, coastal protection and other ecological services of mangrove forests in the host country.

Prepared and Submitted by	Review and Nominated by
Catherine Lovelock	
Prof Catherine Lovelock	Dr. Nyi Nyi Kyaw Director General of Forest Department
Project Proponent Signature Date 01/02/2017	Focal Point Signature Date 02/02/2017

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Abbreviations and acronyms

ACIAR: Australian Centre for International Agriculture Research
ACTMANG: Action for Mangrove Reforestation, Japan
APFNET: Asia-Pacific Network for Sustainable Forest Management and Rehabilitation
CIFOR: The Center for International Forestry Research
FREDA: Forest Resource Environment Development and Conservation Association, Myanmar
FRI: Forest Research Institute, Myanmar
IUCN: International Union for Conservation of Nature and Natural Resources
JICA: Japan International Cooperation Agency
MSN: Mangrove Service Network, Myanmar
SNV: Netherlands Development Organization
UQ: the University of Queensland
USFS: United States Forest Services
WIF: Worldview International Foundation, Myanmar office
WMD: Watershed Management Division, Forest Department, Myanmar

Project details

1. Background and Rationale

Mangrove forests are vital ecosystems in tropical coastal regions. Mangroves provide sediment trapping to sustain coastal land; habitat for wildlife; protection for inland sites from storm surges and flooding; provide building materials, food, firewood, traditional medicines and other products to support human needs. Mangrove forests are essential components for climate change mitigation, particularly for sea level rise on low lying coastal deltas[4]. They enhance the resilience of coastal landscapes and provide solutions for climate change and its impacts.

South East Asia has more than one-third of world's mangrove forests with the highest biodiversity of any region. However mangroves have been significantly decreased in this region, with loss of more than 100,000 ha per year during 2000 – 2012 period[5].

The Irrawaddy mega-delta in Myanmar is the major rice and aquaculture production region for Myanmar. But rice agriculture and aquaculture are among the major causes of land use conversion by clearing and have resulted in degradation of mangrove forests.

The coastal regions of Myanmar are extremely vulnerable to climate change and sea level rise. Large areas of Irrawaddy delta are projected to be submerged under even moderate climate change scenarios. Recent monitoring data indicates that many parts of the coast of the Asian mega-deltas are being severely eroded due to mangrove loss and erosion associated with storms, sea level rise and changes in tidal currents[6].

The proposed project area is facing critical challenges due to the combination of climate change and unsustainable development. A large area of Amar sub-township in Myanmar is within the Pyindaye Mangrove Forest Reserve. The sub-township has over 100,000 inhabitants. Local communities, especially villages within the forest reserve have livelihoods that are strongly dependent on mangrove resources.

Causes of mangrove deforestation & degradation in Irrawaddy delta, Myanmar:

It was reported that rice agriculture and aquaculture are among the major causes of land use conversion of mangrove forests and have resulted in degradation of mangrove forests in the Irrawaddy delta[7]. Other sources have indicated that additional causes of degradation are timber and wood exploitation for charcoal, extraction of firewood for use in fish processing, and clearing for expanding residential settlements and home gardens[8].

Our PRA meeting and interviews with local communities, aquaculture farm owners, local officers and experts revealed that the major causes of mangrove deforestation and degradation with the project region are complex, and include collecting timber & wood for charcoal for the local fishery industry (see the Feasibility report for list of communities, staff, officers and experts were at meetings and interviewed[9]). 100 % of local experts and staff reported that local fishery practices use

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[4]The Importance of Mangroves to People: A Call to Action. van Bochove, J., Sullivan, E., Nakamura, T. (Eds). United Nations Environment Programme World Conservation Monitoring Centre, Cambridge. 128 pp. (2014)

[5] Rate and drivers of mangrove deforestation in Southeast Asia, 2000 – 2012.Proceedings of the National Academy of Sciences (PNAS), 113(2), 344-349. Richards, D. R., & Friess, D. A. (2016)

[6] Vulnerability of Indo pacific mangrove forests to sea level rise. Nature 526, 559 – 563. Lovelock CE, Cahoon DR, Friess DA, Guntenspergen GR, Krauss KW, Reef R, Rogers L, Saunders M, Sidik F, Swales A, Saintilan N, Thuyen LX & Tran T. (2015)

[7] Rate and drivers of mangrove deforestation in Southeast Asia, 2000 – 2012.Proceedings of the National Academy of Sciences (PNAS), 113(2), 344-349. Richards, D. R., & Friess, D. A. (2016)

[8] Challenges and lessons learned from ongoing CLEARR project (MERN). Workshop on mangrove rehabilitation and conservation, November 2012, Myanmar.

[9] Feasibility Study report for proposed project "Integrated planning and practices for mangrove management associated with agriculture and aquaculture in Myanmar and Vietnam". University of Queensland, 2016

much of the charcoal derived from mangrove wood. Charcoal is used for cooking shrimp and fish because ice is very expensive for fishermen and they have few options for preserving the catch. A key question posed by local stakeholders was how to change fishery practices from using charcoal to ice, which would significantly contribute to reducing the demand for mangrove's timber & wood. This is not easily changed in the short-term because of the inadequate infrastructure, particularly the electricity systems within the project region[10]. The introduction of solar power for increased lighting in rural areas of Myanmar is occurring, but production of ice is still limited[11,12]. Additionally, as indicated by interviews and surveyed by UQ's researchers, mangrove firewood is used for all residential cooking needs in the proposed project area. These are key reasons for mangrove deforestation and degradation, in addition to land use conversion.

Because of the local importance of exploitation of timber to mangrove degradation, projects that focus on how to increase incomes earned from mangrove forests while still meeting the high demand for timber & wood requirements are crucial. Moreover mangrove forests provide a range of essential ecosystem services, including roles in protection of the shores and the shelter of communities and support of biodiversity and fisheries. Sustainable aquaculture integrated within mangrove forests is one of the most feasible solutions, along with other activities that include increasing the efficiency of wood burning stoves. The design of sustainable aquaculture within mangrove forests would provide both reasonable income, firewood for local communities as well as additional ecosystem services.

Participatory planning approaches for land use, resource utilization and landscape management have been introduced and practiced in developing countries for a long time[13]. A number of successful stories using these approaches have been reported worldwide, including for mangrove restoration[14].

Mangrove rehabilitation techniques have also been developed and practiced for several decades. Research suggests that promotion of natural regeneration through hydrological restoration is a cost effective option to restore mangrove forests[15,16]. However, in some sites, where establishment of seedlings is poor or natural dispersal is limited (e.g. abandoned agricultural lands), planting mangrove species can be a suitable method, having additional benefits for community engagement and education, and is often practiced in South East Asia countries[17].

There is research available on mangrove restoration, fish production, as well as forestry and aquaculture integrated within mangrove forests. Aquaculture within mangrove forests was introduced in the early 1980s in Myanmar, but this approach has not become a commonplace aquaculture technique[18]. With high demand for fish and other seafood, coastal aquaculture has been expanding in Myanmar and competing with mangrove forests for space in the landscape.

Lessons learned from other projects on mangrove forest areas in Myanmar:

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[10]http://www.myanmarsolarpower.net/

[11] Myanmar seafood exports Quick scan of the EU market potential, 2012

[12]http://www.fao.org/fishery/facp/MMR/en

[13] Land use planning – Concepts, Tools and Applications. GIZ, 2012

[14]Brown, B., Fadillah, R., Nurdin, Y., Soulsby, I., & Ahmad, R. (2014). CASE STUDY: Community Based Ecological Mangrove Rehabilitation (CBEMR) in Indonesia. From small (12-33 ha) to medium scales (400 ha) with pathways for adoption at larger scales (> 5000 ha). SAPI EN. S. Surveys and Perspectives Integrating Environment and Society, (7.2).

[15]Ecologically based goal setting in mangrove forest and tidal marsh restoration. Ecol. Eng. 15, 191–198. Lewis, R.R., 2000

[16]Ecological mangrove rehabilitation — a field manual for practitioners.Mangrove Action Project Indonesia, Blue Forests, Canadian InternationalDevelopment Agency, and OXFAM. Lewis, R.R., Brown, B., 2014

[17]Plan for Erosion Management, Mangrove Restoration and Coastal Livelihood for Kien Giang Province. Agriculture and Publishing House, Ho Chi Minh city. Michael J Russell, 2013

[18] Sustainable Coastal Zone Management in Myanmar. Fauna & Flora International. Christoph Zöckler et al. 2013

Due to the essential needs for mangrove restoration in Myanmar, a number of projects and programs have been conducted in coastal areas which have been sponsored by international donors and the Myanmar's Government (Forest Department)[19]. Most of the projects have focused on single issues or a limited suite of aspects associated with mangrove forest conservation or restoration. Some projects and programs have worked on mangrove restoration while the others have focused on building community forestry institutions and frameworks. Some projects supported the development of aquaculture but did not integrate mangrove forests as important habitat for aquaculture species. Thus many projects have not achieved sustainable success and there is a need to consider both mangrove restoration and livelihood improvement concurrently.

Experiences of UQ on mangrove restoration and coordination between UQ and Myanmar's counterparts:

The University of Queensland (UQ) is the leading Australian institution in research collaboration with Myanmar within the agriculture sectors. UQ has been collaborated with Myanmar government institutions to conduct 08 major R & D projects sponsored by Australian Centre for International Agricultural Research (ACIAR) since 1987[20]. Experiences and coordination lessons learned UQ and Myanmar's institutions of these projects and other activities are important foundations for the activities proposed in this project. UQ has significant experience in managing collaborative projects with a wide range of partners, managing $385 million dollars in research funding in 2015, with a third of this funding in environmental sciences[21]. Detail coordination and plan between UQ and Myanmar's counterparts is proposed in section 5.4 of this proposal.

The School of Biological Sciences and School of Agriculture and Food Sciences at UQ have experience in the ecology, physiology, conservation and restoration of mangrove forests and have experience in managing large projects in SE Asia, including in Vietnam and Myanmar[6]. Professor Lovelock is a world expert in mangrove forest ecology and restoration[22]. She has conducted a range of collaborative projects in SE Asia, supervising PhD students and conducting collaborative research[7, 23, 24, 25, 26]. In addition, the project team have experience in successfully managing projects and working within the region. Dr Aziz has a wealth of experience in assessment of management of the production mangrove forests of Malaysia and the ecosystem services they provide. He is an expert in remote sensing of mangrove forests[27]. Prof Lovelock has recently managed a large project with the Australian government aimed at enhancing regional land-use management for climate change adaptation[28].

How to maintain sustainable food production to meet increasing demand by local people while increasing the resilience of these lowland deltas to climate change and sea level rise is a key question addressed by the international community, policy makers and local organizations and practitioners. This project will review existing issues and problems in some typical mangrove landscapes in the most important delta of Myanmar, propose planning and practices for restoration and management

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[19] List of ODA projects in Forestry sector (Forest Department)

[20] http://aciar.gov.au/country/myanmar/view/currentprojects and http://aciar.gov.au/country/myanmar/view/concludedprojects

[21] http://www.uq.edu.au/research/research-at-uq/ecology-and-environmental-science

[22] https://scholar.google.com.au/citations?user=PZfbYkAAAAAJ&hl=en

[23] DM, Murdiyarso D, Fourqurean JW, Kauffman JB, Hutahaean A, Crooks S, Lovelock CE et al. (2015). Indonesia's blue carbon: a globally significant and vulnerable sink for seagrass and mangrove carbon. Wetlands Ecology and Management

[24] Sidik F, Lovelock CE. 2013. CO_2 efflux from shrimp ponds in Indonesia. PLoS ONE 8(6)

[25] Salmo S, Duke N, Lovelock CE. 2013. Vegetation and soil characteristics as indicators of restoration trajectories in restored mangroves. Hydrobiologia 720: 1-18

[26] Salmo III, S. G., Lovelock, C. E., & Duke, N. C. (2014). Assessment of vegetation and soil conditions in restored mangroves interrupted by severe tropical typhoon 'Chan-hom'in the Philippines. Hydrobiologia, 733(1), 85-102

[27] https://scholar.google.com.au/citations?user=s84Gcc4AAAAJ&hl=en

[28] https://www.environment.gov.au/climate-change/adaptation/planning-climate-change-nrm

of mangrove forests and associated aquaculture and agriculture in the project's target sites. It will be participatory, using integrated approaches and international best practices for micro-planning and implementation of mangrove forest management and rehabilitation.

2. Goal(s)and Objectives

Goals: This project is designed to achieve the following overall goals:

(i) Build capacity for restoration and sustainable management of mangrove forests in the Irrawaddy delta in Myanmar

(ii) Contribute to livelihood improvement and sustainable development through enhancing aquaculture and agriculture associated with mangrove forests within the project regions

Project Objectives are to:

- Investigate key issues associated with mangrove conversion and degradation
- Conduct participatory micro-planning for mangrove management in associated with agriculture and aquaculture development
- Integrate best practices to design mangrove restoration and management and aquaculture in mangrove forests
- Demonstrate selected designs and best practices in mangrove restoration and management and aquaculture in mangrove forests.
- Enhance policy development capacity in respect to the design and implementation of mangrove restoration and management
- Contribute to sustainable livelihood and community development within the project areas

3. Expected Outputs, Strategy, and key Activities

3.1 Expected outputs

Output 1. Developing integrated micro-planning approaches for sustainable mangrove management in associated with agriculture and aquaculture production in selected landscapes

Output 2. Implementation of developed plans and pilot model establishment for demonstration of best practices in the host country.

Output 3. Capacity building and expertise exchange

Output 4: Improvement of ecosystem services, local livelihoods and project's scientific outputs

3.2 Activities

To achieve the expected outputs the project's activities are proposed as below

Output 1: Developing integrated micro-planning approaches for sustainable mangrove management in associated with agriculture and aquaculture production in selected landscapes

Activity 1.1: Biophysical surveys and collection of socio-economic information for planning and assessment of local capacity and needs.

Surveys are carried out to collect information and data needed for project's planning. This activity including work packages:

1.1.1 Mangrove forests and other land uses inventory

1.1.2 Household socio-economic survey

1.1.3 Local capacity assessment

Method: We will conduct an inventory for each land use and perform detailed mapping developing a Global Information System (GIS) database. Secondary data for socio-economic status and local capacity will be collected using interviews.

Responsible partners: Watershed Management Division (WMD), Myanmar; local project's staff, the University of Queensland (guideline development, field-training and monitoring and evaluation).

Work plan: This work will be conducted in the first and second quarters of the first year of the project.

Activity 1.2: Participatory micro-planning for mangrove restoration and management integrated with agriculture and aquaculture

Micro-plans will be compiled using a participatory approach and based on data and information collected. This activity includes eight work packages:

1.2.1 Analysis to identify key issues associated with mangrove conversion and degradation

1.2.2 Analysis to identify the requirement for mangrove forest needed for a sustainable and high resilience landscape

1.2.3 Participatory land use planning training for local staff and community leaders (01 training course)

1.2.4 Land use planning

1.2.5 Multi-stakeholders consultation for planning

1.2.6 Production of a participatory land use planning document (A summary for the community and other stakeholders?

1.2.7 A pilot model, planning for mangrove restoration within aquaculture production.

1.2.8 Species selection for mangrove restoration and aquaculture

Method: We will use participatory rural appraisal (PRA) approaches[29], GIS and remote sensing analyses, and the involvement of experts

Responsible partners: local project's staff, local and international consultants, the University of Queensland, Watershed Management Division (WMD), Myanmar.

Work plan: Second and third quarters of the first year of the project

Output 2: Implementation of the developed plans and establishment of a pilot model for demonstration of best practices in the host country.

Activity 2.1: Approval of micro-planning document by higher administration level(s)

This activity includes three work packages:

2.1.1 Synthesis of planning documents and corresponding practices for mangrove management associated with agriculture and aquaculture

2.1.2 Final multi-stakeholders consultation and feedback on the prepared plans

[29]Community Based Ecological Mangrove Rehabilitation & Subsequent Development of Adaptive Collaborative Mangrove Ecosystem Management, Restoring Coastal Livelihoods. Mainstreaming Mangrove Indonesian Ministry of Forestry, Jakarta. Brown, B., & Massa, Y. N. (2013)

2.1.3 Submission and approval of the prepared plans from higher administration level(s)

Method: Multi-stakeholders consultation, in workshop and informal meetings to obtain consensus agreement on the pilot model.

Responsible partners: Watershed Management Division (WMD), Myanmar; local project's staff, local governments, Myanmar's Forest Department (support), the University of Queensland (support)

Work plan: third and fourth quarters of the first year

Activity 2.2: Development of technical guidelines and training for the pilot model establishment.

Development of technical protocols and carrying out training courses on different processes important for achieving the pilot models. This activity includes four work packages:

2.2.1 Five (05)silviculture and aquaculture technical guidelines development (forest establishment techniques, promoting natural recruitment, tree planting techniques where necessary, fish, shrimp, crab growing techniques, mixed aquaculture & mangrove techniques, organic aquaculture…).

2.2.2 Six (06) General technical guidelines (see detail in activity 3.1)

2.2.3 Ten (10) leaflets on knowledge and techniques of forest restoration, management and aquaculture

2.2.4 Training courses on silviculture and aquaculture associated with mangrove for local farmers, technical staff and practitioners (09training courses). Some courses will be replicated to extend best practices to other communities.

Method: Best practices in the region and key learnings are documented to develop appropriate solutions for the project and future projects.

Responsible partners: international and local consultants, the University of Queensland (key staff), Watershed Management Division (WMD), Myanmar; FREDA (Myanmar), local communities, government staff and practitioners.

Work plan: third and fourth quarters of the first year and first quarter of the second year

Activity 2.3: Establishment of co-management and benefit sharing mechanisms for local communities and forest management bodies at locality

This activity includes two work packages

2.3.1 Development of mangrove forest co-management mechanisms

2.3.2 Agreement and signatures for institutionalizing the mechanism

Method: Experiences in the region of co-management of mangrove resources will be utilized. A participatory approach will be used to increase applicability of the mechanism.

Responsible partners: local communities, local project's staff, government staff and practitioners, international and local consultants, the University of Queensland (key project staff), Watershed Management Division (WMD), Myanmar.

Work plan: third and fourth quarters of the first year and first and second quarters of the second year

Activity 2.4: Establishment of mangrove restoration and aquaculture demonstration models by local communities and technical staff. 71 ha including: 05 ha of mangrove restoration and 66 ha

of mangrove restoration in conjunction with aquaculture production.

We will apply best practices to establish pilot models. This activity includes five work packages:

2.4.1. Site preparation

242 Preparation and procurement of seedlings, fingerling, post larva and juveniles of shrimp, crab juveniles. The timing of these activities may be staggered if there are dependencies (e.g. establish forest first before introducing dependent organisms).

243 Establishment of mangrove restoration model

2.4.4. Establishment of mixed aquaculture & mangrove model

2.4.5 Model maintenance, monitoring and harvest of aquaculture species

Method: Best practices in the region will be documented to develop appropriate solutions for the project and the future.

Responsible partners: local communities, local project's staff, government staff and practitioners, international and local consultants, the University of Queensland (key project staff), Watershed Management Division (WMD), Myanmar.

Work plan: from fourth quarter of the first year to the end of the project.

Activity 2.5: Development of the monitoring and evaluation framework and implementation

Designing monitoring and evaluation (M & E) framework and operationalizing the framework to assess the pilot models and their impacts. This activity is comprised of four elements

2.5.1 Development of measurable criteria and indicators for an internal M&E system

2.5.2 M&E training for project's local staff

2.5.3 Collecting data and information for M & E

2.5.4 Analyzing data for M & E report and other publications

Method: Use of a standard M & E approach and collection of data quarterly.

Responsible partners: international and local consultants, local project staff, the University of Queensland (key project staff).

Work plan: Quarterly data collection, from first quarter to end of the project

Output 3: Capacity building and expertise exchange

Activity 3.1: Development of 11 guidelines, handbooks/manuals or reports on the technical aspects of projects (06 technical guidelines – see below, and 05 silviculture and aquaculture model guidelines) and 02 international publications

We will compiling the technical documents for training and extension and develop international publications from the project's process and results. This activity has nine work packages:

3.1.1 Mangrove forest inventory guideline

3.1.2 Socio-economic survey guideline

3.1.3 Participatory rural appraisal and community forest management guidelines

3.1.4 Land use planning guideline

3.1.5 GIS & mapping guideline

3.1.6 M & E criteria & indicators and data collection manual

3.1.7 05 Silviculture guidelines for mangrove restoration and management and aquaculture in mangrove (shrimp, fish, crab…)

3.1.8 Two peer review papers on international scientific journals developed from data/results of the project

3.1.9 One to two master and/or PhD students will do research projects which partly based on project's data &scientific outputs

Method: Synthesizing applicable and best practices information in the Asia-Pacific region for development of the technical documents in English and Burmese.

Responsible partners: international and local consultants, the University of Queensland and key local partners.

Work plan: from first quarter to end of the project

Activity 3.2: Training courses and international workshops for capacity building

Training courses on different technical aspects will be organized for the technical staff, local practitioners, and farmers. Additionally we will hold a international workshop to allow for learning among project sites.

3.2.1 One (01) training courses for researchers and technical staff on mangrove forest inventory, socio-economic survey, participatory rural appraisal and community forest management.

3.2.2 One (01) training courses for researchers and technical staff on land use planning and GIS & mapping.

3.2.3 Three (03) training courses for technical staff & local farmers on mangrove forest restoration and management associated with aquaculture and agriculture

3.2.4Four (04) training courses for technical staff & local farmers on different model techniques of aquaculture in mangrove (e.g. shrimp, fish, crab…)

3.2.5 Two (02) international workshops on: sustainable management and restoration of mangrove associated with livelihood improvement. The first workshop will be organized during inception workshop for sharing knowledges and best practices on mangrove restoration and sustainable management in associated with aquaculture and agriculture in Asia Pacific region. The second one, later in the project will review project results and elaborate further collaboration and development post-project in the region.

3.2.6 Mid-term review workshop

3.2.7Training by doing: training courses will be associated with all project activities thus trainees learn and experience from field activities directly.

Method: Synthesizing applicable and best practices in the Asia-Pacific region for developing technical documents, training and extension. Learning by doing process for local technical staff & farmers

Responsible partners: international and local consultants, local communities, local project's staff, government staff and practitioners, the University of Queensland. Forest Resource Environment Development and Conservation Association, Myanmar (FREDA), Watershed Management Division, Myanmar.

Work plan: from second quarter to end of the project

Output 4: Improvement of ecosystem services, local livelihoods and project's scientific outputs

Activity 4.1: Assess production of aquaculture products from the pilot project, marketing and sale

In this component of the project we have three work packages:

4.1.1 Assessment of the capacity for harvest of aquaculture products, marketing and sale, especially focusing on fish, shrimp, crabs and clams. We will also explore the potential for seaweed aquaculture in ponds, which is occurring to a limited extent in Indonesia (Rimmer et al. 2013).

4.1.2 Harvesting shrimp, crabs, clam and fish and sale if applicable

4.1.3 Monitoring and evaluation to evaluate impacts of the

projects

Method: Selection of suitable species and techniques; market study to determine how high value product can be delivered.

Responsible partners: local communities, local project's staff, government staff and practitioners, international and local consultants, the University of Queensland (key project staff), Watershed Management Division (WMD), Myanmar.

Work plan: from first quarter of the second year to the end of the project.

Activity 4.2: Enhancing scientific outputs of the project

In this component of the project we have four work packages:

4.2.1 Experiment design in pilot models and control areas

4.2.2 Conducting experiment during pilot model establishment to assess limitations to forest growth, how to enhance forest production; as well as benefits from carbon sequestration and sediment accumulation.

4.2.3 Data and sample collection and sample analysis at UQ's labs

4.2.4. Data analysis and publication development Method: Standard and advanced scientific research methods

Responsible partners: University of Queensland, Watershed Management Division (WMD), Myanmar.

Work plan: from third quarter of the first year to the end of the project.

4. Risks, assumptions and solutions

4.1. Project assumptions

Some major assumptions of the project are:

- High participation of local communities, forest management bodies
- Species, model and techniques selected are suitable to biophysical and socio-economic conditions of project sites
- Sufficient budget for qualified activities
- No major pest, disease and natural disaster problems

4.2. Risks and solutions

To minimize risks of low participation of local communities and forestry management bodies we conducted a feasibility study during preparation of project document which was submitted to APFNet. During this study representative(s) from The University of Queensland held meetings and discussions with the relevant project's stakeholders including government authorities, forest management boards in project areas, local communities, and local experts. Additionally consultation meetings were organized with local partners which have substantial local knowledge and experiences which can be used in developing appropriate activities and corresponding approaches. Local needs are one of the key parameters to define project interventions and solutions.

The project will apply best practices in the Asia-Pacific region, particularly best practices in the host country in micro-planning, mangrove restoration and aquaculture within mangrove forests in order to minimize risks in the selection of techniques and development of pilot model sites. Additionally species selection for the project will be based on indigenous knowledge, local needs and experiences from other program/projects to minimize failure from choosing inappropriate species. Forest inventory, socio-economic surveys and participatory rural appraisal at the initial stages of the project will also help to define project's interventions that are suitable and compatible with local aspirations and conditions.

Budget estimations will be carefully elaborated to achieve the project targets. In addition to secondary budget data collected from reference documents and staff experiences, the costs of project establishment was surveyed during the feasibility study of The University of Queensland which allows us to make appropriate and accurate cost estimations.

A risk currently exists that timber and firewood supply deficits and poverty will increase illegal logging, making sustainable forest management less attractive and profitable in the short term. To mitigate this risk, the incomes of households and local communities will be enhanced through the activities of the project. On the technical side, both in the short- and long-term product-supplying aquaculture species will be introduced to local producers by the project.

Major pest, diseases and natural disaster like typhoons and floods would damage project sites. To reduce the likelihood of pests and disease risks, high quality materials and suitable aquaculture and silviculture techniques will be used. Careful land use planning and model design also help to decrease the negative impacts of natural disasters. Early warning to have appropriate response solutions will be also addressed in project guidelines and M&E system.

The University of Queensland has not previously conducted a mangrove restoration or community development project in mangrove forest areas of Myanmar and thus there is a risk failure of project administration. These risks are minimized by the systems of accountability within UQs structure, the experience within UQ of working on projects in Myanmar (ACIAR funded) and the experience of Prof Lovelock and the project team. Additionally, Prof Lovelock and the project team are integrated within a network of organizations working on mangroves in the region, including CIFOR and the US Department of Forestry as well as NGO's, who have similar goals and have agreed to work collaboratively.

5. Human Resources and capacity assessment

5.1 The Project Steering Committee (PSC)

The PSC will include:

- An officer from Department of Forestry, Myanmar
- An officer from Department of Agriculture and Water Resources, Australia
- A staff member of APFNet
- Project director (The University of Queensland)
- Project coordinator (The University of Queensland) who will act as secretary of PSC

Responsibilities of PSC: The role of the PSC is to give policy guidance, endorse project proposals and the overall budget plan to help the Project fulfill its targets and contribute to the socio-economic development of the project sites in accordance with project objectives and activities, specifically:

- Review and approval of project document which includes overall work plan to submit APFNet.
- Administrative support for project counterparts in project implementation
- Suggest appropriate changes in project activities to help project achieve it's target successfully if needed
- Review project's progress through M & E reporting annually by project management board and give any guidance and support if needed
- In general, Project Steering Committee shall meet at inception, mid-term review and project completion workshops. The meeting minutes should be recorded as formal recommendations of the Project Steering Committee to the project. Travelling costs of these meeting shall be covered by project's budget. If any essential problems occur which hinder the project implementation, the EA shall write report to APFNet to state the reasons and the suggested solution to through PSC to APFNet for approval. In this regard, a virtual PSC meeting shall be organized to resolve the problems in a timely fashion and make efficient use of the project funding.

5.2 Project Management Board (PMB)

- Director of Project Management Board will be staff of The University of Queensland (20 %)
- 01 project coordinator who is staff of University of Queensland (50 % time);
- Project member: academic staff of University of Queensland (10 %)
- Financial officer (contributed by The University of Queensland) (by duties assigned)

Responsibilities of PMB: Responsibilities & functions of Project Management Board are included:

- Developing overall implementation and budget plans of the project to submit to the PSC, and to APFNet for approval
- Developing annual implementation and budget plans of the project to submit APFNet for approval
- Conducting project's activities consistent with the approved plans

- Contracting with local partners as sub-contractors to fulfil some project activities, especially activities in the field
- Selection of and contracting local project staff and consultants and project's procurement
- Selection and nomination of international experts for APFNet
- Developing technical guidelines/handbooks/manuals and leaflets for the project with consultants and local staff
- Financial, asset and disbursement management:
- Administrative, coordinating issues of the project
- Project's monitoring, evaluation and reporting
- Acceptance of funding from APFNet, payment and project's account balance reporting
- Any other duties, including scientific outputs and project publicity on social media and other platforms.

Project director: The project director Prof Catherine Lovelock is a leading international expert on mangrove ecology and management. The director has conducted a wide range of research and development projects in associated fields as a leader and key investigator. The director has strong connections with scientific and management communities for sustainable management of mangrove forests in Southeast Asian countries.

Project coordinator: The Project Coordinator will work almost full time for the project and help the Project Director in daily project implementation in the fields and at the office, reporting, monitoring and evaluation.

Qualifications: PhD degree, have at least 10 years experience in forest/mangrove research and project management in South East Asia countries, at least 03 years experience as project's technical team leader. Familiar with ODA project implementation procedure and modality in developing countries. English fluency is a must.

- Preparing project document, overall, yearly and quarterly plans.
- Preparing project's budget plan to meet project activities timely and efficiently.
- Conducting of project's plans with project counterparts.
- Coordinating activities between Executive Agency (University of Queensland) and Burmese partners.
- Acting as the chief technical advisor in the fields to discuss with project's experts for proposing appropriate technical solutions for project's activities
- Coordinating activities of project team includes international experts, national consultants, project staff, local practitioners and communities
- Developing technical guidelines, leaflets with project's consultants
- Conducting training courses and international workshops with project's partners, local staff and consultants.
- Developing M & E system with expert and conducting M & E in the fields with project's staff.
- Project's research design and implementation in the fields
- Data analysis and publication development

- Supporting postgraduate students in project's related studies; co-supervising students if needed
- Preparing project's reports with the project director.

Project's local staff: The project will employ a full time local staff member for daily duties, especially in the field. Local project staff will be nominated by the key partner and selected by project director and coordinator. Local project staffs play important roles in coordination between local stakeholders and with the wider project. The local staff will possess a minimum of a bachelors degree in agriculture/forestry/aquaculture; have at least 05 years working experience with 02 years working on projects within mangrove forest habitats; be willing to be located at field sites most of the time; have good English communication; be in good health and with swimming and other field safety skills. Local project staff report directly to the Project Coordinator and the Project Director and receive salary from the University of Queensland.

5.3 Local partners

Local partners are selected based on their expertise relevant to project's activities and the duties within the project. The nominated key local partners are Watershed Management Division (WMD), Forest Department, Myanmar.WMD have conducted numerous research and development projects on forest rehabilitation, management and conservation, and livelihood improvement in rural areas Myanmar. WMD has a number of research staff that have graduated with postgraduate degrees from developed countries. Additionally, in the national forest management system in Myanmar, mangrove forests are under management of the forestry sector, directly under WMD. Thus it will help to enhance and smooth the coordination process, reduce transaction times and costs and increase the effectiveness of project activities.

Besides the key local partner WMD other institutions which have long-term experience and special expertise on mangrove forest management, aquaculture in mangrove habitats, and coastal community management will be also consulted and partnered with. Organizations already identified in Myanmar are the Forest Resource Environment Development and Conservation Association (FREDA), Forest Research Institute (FRI), Forestry University, Mangrove Service Network (MSN), Worldview International Foundation (WIF) – Myanmar office.

We'll also work with Center for International Forest Research (CIFOR), the United States Forest Services (USFS) and Blue Forests who have active mangrove restoration projects in the region.

5.4 Responsibilities and fund for the executive agency and key partners

Table below present specific roles and fund for the project's executive agency and key partners

Table 1 Responsibilities and fund for the executive agency and local key partners

Activity	**Key responsibility counterpart**	**Fund Disbursement**	**Note**
Inception workshop	Executive Agency – The University of Queensland WMD	UQ	WMD support to issue invitation letters for international experts for visa
Forest Inventory	WMD	WMD	Technical support

Activity	Key responsibility counterpart	Fund Disbursement	Note
			and M & E by UQ
Socio-economic survey & PRA	WMD	WMD	Technical support and M & E by UQ
Land use planning	WMD	WMD	Technical support and M & E by UQ
Establishment of mangrove restoration pilot models	WMD	WMD	Technical support by experts & UQ; M & E by UQ
Aquaculture models	WMD	WMD	Technical support by experts & UQ; M & E by UQ
Research design and implementation	UQ	UQ	
Technical document development	Project management board & experts	Project management board & experts	Key local partners support
Training courses	WMD	WMD (cost for experts will be paid directly by UQ)	UQ select & employ instructors and M & E
Publication in local languages	WMD	WMD	
Mid-term workshop	UQ	UQ	Location to be defined after consultation with project partners
Completion workshop	UQ WMD support	UQ	WMD support to issue invitation letters for international experts for visa
Auditing	WMD	WMD	UQ support
International experts (nominated by UQ, selected by UQ and	APFNet, UQ	UQ &APFNet	UQ pay costs for international experts directlyunder

Activity	Key responsibility counterpart	Fund Disbursement	Note
APFNet)			agreement with APFNet
National experts (nominated by partners, selected by UQ)	UQ	UQ	UQ pay costs for national experts directly
Project's local staff (nominated by key local partners, selected by UQ)	Local partners, UQ	UQ	UQ pay salary for project's staff directly

5.5 Consultants

International mangrove restoration and community development expert (1 person-month)

Qualifications: Minimum bachelor degree; At least 10 years experience in mangrove restoration community development in South East Asia. English fluency is a must.

Responsibilities:

- Review mangrove restoration best practices.
- Visit field sites and propose appropriate mangrove restoration techniquesthat are consistent with aquaculture
- With the help of national consultant, find and propose suitable techniques and species to restore mangrove forests in project areas.
- Review current nursery practices in project's areas on producing mangrove seedlings. Investigate the efficacy of natural regeneration. Identify constraints to improvements in quality and recommend practices to effect improvement in mangrove recruitment.
- Where appropriate review supply plans prepared for seedling delivery by project management board. Recommend requirements/criteria/guidelines improvements to facilitate delivery of quality seedlings to the planting site. Propose seedling acceptance standards.
- Where appropriate propose planting and tending techniques for selected species
- Work with project staff and local consultants to develop silvicultural guidelines for project pilot models
- Provide advice on community monitoring of the success of restoration into the future
- Establish a participatory approach for community forest management and livelihood improvement interventions in project's villages.
- Visit field sites to assess the most effective ways to deliver relevant project components
- Work with project staff and local consultants to develop participatory rural appraisal guidelines
- Propose co-management mechanism for managing mangrove forests in project's regions

- Assist in the design of data collection for households and communities of the project.
- Deliver: a report on suitable and/or promising techniques and species for mangrove restoration in the project sites. Community development report which suggest participatory approaches for project's areas.

International expert on aquaculture in mangrove (1 person-month)

Qualifications: Minimum bachelor degree;at least 06years experience in mangrove aquaculture; possess South East Asia experiences. English fluency is a must.

- Review best practices in aquaculture associated with mangrove forests and existing national and local technical policy for aquaculture
- Visit the field sites in Myanmar to propose models for aquaculture within mangrove forests
- Work with project staff and local consultants to develop models for establishing sustainable aquaculture in mangrove forests and develop guidelines
- Review supply plans prepared by the project for fingerling, post larva and juveniles of shrimp, crab juveniles for mangrove aquaculture. Make recommendations on requirements/criteria/guidelines improvements to facilitate delivery of quality material to the field sites. Propose acceptance standards.
- Propose aquaculture techniques for selected species and sites
- Deliver: Report on suitable and/or promising species for aquaculture in mangrove forests in the project region. Provide an evaluation report on current practices foraquaculture species. Provide guidelines for nurseries and aquaculture techniques.

National community development experts (01 person – month)

Qualifications: A Bachelor degree in agriculture/forestry/aquaculture/social sciences; At least 5 years experience on rural community development and management, and prior experience as a consultant for ODA projects; English fluency is a must.

Responsibilities

- Assist international community development expert and project staff in field work. This may include role as a interpreter during field trips with international experts and project's staff
- Work with international experts and project staff in development of guidelines.
- Translate and/or edit technical guidelines on participatory approaches developed by international experts into local language if needed
- Conduct training courses for local staff and farmers for the components of the project for which the person is responsible as the key instructor
- Deliver: timely and effective assistance to international experts and project staff; training documents in local languages and training courses

National experts on aquaculture in mangrove (1.5 person – months)

Qualifications: At least bachelor degree on aquaculture; At least 5 years experience in the aquaculture industry including 02 years in aquaculture in mangrove forests, and experience consulting for ODA projects; English fluency is a must.

Responsibilities:

- Assist international experts on aquaculture in mangrove and project staff in field work. This may include role as a interpreter during field trips with international experts and project's staff
- Work with international experts and project staff to develop technical guidelines.
- Translate and/or edit technical guidelines on aquaculture within mangrove habitats if needed.
- Conduct training courses for local staff and farmers for the components of the project for which the person is responsible as the key instructor
- Deliver: timely and effective assistance to international experts and project staff; training documents in local languages and training courses

Land use planning and GIS experts (1.5 person – months)

Qualifications: At least a bachelors degree on agriculture/forestry/aquaculture; At least 5 years experience inland use planning, mapping and GIS, and prior experience as a consultant for ODA projects; English fluency is a must.

Responsibilities:

- Assist project staff in field work. This may include role as a interpreter during field trips with project's staff
- Work with project staff to develop technical guidelines on land use planning, GIS & mapping
- Translate and/or edit technical guidelines into local language if needed.
- Conduct training courses for local staff and farmers for the components of the project for which the person is responsible as the key instructor
- Deliver: timely and effective consultant to project; training documents in local languages and training courses

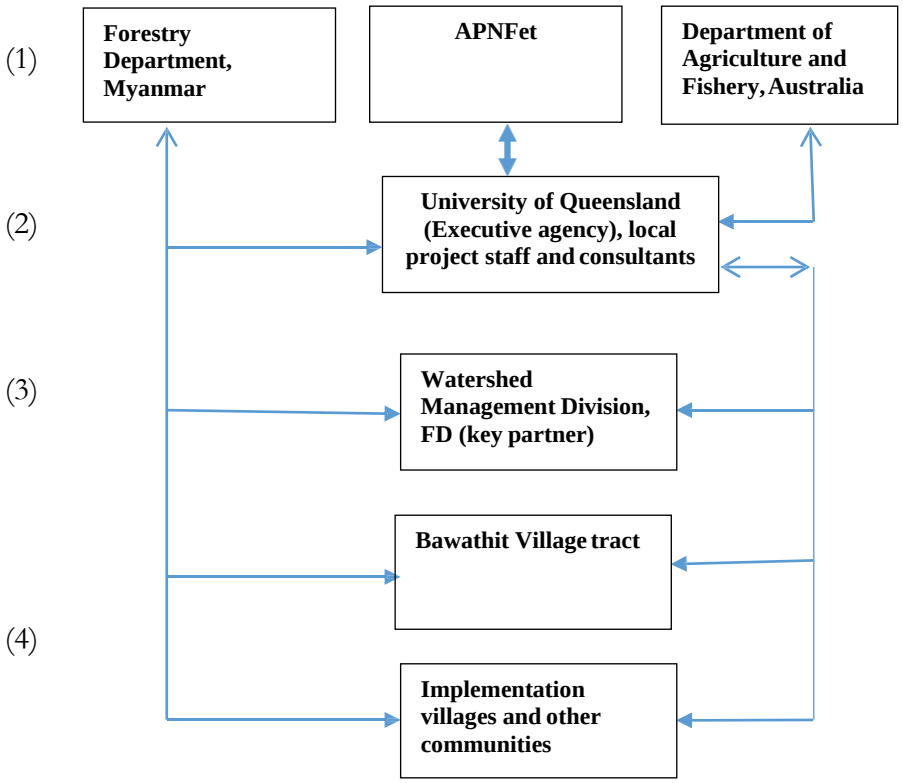
National M & E experts (01 person-months)

Qualifications: A bachelor's degree and at least 5 years experience in M&E of the natural resources and livelihood sectors i.e. designing M&E methodology and systems, specification of planning and programming of M&E implementation, linkages to reporting formats and reporting procedures. Good command of English.

- The M&E consultant should study the M&E system introduced to the project and suggest how to mainstream and operationalize it within the project.
- Propose an approach to baseline survey and propose the implementing mechanisms required.
- Assist to design the methodology/system for recurrent monitoring of project progress.
- The M&E specialist will support the compilation of training material and take part in the training of staff and community members in the different aspects of M&E.
- Deliver: methodology and implementation mechanisms for the baseline and recurrent M&E systems. Training material and plans to get the M&E systems up and running.

5.6 Project organization chart

Project's organizational chart (management structure)



(1) Project steering committee
(2) Project management board – Executive agency
(3) Project key local partners
(4) Field intervention level

6. Budget, funding resources and financial management

6.1 Overall budget of the project

Detailed project cost is indicated in Annex E. The table 2 below present overall budget lines of the project.

6.2. Financial management principles

Accounting: Strictly follows UQ's policy and APFNet regulations

Project budget management: The Project Management board is fully in charge of financial management of the Project under current policies of the University of Queensland and APFNet which includes project accounts, accounting management, financial reporting, monitoring and evaluation, payment inspection.

Financial reports will be submitted to APFNet on an annual basis.

6.3 Detail financial management

Elaboration of project's financial plan:

The Project Director is responsible for elaborating and submitting financial plans for project activities, including plans for APFNet support budget, UQ fund and in kind contribution from local partners.

Accounting: The Project Accountant and Project Director are responsible for the setting up and continuous maintenance of the accounting system.

Project accounts:
A project account will be opened at within University of Queensland financial system. The account in AUD and USD is opened for payments of all sub-contractors and partners as well as other expenditures in Australia and in host country.

The account should be signed by two signatories together, the Project Director and the Accountant.

Funds will be transferred to the UQ's account from APFNet, on request by Project Director. Transfers should be supported by a budget which broadly justifies the funds needed.

The project budget balance will be recorded monthly in the financial report. Financial statements will document all transactions on the account. All transactions will be verified in the accounting system reports.

Transactions, vouchers:
For any financial transaction in the project accounting system, payment or receiving, a payment voucher should be raised. The voucher should contain the following information;

- a unique reference number
- date for the transaction
- payee or payer
- means of payment - including id number of cheques etc.
- purpose of payment; (what, why, when), including reference to supporting documents such as invoice numbers or Contract / agreement number
- amount in words and figures, with currency included
- name and signature of person who has prepared the voucher
- name and signature of personnel who authorized the payment

Any supporting documents should be attached to the voucher, in original (for receipts and invoices) or copies, for Contracts.

All international payments should be made from the project office by USD. This includes all invoices from international consultants, local staffs and sub-contractors including remuneration, per diem and international travels.

Attestation:
All payments and supporting documents should be attested by Project Director. That includes;

- approval of financial reports from project office
- invoices from sub-contractors and partners
- time reports from all personnel
- any other payments.

Petty cash
Petty-cash transaction may be used for direct payment in the field (e.g. local labors, travel costs etc.). Petty cash should be below USD 1000 each payment.

The Project Director should check the following when approving payment;

- payment is according to invoice, Contract or agreement
- delivery of service or goods is verified (quantity and quality), e.g. through statement, time sheet, etc.
- the amount is within the project budget (if not so the APFNet should be consulted)
- that approval procedures for payment follows UQ's financial regulations

The petty-cash transactions should be entered immediately into system (same day or day after). When a computerized accounting or cashbook system is used the petty cash should be recorded under a separate account. This record may function as petty cash ledger. The Project Director may undertake unannounced verifications of the petty cash at any time.

Advance payment
Cash advances can be given by the program office, to advisors on assignment in the country of operation. An advance request should be filled in and approved by the Project Director for each individual advance. Advances can be given to cover service travel expenditures or other large payments without invoice such as rent, and other private reimbursable costs.

If advances are requested by short-term international consultants, these should be paid by the project accountant under approval of the Project Director.

Travel claim
All staff and consultants who are entitled to get costs reimbursed in relation to national and international travels should submit a travel claim to the Project Director. The travel claim should be made on a special form, as decided by the Project Director under University of Queensland policy.

Internal audit
Preparation of invoice: The Accountant should prepare a draft invoice. When approving the draft invoice the Project Director should check the following;

- that the invoice is prepared and delivered according to instructions stated in the Agreement with Funding Agency (APFNet)
- that the fees invoiced are according to the Contract, that all increments etc. have been included
- that the time invoiced (the fees) is accurate and according to time sheets
- that the fee and reimbursable costs invoiced are within the budget frame in the Contract with the Funding agent, (if this is not the case the Project Director should immediately inform the Steering Committee and APFNet)

After approval the Accountant should prepare the original invoice. It is the responsibility of the Project Director to ensure that the invoice is delivered according to instructions in the Agreement with APFNet. If approval by a counterpart organization is required the Project Director has to organize this. If possible, date of delivery of the invoice should be verified, in all cases the date shall be recorded internally.

The Project Director should ensure that the budget follow-up is accurate and correct and the assignment follows the budget in the Agreement with APFNet.

7. Reporting, monitoring and evaluation

7.1 Reporting, monitoring and evaluation

Monitoring and evaluation of the project include monitoring at the field sites and desk-top work, such as writing the progress reports (by quarters, 06 months and years), updating data into the project's information management system, periodic assessments and before finishing the project assessments. The work in the field will be done synchronously at every level with a specific schedule of monitoring and with clearly allocated tasks. The project local staff, village head and technical staff of village tracts and commune will be trained in skills for monitoring and evaluating, and provided fully with materials which are related to M&E of the field activities. Annual progress report will be prepared following the format provided by APFNet and submitted to APFNet for approval by the end of each project year. External evaluations will be conducted by APFNet in mid-term and on completion of the project.

Monitoring and evaluation report system: A form of implemented progress report of the project **(by quarters, 06 months and years)** will be developed. However, in the implementing process of the project, the report form can be changed or updated for appropriate with the tasks, functions and the number of works. The staff of the project will be trained in using the report form and methods of collecting information, and in the methods of laying out the sections of the report. The schedule for sending monitoring and evaluating reports between levels will be stipulated at a specific day of every quarter, every six months and every year. Beside the internal monitoring and evaluating form, the project will also follow the report forms approved by APFNet.

Implementing schedule of monitoring and evaluation activities: All monitoring and evaluation activities will be implemented by following a set schedule. In the schedule, the start and the end time will be showed clearly. Firstly, we will develop the internal report forms, MIS and organize training for monitoring and evaluation skills for the staff of the project.

Criteria, verifiable indicators and parameters of monitoring and evaluation for the project: Based on components and activities of the project, a monitoring and evaluation framework will be developed to clearly determine the criteria, indicators and parameters for monitoring and evaluation of the project and specifically allocate jobs and responsibilities and determine methods of collecting data for those parameters. The parameters of monitoring and evaluation will be transferred into the internal report forms and management information system which will be collected and updated regularly by the project staff. The parameters of monitoring and evaluation also will be used for the periodic or the final evaluation of the project. The proposed initial detailed criteria, indicators and parameters for monitoring and evaluation are presented in **Annex B – project logical framework.**

Monitoring and evaluation at the field of the beneficiaries: Most of the activities of the project will be implemented at the field, thus, it is very important to ensure their quality. To monitor the implementation of the work at the field sites, the project's local staffwill work in the field regularly to ensure the quality of the project activities, identify and timely regulate deficiencies, and to promote the progress of implementing the work of the project if the situation of slow progress occurs. Additionally, the beneficiaries, specifically, village heads, village tracts or commune leaders, will immediately inform the project management board if there are problems associated project activities in the field.

7.2 Monitoring and evaluation of pilot models

The project will develop a mechanism for strictly monitoring and evaluating of implementing model activities to make sure that they meet the demands of the communities and achieve high quality outcomes.

Quality of seedlings, fingerling, post larva and juveniles of shrimp, and crab juveniles etc. This is an important stage and plays a decisive role in the productivity and quality of the

pilot models of the project. Therefore, standards of testing quality should be strictly applied to make sure that materials are high quality and sufficient quantity to achieve high survival rates and the pilot model's success.

Beside the strict standard for mentioned material, capacity and experience of the providers need to be considered.

Checks before acceptance and verifying and monitoring of model establishment: In the processing of implementing model establishment (project staff and local technical staff) will be delegated to monitor and give guidance on techniques and implementation. After completed model establishment, the project will be checked before acceptance at the primary level by a board that includes the project staff, project local staff, local government representatives and farmers.

Annually, the projects have responsibility for updating the data of planting, protecting and tending the forest and resources. The data will be provided to field monitoring staff in order to make periodic evaluation, include random sampling to verify the updated data.

8. Dissemination and knowledge sharing

Communication: to better inform the public of the project during inception and project's completion workshops, press releases and conferences will be organized. Project objectives, activities, achievements and relevant information will be presented.

Dissemination and knowledge sharing: All technical guidelines and leaflets will be delivered in other communities in the project regions. Training courses are conducted not only for project's communities, staff and authorities in project areas but are also open for other communities and technical staff at different management levels from national to grass-root bodies for extending project's approaches and increase long term development.

Applying best practices in micro-planning, mangrove restoration and aquaculture in mangrove forests, this project is expected to achieve high quality and influential outcomes and pilot models that will contribute to the development of technical policy in the host country. These may consist of coastal community development policy, mangrove forest restoration and management techniques, criteria and standards for aquaculture in mangrove habitats to enhance resilience, biodiversity and economic outcomes for communities.

Two peer review international papers will be developed from project data/results which will bring knowledge to international community. Additionally it is expected 01 – 02 master/PhD students from host country will conduct research thesis partly based on project data & outcomes. This will contribute to capacity building for long-term development and management of mangrove forests in these economies.

9. Duplicability and sustainability

9.1Potential impact of the project on mangrove, population and environment

- The value of mangrove in the project areas will be increased: i) mangrove forest restored and sustainable managed; ii) mangrove forests associated with aquaculture provide additional income from fish, shrimp, crab etc.
- Contribute to livelihood improvement of local communities through: i) combining both short-term incomes from aquaculture and long-term income fromtimber; ii) equality share for local farmers from implementation of community forest management enhance participation of citizens in forest development and sustainable forest management.

- Improve and sustain mangrove forests including mixed species mangrove restoration. Foresee enhancement of biodiversity and biomass productivity that will contribute to increase carbon sequestration of the project's forests. Forest value enhanced and a decrease in forest conversion into unsustainable aquaculture.

9.2Project duplicability

Simple techniques from best practices can be easily duplicated in Myanmar and other coastal regions which have similar ecological and socio-economic conditions.

The success of the project would be expanded to other Asia - Pacific countries, particularly South East Asia where natural and social conditions are similar.

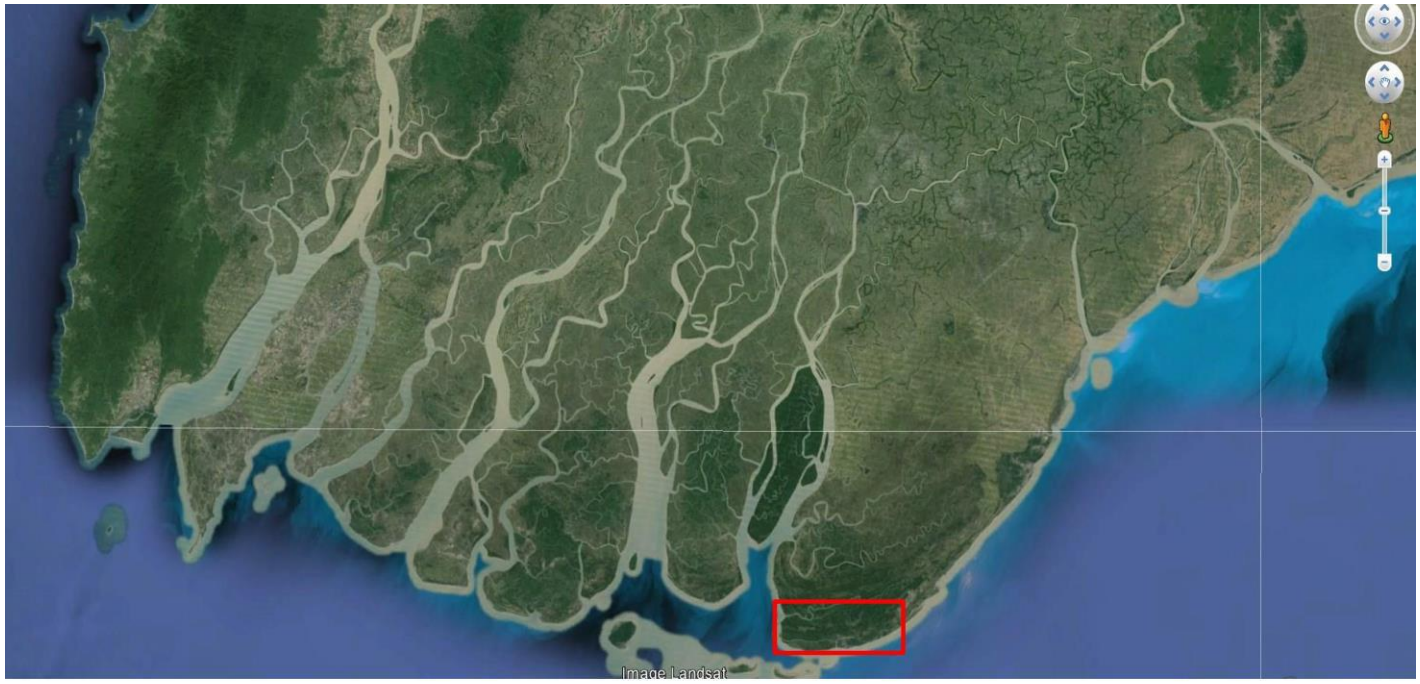
Project sustainability after expiry of donor's funding

- Increased and diversified income from harvesting mangrove forest products (short term aquaculture products and long term non-timber and timber products) contribute to lower pressure on conversion of forests to unsustainable aquaculture and agriculture.
- Capacity of local technical staff at different bodies and communities will be strengthened through training, extension and learning by doing process. This will allow the transfer of project methods and outputs to other communities and regions
- Co-management and benefit sharing regulations between local communities and mangrove management will increase management effectiveness and long-term sustainable mangrove management associated with aquaculture and agriculture.
- Contribution of project areas to increasing the carbon sequestration and other ecological services of mangrove forests. These values will be considered as key assets of forests, becoming increasingly important as climate change progresses and continues to challenge coastal communities.

Annex B: Project logical framework

Annex A: Project site map and relevant information

Pyindaye Forest Reserve, Myanamar



Village Tract: Bawa Thit
Village: Ah Shey Hpyar, Gaw Du, Htaung Gyi Tan, and Tha Mein Pale.
Reserve Forest: Pyindaye
Town: Amar
Township: Pyapon
District: Pyapon
Region: Ayeyarwady (The Ayeyarwady Delta)

Annex B: Project logical framework

	Intervention logic	Objectively verifiable indicators of achievement[5]	Sources of information and means of verification[6]	Assumptions[7]
Goal(s)[1]	Build capacity for restoration and sustainable management of mangrove forests in project region in Irrawaddy delta in Myanmar	- Number of people are trained in mangrove restoration, aquaculture in mangrove forests and sustainable mangrove management - Number and quality of publications, technical guidelines, training document and training courses	- Training documents, leaflets and technical guidelines prepared - Training courses organized - Successful model establishment by local communities - Project M & E	
	Contribute to livelihood improvement and sustainable development through enhancing aquaculture and agriculture associated with mangrove forests within the project regions	- Mangrove areas in the project communities increased - Income of participated households and communities increased - Successful aquaculture and mangrove forestry models	- Forest resource inventory - Socio-economic surveys - Model input & output data - Project M & E data and report	
Objectives[2]	Identifying key issues associated with mangrove conversion and degradation	- Socio-economic issues that have direct negative impact on mangrove conversion and degradation identified	- Socio-economic surveys in 02 communities - Forest inventory in 02 villages - Participatory rural appraisal for 02 communities	
	Conduct planning for aquaculture and agriculture associated with mangroves by participatory micro-planning approaches	- Participatory micro-planning conducted including: + Land use planning + Forest restoration and management design	- Planning approaches - Planning documents for 02 villages - Model design document for 02 areas (04 models) - Maps for 02 villages - M & E data & report: every quarter	

Annex B: Project logical framework

	Intervention logic	Objectively verifiable indicators of achievement[5]	Sources of information and means of verification[6]	Assumptions[7]
	Integrating best practices to design mangrove restoration and management and aquaculture in mangrove	Best practices integrated in 04 models (02 models of aquaculture in mangrove, 02 models of mangrove restoration): Model approaches Model design	Model design document Maps Training document M & E data & report for every quarter	
	Demonstrate selected design and best practices in mangrove restoration and management and aquaculture in mangrove forests	Model areas; number of seedlings and fish, shrimp, crab andscallop breeds Model quality (survival rates, growth rates)	Model document M & E data & report	
	Enhancing policy development capacity in respect to the design and implementation of mangrove restoration and management	Good practices and technical procedures draw from outcome of the project	Model documents M & E data & report	
	Contribute to livelihood improvement and community development within the project areas	Income of local households increased Local institution strengthened	Co-management and sharing mechanism regulations M & E data and report	
Expected outputs[3]				

Annex B: Project logical framework

	Intervention logic	Objectively verifiable indicators of achievement[5]	Sources of information and means of verification[6]	Assumptions[7]
Output 1	Developing integrated micro-planning approaches for sustainable mangrove management in associated with agriculture and aquaculture production in selected landscapes. Responsibility: Project management board, international and local consultants	Land use planning manual Aquaculture in mangrove manuals	Technical guidelines Project M & E	
Activities[4]				
Activity 1.1	Biophysical surveys and socio-economic information collection for planning and assessment of local capacity and needs	Service provider for forest inventory (at least 04 qualified staff); inventory equipment, forest status maps, inventory manuals and budget	Forest inventory and survey maps and ports M & E data and report	
Activity 1.2	Participatory micro-planning for mangrove restoration and management integrated with agriculture and aquaculture	Community participation (at least 60 % of households in communities participated) Planning document	Planting document M & E on participatory processes	
Output 2	Implementation of developed plans and pilot models establishment for demonstration of best practices in the host country Responsibility: Project management board, consultants, local management bodies, communities	Micro-plan for village tract introduced and approved Number of pilot models established and use of approaches developed	Project report M & E data and report	
Activity 2.1	Approval of micro-planning document by higher administration level(s)	Planning document are approved	Approved documents	Strong support of local authorities

Annex B: Project logical framework

	Intervention logic	Objectively verifiable indicators of achievement[5]	Sources of information and means of verification[6]	Assumptions[7]
Activity 2.2	Technical guidelines development and training for model establishment	Number of technical guidelines Number of training courses Number of participants Training instructors Training budget Training equipment	Trainers, trainees, project staff and experts Training M & E	
Activity 2.3	Establishment of mangrove co-management and sharing benefit mechanisms for local communities and forest management bodies at locality	02 Co-management and sharing benefit regulation for two villages Actual benefit sharing for aquaculture harvest	Signed and approved document Income from models M & E data and report	Consensus agreement between local communities and management bodies
Activity 2.4	Establishment of mangrove restoration and aquaculture demonstration models by local communities and technical staff	At least 95 % of model areas established; survival rate of mangrove species > 75 %; survival rate of aquaculture > 50 % Number of people involved in model establishment	Model M & E data and report Project report	High quality and sufficient number of seedlings and breeds used for pilot models Qualified experts and technical staff; contribution of local farmers
Activity 2.5	Model monitoring and evaluation framework and implementation	M & E framework for model. Data collected regularly (quarterly and during establishment & harvesting)	Model M & E data and report	
Output 3	Capacity building and expertise exchange	Training documents and leaflets developed Training courses organized Training instructors number Number of people attended training by doing	Project document M & E data and report Training evaluation	
Activity 3.1	Development of guidelines, handbooks/manuals on technical aspects of projects and international publications	Number of guidelines/manuals developed Number of leaflets compiled Number of international	Project document M & E data and report Technical experts & project's staff	

Annex B: Project logical framework

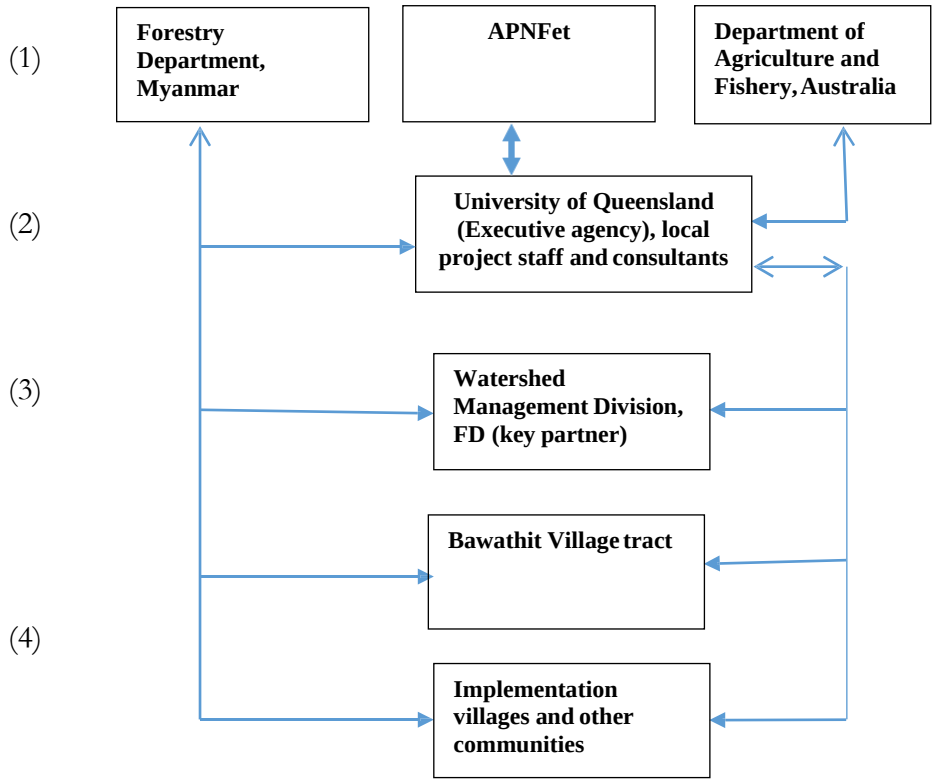
	Intervention logic	Objectively verifiable indicators of achievement[5]	Sources of information and means of verification[6]	Assumptions[7]
		publications		
Activity 3.2	Training courses and international workshops for capacity building	Number of training courses& participants Quality of the courses Number of international workshops organized - participants	Training M & E Training documents	
Output 4	Improvement of ecosystem services, local livelihoods and project's scientific outputs Responsibility: University of Queensland, Project management board, consultants, local management bodies, communities, local partners	Forest areas increased Forest biodiversity improved Income from aquaculture of model areas will be increased at least 50 %	Forest inventory Socio-economic survey Project M & E data and report	
Activity 4.1	Assess production of aquaculture products from the pilot project, marketing and sale	Volume of harvested products Sale value of harvested products Net income earned from aquaculture increased at least 50 %	Model establishment and harvesting data Project M & E data and report	Aquaculture products can be harvested during project duration

Annex B: Project logical framework

	Intervention logic	Objectively verifiable indicators of achievement[5]	Sources of information and means of verification[6]	Assumptions[7]
Activity 4.2	Enhancing scientific outputs of the project	Experiment design Field experiment Sample & data collection and analysis At least 02 international publications developed from project data	Data & publications Project M & E data and report	

Annex C: Project organizational chart

Project's organizational chart (management structure) (detail roles and responsibility described in section 5)



(1) Project steering committee
(2) Project management board – Executive agency
(3) Project key local partners
(4) Field intervention level