



**Fiji**

# **TECHNOLOGY ACTION PLAN – Adaptation**

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## Executive Summary

Agriculture and coastal zones were two sectors prioritized for adaptation in the Fiji TNA project. This report is the final step of the TNA process that is developing a Technology Action Plan (TAP), which is a roadmap for deployment of the technology in the country. Sectoral TAPs presented in this report were developed from the results of the two previous steps and stakeholder consultations. In the first step, a list of adaptation and mitigation technologies were selected, prioritized and presented in the TNA Report. Barriers to increased diffusion of prioritized technologies were identified through research and stakeholder consultations, and overcoming measures were outlined in the Barrier Analysis and Enabling Framework (BAEF). The following technologies were prioritized in each sector and included in the TAP are listed below:

### Agriculture Sector

- Agroforestry
- Integrated Nutrient Management
- Improved Crop Varieties

### Coastal Zones

- Mangrove rehabilitation
- Construction of Seawalls with groynes
- Flood hazard and risk assessment mapping

The Barrier Analysis and Enabling Framework (BAEF) involved a stakeholder consultative process whereby identification, screening, decomposition and analysis of root causes of barriers were undertaken through the national workshop conducted. The BAEF report highlighted linkages of barriers in each sector showed similar barriers relating to economic and financial barriers, policy and regulatory barriers, technical barrier and information and awareness barriers. The BAEF report also identified the measures and the enabling environment for the deployment of the prioritised technologies.

TAP followed the similar process involving stakeholder consultation like in previous two steps. Multiple stakeholders, public and private sector representatives and the TNA Steering Committee looked at the enabling measures and prioritized measures from the BAEF report that were critical in the deployment of the technology. These prioritized measures were then transformed into determined viable, concrete actions for the TAP. For each action, a set of activities were identified that would lead to successful adoption of these technologies in the country.

The Table below summarizes the ambition, actions, timeframe for implementation and total costs for implementation for prioritized technologies included in the action plan for both sectors:

## Agriculture Sector

Ambition	Actions	Timeframe for Implementation	Total cost for implementation
<b>Technology 1: Agroforestry</b>			
Agroforestry practices to be implemented across at least one third of agricultural areas by 2030 and is supported through development and implementation Fiji's agroforestry Policy.	<ol style="list-style-type: none"> <li>1. Launch Program to develop Agroforestry Policy.</li> <li>2. Develop Agroforestry Policy.</li> <li>3. Securing sustainable funds.</li> <li>4. Establish 3 pilot projects for adopted agroforestry technology.</li> <li>5. Develop Water Payments for Ecosystems Services.</li> <li>6. Land Use Planning to identify &amp; map areas suitable for Agroforestry.</li> <li>7. Mainstream Fiji's Agroforestry Policy.</li> </ol>	2024 - 2030	FJD 3, 748, 500
<b>Technology 2: Improved Crop Varieties</b>			
Enhance institutional capacities for the development and adoption of saltwater tolerant rice variety, bacterial wilt tolerant eggplant and anthracnose disease tolerant chillies by 2030.	<ol style="list-style-type: none"> <li>1. Develop and strengthen coordination between existing initiatives on improved crop varieties.</li> <li>2. Develop institutional capacities to deliver training.</li> <li>3. Conserve, develop and evaluate improved and resilient varieties of priority crops.</li> <li>4. Promote the use of improved and resilient varieties crop.</li> </ol>	2024 - 2028	FJD 8, 012,000
<b>Technology 3: Integrated Nutrient Management</b>			
Improving and sustaining soil health by integrated nutrient management to increase sugarcane production in Western and Northern Division.	<ol style="list-style-type: none"> <li>1. Creating awareness in INM in the Sugar and Agriculture sector.</li> <li>2. Development of national policy around INM.</li> <li>3. Development and adoption of INM technologies with private sector involvement.</li> <li>4. Build capacity in INM in the Sugar and Agriculture sector.</li> </ol>	2024 - 2027	FJD 4, 450, 000

## **Coastal Zone Sector**

Ambition	Actions	Timeframe for Implementation	Total cost for implementation
<b>Technology 1: Mangrove Rehabilitation</b>			
To strengthen national policies and regulations on mangroves and restore 20% of mangroves (additional 8,520 ha) by 2030.	<ol style="list-style-type: none"> <li>1. Policy Framework and Protection.</li> <li>2. Sustainable Financing and Economic Opportunities.</li> <li>3. Integrated Land and Seascape Planning and Restoration.</li> </ol>	2023 - 2026	FJD 5,350,000
<b>Technology 2: Seawalls with Groynes</b>			
To enable the resilience of maritime and high risk communities on mainland through the implementation of tidal barrier technologies.	<ol style="list-style-type: none"> <li>1. Identify &amp; Prioritize high risk communities</li> <li>2. Identify Effective Designs</li> <li>3. Secure Funding</li> <li>4. Awareness and Training.</li> </ol>	2023 - 2026	FJD 800,000
<b>Technology 3: Flood Hazard and Risk Assessment Mapping</b>			
To strengthen risk informed decision towards sound coastal development planning, investment and long term development strategy.	<ol style="list-style-type: none"> <li>1. Develop coherent guideline towards high quality and consistent coastal risk mapping as well as policy and regulations.</li> <li>2. Government to allocate budgetary funds and also access funds from the Green Climate Fund (GCF).</li> <li>3. To obtain data using modern technologies such as LiDAR, MBES, GNSS and drones.</li> <li>4. Provide more training opportunities for local meteorologists, hydrologists and coastal scientists.</li> </ol>	2023 - 2026	FJD 3,831,000

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## Acronyms

ADB	Asian Development Bank
BAEF	Barrier Analysis and Enabling Framework
CCD	Climate Change Division
CI	Conservation International
CSA	Climate Smart Agriculture
CSO	Civil Society Organization
CVA	Climate Vulnerability Assessment
FHO	Fiji Hydrographic Office
FLMMA	Fiji Locally Managed Marine Area
FMS	Fiji Meteorological Society
FNU	Fiji National University
FSC	Fiji Sugar Corporation
GCF	Green Climate Fund
GEF	Global Environment Facility
GNSS	Global navigation satellite system
GoF	Government of Fiji
ICZM	Integrated Coastal Zone Management
IUCN	International Union for Conservation of Nature
LEDS	Low Emission development Strategies
LiDAR	Light Detection and Ranging
MBES	Multispectral Multibeam Echo sounder Backscatter Data
MCS	Ministry of Civil Service
MECC	Ministry of Environment and Climate Change
MLMR	Ministry of Lands and Mineral Resources
MoF	Ministry of Finance, Strategic Planning, National Development and Statistics
MoA	Ministry of Agriculture and Waterways
MRMDDM	Ministry of Rural and Maritime Development and Disaster Management
MRTT	Mangrove Restoration and Tracking Tool
MSI	Ministry of Sugar Industry
MTA	Ministry of iTaukei Affairs
MMF	Ministry of Forestry and Fisheries
MMP	Mangrove Management Plan
NAP	National Adaptation Plan
NCCP	National Climate Change Policy
NDP	National Development Plan
NGO	Non-Governmental Organization
PES	Payment of Environmental Services
SDG	Strategic Development Goals
SDP	Strategic Development Plan
SG	Solicitor General
SLR	Sea-level Rise
SRIF	Sugar Research Institute of Fiji

TAP	Technology Action Plan
TNA	Technology Needs Assessment
ToT	Training of Trainers
USP	The University of the South Pacific
USAID	United States Agency for International Development
UNDP	United Nations Development Agency
WCS	Wildlife Conservation Society
WWF	World Wide Fund for Nature

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# Chapter 1 Technology Action Plan and Project Ideas for Agriculture Sector

## 1.1 TAP for Agriculture Sector

### 1.1.1 Sector overview

The agriculture sector plays a key role in the Fijian economy and is regarded as a transformational thrust for Fiji's development (GoF, 2017). Agriculture supports livelihoods of 118, 801 households (61% of all households) either directly or indirectly (GoF, 2017). The annual export earnings from the agriculture sector over the last 5 years amounts to FJD 194.2 million. The Climate Vulnerability Assessment report highlighted estimated damage of FJD 791 million in the agriculture sector from natural climate hazards over a period of 16 years. Although the future costs, losses or damages are highly uncertain, it is anticipated that projected conditions of climate change and more high-intensity cyclones could only increase our economic losses and create more poverty. Hence, there is a need for technology transfer and climate financing to reduce the vulnerability of the agriculture sector and promote the economic growth of the country.

The National Climate Change Policy (NCCP) (2018) focuses on streamlining climate change issues in different sectors. Objective 5 of NCCP (2018) is on adaptation to climate change and the adaptation measures proposed in the policy clearly outlined the development of sustainable technologies that incorporate traditional knowledge and strongly support an ecosystem-based approach in food security and agriculture. The National Adaptation Plan (NAP) highlights the long-term impact of climate change on the agriculture sector and has adopted the climate smart agriculture (CSA) technologies to make the sector more resilient to the impacts of climate change.

The Ministry of Agriculture launched its 5-year Strategic Development Plan (SDP) 2019 – 2023 which has the primary objective to build a “sustainable, competitive and resilient agriculture sector” and contribute to the Fiji's National Development Plan thus building a vibrant and robust economic growth. The priorities of SDP are well aligned to the NDP and Sustainable Development Goals (SDGs). The strategic plan realizes the potential in agriculture sector to reduce the import of crops and fruits through a holistic approach supported through technological interventions, financing, integrated framework of policies, farmers and youth farming programs, incentives, and infrastructure investment. The SDP does take into consideration that the major threat to the agriculture sector is due to the impacts of climate change such as increase in incidence of high intensity cyclones, rainfall and increasing temperature giving rise to increase of incidence in pest and diseases. The future climate will also impact soil degradation, salinization of groundwater, desertification, and further shift of agriculture cultivation to marginal slope. In addition, the following risks in the agriculture sector were also identified:

- Land tenure or land rights could be an impediment in accessing credit or loan from the financial institutions.
- Poor road infrastructure in remote rural areas leading to inaccessibility to markets.
- Low uptake of new technologies, breeds and varieties by farmers.
- Aging farmers' population and low youth involvement. The Fiji agriculture census report highlights that 15.4% of farmers are above the age of 60 and 57.3% of farmers are aged 40 or above (MoA, 2021).
- Lack of public private partnership.

- Lack of expertise in research, science, genetics and other areas.
- Lack of financial resources to ensure there is sufficient staffing, infrastructure and technical resources.

The three technologies prioritized as part of the TNA process broadly falls under the climate smart agriculture priority #3 of SDP which states “Improve the adoption of sustainable resource management and CSA”. The preliminary targets for technology transfer are aligned to the 5 year target of SDP for the strategic theme: adoption of sustainable resource management and CSA practices. The three prioritized technologies in the agriculture sector are described below in Table 1, to gather with the future targets derived from the Agriculture SDP.

Table 1: Technologies prioritized in the agriculture sector, level of current uptake and preliminary target.

Technology Prioritized	Level of Current Uptake	Preliminary targets
Agroforestry	Early stages – few demonstration plots set-up	Establish 40 farms practicing agroforestry with fruit orchards (mangoes, avocados, guavas, dragon fruit, breadfruit, citrus, and passionfruit and Tahitian chestnuts) with leguminous cash crops such as beans, peas, chickpeas and trees such as tamarind and sandalwood.
Improved Crop Varieties	Medium (few varieties developed).	3 new crop varieties released through a strengthened germplasm facilities and expanded seed nurseries.
Integrated Nutrient Management	Early stages – household scale not farm scale.	Establish two soil diagnostic labs in Western and Northern division and three national composting facilities so that there is an increase of 25% in number of farmers adopting organic production with secure market access.

## 1.1.2 Action Plan for Agroforestry

### 1.1.2.1. Introduction

Agro-forestry is a land-use system that aims towards optimal utilization of available land resources by multiple as well as beneficial practices of agriculture and forestry. The main purpose of agro-forestry activities is to sustain the fertility of the soil by substituting the nutrition required by intensive agriculture. The World Agro Forestry Centre defines the technology as an integrated approach to the production of trees and non-tree crops or animals on the same piece of land. The crops can be grown together at the same time, in rotation or in separate plots. The technology is proven to be an adaptation tool in agriculture but also has a high mitigation potential as well, as trees are classified carbon sink and is well aligned with Fiji Government’s initiative of planting 30 Million Trees in 15 years and have allocated FJD 3.3 million for this initiative. Agroforestry offers many environmental benefits:

- Stops soil degradation by adding organic matter to soil through litter, holds the soil and reduces erosion and addresses the nutrient deficiency.

- Trees relieve water stress in farm systems through more efficient use of rainwater through the root system that helps in water distribution. It reduces surface run-offs by improving infiltration leading to groundwater storage and hence conserving water in the farm landscape.
- The nitrogen fixing trees reduce the dependency on the application of inorganic nitrogen fertilizers and assists in curbing its associated environmental pollution such as GHG emissions and contamination of aquatic systems.
- Agriculture in Fiji is known to emit 550k tonnes of greenhouse gases (GoF, 2018). In the Fiji recent National Inventory Report, a total of 529990 tonnes of carbon dioxide equivalence emissions was recorded for the year 2019. Agroforestry practices can enhance mitigating greenhouse gases from agriculture as it increases carbon sequestration aboveground in biomass particularly in the tropics and through incorporation of leave litter and roots underground that assist in mobilization of organic material into soil. Also the nitrogen fixing plants may increase nitrous oxide (N<sub>2</sub>O) emission but it will decrease the application of N-based fertilizer decreasing the net emissions of N<sub>2</sub>O thereby further mitigating greenhouse gas emissions. Research has shown that agro-silvicultural system has the carbon sequestration potential of  $7.2 \pm 2.8$  tons C per ha (Kim et al., 2016).
- Conserves biodiversity for a number of ecosystem services such as pollination and water storage.
- Bioenergy in the form of sustainable fuel wood from trees for cooking and this is also promoted in the Fiji 2020 Agriculture Sector Policy Agenda.
- Trees help in modifying microclimate by providing shade and providing cooler environment and also act as wind breakers in the event of strong winds.
- Agroforestry yields the desired timber for construction, fuel wood and non-wood forest produce.

The Agroforestry models concentrate both on the short term returns from agriculture as well as long term returns from forestry activities. Agroforestry activities also ensure diversity in crops raised as well as enhances species diversity by encouraging plantation of multiple-tree species for various uses or plantation of multiple- purpose tree species. Agroforestry if practiced properly not only increases agricultural yields but alleviates food insecurity and poverty levels of farmers while increasing resilience of farm systems to more variable and extreme climate. It has been proven that agroforestry is a gender inclusive and sensitive technique as it allows women, who play a major role in food production and collecting firewood, greater access to natural resources and contributing to the benefits of agroforestry (Agroforestry Network, 2020). Although agroforestry is not new in Fiji but is practiced at a rudimentary level due to numerous barriers faced by local farmers to upscale this technology in the country.

#### 1.1.2.2. Ambition for TAP

Agroforestry is not a new technology but it is not a very mature technology as well. This technology has suffered from lack of legislative policy and poor land-use planning that led to clearing of forests that provide ecosystem benefits. It is envisaged that an Agroforestry Policy needs to be developed and mainstreamed into climate change NAP and 5 year and 20 year NDP. Fiji is a naturally forested island country, which has lost one third area tree cover due to poor land-use planning. Minimum one third tree cover across any landscape is also required for the basic rehabilitation of ecosystems services associated with forests and trees. Hence the ambition for this technology is that Agroforestry practices to be implemented across at least one third of agricultural areas by 2030 and is supported through development and implementation Fiji's agroforestry Policy.

### 1.1.2.3 Actions and Activities selected for inclusion in the TAP for Agroforestry

#### a) Summary of barriers and measures to overcome barriers

In the TAP stakeholder consultation workshop conducted on 13<sup>th</sup> and 14<sup>th</sup> December, 2021 it was discussed that the barriers restricted to Economic and financial, institutional and organizational structure, technical barriers, human capacity and information and awareness were of high importance as these impedes the successful implementation or diffusion of this technology. Table 2 discusses these identified barriers and measures to meet the specified ambition for the deployment/transfer and diffusion of this technology.

Table 2: Summary of barriers and measures for Agroforestry.

Categories of Barriers	Measures to overcome barriers
Institutional governance	To develop national Agroforestry Policy and implementable action plan that provides clear guidance, alignment and that can be integrated into subnational level plans, programs, and policies that would focus on upscaling agroforestry. The development of policies and strategies will provide designated responsibilities within different ministries for more coherent coordination efforts and lay out incentive structures and information as an actor or driver of practice change. The development of appropriate policy mechanisms and instruments for agroforestry will ensure that state financial funds are directed to catalyzing the adoption of the technology at the district and national levels.
Economic and Financial	To overcome the economic and financial barriers the following measures were suggested: <ul style="list-style-type: none"> <li>• Improving access to loan with suitable financial model tailor made for agroforestry with subsidies from the government.</li> <li>• Government subsidies to encourage farmers to convert from mono-cropping to agroforestry practices.</li> <li>• Donor or state funding needs to be channeled to set-up agroforestry tree germplasm systems to produce high quality seedlings for indigenous tree species.</li> <li>• Government should provide incentives to farmers practicing agroforestry. Payments of environmental services (PES) for save-guarding biodiversity and watershed management needs to be explored (Jacobi et al., 2017).</li> <li>• To ensure higher economic returns from the agroforestry, careful planning is required regarding diversification of crops and trees that would generate income on short-term, medium term and long term. Value adding chains for non-timber agroforestry needs (such as biomass energy generation, handicrafts) to be developed with support from market access and product commercialisation.</li> </ul>
Technical and Human capacity Barrier	Increase investments in government-led extension services with clear mandate to provide training in landscape planning and diversification to support farmers in the agroforestry sector. Strong collaboration links

	with the government ministries and tertiary institution like the College of Agriculture, Fisheries and Forestry at Fiji National University (FNU) is mandatory to enhance the curriculum on agroforestry particularly on landscape planning and diversification which will develop human skills capacity within the region. A platform for more engagement and better coordination between relevant extension and research organizations, as well as NGOs and other stakeholders such as private partnership would lead to identification of gaps that needs to be addressed. Such engagement would facilitate further research to get value adding chain for agroforestry products from a sustainable farming system.
Awareness and Information	There should be greater need for information sharing and creating awareness about the enviro-socio-economic benefits and incentives given for agroforestry practices. The government led extension services should play an active role here to create awareness about the technology through farmers' field training including demonstration plot and producing an agroforestry manual. Agroforestry farmers are often in remote areas and not well connected to each other or supportive organizations hence forming an agroforestry farmer organizations or cooperatives will allow knowledge sharing amongst farmers and awards to be given for best practices which needs to be publicized widely so that it would encourage farmers to adopt these practices and increase the adoption rate of the technology.

**b) Actions selected for inclusion in the TAP**

This section provides a list of narrative descriptions and reasonable arguments for each of the measures selected as actions to be included in the TAP for Agroforestry. The measures considered as actions are based on economic and non-economic measures particularly relating to development and approval of national agroforestry policy and mainstreaming policy in other national and sectoral policies. The non-economic measures provides a pathway for generating and sharing knowledge, land use planning and developing pilot projects in communities. Table 3 provides the list of actions and its narrative descriptions

Table 3: Actions selected for Agroforestry inclusion in the TAP.

Barriers	Actions	Descriptions
Institutional and Organizational	Launch Program to develop Agroforestry Policy (Action1)  Develop Agroforestry Policy (Action 2)	This action deals with building institutional capacity to develop national Agroforestry Policy by hiring Agroforestry Policy Officer and Food Forestry Officer who will help with the coordination activities and bringing stakeholders together and form consultation group. The Technical Advisor as a consultant will be hired to develop and finalize the policy through



		various workshops and meetings with stakeholder consultation groups.
Economic and Financial	Secure sustainable funding (Action 3)  Develop payments for Ecosystems Services (PES) (Action 5)	Agroforestry requires huge capital investment and having a national policy agroforestry will increase budgetary allocations. Food forestry concept note to be developed and proposals should be developed for donor agencies. Mainstreaming agroforestry policy will also generate income through value addition of non-timber products.  Developing a PES is a complex issue and therefore requires a specialized consultant to develop PES for trees in Fiji. This will provide some form of income to farmers and will encourage adoption of the technology.
Technical	Establish 3 pilot projects for adopted agroforestry technology (Action 4)  Land Use Planning to identify & map areas suitable for Agroforestry	Communities are identified to trial the agroforestry technology with the establishment of nursery, seedlings and a pilot project which could be used as a demonstration plot for agroforestry technology.  This action looks into the barrier of poor land use planning that may lead to diminished forest and therefore to have a more robust land use planning system in place to map areas suitable for Agroforestry.
Information awareness & Human Capacity	Mainstreaming Agroforestry Policy	This action was suggested to promote and create awareness through formation of Agroforestry farmers' organization to share best practices and developing standards and rewarding best practices to accelerate adoption of the technology. The also involves empowering people in the principles and practice of Agroforestry by developing or strengthening curriculum on Agroforestry in tertiary institution.

**c) Activities identified for implementation of selected actions**

This section aims to expand the identified actions into more specific activities. Table 4 presents a list of activities which need to be implemented to achieve each identified actions.

Table 4: Activities identified for implementation of Agroforestry actions.

<b>Actions</b>	<b>Activities</b>
<b>1. Launch Program to develop Agroforestry Policy</b>	<b>Activity 1.1</b> Engagement of Agroforestry Project Officers: Agroforestry Policy Officer Food Forestry Officer
	<b>Activity 1.2</b> Purchase all project equipment : e.g. vehicle + trailer, laptops, phones + communication contracts
	<b>Activity 1.3</b> Develop Terms of Reference for the Agroforestry Development Consultation Group
	<b>Activity 1.4</b> Develop Terms of References for the Agroforestry Technical Adviser Consultant
	<b>Activity 1.5</b> Contract Agroforestry Technical Advisor to draft & finalize policy development and designing food forests systems
<b>2. Develop Agroforestry Policy</b>	<b>Activity 2.1</b> Inception Workshop for awareness & to identify & register Agroforestry Stakeholders Consultation Group and Technical Advisors
	<b>Activity 2.2</b> Regular Technical Advisors Meetings to progress Agroforestry Policy Development & Implementation
	<b>Activity 2.3</b> Formalize & operationalize the Agroforestry Development Consultation Group
	<b>Activity 2.4</b> Engage Agroforestry Development Partner(s) – e.g. World Agroforestry Centre (ICRAFT)
	<b>Activity 2.5</b> Ministry of Forestry & Ministry of Agriculture to submit to Cabinet for endorsement
<b>3. Securing sustainable funds</b>	<b>Activity 3.1</b> Adopt & develop Food Forestry Concept to implement Agroforestry Principles.
	<b>Activity 3.2</b> Identify donors and prepare proposals
<b>4. Establish 3 pilot projects for adopted agroforestry technology</b>	<b>Activity 4.1</b> Site Identification
	<b>Activity 4.2</b> Nursery development
	<b>Activity 4.3</b> Formalize & maintain relationships with pilot project communities
	<b>Activity 4.4</b> Develop Terms of References for Community Food Forest Committees
	<b>Activity 4.5</b> Regular guidance/advice to communities with regular reporting
<b>5. Develop Water Payments for Ecosystems Services</b>	<b>Activity 5.1</b> Advertise & engage consultant with GIS expertise to develop <b>National PES Mechanism</b>
	<b>Activity 5.2</b> Develop PES
<b>6. Land Use Planning to identify &amp; map areas suitable for Agroforestry</b>	<b>Activity 6.1</b> Identify & <b>map agroforestry</b> suitable areas
	<b>Activity 6.2</b> Conduct land use planning with community to designate areas for Agroforestry
	<b>Activity 6.3</b> Monitoring and Evaluation of Land Use Plans
<b>7. Mainstream Fiji's Agroforestry Policy</b>	<b>Activity 7.1</b> Organize Food Forestry Awareness Program
	<b>Activity 7.2</b> Tertiary institution to strengthen the agroforestry curriculum.
	<b>Activity 7.3</b> Formation/joining of agroforestry farmer organization to share best practices and implementing award system for best practices
	<b>Activity 7.4</b> Product development and Value adding chains for non-timber agroforestry products
	<b>Activity 7.5</b> Develop Standards for Good Agroforestry Practices

	<b>Activity 7.6</b> Budgetary allocation should be increased to strengthen extension services in terms of human capacity to provide training to local farmers.
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**d) Actions to be implemented as Project Ideas**

The above actions were turned into Project ideas for the realization of TAP, which were carefully and technically considered by the agricultural working group. The following Projects Ideas were identified to create an enabling environment for technology diffusion:

- (i) To develop a national agroforestry policy that could be mainstreamed in other sectoral policies, climate change NAP and 5 year and 20 year NDP.
- (ii) Establish a pilot project as a model in rural and urban settings to advance the agroforestry technology.
- (iii) Develop and operationalize the PES so that it provides an alternative source of income for farmers and compensate for the long term income returns from forest.
- (iv) Establish a robust Land Use Plans and have a system in place for its monitoring and evaluation.
- (v) Creating research and development opportunities in the area of value adding chains for non-timber agroforestry products with easier access to market.

**1.1.2.4 Stakeholders and Timelines for the Implementation of TAP for Agroforestry**

**a) Overview of Stakeholders and Timeline for implementation of TAP**

The main implementing agency is Ministry of Forestry and Fisheries (MFF) who will coordinate the overall agroforestry technology diffusion in the country. MFF will be responsible for coordinating all the meetings and will be driving the submission and acceptance of the national agroforestry policy. The other main partner will be Ministry of Agriculture and Waterways (MAW) who will work along MFF in providing technical support and extension services to farmers. The SPC-Land use Resources Development (LRD) could provide technical input in terms of providing guidance on landscape designing and land use plans. The Ministry of Climate Change and Environment (MECC) could provide assistance in formalizing the National Agroforestry Policy and seeking consultations from the climate change steering committee so that the policy is well aligned to other sectoral policies. The Ministry of I-taukei Affairs (MTA) and Ministry of Lands & Mineral Resources (MLMR) could assist in identification of land and liaising with local communities, MLMR could provide advice on the use of land-use plans. The tertiary institutions such as Fiji National University (FNU), The University of the South Pacific (USP) and the University of Fiji (UniFiji) on advice from the programme review committee could strengthen and develop curriculum on agroforestry and also undertake research in agroforestry. The Solicitor Generals (SGs) office could provide feedback on the draft policy before submission to cabinet and Ministry Finance could look into budget submissions from MFF and MAW to accelerate the diffusion of the technology at a nationwide scale.

**b) Scheduling and sequencing of specific activities**

Table 5 below aims at describing the scheduling and sequencing of specific activities to be undertaken to achieve the actions identified for agroforestry technology. The planning and implementation phase of the TAP is till the end of 2030, although the main action on development

and approval of a national agroforestry policy will be done by end of 2024 and all the actions such as development of nursery, identification of sites for implementation using land use plans and pilot projects at urban and rural settings will be completed by 2027.

Table 5: Scheduling and sequencing of specific activities in Agroforestry.

Activity	Timeframe (Planning and Implementation)								Responsible Body
	End 2024	Mid 2025	End 2025	2026	2027	2028	2029	2030	
1.1	█								MAW, MFF, OPM
1.2									MFF
1.3	█								MAW, MFF, OPM, SPC (LRD)
1.4	█	█							MTA, MLMR, MAW, MFF, OPM,SPC(LRD)
1.5	█								MFF
2.1	█								MTA, MLMR, MAW, MFF, OPM,SPC(LRD)
2.2	█	█	█	█	█	█	█	█	MTA, MLMR, MAW, MFF, OPM,SPC(LRD)
2.3	█								MTA, MLMR, MAW, MFF, OPM,SPC(LRD)
2.4		█	█	█	█	█	█	█	MFF
2.5	█								MFF and MoA
3.1			█	█					MFF, MoA, consultants
3.2			█	█	█				MFF, MoA, consultants
4.1	█	█	█						MFF, MoA, Ministry of I-taukei affairs and Lands
4.2		█	█	█	█				MFF, MoA
4.3				█	█	█			MoA and SRIF
4.4				█	█	█			MoA and SRIF
4.5				█	█	█			MoA, SRIF
5.1			█	█					MFF, MoA, stakeholder group
5.2				█	█	█			MFF, MoA, consultant
6.1		█	█	█	█				MTA Affairs, MLMR, MoA, MFF.
6.2		█	█	█	█				MTA, MLMR, MoA, MFF.

6.3									MTA, MLMR, MoA, MFF.
7.1									MFF, MoA
7.2									MFF, MoA, USP, Unifiji, FNU.
7.3									MFF, MoA,
7.4									MFF, MoA
7.5									MFF, MoA
7.6									MFF, MoA, Ministry of Finance

### 1.1.2.5 Estimation of Resources needed for action and activities

#### a) *Estimation of capacity building needs*

The value of trees in sustainable farming systems is not realized by farmers and this leads to forest removal and the agriculture sector becoming more vulnerable to the impacts of climate change. To upscale the agroforestry technology there is much needed change in the attitude of people, hence more awareness raising and knowledge sharing capacity building is required. There is also a lack of national policy that will guide the implementation of agroforestry practices across the country. To accelerate the implementation of the technology there needs to be a dedicated unit with at least 2 staff members within MFF that would lead and coordinate all agroforestry activities in the country. The policy will improve and enhance the institutional and governance of the technology and could be used to increase the budgetary allocations for the huge capital investment cost required to diffuse this technology in the country. The training needs of the extension staff and farmers needs to be mapped out and opportunities for upskilling either through local institutions or training abroad needs to be provided. There is a dire need for capacity building in research and development of products or value adding chains to non-timber products that will see farmers earning income and reduces the payback time. Capacity development in designing the PES or incentives and how it will encourage diffusion of the technology is of paramount importance.

#### b) *Estimations of costs of actions and activities*

Table 6 provides the total costs of actions and activities to implement the TAP and cost approximately FJD 3.348M. Action 1 and Action 7 both dealing with enhancing institutional capacity needs to launch the development of agroforestry policy and mainstreaming policy as an adaptation tool cost approximately FJD 2.267M. The cost is high due to salary payment of two agroforestry staff for the duration of the implementation phase, purchase of equipment and vehicle, development of product and value adding chains for non-timber product and establishing nurseries in communities to supply seedlings. This investment will ensure that we have developed national capacity to do upscaling to adapt to future climate change effects.

Table 6: Estimations of costs and activities in Agroforestry

<i>Actions</i>	<i>Activity</i>	<i>Cost (FJD)</i>	<i>Sub-total for Action (FJD)</i>	<i>Sources of Funding</i>
<b>Action 1</b>	Activity 1.1	400,000	<b>856,500</b>	GoF, GCF, GEF,
	Activity 1.2	400,500		GoF, GCF, GEF
	Activity 1.3	1000		GoF
	Activity 1.4	5000		GoF
	Activity 1.5	50,000		GoF
<b>Action 2</b>	Activity 2.1	30,000	<b>71,000</b>	GoF
	Activity 2.2	10,000		GoF
	Activity 2.3	10,000		GoF
	Activity 2.4	20,000		GoF, donor
	Activity 2.5	1000		GoF
<b>Action 3</b>	Activity 3.1	100,000	<b>120,000</b>	GoF, Donor
	Activity 3.2	20,000		GoF, Donor
<b>Action 4</b>	Activity 4.1	30000	<b>770,000</b>	Donor funding
	Activity 4.2	500000		Donor funding
	Activity 4.3	200000		Donor funding
	Activity 4.4	20000		Stakeholder
	Activity 4.5	20000		GoF, donor
<b>Action 5</b>	Activity 5.1	100000	<b>120,000</b>	GoF, donor
	Activity 5.2	20000		GoF, donor
<b>Action 6</b>	Activity 6.1	200000	<b>400,000</b>	GoF, donor
	Activity 6.2	100,000		GoF, donor
	Activity 6.3	100,000		GoF, donor
<b>Action 7</b>	Activity 7.1	10,000	<b>1.411M</b>	GoF, donor
	Activity 7.2	100,000		GoF, donor
	Activity 7.3	100,000		GoF, donor
	Activity 7.4	1M		GoF, GCF, GEF
	Activity 7.5	200,000		GoF, donor
	Activity 7.6	1,000		GoF, donor
<b>Total (FJD)</b>			<b>3,748,500</b>	

### 1.1.2.6 Management Planning

#### a) Risks and Contingency Planning

There is a possibility that TAP may not be implemented effectively due to following risks and therefore some contingency plans are proposed for the implementation of the TAP:

- (i) Access to sustainable funding: there maybe challenges from government funding to sustain agroforestry at a national scale. Trees do take a lot of time to grow and sometimes the donor funds are time bound and the technology could not be sustained after few years. The contingency plan is to increase government budgetary allocations to sustain development and adoption of the technology. Funding support and grant submission to GCF and GEF should be encouraged.
- (ii) Currently the technology is well aligned with the government priority of 30 million tress in 15years initiative. The MFF should emphasize on the importance of this technology and highlight the co-benefits of climate change mitigation and the contribution to national commitments to Paris Agreement.
- (iii) Lack of commitment from stakeholders: This emanates from lack of a mandatory policy that would guide institutional and governance structure of the agroforestry in the country. A national policy will mandate a designated unit and all relevant stakeholders to form a working group to inform decision making in agroforestry technology.
- (iv) Farmers' acceptance of the technology: There is lack of awareness raising amongst the farmers regarding the technology and there needs to be some awareness raising through developing local or national networks and information dissemination through local media. Formation of farmers' organization and sharing knowledge or best practices or even awarding best practices in agroforestry may encourage farmers to adopt the technology. Greater involvement of extension services through farmers field days and using demo plots to train farmers in applying agroforestry

***b) Next Steps***

Stakeholders suggested to accelerate the adoption of the agroforestry technology the following critical and immediate steps needs to be implemented:

- (i) Form agroforestry stakeholder consultation group that will help to coordinate agroforestry activities such developing ToR for consultants and identifying and overcoming institutional gaps, identifying funding opportunities to accelerate the deployment of technology (critical requirement).
- (ii) The consultant needs to be hired to develop the National Agroforestry Policy by end of 2024 (critical requirement).
- (iii) Developing effective land-use plan to identify sites for agroforestry and also identifying communities to trial food forestry concept in agricultural lands.

Table 7: TAP overview table for Agroforestry.

TAP Overview Table								
<b>Sector</b>	Agriculture							
<b>Sub-sector</b>	Sustainable farming systems							
<b>Technology</b>	Agroforestry							
<b>Ambition</b>	Agroforestry practices to be implemented across at least one third of agricultural areas by 2030 and is supported through development and implementation Fiji's agroforestry Policy.							
<b>Benefits</b>	Agro-forestry can improve the resilience of agricultural production to current climate variability as well as long-term climate change through the use of trees for intensification, diversification and buffering of farming systems. Enhances the carbon sink and reduce the country's carbon footprint and also increases the livelihoods of people.							
<b>Actions</b>	<b>Activities to be implemented</b>	<b>Sources of Funding</b>	<b>Responsible body and focal point</b>	<b>Time frame</b>	<b>Risks</b>	<b>Success Criteria</b>	<b>Indicators for monitoring of implementation</b>	<b>Budget Per Activity</b>
<b>Action 1 Launch Program to develop Agroforestry Policy</b>	Activity 1.1 Engagement of Agroforestry Project Officers: Agroforestry Policy Officer Food Forestry Officer	GoF, GCF, GEF,	MAW, MFF, OPM	End 2024	Funds are late to arrive or not accessible.	Two positions are filled.	Positions are advertised and recruitment process completed.	400,000
	Activity 1.2 Purchase all project equipment : e.g. vehicle + trailer, laptops, phones + communication contracts	GoF, GCF, GEF	MFF	End of 2024	Devaluation of FJD to result in more expensive equipment → over budget	All Project equipment procured	Quotations sought; procurement process completed	400,500
	Activity 1.3 Develop Terms of Reference for the Agroforestry Development Consultation Group	GoF	MAW, MFF, OPM, SPC (LRD)	End 2024	Delay due to lack of commitment from stakeholders	ToR developed	Consultations done and draft ToR developed	1000
	Activity 1.4 Develop Terms of References for the Agroforestry Technical Adviser Consultant	GoF	MTA MLMR Lands, MAW, MFF, OPM,SPC(LRD)	Mid 2025	Delay due to lack of commitment from stakeholders	ToR developed	Consultations done and draft ToR developed	5000
	Activity 1.5 Contract Agroforestry Technical Advisor to draft & finalize policy development and designing food forests systems	GoF	MFF	End 2024	Consultant not available.	Consultant is hired	Position is advertised and selection process is completed.	50,000



<b>Action 2 Develop Agroforestry Policy</b>	Activity 2.1 Inception Workshop for awareness & to identify & register Agroforestry Stakeholders Consultation Group and Technical Advisors	GoF	MTA, MLMR, MAW, MFF, OPM, SPC(LRD)	End 2024	Disagreement / non-commitment from stakeholders	Inception workshop conducted	Stakeholders and technical advisors identified and invitations sent out.	30,000
	Activity 2.2 Regular Technical Advisors Meetings to progress Agroforestry Policy Development & Implementation	GoF	MTA, MLMR, MAW, MFF, OPM, SPC(LRD)	ongoing	Disagreement / non-commitment from Technical Advisors	Biannually meetings conducted	Agenda prepared and meeting notice sent out.	10,000
	Activity 2.3 Formalize & operationalize the Agroforestry Development Consultation Group	GoF	MTA, MLMR, MAW, MFF, OPM, SPC(LRD)	End 2024	Disagreement / non-commitment from stakeholders	Agroforestry Development Consultation Group established	ToR of the group prepared. Chairperson selected	10,000
	Activity 2.4 Engage Agroforestry Development Partner(s) – e.g. . . . World Agroforestry Centre (ICRAFT)	GoF, donor	MFF	ongoing	International crisis (e.g. COVID-19)	A consultant engaged from development partner.	Discussions initiated and a person is identified.	20,000
	Activity 2.5 Ministry of Forestry & Ministry of Agriculture to submit to Cabinet for endorsement	GoF	MFF and MoA	End of 2024	Cabinet does not endorse, to be mitigated with thorough stakeholder consultation	Policy submitted	Consultations done, draft sent to SG office for vetting.	1000
<b>Action 3 Securing sustainable funds</b>	Activity 3.1 Adopt & develop Food Forestry Concept to implement Agroforestry Principles.	GoF, Donor	MFF, MoA, consultants	2025 - 2026	Agroforestry & trees require more time than short-term project to establish	Concept note is developed	Consultant is hired to draft the concept note.	100,000
	Activity 3.2 Identify donors and prepare proposals	GoF, Donor	MFF, MoA, consultants	2026 - 2027	Do not meet donor's requirements.	Donors identified and proposals submitted	Consultations done to develop proposals	20,000

<b>Action 4</b> Establish 3 pilot projects for adopted agroforestry technology – to encompass various types of stakeholders in urban & rural settings	Activity 4.1 Site Identification	Donor funding	MFF, MoA, MTA, MLMR	2024-2026	Delays in identification for an appropriate site	Site identified	Site visitations and liaising with ministries and local communities	30000
	Activity 4.2 Nursery development	Donor funding	MFF, SPC-LRD, MoA	2025-2027	Cyclones or drought	Nursery established	Land acquired for nursery development, nursery is built.	500000
	Activity 4.3 Formalize & maintain relationships with pilot project communities ),	Donor funding	MoA , SPC-LRD SRIF	2026-2028	Communities lose interest in the project.	Agreements with communities done	Communities identified and consultations done.	200000
	Activity 4.4 Develop Terms of References for Community Food Forest Committees	Stakeholder	MoA and SRIF	2026-2028	Stakeholder disagreement	ToR developed	Stakeholder consultations done; draft reviewed and finalized.	20000
	Activity 4.5 Regular guidance/advice to communities with regular reporting	GoF, donor	MoA, SPC-LRD, SRIF	2026-2028	Communities lose interest; Environmental catastrophe	Reporting structure in place	Regular meetings and updates done. Meeting minutes compiled	20000
<b>Action 5</b> Develop Water Payments for Ecosystems Services	Activity 5.1 Advertise & engage consultant to develop <b>National Water PES Mechanism</b>	GoF, donor	MFF, MoA, stakeholder group	2025-2026	Water PES is a complex concept with wide potential impacts & many stakeholders	Consultant is hired	Advertisement prepared and selection process completed	100000
	Activity 5.2 Develop financial incentives to promote Water PES	GoF, donor	MFF, MoA, consultant	2025 - 2028		The PES model developed	Consultations done. Draft PES model is prepared for consultations	20000
<b>Action 6</b> Land Use Planning to identify & map areas suitable for Agroforestry	Activity 6.1 Identify & <b>map agroforestry</b> suitable areas	GoF, donor	MTA MLMR, MoA, MFF.	2025-2028	Lack of suitable accessible land for agroforestry;	Areas for agroforestry identified.	Consultations with stakeholders done. Mapping done.	200,000
	Activity 6.2 Conduct land use planning with community to designate areas for Agroforestry	GoF, donor	MTA, MLMR, MoA, MFF.	2025-2028	Lack of commitment from communities	LUP sessions done with community.	Awareness session with community conducted. Areas identified	100,000

	Activity 6.3 Monitoring and Evaluation of Land Use Plans	GoF, donor	MTA, MLMR, MoA, MFF.	2025-2028	Lack of data; LUP not updated	LUP are monitored and evaluated.	LUP needs to be updated regularly; monitoring carried out with mandatory site visits	100,000
Action 7 Mainstream Fiji's Agroforestry Policy	Activity 7.1 Organize Food Forestry Awareness Program	GoF, donor	MFF, MoA	2025 - 2030	Another lockdown, adoption technology is a barrier.	Food forestry awareness program organized.	Materials prepared; community advised through local media.	10,000
	Activity 7.2 Tertiary institution to strengthen the agroforestry curriculum.	GoF, donor	MFF, MoA, USP, Unifiji, FNU.	2025-2030	No specialized staff to develop and teach curriculum.	Agroforestry curriculum strengthened or developed.	Specialized staff hired to teach; Stakeholder participation in Programme Review Committee	100,000
	Activity 7.3 Formation/joining of agroforestry farmer organization to share best practices and implementing award system for best practices	GoF, donor	MFF, MoA,	2025 - 2030	Lack of willingness from farmers to participate.	Agroforestry farmer organization formed.	Agroforestry farmers identified and brought together to share success stories and practices.	100,000
	Activity 7.4 Product development and Value adding chains for non-timber agroforestry products	GoF, GCF, GEF	MFF, MoA	2026 - 2030	Climate change, cyclones, drought	Product developed for value adding.	Concept note developed. Market developed for non-timber products.	1M
	Activity 7.5 Develop Standards for Good Agroforestry Practices	GoF, donor	MFF, MoA	2025 - 2030	Urbanization and lack of farmers in rural areas; Farming not rewarding; Informal settlement in urban areas.	Standards for Good Agroforestry Practices developed and adopted.	Standards developed in consultations with all the stakeholders.	200,000
	Activity 7.6 Budgetary allocation should be increased to strengthen extension services in terms of human	GoF, donor	MFF, MoA, Ministry of Finance	2024 - 2030	Lack of government commitment due to lack of policy.	Budgetary allocations increased	Internal review of resources and capacity building needs analysis; Submissions	1,000

	capacity to provide training to local farmers.						made to Ministry of Finance.	
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### 1.1.3 Action plan for Improved Crop Varieties

#### 1.1.3.1 Introduction

The introduction of improved crop varieties is aimed at enhancing crop yield, nutritional value and increasing crop's adaptive capacity to diseases, pests and changing climate and soil conditions. Plant breeding results in improved crop varieties with desired traits that are well adapted to changing climate. The process requires farmer experimentation with new varieties whereby agricultural researchers and extension agents can help farmers identify new varieties. Plant breeding is conducted in research institutes and big nurseries, and requires lab and field experimentations as well as genetic resources conservation facilities (seed bank, mother plants orchard, etc.). The varieties are tested for their characteristics for several years in trial plots and following are the criteria used for evaluation of the new variety:

- Fruit characteristics (flavor, color, caliber, maturity date, etc.)
- Plant characteristics (shape, vigor, type and date of blossom, etc.)
- Agriculture characteristics (yield, bearing year for trees, resistance/tolerance to pests and diseases, training and pruning type for trees, winter/summer crop for field crops, etc.)
- Environmental characteristics (tolerance/resistance to: different soil conditions such as saltwater intrusion, high/ low temperatures, chilling requirement, drought, etc.).

An introduction of new variety can increase farmers' livelihoods by increasing yields through improving resilience to changing climate (drought, flooding and heat stress) and pests and diseases and also capturing new market. This technology allows innovative partnerships between producers, research institutes and the private sector. However, market demand could be low for new varieties and the failure of farmer experimentation is the misconception that local species have low productivity. The countries that adopted this technology also noted that more trained breeders are needed. It was also noted that in the Pacific Island, crops and cropping systems were more vulnerable to the impacts of climate change due to narrow genetic base of these crops (McGregor et al., 2011).

This technology is not new to the region and there have been a number improved varieties of bean that can contribute to food and nutrition security. Improved crop varieties such as new taro leaf blight tolerant varieties ("Tarova Loa" and "Tarova Vula" and new sweet potato variety ("Golden Brown") which is drought tolerant and resistant to kumala scab disease. The Pacific Adaptation to Climate Change (PACC) Programme is the one of the initial climate change initiative implemented in Fiji through SPREP to improve crop resilience to extreme events such as flooding by improving drainage systems in lowland farming areas in the Tailevu-Rewa and Serua-Namosi Province. The project also tested staple root crops (taro, cassava and sweet potatoes) for saltwater and waterlogging tolerant varieties at two pilot sites.

#### 1.1.3.2 Ambition for TAP

This technology is a mature technology in the country but until now it has been done on ad-hoc basis and there is a need to establish a more targeted efforts in developing new varieties of crops to address the food security and agricultural economy impacted by climate change. Hence, the ambition of this TAP is to enhance institutional capacities for the development and adoption of saltwater tolerant rice variety, bacterial wilt tolerant eggplant and anthracnose disease tolerant chillies by 2030. The ambition deals with upscaling the expertise and facilities required for accelerated diffusion of technology in the country.

### 1.1.3.3 Actions and Activities selected for inclusion in the TAP for Improved Crop Varieties

#### a) *Summary of Barriers and measures to overcome barriers*

In the TAP stakeholder consultation workshop conducted on 13<sup>th</sup> and 14<sup>th</sup> December, 2021 it was discussed that the barriers restricted to economic and financial, institutional and organizational structure, technical barriers and information and awareness were of high importance as these impeded the successful implementation or diffusion of this technology. Table 8 discusses these identified barriers and measures to meet the specified ambition for the deployment/transfer and diffusion of this technology.

Table 8: Summary of barriers and measures for Improved Crop Varieties.

Categories of Barrier	Measures to overcome barriers
Economic and Financial	To address the high investment cost in the technology due to upgrading of research facilities, training and capacity building for human resources, providing subsidies to farmers to adopt the technology and dissemination of information, it is highly recommended that government together with the identified donor agencies secure sustainable finance.
Institutional and Organizational	Ministry of Agriculture, SRIF and CePACT SPC are the three main organizations that are involved in crop breeding, however there is a need to strengthen the current institutions (such as SPC CePaCT, SRIF, FNU, USP and MoA) with human resources and required facilities for accelerating research in developing new varieties, preserving traditional varieties, and undertaking field trials for evaluation before distribution to farmers. To create synergies between the institutions so that they can have a structured work plan and pool resources together for targeted breeding programmes. A working group or task group needs to be established.
Technical	Staff should be sent on exchange programmes or capacity building programmes so that they are trained on the latest techniques and therefore increasing the institutional capacity in terms of developing new varieties. The tertiary institutions such as FNU and USP should provide short courses on plant breeding techniques or how to multiply seeds. The curriculum in the agricultural programmes should be re-visited and plant breeding components need to be enhanced to address the lack of human capacity barrier in this field.
Information and Awareness	Design and conduct awareness campaigns to spread information about challenges with existing crops and the need to develop and disseminate new varieties of crops that are pest and drought resistant. This will potentially consist of: <ul style="list-style-type: none"> <li>I. Sharing of success stories in local media to attract attention</li> <li>II. Farmers' field schools organized nationwide by extension services</li> <li>III. Organizing awareness campaigns and preparing campaign materials suited for farmers.</li> <li>IV. Collaborating with village level bodies such as farmers' cooperatives to disseminate information to local people.</li> </ul>

***b) Actions selected for inclusion in the TAP for improved crop varieties***

This section provides a list of narrative descriptions and reasonable arguments for each of the measures selected as actions to be included in the TAP for the improved crop varieties. The measures considered as actions are based on non-economic measures particularly relating to acceleration of technology adoption in the country by enhancing the institutional capacity to provide targeted breeding plant programs for new varieties prioritized locally. Table 9 provides the list of actions and its narrative descriptions

Table 9: Actions selected for inclusion in the TAP for improved crop varieties.

Barriers	Actions	Descriptions
Institutional and Organizational	Develop and strengthen coordination between existing initiatives on improved crop varieties	This action deals with a stock take of all current initiatives on improved crop varieties and bringing all stakeholders together to find synergies, and priorities for future crop improvement needs. The partnerships between different institutions could be formalized through signing of MoUs/ LOA. A working group should be established for different priority crop for better coordination and pooling resources and expertise together to reduce the huge investment cost in terms of lab facilities.
Technical	Develop institutional capacities to deliver training  Conserve, develop and evaluate improved and resilient varieties of priority crops	There are very limited plant breeders available locally and more trained specialist are required. The tertiary institutions like FNU and USP should provide tailor made courses for plant breeding or techniques for improving crop varieties.  This action deals with Identifying and characterizing traditional varieties of priority crop and developing strategy for safe conservation. Once the traditional varieties are identified for improvement then plant breeding and participatory trials could be conducted and then later extended to evaluation trials to establish a new line of variety with desired traits, which needs to be conserved.
Information awareness	Promote the use of improved and resilient crop varieties.	This action was suggested because generally there is lack of farmers' acceptance of new improved varieties in the market. Hence a wider promotion and dissemination of information on local media needs to be done to gain attention. The lead farmers should be identified and

		subsidies given to them to adopt the new technology and provide seeds for further propagation.
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*c) Activities identified for implementation of selected actions*

This section aims to expand the identified actions into more specific activities. Table 10 presents a list of activities which need to be implemented to achieve each identified actions.

Table 10: Activities identified for implementations of improved Crop varieties selected actions.

Action	Activity
Develop and strengthen coordination between existing initiatives on improved crop varieties	1.1 Carry out a stock-take of existing initiatives. 1.2 Meeting to bring all stakeholders together to share and find synergies, and priorities for future crop improvement needs (Crop and Trait). 1.3 Develop or re-evaluate existing MOU's/LOA between the different institutions. 1.4 Create working groups for different priority crops to support coordination.
Develop institutional capacities to deliver training	2.1 Develop MOU between international and national research and academic institutions to facilitate training. 2.2 PhD and MSc scholarships to engage students on improving crop varieties. 2.3 Strengthen Technical and Vocational Education and Training (TVET) curriculum on improving crop varieties. 2.4 Upgrade institutional facilities to host and delivery training. 2.5 Develop Partnership with CGIAR, ITPGRFA and other international institutes for capacity building
Conserve, develop and evaluate improved and resilient varieties of priority crops	3.1 Identify and characterize traditional varieties of priority crop and develop strategy for safe conservation. 3.2 Upgrade existing institutional capacities to conserve traditional PGR of priority. 3.3 Breeding and participatory trials conducted. 3.4 Identification of improved lines of priority crops and carry out evaluation trials. 3.5 Establishment of seed testing and storage facilities to support safe seed exchange.



	<p>3.6 Develop database/registry of crop varieties to facilitate data sharing and dissemination.</p> <p>3.7 Standardize and/or develop protocols for phenotyping and genotyping.</p>
Promote the use of improved and resilient varieties crop	<p>4.1 Develop and distribute promotional materials for improved crop varieties.</p> <p>4.2 Farmer field days to promote the project and new the varieties.</p> <p>4.3 Organize launch of the new varieties.</p> <p>4.4 Disseminate information via vernacular radio and TV shows as well as newspaper.</p> <p>4.5 Identify lead farmers and provide them subsidies to propagate and supply seeds.</p>

**d) Actions to be implemented as Project Ideas (PIs)**

The above actions were turned into Project ideas for the realization of TAP and were carefully and technically considered by the agricultural working group. The following Projects Ideas were identified to create an enabling environment for technology diffusion:

- (i) The capacity for the laboratory facilities needs to be increased with modern machines and techniques required for DNA fingerprinting and other genotype and phenotype tests.
- (ii) Develop a local pool of expertise in plant breeding and identify targeted national programmes for improved new crop varieties.
- (iii) Formation of a working group consisting of partners from different organization and finding synergies and giving a platform to share experiences and knowledge for better coordination of national programmes on new improved crop variety.
- (iv) Strengthen tertiary curriculum to include plant breeding component.
- (v) Establish a seed testing and storage facility.
- (vi) Identify lead farmers that could trial the new technology and propagate seeds for distribution.

**1.1.3.4 Stakeholders and Timelines for the Implementation of TAP for improved crop varieties**

**a) Overview of Stakeholders and Timeline for implementation of TAP**

This section describes the main stakeholders identified and their roles in the implementation of the TAP. Ministry of Agriculture (MoA) will be the lead implementing agency and will be responsible for identifying training needs, identifying crop prioritized for improved trait and climate resilient variety (salt tolerant, drought tolerant) and coordinating activities to launch a national programme on improved crop varieties. The extension services of MoA will be involved in organizing the farmer field days and will work with lead farmers for trial purposes and seed propagation. The SPC CEPACT together with SRIF could provide technical support and develop protocols for standardizing, providing assistance in conserving and testing new varieties. The tertiary institutions (USP and FNU) will need to discuss with stakeholders and design programmes that is tailor made for improving crop varieties that are susceptible to the effects of climate change.

**b) Scheduling and sequencing of specific activities**

Table 11 below aims at describing the scheduling and sequencing of specific activities to be undertaken to achieve the actions identified for improved crop varieties. The planning and implementation phase of the TAP is till the end of 2028, giving ample time for the realization of ambition by 2030, that is, the country to have enhanced institutional capacity to accelerate the adoption of the improved crop variety at a national scale.

Table 11: Scheduling, sequencing and responsible stakeholders of specific activities in improved crop varieties.

Activity	Timeframe (Planning and Implementation)							Responsible Body
	End 2023	Mid 2024	End 2024	2025	2026	2027	2028	
1.1								MoA
1.2								SPC, MoA, SRIF
1.3								All stakeholders identified in the meeting
1.4								MoA, SPC, SRIF, USP, FNU, UniFiji,
2.1								SPC, MoA, SRIF, USP, FNU, UniFiji
2.2								USP, FNU, UniFiji, International universities
2.3								USP, FNU, UniFiji
2.4								MoA, SRIF
2.5								SPC
3.1								SPC, MoA and SRIF
3.2								SPC, MoA and SRIF
3.3								SPC, MoA, SRIF, FNU
3.4								MoA and SRIF
3.5								SPC, MoA, SRIF
3.6								MoA, SRIF
3.7								SPC, MoA and SRIF
4.1								SPC, MoA and SRIF
4.2								SPC, MoA and SRIF
4.3								MoA and SRIF
4.4								MoA and SRIF
4.5								MoA, SRIF

1.1.3.5 Estimation of Resources needed for action and activities

**a) Estimation of capacity building needs**

The technology is not a new technology and have been used as an adaptation technology in the agriculture sectors and is even stipulated in the NAP and SDP of agriculture. However the major

barrier discussed was the institutional capacity in terms of human resources and laboratory facilities needed to upscale this technology at the national level. To build the national capacity more training opportunities needs to be provided in the area of developing new varieties from traditional varieties. There is a need for a revised curriculum in tertiary institutions that would help to address the human resources sector in terms of plant breeding and genetics.

**b) Estimations of costs of actions and activities**

Table 12 provides the total costs of actions and activities to implement the TAP and cost approximately FJD 1.2 M. Action 2 and Action 3 both dealing with enhancing capacity on technical expertise in developing new variety of crops contributes approximately 1M. This investment will ensure that we have developed national capacity to do more concerted and targeted and desired crop varieties to adapt to future climate change effects.

Table 12: Estimations of costs of actions and activities for improved crop varieties.

<i>Actions</i>	<i>Activity</i>	<i>Cost (FJD)</i>	<i>Sub-total for Action (FJD)</i>	<i>Sources of Funding</i>
<b>Action 1</b>	Activity 1.1	40,000	<b>51,000</b>	GoF
	Activity 1.2	5,000		GoF
	Activity 1.3	1,000		GoF
	Activity 1.4	5,000		GoF
<b>Action 2</b>	Activity 2.1	1,000	<b>7,301,000</b>	GoF
	Activity 2.2	200,000		GoF, GCF, MFAT, DFAT, USAID
	Activity 2.3	100,000		USP, FNU
	Activity 2.4	7,000,000		USP, FNU, GoF,
	Activity 2.5	0		No funding required
<b>Action 3</b>	Activity 3.1	20,000	<b>540,000</b>	GoF, GCF, MFAT, DFAT, USAID
	Activity 3.2	50,000		GoF, GCF, MFAT, DFAT, USAID
	Activity 3.3	20,000		Stakeholder
	Activity 3.4	100,000		Stakeholder and donor
	Activity 3.5	200,000		Donor
	Activity 3.6	100,000		Donor
	Activity 3.7	50,000		Donor
<b>Action 4</b>	Activity 4.1	10,000	<b>120,000</b>	Donor funding
	Activity 4.2	50,000		Donor funding
	Activity 4.3	20,000		Donor funding
	Activity 4.4	20,000		Donor funding
	Activity 4.5	20,000		Donor/GoF funding
<b>Total (FJD)</b>			<b>8,012,000</b>	

### 1.1.3.6 Management Planning

#### *a) Risks and Contingency Planning*

There is a possibility that TAP may not be implemented effectively due to following risks and therefore some contingency plans are proposed for the implementation of the TAP:

- (i) Access to sustainable funding: there is lack of government funding to sustain new crop variety development and also donor agency funds are time bound. The contingency plan is to increase government budgetary allocations to sustain development of climate resilient variety crop in Fiji. Funding support from the development partners like MFAT and DFAT should be explored seriously by the government and other stakeholders like SPC and SRIF.
- (ii) Government priority could change and may divert attention to other sectors that need immediate attention such as coastal communities facing relocation. The MoA should emphasize on the importance of this technology in safeguarding food security and country's economy. There needs to be constant requests from MoA to increase budgetary allocations so that institutional capacity could be built and would be beneficial in long term.
- (iii) Lack of commitment from stakeholders: There is a need to set-up a working group immediately and getting MoU and LOA to be signed. Even the MoU and LOA could be delayed but sincere efforts and better coordination amongst the units could expedite this process.
- (iv) Farmers' acceptance of the technology: Incentives needs to be provided to farmers to try the new variety and propagate seeds for further distribution. Additionally there needs to be some awareness raising through developing local or national networks and information dissemination through local media.

#### *b) Next Steps*

Stakeholders think that to move forward the improved crop varieties for in Fiji the following critical and immediate requirements need to be implemented:

- (i) Currently this technology is implemented on an ad-hoc basis and therefore first step would be stock take of all the initiatives and then see what the priority crop and what desired trait is that needs to be developed so it becomes more climate resilient (critical requirement).
- (ii) The stakeholders need to find ways to secure funding from donors to implement this technology particularly in terms of building national capacity. Without funding the TAP could not be realized (critical requirement).
- (iii) Finding synergies with different stakeholders and pooling resources, upgrading facilities and training people to build national capacity to upscale this technology (immediate requirement).
- (iv) To train people to become professional plant breeders and tailor-made programmes/curriculum to be developed in consultation with tertiary institutions (immediate requirement).

Table 13: TAP overview table for Improved Crop Varieties

TAP Overview Table								
<b>Sector</b>	Agriculture							
<b>Sub-sector</b>	Improved Crop Varieties							
<b>Technology</b>	Improved Crop Varieties							
<b>Ambition</b>	Enhance institutional capacities for the development and adoption of saltwater tolerant rice variety, bacterial wilt tolerant eggplant and anthracnose disease tolerant chillies by 2023.							
<b>Benefits</b>	Improved crop varieties are resilient to the impacts of climate change and therefore increases farmers' income and supports the economy of the country. The technology will enhance the technical capacity and will job opportunities at technical level.							
<b>Actions</b>	<b>Activities to be implemented</b>	<b>Sources of Funding</b>	<b>Responsible body and focal point</b>	<b>Time frame</b>	<b>Risks</b>	<b>Success Criteria</b>	<b>Indicators for monitoring of implementation</b>	<b>Budget Per Activity</b>
<b>Action 1</b> Develop and strengthen coordination between existing initiatives on improved crop varieties	Activity 1.1 Carry out a stock take of existing initiatives	GoF	MoA	End of 2023	Some initiatives not captured	Stock-take done	Hiring a research assistant to compile data. Regular meetings with stakeholders.	40000
	Activity 1.2 Meeting to bring all stakeholders together to share and find synergies, and priorities for future crop improvement needs (Crop and Trait)	GoF	SPC, MoA, SRIF	End of 2023	Lack of stakeholders' commitment.	All stakeholders met to discuss.	Invitations sent. ToR of working group formed.	5000
	Activity 1.3 Develop MOU's/LOA between the different institutions	GoF	All stakeholders identified in the meeting	Mid 2024	Delays in signing of MoU's/LOA	MoUs/LoA signed	Draft prepared and circulated between parties	1000
	Activity 1.4 Create working groups for different priority crops to support coordination.	GoF	All stakeholders identified in the meeting	Mid 2024	Disagreement between stakeholders regarding priority crop.	Working group for different priority crops established	ToR of working group developed; Priority crop identified.	5000
<b>Action 2</b> Develop institutional	Activity 2.1 Develop MOU between research and academic institutions to facilitate training.	GoF	SPC, MoA, SRIF, USP, FNU, UniFiji	Mid 2024	Lack of specialist	MoU developed	Inception meeting between institutions; Draft MoU shared.	1000

capacities to deliver training	Activity 2.2 PhD and MSc scholarships to engage students on improving crop varieties.	GoF, GCF, MFAT, DFAT, USAID	USP, FNU, UniFiji, International universities	End 2024	Suitable candidates not found; lack of funding	Scholarships offered	Funding secured; scholarships advertised;	200000
	Activity 2.3 Strengthen TVET curriculum on improving crop varieties.	Universities	USP, FNU, UniFiji	2024	Lack of initiative from tertiary initiative	TVET courses strengthened	Programme review committee organized; stakeholder consultations done.	1000
	Activity 2.4 Upgrade institutional facilities to host and delivery training.	Universities, GoF,	MoA, SRIF	Mid 2025	Lack of university funding	Institutional facilities improved	Equipment procured and people trained on its use.	100000
	Activity 2.5 develop Partnership with CGIAR, ITPGRFA and other international institutes for capacity building	0	SPC	2025	Lack of commitment	Partnership agreement signed.	Institutions identified, inception meeting conducted; draft agreement circulated.	-
<b>Action 3</b> Conserve, develop and evaluate improved and resilient varieties of priority crops	Activity 3.1 Identify and characterize traditional varieties of priority crop and develop strategy for safe conservation	GoF, GCF, MFAT, DFAT, USAID	SPC, MoA and SRIF	Ongoing	Traditional varieties already lost in field;	List of traditional varieties with characterization information available and published; Conservation strategies in place.	Experts in place to collate information on traditional varieties and carry out characterization; Meeting with stakeholders to validate traditional varieties; Strategies available for safe conservation of PGR.	20000
	Activity 3.2 Upgrade existing institutional capacities to conserve traditional PGR of priority	GoF, GCF, MFAT, DFAT, USAID	SPC, MoA and SRIF	2024-2025	Institutions with conservation capacities not present.	Well capacitated institutes in place to carry	Identify institutes to upgrade; Equipment and consumables	50000

						out conservation of traditional varieties.	procured; Training on conservation of traditional varieties conducted.	
Activity 3.3 Breeding and participatory trials conducted	Stakeholder	SPC, MoA, SRIF, FNU	2024-2028	Partners willingness to work together in not there; funding as breeding activities can be long term	New breeding lines available and evaluated in participatory manner. New lines with desired agronomic traits available.	Traits for breeding agreed upon; crosses carried out and new breeding lines available; farmers identified for participatory trials; evaluation of new breeding lines conducted.	20000	
Activity 3.4 Identification of improved lines of priority crops and carry out evaluation trials.	Stakeholder and donor	MoA and SRIF	2024-2026	Breeding does not eventuate in improvement.	Improved lines of priority crops available and evaluated.	Improved lines of priority crop identified and evaluated.	100000	
Activity 3.5 Establishment of seed testing facilities to support safe seed exchange.	Donor	SPC, MoA, SRIF	2027	Institute not in place support the establishment of seed testing facility	Fully equipped and capacitated seed testing facility in place and supporting safe seed exchange.	Institutes capable of hosting seed testing facilities identified; Seed testing facilities set up, equipped and properly resourced.	200000	
Activity 3.6 Develop database/registry of crop varieties to facilitate data sharing and dissemination	Donor	MoA, SRIF	2025	Sufficient infrastructure not available to host database	Fully functional database with crop information available and used for data sharing and dissemination.	Identify existing database structures that can survey the purpose; if none available develop database for sharing and dissemination of	100000	

							crop information; populate database with crop data; make available to all stakeholders the fully functional database.	
	Activity 3.7 Standardize and/or develop protocols for phenotyping and genotyping.	Donor	SPC, MoA and SRIF	2025	Experts to support development of phenotyping and genotyping protocol.	Protocols for phenotyping available and used to phenotype the traditional varieties; Genotyping protocols available and used to genotype the traditional varieties.	Literature review of existing phenotyping and genotyping protocols. Experts recruited to standardize or develop phenotyping and genotyping protocol. Protocols shared with stakeholders and published. Phenotyping and genotyping protocol widely used for purpose of crop conservation and utilization.	50000
<b>Action 4</b> Promote the use of improved and resilient varieties crop	Activity 4.1 Develop and distribute promotional materials for improved crop varieties.	Donor funding	SPC, MoA and SRIF	2027-2028	Lack of funding; materials developed is not informative.	Promotional materials developed.	Media person hired to develop content; materials approved by working group.	10000
	Activity 4.2 Farmer field days to promote the project and new the varieties.	Donor funding	SPC, MoA and SRIF	2027-2028	Low turnout	X Number of field days organized.	Agenda prepared and invitations sent out to farmers	50000



	Activity 4.3 Organize launch of the new varieties	Donor funding	MoA and SRIF	2027-2028	Delays as developing new varieties is time consuming; Poor turnout.	Launch of new variety organized.	Logistics of launch done; mass media advertisement of the event.	20000
	Activity 4.4 Disseminate information via vernacular radio and TV shows as well as newspaper.	Donor funding	MoA and SRIF	2027-2028	Media specialist lacking appropriate content.	Information disseminated in local media.	Media specialist hired to develop contents; arrangements made with media companies;	20000
	Activity 4.5 Identify lead farmers and provide them subsidies to propagate and supply seeds.	Government/donor	MoA, SRIF	2027-2028	Lack of commitment from lead farmers.	Lead farmers are identified.	Scoping for Lead farmers done; materials and subsidies provided.	20000

## 1.1.4 Action plan for Integrated Nutrient Management (INM)

### 1.1.4.1 Introduction

The basis of INM is to integrate the use of inorganic, organic and biological components to maintain soil fertility at an optimum level to increase crop productivity and preserve soil productivity for future generations. Organic fertilizers have gained worldwide attention in INM approaches because it increases productivity and decreases environmental pollution in terms of greenhouse gas emissions and water pollution. If organic fertilizers such as manure are applied incorrectly and excessively then nutrient could leach to waterways causing algal blooming.

Organic fertilizers are derived from substances of plant or animal origin, such as manure, compost, seaweed and vegetable peelings. Organic matter amendment of the soil, helps to condition soil by improving water and nutrient retention capacity, buffer pH changes and thereby increasing the soil health for better yield. This use of organic matter decreases the dependency on the application of N-based synthetic fertilizer. The decrease usage of nitrogen-based fertilizers because of adoption of INM leads to less nitrogen leaching and losses to water and atmosphere. It decreases the N<sub>2</sub>O emissions to the atmosphere and help in reducing the national carbon footprint. However, it should be noted that sometimes the organic sources may not have all the necessary micro and macro nutrients required by plants and therefore needs to be supplemented by inorganic fertilizers. Efficient use of all nutrient sources, including organic sources, recyclable wastes, mineral fertilizers and bio-fertilizers should therefore be promoted through INM.

INM relies on several factors, including appropriate nutrient application and conservation and the transfer of knowledge about INM practices to farmers and researchers. In addition to the standard selection and application of fertilizers, INM practices include new techniques such as deep placement of fertilizers and the use of inhibitors or urea coatings (use of urea coating agent helps to retard the activity and growth of the bacteria responsible for denitrification) that have been developed to improve nutrient uptake.

### 1.1.4.2 Ambition of the TAP

The current practice in the country for soil nutrient management is primarily dependent on the application of synthetic fertilizer and it is believed that more fertilizer application improves the health of the soil. Farmers do not realize that over-application of fertilizers can lead to environmental detrimental effects such as nutrient leaching and emissions of greenhouse gas such as nitrous oxide (N<sub>2</sub>O). There is some awareness regarding the organic farming to sustain the health of the soil but not so far practiced on very large farm scales such as in the sugar-cane plantation. There is a need to upscale this technology in the country through wider consultations and awareness raising amongst farmers. Hence the ambition of the TAP is to improve and sustain soil health by INM to increase sugarcane production in Western and Northern Division.

### 1.1.4.3 Actions and Activities selected for inclusion in the TAP for INM

#### a) *Summary of Barriers and measures to overcome barriers*

In the TAP stakeholder consultation workshop conducted on 13<sup>th</sup> and 14<sup>th</sup> December, 2021 it was discussed that the barriers restricted to policy and regulation, institutional and organizational structure, technical barriers and information and awareness were of high importance as these impedes the successful implementation or diffusion of this technology. Table 14 discusses these identified barriers and measures to meet the specified ambition for the deployment/transfer and diffusion of this technology.

Table 14: Summary of barriers and measures to overcome barriers for INM.

Categories of Barrier	Measures to overcome barriers
Policy, legal and Institutional	Develop appropriate policy to mandate INM and to provide better coordination between different stakeholders. The policy will also guide INM strategy that would provide faster adoption of the technology nationwide.
Technical Barrier	The technical barrier relates to human resources, soil testing facilities and large scale investment in biochar/composting facilities to generate organic manure. These technical barriers could be lessened through accessible to funds and providing training opportunities for people and strengthening the laboratory facility for soil testing and establishment of a national composting facility.
Information and Awareness	The farmers are not aware of the INM and very dependent on the inorganic fertilizers and are in misconception that synthetic fertilizers provides faster results and are easier to use. There needs to be more farmers field days organized to demonstrate the significance of INM and need to teach through demonstration plots on how to manage soil nutrient requirements without much dependence on the inorganic fertilizers. These sessions with farmers need to show the cost benefit analysis of incorporating INM and how it is cost effective in the long term. New groups or farmers' cooperatives specifically for INM or finding pathways to integrate INMs into existing farmers group, farmers field schools and MoA extension services needs to be established.

***b) Actions selected for inclusion in the TAP for INM***

This section provides a list of narrative descriptions and reasonable arguments for each of the measures selected as actions to be included in the TAP for INM. The measures considered as actions are based on non-economic measures particularly relating to acceleration of technology adoption in the country by establishing a policy on INM and enhancing the institutional capacity for INM related projects. One of the most important action resulting from the aware and information barrier, that is, lack of knowledge and awareness about INM amongst the farming communities is also prioritized in this TAP. Table 15 provides the list of actions and its narrative descriptions.

Table 15: Actions selected for inclusion in the TAP for INM.

Barriers	Actions	Descriptions
Policy, Legal and Institutional	Development of national policy around INM	Development of a national policy around INM would see acceleration of the technology adoption nationally. The policy will ensure that INM is prioritized within the implementing government ministry and will have access to budgetary allocations. The policy will provide clear mandate to a coordinating unit and also outline the roles of other stakeholders. INM is

		practiced on an ad-hoc basis but a national policy will provide a clear directive.
Technical	<p>Development and adoption of INM technologies with private sector involvement.</p> <p>Build capacity in INM in the Sugar and Agriculture sector</p>	<p>The action on development and adoption of INM will encourage uptake of the technology nationally. This will see capacity building in terms of resources such as improved soil testing facilities, development and promotion of INM technologies and development of a national compost or biochar facility with public private partnership.</p> <p>To overcome the barrier of lack of human capacity to upscale the INM technologies in Fiji it is imperative to train people on INM and empowering current extension staff within MoA on INM technologies and to build a skillset on INM technologies it is recommended that curriculum needs to be revisited and re-designed to include INM.</p>
Information awareness	Creating awareness in INM in the Sugar and Agriculture sector	During the stakeholder consultations it was decided that raising awareness amongst farmers is critical for successful deployment of the technology in Fiji. Hence field farmers days needs to organized to inform farmers about INM, success stories and perhaps making them understand the CBA of INM and if it is profitable in long term. Farmers’ need to be empowered through development of demo plots and knowledge on designing INM plan needs to be very broadly advertised through different media platforms. A mass communication on INM techniques is required to make people understand the importance of INM technologies.

***c) Activities identified for implementation of selected actions***

This section aims to expand the identified actions into more specific activities. Table 16 presents a list of activities which need to be implemented to achieve each identified actions.

Table 16: Activities identified for implementation of selections actions for INM.

Action	Activity
Creating awareness in INM in the Sugar and Agriculture sector.	1.1 Media publications on INM technologies developed and distributed. 1.2 Outreach material on composting technologies that includes in situ composting of trash developed and disseminated. 1.3 FRCS tax and customs exemptions supporting INM technologies (agriculture) promoted. 1.4 Informal sessions with farmer clusters on INM.
Development of national policy	2.1 Draft national policy on INM. 2.2 Stakeholder consultation on INM policy 2.3 Endorsement of INM policy by cabinet
Development and adoption of INM technologies with private sector involvement.	3.1 Strengthen national soil testing facility - SRIF and MOA-Fiji Chemistry Lab. 3.2 Develop and identify appropriate INM technologies based on scientific research. 3.3 Promotion and adoption of INM technologies such as green and organic manure, liming and Biochar application. 3.4 Setup of a biochar/compost facility. 3.5 Provision of subsidies and incentives for the adoption of INM technologies. 3.6 Establish regional and international collaboration with research agencies on INM
Build capacity in INM in the Sugar and Agriculture sector.	4.1 b

**d) Actions to be implemented as Project Ideas (PIs)**

The above actions were turned into Project ideas that mostly deals with promotion and generally enhancing adoption and recognition of the technology. The following Projects Ideas were identified to create an enabling environment for technology diffusion:

- (i) Develop national INM policy that will identify a lead coordinating unit for INM programs and the policy could be streamlined into the NAP and get wider recognition in the country.
- (ii) Set up soil diagnostic labs in western and northern divisions.
- (iii) Prepare promotional materials on INM technologies with success stories and disseminated to public for wider recognition of the technology.

- (iv) Set-up demo plots showcasing different INM strategies and used in farmers field days.
- (v) Set up composting facilities using agricultural waste in the country to generate organic manure.
- (vi) Establish farmers group or farmers’ cooperatives which can have access to subsidies to practice INM and this will encourage sustainable and faster adoption of INM practices in the farming communities.

#### 1.1.4.4 Stakeholders and Timelines for the Implementation of TAP for INM

##### a) *Overview of Stakeholders and Timeline for implementation of TAP*

This section describes the main stakeholders identified and their roles in the implementation of the TAP. Ministry of Agriculture (MoA) particularly the soil unit will be the lead implementing agency and will be responsible for identifying training needs of extension services staff and chemistry laboratory, resources, developing INM strategy and coordinating activities such as preparation of promotional materials to launch a national awareness raising program on INM. The extension services of MoA will be involved in organizing the farmer field days and develop demo plots and training materials for farmers. The FSC and SRIF could provide technical support in soil testing and developing INM technologies such as composting facilities, biochar facility and developing Public-Private Partnership in leveraging funds to establish these facilities. SPC could provide technical advice on organic manure and assist government in identifying donors to promote and accelerate adoption of INM. The tertiary institutions (USP and FNU) will need to discuss with stakeholders and design programmes or TVET courses that is tailor made for enhancing INM skillset amongst our current farmers or young future farmers.

##### b) *Scheduling and sequencing of specific activities*

Table 17 below aims at describing the scheduling and sequencing of specific activities to be undertaken to achieve the actions identified for INM. The planning and implementation phase of the TAP is till the end of 2027, giving ample time for the realization of ambition by 2030. However, it should be noted that the specific timing for implementation is dependent on the availability of funds from the government or donor agencies.

Table 17: Scheduling, sequencing and responsible stakeholders of specific activities for INM.

Activity	End 2023	2024	2025	2026	2027	Responsible body
1.1						SRIF; FSC; MOA; FCLC - SPC - soil unit
1.2						SRIF; FSC; MOA; FCLC - SPC - soil unit
1.3						-FRCS
1.4						SRIF; FSC; MOA; FCLC - SPC - soil unit
2.1						SRIF; FSC; MOA; FCLC; SPC; consultants; farmers
2.2						SRIF; FSC; MOA; FCLC; SPC; consultants; farmers

2.3						Fiji Government, SG's office
3.1						SRIF, MOA, SPC, FNU, USP
3.2						SRIF, MOA, SPC, FNU, USP
3.3						SRIF, MOA, SPC, FNU, USP
3.4						SRIF; FSC; MOA; FCLC; SPC, consultants; farmers, BAT Private sector partners, Municipal markets
3.5						- FSC -Ministry of Finance
3.6						- FSC -Ministry of Finance
4.1						SRIF, MOA, SPC, FNU, USP
4.2						SRIF, MOA, SPC, FNU, USP
4.3						SRIF, MOA, SPC, FNU, USP

#### 1.1.3.5 Estimation of Resources needed for action and activities

##### a) *Estimation of capacity building needs*

To accelerate the adoption of INM technology nationwide, huge investment is required to understand the nutritional value of the feedstock such as green manure, sugar-cane trash, mill mud, and animal waste and how composting will enhance soil health. To understand soil health, soil analysis needs to be undertaken to understand what nutrition is lacking and how INM technology can address the deficient minerals and to this end capacity building in laboratory facilities and lab technicians needs to be strengthened. More man power in term as of technical expertise is required to understand deficient minerals in soils and what INM strategy needs to be incorporated. There needs to be a specific center dedicated for training and research in composting and local composting facilities built to generate compost manure which will be distributed to farmers. Some incentives needs to be provided to accelerate the adoption of the technology to be rewarded. There is a need to provide training opportunities for extension staff in building capacity in knowledge transfer of INM and formation of farmers group and association is needed to share experiences and rewarding best practices.

##### b) *Estimations of costs of actions and activities*

Table 18 provides the total costs of actions and activities to implement the TAP and cost approximately FJD 2.74 M. Action 3 is most costly and contributes to development and adoption of INM technology. Although organic farming is practiced on ad-hoc basis but INM technology implementation nationwide and on more structured diffusion of the technology is largely absent due to the barriers identified earlier. To accelerate the development and adoption of the technology in the country requires large investment.

Table 18: Estimations of costs of actions and activities for INM.

<i>Actions</i>	<i>Activity</i>	<i>Cost (FJD)</i>	<i>Sub-total for Action (FJD)</i>	<i>Sources of Funding</i>
<b>Action 1</b>	Activity 1.1	100,000	<b>350, 000</b>	GoF, donor
	Activity 1.2	100,000		GoF, donor
	Activity 1.3	100,000		GoF, donor
	Activity 1.4	50,000		GoF, donor
<b>Action 2</b>	Activity 2.1	150,000	<b>250, 000</b>	GoF, donor
	Activity 2.2	100,000		GoF, donor
	Activity 2.3	0		GoF, donor
<b>Action 3</b>	Activity 3.1	250000	<b>3,450,000</b>	GoF, donor
	Activity 3.2	500000		GoF, donor
	Activity 3.3	100000		GoF, donor
	Activity 3.4	2,000, 000		GoF, donor
	Activity 3.5	500000		GoF, donor
	Activity 3.6	100,000		GoF, donor
<b>Action 4</b>	Activity 4.1	250,000	<b>400, 000</b>	GoF, donor
	Activity 4.2	50,000		GoF, donor
	Activity 4.3	100,000		GoF, donor
<b>Total (FJD)</b>			<b>4, 450, 000</b>	

#### 1.1.4.6 Management Planning

##### a) Risks and Contingency Planning

There is a possibility that TAP may not be implemented effectively due to following risks and therefore some contingency plans are proposed for the implementation of the TAP:

- (i) Access to sustainable funding: there is lack of government funding to promote the development and adoption of the technology. The contingency plan is to increase government budgetary allocations to sustain development of INM technology. There needs to be a national policy framework in place that would form the basis of government budget allocations, and also a cost benefit analysis of INM should be done so the long term economic and environmental benefit could be realized and more funding opportunities may arise.



- (ii) Government priority could change and may divert attention to other sectors that need immediate attention such as coastal communities facing relocation. The Ministry of Sugar Industries and MoA should emphasize on the importance of this technology in enhancing soil health which could degrade under over-fertilization and impacts of changing climate. There needs to be constant requests from MSI to increase budgetary allocations so that institutional capacity could be built and would be beneficial in long term.
- (iii) Farmers' acceptance of the technology: Incentives needs to be provided to farmers to try the new soil management technology. Additionally there needs to be some awareness raising through developing local or national networks and information dissemination through local media.
- (iv) Lack of feedstock for the national composting facility: There is a risk that the composting facility built is not running to its full capacity and there is not enough feedstock. Consequently the compost facility cannot meet the demand of producing enough compost for farmers. There needs to be some agreement between MSI and Lautoka City Council and the compost facility operator regarding the cartage of sugar cane field thrash, mill mud and other agricultural waste or market green waste to the facility.

***b) Next Steps***

Stakeholders think that to move forward the INM technology in Fiji the following critical and immediate requirements need to be implemented:

- (i) Currently this technology is implemented on an ad-hoc basis and therefore first step would be stock take of all feedstock available for composting and get a nutritional analysis done to devise an INM strategy (critical requirement).
- (ii) The stakeholders need to find ways to secure funding from donors to implement this technology particularly in terms of building national capacity. Without funding the TAP could not be realized (critical requirement).
- (iii) To develop a national policy framework on INM that could be mainstreamed into NAP and MoA SDP to provide more coordination amongst different stakeholders and leverage budgetary allocations from the government for capacity building needs (immediate requirement)
- (iv) To train people especially extension staff through career development plans and tailor made programmes/curriculum to be developed in consultation with tertiary institutions to develop new skillset in INM (immediate requirement).

Table 19: TAP Overview table for INM.

TAP Overview Table								
<b>Sector</b>	Agriculture							
<b>Sub-sector</b>	Soil Management							
<b>Technology</b>	Integrated Nutrient Management (INM)							
<b>Ambition</b>	Improving and sustaining soil health by integrated nutrient management to increase sugarcane production in western and northern division.							
<b>Benefits</b>	Integrated Soil Nutrient Management will contribute to reduction in the use of inorganic fertilizers and reduce water pollution and greenhouse gas emissions. It will create job opportunities and encourages private-public partnerships.							
<b>Actions</b>	<b>Activities to be implemented</b>	<b>Sources of Fundin g</b>	<b>Responsible body and focal point</b>	<b>Time frame</b>	<b>Risks</b>	<b>Success Criteria</b>	<b>Indicators for monitoring of implementation</b>	<b>Budget Per Activity</b>
<b>Action 1</b> Creating awareness in INM in the Sugar and Agriculture sector	Activity 1.1 Media publications on INM technologies developed and distributed	GoF, donor	SRIF; FSC; MOA; FCLC - SPC - soil unit	2024	Availability of budget media personals to develop the products	Media publications developed and distributed.	Media personnel hired and content developed.	100000
	Activity 1.2 Outreach material on composting technologies that includes in situ composting of trash developed and disseminated	GoF, donor	SRIF; FSC; MOA; FCLC - SPC - soil unit	2024	Outreach materials not developed on time or with expected quality	Outreach materials developed and distributed.	Draft prepared and circulated for review.	100000
	Activity 1.3 FRCS tax and customs exemptions supporting INM technologies (agriculture) promoted.	GoF, donor	-FRCS	2024	FRCS tax and customs priorities change	FRCS tax exemptions approved.	Stakeholder consultations and tax exemption value decided.	10000

	Activity 1.4 Informal sessions with farmer clusters on INM.	GoF, donor	SRIF; FSC; MOA; FCLC - SPC - soil unit	2024	COVID restrictions do not allow for gathering - Low farmer turnout	Number of informal sessions conducted	Invitations for farmers clusters done. Farmers informed.	50000
<b>Action 2</b> Development of national policy around INM	Activity 2.1 Draft national policy on INM	GoF, donor	SRIF; FSC; MOA; FCLC; SPC; consultants; farmers	2025	Change in government, change in priority. - Cost out way short-term benefit.	Draft policy on INM completed	Hire of consultant to draft the policy and consultations done	150000
	Activity 2.2 Stakeholder consultation on INM policy	GoF, donor	SRIF; FSC; MOA; FCLC; SPC; consultants; farmers	2025	- Low turnout of stakeholders - Stakeholders don't think INM policy is important	Stakeholder consultations done	Invites sent for stakeholder consultation and confirmation received.	100000
	Activity 2.3 Endorsement of INM policy by cabinet	GoF, donor	Fiji Government, Solicitor General's Office	2025	Change in government, change in priority.	Policy endorsed by cabinet	Policy draft finalized	0
<b>Action 3</b> Development and adoption of INM technologies with private sector involvement	Activity 3.1 Strengthen national soil testing facility - SRIF and MOA-Fiji Chemistry Lab.	GoF, Donor	SRIF, MOA, SPC, FNU, USP	2025	Lack of human resources and specialized equipment	Testing facility updated.	More technicians hired and procurement of equipment.	250000
	Activity 3.2 Develop and identify appropriate INM technologies based on scientific research	GoF, Donor	SRIF, MOA, SPC, FNU, USP	2025	Lack of human resources	INM technologies identified	A consultant hired to undertake review	500000
	Activity 3.3 Promotion and adoption of INM technologies such as green and organic manure, liming and Biochar application.	GoF, donor	SRIF, MOA, SPC, FNU, USP	2026	Farmers acceptance of INM	INM technologies promoted and adopted at national scale.	Promotion materials prepared; farmers' field days organized.	100000
	Activity 3.4 Setup of a biochar/compost facility	GoF, donor	SRIF; FSC; MOA; FCLC; SPC, consultants; farmers, BAT	2026	Lack of feedstock for compost facility;  Extra staff required to operate the facility	Biochar/compost facility up is operational	The components of the facility procured and installed. Trainings conducted on the use.	2M

			Private sector partners, Municipal markets					
	Activity 3.5 Provision of subsidies and incentives for the adoption of INM technologies.	GoF, Donor	- FSC -Ministry of Finance	2027	Lack of funding	Incentive model designed.	Discussions on incentive model with stakeholders.	500,000
	Activity 3.6 Establish regional and international collaboration with research agencies on INM	GoF, Donor	SRIF, MOA, SPC, FNU, USP	2026	Collaboration does not have a clear directive and lacks funding to support.	International collaboration agreement in place.	MoU signed between international laboratories.	100000
<b>Action 4</b> Build capacity in INM in the Sugar and Agriculture sector	Activity 4.1 Training - farmers and extension staff on INM	GoF, Donor funding	SRIF, MOA, SPC, FNU, USP	2027	Lack of trainers; lack of commitments from farmers.	Training conducted	Farmers made aware of the training. Training materials developed.	250000
	Activity 4.2 Demo plots for displaying INM strategies setup (farmer field school).	GoF, Donor funding	SRIF, MOA, SPC, FNU, USP	2027	Land not secured; location not favorable for farmers	Demo plots set-up	Location identified and plot prepared for demo.	50000
	Activity 4.3 TVET courses on INM technologies developed and included in curriculum	GoF, Donor	SRIF, MOA, SPC, FNU, USP	2027	No specialized staff to develop and teach. Lack of funding.	TVET courses developed	Agreement in-place with tertiary institution to develop the course.	100000

## Chapter 2 Technology Action Plan and Project Ideas for Coastal Zone Sector

### 2.1 TAP for Coastal Zone Sector

#### 2.1.1 Sector overview

The Fiji Climate Vulnerability Assessment (2017) identified coastal zones (coastal communities and fisheries) to be more vulnerable to natural hazards such as coastal flooding and tropical storm surges. The impacts of climate change and sea level rise is now evident in many coastal communities. It was reported that shoreline retreats of 15 – 20 m over recent decades have been observed in Fiji and this was partly attributed to loss of mangroves (World Bank, 2000). In 2013, the village of Vunidogoloa was the first village to be fully relocated (McNamara and Des Combes, 2015) with an additional 42 communities identified to be at risk from rising sea level, riverine erosion and flooding. Hence some interventions in adaptation measures in safeguarding the coastal communities from extreme climatic hazards and long-term climate change impacts is of national paramount importance.

The technologies prioritized in the coastal zone sector were aligned to the Fiji NAP and CVA. The adaptation measures for natural hazards and natural environment identified in NAP (GoF, 2017) which are aligned to the prioritized technologies are as follows:

- Integrate ecosystem-based adaptation measures into considerations regarding the construction of seawalls and river banks, including mangrove planting and vetiver planting as adaptation intervention for riverine erosion.
- Implement coastal protection measures in highly vulnerable communities (e.g. foreshore protection, artificial wave break etc.).
- Create flood risk and management action plans for all human settlements which operate at the catchment scale and involve either hybrid or nature-based solutions and payments for ecosystems services.
- Flood management activities for priority river systems, such as Nadi River, Sigatoka River, Rewa River, and Labasa River.
- Conduct Regular River flow monitoring and flood forecasting.
- Strengthen enforcement of planning and environmental legislative and institutional frameworks, most notably the Environment Management Act and Environment Impact Assessment process.
- Prioritize and delineate critical areas for protection and sustainable management based on ecosystem services, cultural importance, biodiversity, food security, water security, access and benefit sharing, and importance for adaptation and disaster risk reduction.
- Assess and monitor the state of coastal ecosystems and protect and enhance the natural coastal defenses.
- Gain endorsement of mangrove management plan, implement mangrove rehabilitation projects and strengthen the regulations regarding mangrove removal and conversion.

The following three technologies were prioritized in the first phase of the TNA process:

1. **Mangrove Rehabilitation:** The technology already exists in Fiji and the barriers for implementation of such technology is well known, such as survival rates of mangrove seedlings, species selection, monitoring and maintenance protocols for mangrove rehabilitation/management

and lack of commitment from the local communities to sustain the mangrove. Nonetheless, it is a soft mechanism that will protect against coastal erosion from storm surges and provides a buffer between the coast and the reef system in terms of trapping nutrients, chemicals and sediments which could potentially damage the reef system. The project target to replant 1,000 ha of mangrove by 2030 particularly those areas that are faced with storm surges associated with the impact from high intensity cyclones.

2. **Construction of Sea wall with Groynes:** Sea walls of various forms have been around Fiji since 1960s, however the durability of the technology remains a concern and therefore appropriate and sustainable designs needs to be implemented. The construction of seawalls with groynes will be relatively new technology and this will help in withstanding the strong backwash in waves that undercuts the seawall causing it to collapse. The groynes could be wooden or cement structures or gabions perpendicular to the coastline extending out into the sea. The groynes prevent the movement of sand and helps in building a larger section of beach in front of seawalls. The new beach will increase the distance that waves have to travel to reach the coast and, in the process lose most of their energy, reducing their impact on the seawall. The project target to build sustainable seawall in northern and western divisions and hard engineered structures in 3 maritime sites if NbS seawalls are not application by design and resources available.
3. **Flood Hazard Mapping:** A valuable tool to map out coastal regions which are more prone to flooding in future due to climate change. In Fiji flooding causes huge economic losses in terms of structural damage to infrastructure and damages to the agriculture sector. The use of LiDAR measurements in conjunction with changes in bathymetry and topographic data could provide useful flood hazard mapping and robust risk assessment that could steer away infrastructure developments from future climate hazard and could also be useful in planning national disaster risk reductions programs. The preliminary diffusion target is to provide a coastal flood hazard mapping for vulnerable areas in Fiji.

## 2.1.2. Action Plan for Technology 1: Mangrove Rehabilitation

### 2.1.2.1 Introduction

Mangroves are part of the wetland ecosystems and provide many direct and indirect benefits for our communities. One of the most important function of mangroves is to provide coastal protection against coastal flooding. They induce wave and tidal energy dissipation and act as a sediment trap for materials, thus helping to build land seawards. The dense root mats of wetland plants also help to stabilize shore sediments, thus reducing erosion. Restoration of degraded mangrove ecosystem is required not only to provide coastal defense from extreme climate events but it also provides other benefits for the local community and the environment.

Mangrove ecosystem supports the livelihood of the local communities. The mangrove ecosystem acts as the nursing ground for a number of reef fish such as snapper, jack, trevally and surgeonfish. Mangroves also provide habitats for crabs and shrimps and the ecological benefits also extend to offshore. Mangroves helps in sediment and nutrient trapping and improves water quality that promotes healthy growth of corals that leads to increase in fish stock. Mangrove is also a major source of firewood, charcoal and also used in

construction. The leaves of mangroves have a number of medicinal uses and used in the local community as traditional medicine (Greenhalgh et al., 2018). In addition, it has been used for making traditional artefacts particularly using the bark to prepare traditional clothing used for weddings.

Mangroves were prioritized as an adaptation tool in this TNA project because mangroves provide coastline protection against waves, storms, flooding, and coastal erosion and therefore protect coastal developments such as buildings, agricultures and road systems. It was estimated that 100m of mangrove forest can dissipate wave energy by 20% (Mazda et al., 1997). The importance of mangrove system was realized during Cyclone Winston, a category 5 cyclone, whereby houses in the Ra province were badly damaged particularly in the areas where there were no mangroves to provide protection from the wave force and winds (SPC, 2015). Mangroves have provided benefits in protecting the sea walls, protecting the life of the sea wall by reducing sediment erosion from the foundation of these structures. Hence mangroves reduce the maintenance cost of seawalls and makes it more durable (Greenhalgh et al., 2018).

Mangroves are highly efficient in removing or sequestering carbon dioxide (CO<sub>2</sub>) from the atmosphere and storing in the plant material and also storing in soil as well. It is estimated that mangroves can remove approximately 1,000 tonnes of CO<sub>2</sub> /ha and therefore mangrove conversion results in the emission although this emission is not accounted for in the National Greenhouse Gas Inventory. The carbon sequestered by mangroves can be used to offset greenhouse gas emissions. There is great potential that mangroves could provide opportunities for the REDD+ implementation and ecotourism.

Mangrove restoration is currently promoted in Fiji as the nature based solution for climate change adaptation efforts in the country to protect our coastlines. In addition to coastal defense mechanism and mitigation co-benefits, mangroves also provide an ecosystem service to sustain livelihood of people and the economy of the country. However due to unsustainable coastal developments and the financial and governance barriers have led to decline in mangrove forests or slow diffusion in the technology. Hence mangrove reforestation was identified as a prioritized technology to make our coastal communities less vulnerable to the impacts of climate change and sea level rise. The prioritization and preliminary target for diffusion is derived from the Fiji NAP and LEDS.

#### 2.1.2.2 Ambition for TAP

The objectives and target for the deployment and diffusion of the mangrove rehabilitation programmes in Fiji is to strengthen national policies and regulations on mangroves and restore 20% of mangroves (additional 8,520 ha) by 2030. This will involve having a good governance system that would mainstream mangrove management and restoration into current coastal development plans. The mangrove reforestation will be mostly targeted in communities that are vulnerable to sea level rise and coastal flooding from storm surges.

#### 2.1.2.3. Actions and Activities selected for inclusion in the TAP for Mangrove Rehabilitation

##### *a) Summary of Barriers and measures to overcome barriers*

In the TAP stakeholder consultation workshop conducted on 13<sup>th</sup> and 14<sup>th</sup> December, 2021 it was discussed that the barriers restricted to Economic and financial, legal and Regulatory and technical barriers were of high importance as these impedes the successful implementation or diffusion of this technology. Table 20 discusses these identified barriers and measures to meet the specified ambition for the deployment/transfer and diffusion of this technology.

Table 20: Summary of barriers and measures for mangrove rehabilitation.

Categories of Barrier	Measures to overcome barriers
Economic and Financial	To address the high cost for restoration programmes it was highly recommended to attract donor agency funds through development of a thorough large grant proposals. It was also proposed that conserving mangrove forest for protection and rehabilitation should be incentivized under the Blue carbon and REDD+ schemes.
Legal & Regulatory	A national mangrove policy should be developed that will designate a clear national mandated authority on mangroves and will assist multiple stakeholders to make sound decisions regarding the use of the resources. A mandated authority for mangrove restoration and rehabilitation which would be enshrined in the policy will also overcome the institutional and organization barrier. The cabinet to endorse the Mangrove Management Plan (MMP) so that the implementation framework for MMP could be commissioned. This will result in the revival of an effective and efficient Mangrove Management Committee (MMC), which should constitute of policy regulators, scientific/academia and NGOs and could evaluate the impact of coastal developments on mangrove ecosystems.
Technical	The technical barriers is mostly to do with lack of knowledge on how to carryout mangrove restoration work and also due to lack of updated zonal maps to highlight where mangroves grew historically as mangroves will not grow in all sites. Hence it was highly recommended to develop tools such as such as updated zonal mangrove maps needed as a decision tool for better land use planning. Another identified measure was to develop a mangrove restoration manual and national Land-use plan.

***b) Actions selected for inclusion in the TAP for the mangrove rehabilitation***

This section provides a list of narrative descriptions and reasonable arguments for each of the measures selected as actions to be included in the TAP for the mangrove rehabilitation. The measures considered be used as actions are based on the economic and non-economic measures particularly relating to policy and technical barriers. Table 21 provides the list of actions and its narrative descriptions

Table 21: Actions selected for mangrove rehabilitation inclusion in the TAP

Barriers	Actions	Descriptions
Legal and Regulatory	Develop Policy framework and Protection for mangrove restoration/rehabilitation in Fiji.	Current draft MMP is not yet endorsed by cabinet, needs to be reviewed, updated and submitted for cabinet approval; legal gap analysis done for mangroves recommends a new legislation is developed to address gaps and provide a clear mandate on national authority and cooperation across ministries and sectors related to mangrove management and use.



		Ensure legislative frameworks are in place; Clear demarcation of roles and responsibilities and cooperation across ministries and sectors; designated national hub for mitigation and adaptation data and research on mangroves.
Economic and Financial	Explore and secure sustainable financing and economic opportunities for mangrove restoration work.	Explore opportunities to develop sustainable and innovative financing mechanisms for mangrove management and restoration including in national budgetary processes; developing proposals to seek donor agency funding. These could also include development of national blue carbon project using lessons learnt from REDD+ initiative leading to introduction of incentives under the REDD+ and Blue Carbon. Also e parametric insurance (impacts of cyclones on mangroves) and identifying mangrove related SME for coastal communities with special focus on women in fisheries should be explored.
Technical	Provide an Integrated Land-use and Seascape Spatial Plan and Restoration manual and tools for higher success in restoration efforts.	Integrate mangroves into wider land and seascape spatial maps and planning to develop an integrated national land and seascape plans. Development of climate smart mangrove restoration manual is highly recommended. Current mangrove restoration efforts are hindered by cyclones, flooding and sea-level rise so restoration plans must take into account climate factors and climate change projections.

***c) Activities identified for implementation of selected actions***

This section aims to expand the identified actions into more specific activities. Table 22 presents a list of activities which need to be implemented to achieve each identified actions.

Table 22: Activities identified for implementation of selected actions for mangrove rehabilitation.

Action	Activity
Develop Policy framework and Protection for mangrove restoration/rehabilitation in Fiji.	1.1 Facilitate consultation to review and update current draft of National Mangrove Management Plan and submission to cabinet for endorsement. 1.2 Recruit consultant to facilitate national consultations and drafting of the Mangrove legislation; submission to Parliament to be passed into Law.

	<p>1.3 Explore opportunities to work together with local communities to establish community based and state-based mangrove protected areas as part of a wider network of ecologically represented networks of protected areas to halt further loss of existing mangrove forests.</p>
<p>Explore and secure sustainable financing and economic opportunities for mangrove restoration work.</p>	<p>2.1 Desktop review and stock-take of current and possible future funding commitment for mangroves - public and private funding; take note of ongoing proposal developments and pipelines at national level; identify funding gaps and opportunities to develop future funding proposals and concepts notes.</p> <p>2.2 Desktop review of global efforts and best practices on mangrove related adaptation technology and nature-based solutions that can be adopted at national efforts to increase the success of funding proposals.</p> <p>2.3 Develop innovative and nationally relevant projects and proposals for mangrove adaptation technology included blended financing mechanisms supporting efforts at national and grass-roots level.</p> <p>2.4 Design and support ongoing efforts and pilot project on Blue Carbon and explore opportunities to upscale best practices.</p>
<p>Provide an Integrated Land-use and Seascape Spatial Plan and Restoration manual and tools for higher success in restoration efforts</p>	<p>3.1 Using GIS mapping and data, facilitate nationwide land-use spatial planning integrating mangrove management into wider land-use and seascape plans.</p> <p>3.2 Develop climate-smart mangrove restoration tools and manual to build capacity of local actors to strengthen restoration effort at national and local efforts as part of wider integrated land-use plans.</p> <p>3.3 Facilitate, promote and monitor ongoing restoration efforts at national and local level and ensure that this data is regularly fed into national GIS database and national mangrove GIS maps are regularly updated.</p> <p>3.4 Train and promote the use of Mangrove Restoration Tracking Tool (MRTT) to assist with monitoring effectiveness of Mangrove restoration and ensure national data is being updated.</p>

**d) Actions to be implemented as Project Ideas (PIs)**

The above actions selected were turned into Project ideas for the realization of TAP carefully and technically considered by the coastal zone technical working group. The following Projects Ideas were identified to create an enabling environment for technology diffusion:

- (i) Mangrove Management Plan and National Mangrove Legislation is to be instituted so that it will provide legal framework and provide clear mandate to a national authority to enforce and spearhead mangrove restoration work.

- (ii) Create climate smart Mangrove Restoration Tracking tool (MRTT) and restoration manual to guide communities to monitor mangrove restoration efforts and be successful.
- (iii) Creating a database of all the mangrove restoration work and the data gathered and fed into a GIS system to update the Land-Use Spatial Plans.

#### 2.1.2.4 Stakeholders and Timelines for the Implementation of TAP for Mangrove Rehabilitation

##### a) *Overview of Stakeholders and Timeline for implementation of TAP*

This section describes the main stakeholders identified and their roles as required for each of the actions to be implemented. The Department of Environment under the Ministry of Environment and Climate Change is currently the designated national focal point for mangrove restoration work. As such, presented in Table 23 are the identified key stakeholders for each action with their associated roles.

Table 23: Identified key stakeholders and their roles in the Mangrove rehabilitation.

Key Stakeholder	Roles
Action 1 Department of Environment, Ministry for Lands and Mineral Resources, Ministry of iTaukei Affairs and Ministry for Fisheries and Forestry.	Department of Environment in partnership with Lands, Forestry and Fisheries will facilitate national level consultations with other stakeholders such as CSOs, FLMMA, academic institutions and NGOs to review and finalize draft MMP and submit to cabinet for endorsement. The Department of Environment to facilitate the hiring of consultant to undertake the mangrove legislation work. The Solicitor General’s office will provide clearance and endorsement of MMP and Mangrove Legislation before it is tabled in the cabinet for approval.
Action 2 Department of Environment and Climate Change Division and all relevant stakeholders such as IUCN, WWF, Conservation International, WCS part of global mangrove alliance.	Department of Environment is the national focal point for mangrove restoration work and therefore all proposals to GEF and GCF needs to be endorsed by the Ministry of Environment and Climate Change (MECC).  The NGOs such as IUCN, WWF, CI, WCS can assist the Department of Environment in identifying funding opportunities and can guide consultants to write and attract funding.
Action 3 Ministry of Lands, Ministry for Fisheries and Forestry, GIS experts, Climate Change Division Global Mangrove Alliance, academic institutions and private sector or CSOs.	Ministry of Lands together with local GIS experts will be able to provide remote sensing and ground truthing of data to update mangrove GIS Maps.  Given the relevant and extensive experience of Global Mangrove Alliance in mangrove restoration work can assist the local focal point to develop mangrove restoration tracking Tools and restoration manual to create awareness amongst the communities.  The Climate Change Division can collate data from other departments and are responsible for a repository on mangrove

	restoration work that can be used to update the Land-use Plan and can be used to track the success of NAP. The academia, private sector could be involved in the research and design and deployment of the MRTTs. The Civil Society Organizations (CSOs) could be involved in the trial and testing component of the MRTT and manual.
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**b) Scheduling and sequencing of specific activities**

Table 24 below aims at describing the scheduling and sequencing of specific activities to be undertaken to achieve the actions identified for mangrove restoration efforts. The planning and implementation phase of the TAP is till the end of 2025, giving ample time for the realization of ambition by 2030. It is imperative that the policy framework needs to be in place to guide concept or project proposal development, hence this is prioritized in scheduling of activities.

Table 24: Scheduling and sequencing of activities in mangrove rehabilitation.

Activity	Timeframe (Planning and Implementation)						
	End 2023	Mid 2024	End 2024	Mid 2025	End 2025	Mid 2026	End 2026
1.1							
1.2							
1.3							
2.1							
2.2							
2.3							
2.4							
3.1							
3.2							
3.3							
3.4							

**2.1.2.5 Estimation of Resources needed for action and activities**

**a) Estimation of capacity building needs**

Ongoing capacity building, knowledge and skills related to mangrove related adaptation technology for current and future generations is urgently needed. The successful diffusion is dependent on the human capacity or expertise to implement the project. There needs to be a dedicated unit within the national focal point to steer all mangrove restoration and rehabilitation work. Some capacity development is needed in producing or updating mangrove spatial maps using special GIS techniques so that it acts as a decision tool for better land use planning and guide coastal developments. It is acknowledged that there is insufficient capacity and resources currently to produce spatial maps with zones demarcated for different purposes such as housing, industrialization, tourism, agriculture and reserves. Current mangrove restoration efforts are hindered by cyclones, flooding and sea-level rise so restoration plans must take into account climate factors and climate change projections. Hence

greater synergies with meteorological departments and capacity development within the department is needed in generating the climate related data to guide the mangrove restoration work. The success of mangrove restoration work could be enhanced through the use of MRTT and restoration manual. There needs to be Training of Trainers (ToT) and training workshops conducted for local communities to undertake application of such tools and taking ownership in the local ecosystem based adaptation strategy.

*b) Estimations of costs of actions and activities*

Table 25 provides the total costs of actions and activities to implement the TAP. More than 50% of the money is spent on developing tools such as MRTT, restoration manuals and conducting trainings of ToT and workshops within local communities to successfully foster ecosystem based adaptation measures like mangrove reforestation. Data gathering to prepare spatial mangrove maps and that could guide land-use planning and climate smart tool is proven to be expensive.

Table 25: Estimations of costs of actions and activities in mangrove rehabilitation.

<i>Actions</i>	<i>Activity</i>	<i>Cost (FJD)</i>	<i>Sub-total for Action (FJD)</i>	<i>Sources of Funding</i>
<b>Action 1</b>	Activity 1.1	100, 000	<b>500, 000</b>	GEF, global biodiversity framework, GoF
	Activity 1.2	200,000		GoF, GEF, Philanthropy, Bilateral funding
	Activity 1.3	200,000		GoF, GEF, GCF (blending financing mechanism)
<b>Action 2</b>	Activity 2.1	100, 000	<b>1, 350,000</b>	GoF, NGO partners
	Activity 2.2	50, 000		GoF, NGO Partners
	Activity 2.3	1, 000, 000		GoF, GEF, GCF, NGO partners
	Activity 2.4	200, 000		GoF, GEF, GCF, NGO partners
<b>Action 3</b>	Activity 3.1	500, 000	<b>3, 500,000</b>	GEF, GCF, USAID,
	Activity 3.2	500, 000		GEF, GCF
	Activity 3.3	2,000,000		GEF, GCF, USAID
	<b>Activity 3.4</b>	<b>500,000</b>		<b>GEF, GCF</b>
<b>Total</b>			<b>5,350,000</b>	

### 2.1.2.6 Management Planning

#### a) Risks and Contingency Planning

There is a possibility that TAP may not be implemented effectively due to following risks and therefore some contingency plans are proposed for the implementation of the TAP:

- (v) Access to sustainable funding: there is lack of government funding to sustain mangrove restoration work in Fiji and also donor agency funds are time bound. The contingency plan is to increase government budgetary allocations to sustain mangrove reforestation/rehabilitation work in Fiji. Also in donor agency funds there should be allocations for on-going monitoring and sustaining work in the communities.
- (vi) Limited local technical expertise or capacity in mangrove restoration: Local communities are not well versed on “know to how” on mangrove restoration and as well limited capacity in terms of developing mangrove maps, restoration manual and the use MRTT. The contingency plan is to conduct regular capacity building, hands-on training for mangrove restoration work within communities. The personnel within the line ministries to undergo upskilling in the latest GIS techniques through long and short training opportunities. There needs to be greater partnership with the academic institutions in terms of conducting research and developing tools to track mangrove restoration and understanding the impacts of climate actors on mangrove restoration.
- (vii) Inadequate institutional arrangements and data sharing: There are more than one line ministry that have interest in mangroves and there is a possibility that clear responsibilities are not instituted and this could lead to some prolonged delays in approvals of some of the activities. This should be resolved once the legislation is in place which will clearly give the mandate for a national authority. Additionally there needs to be some awareness raising through developing local or national networks, data repository or websites for climate change data sharing specifically for mangrove restoration.

#### b) Next Steps

Stakeholders think that to move forward the mangrove restoration work in the most vulnerable coastal communities in Fiji the following critical and immediate requirements need to be implemented:

- (v) The Mangrove Management Plan needs to be endorsed immediately and a fully functional Mangrove Management Committee to be formed that will look into the Environmental Impact Assessments and approval for coastal developments. This will certainly strengthen the decision making in mangrove restoration or removal in Fiji. (critical requirement)
- (vi) Government needs to prioritize mangrove restoration and rehabilitation in NAP and to be included in their work package so that it can actively seek funding locally and internationally. (immediate requirement)
- (vii) Creating a community of practitioners resulting in continuous engagement of responsible authorities and stakeholders to drive the TAP and mangrove restoration work in Fiji. This will also bring together different expertise together and will provide a more concerted effort in mangrove restoration work. (immediate requirement)

Table 26: TAP overview table for mangrove rehabilitation.

TAP Overview Table								
<b>Sector</b>	Coastal Zones							
<b>Sub-sector</b>	Restoration of Coastal Vegetation							
<b>Technology</b>	Mangrove Rehabilitation							
<b>Ambition</b>	To strengthen national policies and regulations on mangroves and restore 20% of mangroves (additional 8,520 ha) by 2030.							
<b>Benefits</b>	<p><b>Economic:</b> supports livelihoods of communities through fishing, avoids high capital cost in hard engineered coastal defense structures; potential to generate income through blue carbon sequestration carbon commodity market.</p> <p><b>Environmental:</b> Provides coastal protection to sea level rise and storm surges and coastal inundation and coastal erosion, mitigation potential and traps sediments and nutrients and improves water quality. <b>Social:</b> Supports grassroots women fishers in villages and their livelihoods in terms of catching bivalves, crabs and fish from the mangrove area.</p>							
<b>Actions</b>	<b>Activities to be implemented</b>	<b>Sources of Funding</b>	<b>Responsible body and focal point</b>	<b>Time frame</b>	<b>Risks</b>	<b>Success Criteria</b>	<b>Indicators for monitoring of implementation</b>	<b>Budget Per Activity</b>
Policy Framework and Protection	Activity 1.1 - Facilitate consultation to review and update current draft of National Mangrove Management Plan and submission to cabinet for endorsement.	GEF, global biodiversity framework, GoF	MoF national focal point. Department of Environment, , Lands, Fisheries, Forestry, iTaukei Affairs, etc. - with all relevant stakeholders including CSOs,	Mid of 2024	<p>Delay in accessing funds.</p> <p>Lack of dedicated personnel in MoE to spearhead facilitation.</p> <p>Government led initiative could be</p>	National MMP reviewed, updated and approved at cabinet	<p>ToR of a consultant developed.</p> <p>Consultant is hired.</p> <p>Wider stakeholder consultations carried out.</p> <p>MMP reviewed, updated and submitted for</p>	FJD 100K

			Community based organizations, FLMMA, Private Sector, Academic Institutions, etc.		prolonged delays in reviewing and getting approval.  Awareness raising for consultation is limited		approval by cabinet.	
	Activity 1.2 Recruit consultant to facilitate national consultations and drafting of the Mangrove legislation; submission to Parliament to be passed into Law.	GoF, GEF, Philanthropy, Bilateral funding.	Department of Environment, SG's Office, and all relevant Authorities	End of 2023	This is a government led initiative and changes in government structure could delay in submission.  Hiring of consultant could be delayed.	Mangrove legislation submitted to Parliament to be passed into Law.	ToR of a consultant is developed.  Wider stakeholder consultations done.  Drafting of legislation is done and reviewed.  Submission of legislation to SGs office.	FJD 200k
	Activity 1.3 Explore opportunities to work together with local communities to establish community based and state-based mangrove protected areas as part of a wider network of ecologically represented networks of protected	GoF, GEF, GCF (blending financing mechanism)	iTaukei Affairs, Provincial Offices, CSOs, Ministry of Lands, Department of Environment and Forestry, Private Sector	End of 2024	Delay in accessing finance.  Lack of interest or commitment from appropriate agents from	Community based and state based mangrove protected areas identified and established	MMC is initiated and working group is formed.  Training and capacity building workshops done for communities.	FJD 200K



	areas to halt further loss of existing mangrove forests				governments and NGO stakeholders.			
Sustainable Financing and Economic Opportunities	Activity 2.1 - Desktop review and stock-take of current and possible future funding commitment for mangroves - public and private funding; take note of ongoing proposal developments and pipelines at national level; identify funding gaps and opportunities to develop future funding proposals and concepts notes.	GoF, NOGs partner	OPM - Climate change division and all relevant stakeholders - can easily be done by a consultant, ministry of environment, IUCN, WWF, Conservation International, WCS part of global mangrove alliance	Mid of 2025	Accessing finance.  On-time Consultant hiring is slow and a difficult process.	Identifying funding opportunities to support mangrove restoration.  Developing concept note to attract funding	Hiring of consultant to review and stock-take mangrove activities.  Concept note developed.  Grant proposals developed and submitted to potential funding agencies.	100K
	Activity 2.2 Desktop review of global efforts and best practices on mangrove related adaptation technology and nature-based solutions that can be adopted at national efforts	GoF, NGO partners	Department of Environment	End of 2023	Accessing funds.  Delay in review process due to hiring of consultants and is a government led initiative.	A review of best practices on mangrove related technology to gain confidence of the funding agencies.	Consultant is hired.  Stakeholder consultations done.  Review of best practices compiled.	FJD 50K
	Activity 2.3 develop innovative and nationally relevant projects and	GoF, GEF, GCF,	OPM Climate change division and	End of 2026	Accessing funds.	Projects and proposals for	Project developed within collaborations with	FJD 1M

	proposals for mangrove adaptation technology included blended financing mechanisms supporting efforts at national and grass-roots level	NGO partners	all relevant stakeholders - can easily be done by a consultant, ministry of environment, IUCN, WWF, Conservation International, WCS part of global mangrove alliance		Lack of dedicated personnel within designated authority to develop proposals.	mangrove rehabilitation.  Project funding secured.	NGOs, academia and CSOs.	
	Activity 2.4 Support ongoing efforts and pilot project on Blue Carbon and explore opportunities to upscale best practices	GoF, GEF, GCF, NGO partners	OPM - Climate change division and all relevant stakeholders - can easily be done by a consultant, Department of environment, IUCN, WWF, Conservation International, WCS part of global mangrove alliance	End of 2026	Accessing funds.  Communities not aware and willingness to participate in carbon market commodity.  Best practices not incentivized for upscaling purposes.	Pilot project on Blue carbon sequestration identified.	Concept note for pilot project developed.	FJD 200K

Integrated Land and Seascape Planning and Restoration	Activity 3.1 Using GIS mapping and data, facilitate catchment/ wide land-use spatial planning integrating mangrove management into wider land-use and seascape plans.	GEF, GCF, USAID,	Lands, Forestry, - GIS experts and all relevant stakeholders	Mid 2025	Accessing funds  Lack of data or technical expertise within GIS department.  Community commitment	Spatial plans on mangroves to guide land-use and seascape development.	Developing local capacity to do spatial plans.  Spatial plans developed.	FJD 500K
	Activity 3.2 - Develop climate-smart mangrove restoration tools and manual to build capacity of local actors to strengthen restoration effort at national and local efforts as part of wider integrated land-use plans.	GEF, GCF,	WWF, Department of Environment, IUCN CI	End 2024	Accessing Funds  The government may not accept the tool as it is not tailor made to local context.  The tool may not be user friendly.	Climate-smart mangrove restoration tool developed.  Tool used for restoration purposes.	Access to appropriate tool such as Monmang app.  Updating or modifying to adapt to local context.  Conducting ToT and training for communities.	FJD 500K
	Activity 3.3 -Facilitate, promote and monitor ongoing restoration efforts at national and local level and ensure that this data is regularly fed into national GIS database and national mangrove GIS maps are regularly updated	GEF, GCF, USAID,	Lands, Forestry, - GIS experts and all relevant stakeholders	Mid 2025	Accessing funds  Lack of data or technical expertise within GIS department.	Spatial plans on mangroves to guide land-use and seascape development.	Developing local capacity to do spatial plans.  Spatial plans developed.	FJD 2M

					Community commitment			
	Activity 3.4 train and promote the use of Mangrove Restoration Tracking Tool (MRTT) to assist with monitoring effectiveness of Mangrove restoration and ensure national data is being updated.	GEF, GCF,	WWF, Department of Environment, IUCN CI	End 2024	<p>Accessing Funds</p> <p>The government may not accept the tool as it is not tailor made to local context.</p> <p>The tool may not be user friendly.</p>	<p>Climate-smart mangrove restoration tool developed.</p> <p>Tool used for restoration purposes.</p>	<p>Access to appropriate tool such as Monmang app.</p> <p>Updating or modifying to adapt to local context.</p> <p>Conducting ToT and training for communities.</p>	FJD 500K

## 2.1.3 Seawalls with Groynes

### 2.1.3.1 Introduction

Sea walls of various forms have been around Fiji since 1960s, however the durability of the technology remains a concern and therefore appropriate and sustainable designs needs to be implemented. Nonetheless, there was great consensus that despite high cost the technology is proven to provide more environmental, social and economic benefits from sea-level rise (SLR) and storm surges.

The construction of seawalls with groynes offers many benefits to the local community. Some of the benefits of this technology are listed below:

- Sea walls provide a high degree of protection against flooding in low-lying coastal area particularly during the storm tidal surges.
- Seawalls also halts soil erosion and soil salinity and therefore protects agriculture and livelihoods of the coastal communities.
- Seawalls not only protects the infrastructure along the coast but also protects the cultural identity of villagers and their ancestral burial ground which is of immense sentimental value to the villagers.
- The sloped seaward edge or groynes (see Figure 4) leads to greater wave energy dissipation and reduced wave loadings on the structure compared to vertical structures. This is achieved because these seaward slope forces wave to break as the water becomes shallower.
- Wave breaking causes energy dissipation and is beneficial because the process causes waves to lose a significant portion of their energy. Because the waves have lost energy, they are less capable of causing negative effects such as erosion of the shoreline.
- By reducing wave loadings, the probability of catastrophic failure or damage during extreme events is also reduced and prolongs the life of the seawall and becomes a sustainable measure.
- Expansion of tourist hotels will also provide more employment opportunities.
- The groynes prevent the movement of sand and helps in building a larger section of beach in front of seawalls. The new beach will increase the distance that waves have to travel to reach the coast and, in the process lose most of their energy, reducing their impact on the seawall.
- The seawall stops coastal erosion and consequently allow expansion of tourist hotels that will also provide more employment opportunities.

### 2.1.3.2 Ambition of the TAP

The coastal areas are impacted by intense cyclones resulting in tidal surges and coastal flooding and increasing sea level rise that results in the damage of infrastructure, loss of livelihoods and results in community relocations. The objectives and target for the deployment and diffusion of the seawall technology in Fiji is to enable the resilience of maritime and high risk communities on mainland through the implementation of tidal barrier technologies. The ambition encompasses identifying high risk communities and proposing effective designs to provide sustainable long-term coastal protection from the effects of climate change.

### 2.1.3.3. Actions and Activities selected for inclusion in the TAP for Seawall Construction with Groynes

#### a) *Summary of Barriers and measures to overcome barriers*

In the TAP stakeholder consultation workshop conducted on 12<sup>th</sup> October, 2022 it was discussed that the barriers restricted to Economic and financial, technical barriers and social and behavior were of high importance as these impedes the successful implementation or diffusion of this technology. Table 27 discusses these identified barriers and measures to meet the specified ambition for the deployment/transfer and diffusion of this technology.

Table 27: Summary of barriers and measures for seawall construction.

Categories of Barrier	Measures to overcome barriers
Economic and Financial	To address the high initial investment cost due to use of specialized machineries, geographic locations of the site and availability of materials locally it is recommended that there is a substantial increase in national budget allocation from the Government of Fiji and external funds should be sourced from donor agencies. To reduce the cost it was suggested to use the local materials available on the maritime sites or encourage nature based sea-wall.
Technical	The technical barrier emanates from limited or no skilled or specialized contractors/personnel available locally with a good understanding of effective designs of seawalls. To overcome this barrier it was suggested to enhance the technical expertise through capacity building of local people. It was also noted that there is scientific data or risk assessment tool to prioritize and inform decision on effective designs to provide sustainable coastal protection. To overcome this barrier it was suggested that more R&D opportunities needs to be explored between Fiji Meteorological Services, PACE-SD and SPC to obtain environmental monitoring data.
Social and Behavior	The barrier results mostly from lack of awareness and involvement of local communities in maintaining and sustaining the seawall. Currently there is no involvement of local community in the decision making process and therefore no sense of ownership. To overcome these social barriers there is a need for creating awareness in local communities in terms of significance of seawalls and what roles communities can play in sustaining the seawall for long-term protection.

#### b) *Actions selected for inclusion in the TAP for seawall construction*

This section provides a list of narrative descriptions and reasonable arguments for each of the measures selected as actions to be included in the TAP for seawall construction. The measures considered to be used as actions are based on the economic and non-economic measures particularly relating to economic and technical barriers. Table 28 provides the list of actions and its narrative descriptions

Table 28: Actions selected for seawall construction for inclusion in the TAP.

Barriers	Actions	Descriptions
Economic and Financial	Secure Funding	High cost in implementing this technology impedes diffusion and therefore a critical action would be securing funds to achieve the objectives and target of diffusing this technology. A dedicated unit with the ministry will explore funding opportunities with develop proposals with accurate project costings. The project costings will depend on the geographical location and the design of the effective coastal barriers.
Technical	Identify and Prioritize high risk communities	There are a lot of requests received from local communities for seawall constructions. There is a need to prioritize the high risk communities due to limited funds available. This action looks into assessment such as site inspection and determines the urgency of coastal barrier.
Technical	Identify Effective designs	Once the site inspection is done and relevant data is collected as per the checklist and a site is prioritized then documentation on effective design of coastal barrier that would provide sustainable and cost effective coastal protection.
Technical and Social behavior	Training and Awareness Raising	There is lack of specialized local coastal engineers and perhaps academic institutions should look into developing curriculum to address this skillset gap. This action also deals with awareness raising in local communities about the significance of seawalls and how community could be involved in maintaining and sustaining the lifespan of the seawalls.

***c) Activities identified for implementation of selected actions***

This section aims to expand the identified actions into more specific activities. Table 29 presents a list of activities which need to be implemented to achieve each identified actions.

Table 29: Activities identified for implementation of selected actions in seawall construction.

Actions	Activities
1.0 Identify and Prioritize high risk communities	1.1 To review Validity of request 1.2 Site Inspection (resource assessment) 1.3 Prioritization of Urgency
2.0 Identify Effective Designs	2.1 Evaluate detailed survey report 2.2 Designing and documentation
3.0 Secure funding	3.1 Estimate project costing 3.22 Project proposal development and submission
4.0 Training and Awareness Raising	4.1 Preparation of training materials 4.2 Face to Face consultations and workshops 4.3 Development of curriculum on tidal barriers technology

**d) Actions to be implemented as Project Ideas (PIs)**

The following ideas are to be implemented as part of project ideas:

- (i) Decision making tool - Currently a primitive model or checklist is used in site assessment to prioritize the urgency of tidal barrier installation. A more sophisticated scientific based model with GIS or coastal mapping and risk assessment tools are required for site identification. The assessment tool will also incorporate future climate projections and sea-level rise which could inform decisions on effective designs.
- (ii) Skill based training – The Government of Fiji to invest in upskilling coastal engineers in using scientific tools in coastal risk assessment and effective designs of coastal barriers.
- (iii) Effective awareness program – The Government through the Ministry of Agriculture and Waterways (MAW) together with the Ministry of iTaukei Affairs will assist with the advocacy and awareness of the technology and its importance to the community.

**2.1.3.4 Stakeholders and Timelines for the Implementation of TAP for Seawall Construction**

***a) Overview of Stakeholders and Timeline for implementation of TAP***

This section describes the main stakeholders identified and their roles as required for each of the actions to be implemented. MAW is the lead implementing agency for seawall construction. MAW will lead the site inspection and carrying out surveys and prioritizing areas that needs immediate coastal barriers. The MAW will then work with Ministry of Rural and Maritime Development and Disaster Management and Affairs through their provincial administrators to work with the Roko Tui to create awareness with communities. Any civil works requires an EIA and therefore the Department of Environment will issue the permit upon endorsement of the EIA. The Ministry of iTaukei Affairs will be engaged if the land identified for development is native land and therefore permission to use the land would be sought from TLTB under the Ministry however if state land is used then it is Ministry of Lands that needs to be consulted. Mineral Resources department will play a role in supplying raw materials particularly if rocks are used in the construction. The Construction Implementation Unit (CIU) under the Ministry of Finance will look into developing the ToR for contractor engagement and



will be responsible for tender call out, evaluation, contracting and monitoring of contract agreements. Ministry of Public Works will provide technical expertise to execute the work.

**b) Scheduling and sequencing of specific activities**

Table 30 below aims at describing the scheduling and sequencing of specific activities to be undertaken to achieve the actions identified for constructing seawalls. The planning and implementation phase of the TAP is envisaged to be mid of 2026, giving ample time to achieve the ambition of technology diffusion in the country.

Table 30: Scheduling and sequencing and responsible stakeholders of specific activities in construction of seawall with groynes.

Activity	Timeframe (Planning and Implementation)						Responsible Body
	End 2023	Mid 2024	End 2024	Mid 2025	End 2025	Mid 2026	
1.1							MAW, MRMDDM, iTaukei Affairs (Ministry)
1.2							MAW, MRMDDM, iTaukei Affairs (Ministry)
1.3							MAW
2.1							MAW
2.2							MAW
3.1							MAW
3.2							MAW, CCD(MOE)
4.1							MAW, MRMDDM, iTaukei Affairs (Ministry), CCD
4.2							MAW, MRMDDM, iTaukei Affairs (Ministry), CCD
4.3							MCS, Tertiary Institutions, MAW

**2.1.3.5 Estimation of Resources needed for action and activities**

**a) Estimation of capacity building needs**

Seawall construction will only provide solutions to coastal inundation and prevent coastal erosion if effective designs are in place. This will certainly require human capacity or expertise such as coastal engineers to implement the project. A dedicated unit within the implementing agency is required to process and evaluate requests and will also need some capacity building in terms of using more modern tools for assessment. In addition to this, there must be also additional capacity development for local communities in terms of maintenance and sustainability of the infrastructure into the future.

**b) Estimations of costs of actions and activities**

Table 31 provides the total costs of actions and activities to implement the TAP is approximately FJD 800,000. About 50% of the money is spent on Action 4 relating to training and awareness raising, comprising of preparing manuals and conducting trainings such as ToT and workshops within local communities particularly in maritime sites to understand the significance of seawalls and their role in maintaining and sustaining the seawall and developing engineering curriculum around seawall designs. A significant portion of the budget is also spent on site inspection and surveys to collect data and prioritize the urgency of the requests by local communities.

Table 31: Estimations of costs of actions and activities for seawall construction.

<i>Actions</i>	<i>Activity</i>	<i>Cost (FJD)</i>	<i>Sub-total for Action (FJD)</i>	<i>Sources of Funding</i>
<b>Action 1</b>	Activity 1.1	None	<b>300,000</b>	GoF, current operating budget
	Activity 1.2	250,000		GoF, Donor funded-ADB, UNDP, GEF, Adaptation Fund
	Activity 1.3	50,000		GoF
<b>Action 2</b>	Activity 2.1	25,000	<b>50,000</b>	GoF
	Activity 2.2	25,000		GoF
<b>Action 3</b>	Activity 3.1	None	<b>50,000</b>	GoF, Current Operating Budget
	Activity 3.2	50,000		GoF, GEF, GCF and UNDP
<b>Action 4</b>	Activity 4.1	100,000	<b>400,000</b>	GoF, GEF, GCF and UNDP
	Activity 4.2	100,000		GoF, GEF, GCF and UNDP
	Activity 4.3	200,000		GoF, GEF, GCF and UNDP
<b>Total</b>			<b>800,000</b>	

2.1.3.6 Management Planning

**a) Risks and Contingency Planning**

There is a possibility that TAP may not be implemented effectively due to following risks and therefore some contingency plans are proposed for the implementation of the TAP:

- (i) Access to sustainable funding: there is lack of government funding to meet the seawall construction request from local communities. The contingency plan is to increase government budgetary allocations and also identify donor agency funds for implementing sustainable seawall.

- (ii) Site inspection and prioritizing: There is a possibility that high risk site is not submitted as an urgent request to the implementing agency because the village head is not aware of the processes and does not know how to register their concerns with the right government administration. Hence a F2F consultations or awareness raising session with the villages and empowering them with the information about seawall requests and implementation process is critical. The current inspection and survey methodology is very basic and does not take into account the effects of predicted future climate change and also does not inform about the effective design of seawall that would provide sustainable and long lasting coastal solution. There is a need to incorporate climate related data and develop scientific based tool for site assessment and prioritization and perhaps the coastal mapping and risk assessment technology prioritized in TNA could be very beneficial for informing decisions on designs of seawalls.
- (iii) Lack of technical expertise: There is lack of coastal engineers in the country and there is a need to upskill or train people for skill base through short term training abroad or developing curriculum in tertiary institutions. There is no construction company that specializes on seawall construction and perhaps some incentives to be provided by government to lure investment such as tax concessions or reduced import duty on machineries needed for seawall construction.

**b) Next Steps**

Stakeholders think that to accelerate adaptation effort through seawall construction work in the most vulnerable coastal communities in Fiji the following critical and immediate requirements need to be implemented:

- (i) Creating awareness amongst local communities either through the Roko Tui or provincial administrators (Ministry of iTaukei Affairs and Ministry of Rural and Maritime Development and Disaster Management )meetings about the process of sending requests to the responsible government ministry (critical requirement).
- (ii) Government needs to identify donors and blended funding mechanisms to meet with the growing demand of seawall implementation for coastal protection (immediate requirement).
- (iii) Develop a coastal mapping and risk assessment tool for identifying sites and guiding the concept and designs of seawall.

**Table 32: TAP overview table for construction of sea walls with groynes.**

TAP overview Table								
<b>Sector</b>	Coastal							
<b>Sub-sector</b>	Sea Walls Dikes and Barriers							
<b>Technology</b>	Sea walls with groynes							
<b>Ambition</b>	To enable the resilience of maritime and high risk communities on mainland through the implementation of tidal barrier technologies							
<b>Benefits</b>	Environmental: Shoreline/coastal erosion protection from coastal flooding from storm surges and SLR; prevents intrusion of saltwater into coastal agricultural land dissipates wave energy. Economic: Job creation and expansion of tourism industry and coastal businesses. Reduced financial burden due to less damage to coastal infrastructure such as roads and buildings. Social: Increased livelihood for coastal communities and resettlement and loss of cultural identity avoided.							
<b>Action</b>	<b>Activities to be implemented</b>	<b>Sources of funding</b>	<b>Responsible body and focal point (s)</b>	<b>Time frame</b>	<b>Risks</b>	<b>Success criteria</b>	<b>Indicators for Monitoring of implementation</b>	<b>Budget per activity</b>
<b>Action 1</b> <b>Identify &amp; Prioritise high risk communities</b>	Activity 1.1 To review validity of request	GOF	MAW, MRMDDM, iTaukei Affairs (Ministry)	3 months	-Communities not sending in requests, unawareness	Review completed	Request evaluated as per assessment tool	None (OPEX)
	Activity 1.2 Site Inspection (resource assessment)	GOF, Donor funded- ADB, UNDP, GEF,	MAW, MRMDDM, iTaukei Affairs (Ministry)	6 months	Cyclones, Remoteness of Sites and Availability of vessels	Site inspection conducted	Report prepared	Maritime-250,000
	Activity 1.3 Prioritization of urgency	GOF	MAW	1 month	Lack of personnel Insufficient information from site inspection	High risk sites identified	List compiled based on ratings	25,000
<b>Action 2- Identify Effective Designs</b>	Activity 2.1 Evaluate report prepared under 1.2- (detailed survey)	GOF	MAW	1 month	Lack of personnel; Insufficient information from site inspection	Evaluation Completed	Recommendations for designs	25,000

<b>Action 3 Secure Funding</b>	Activity 2.2 Designing and Documentation	GOF	MAW	2 months	Staff turnover	Design and Documentation completed	Design finalized	20,000
	3.1 Project cost estimate	GOF	MAW	1 month	Fluctuation in prices(fuel, construction materials etc.); Under costing/over costing	Cost estimate finalized	Cost estimate confirmed	OPEX
	3.2 Project proposal development and submission (concept note)	GOF, GCF, other donors	MAW, CCD	2 months	Staff turnover; Various donor requirements	Proposal developed	Proposal endorsed (PS)and submitted	50K
<b>Action 4 Awareness and Training.</b>	4.1 Preparation of Training materials	GOF/donor funded	MAW, MRMDDM, iTaukei Affairs (Ministry), CCD	1 month	Language/communication barriers; Technical jargons	Training materials prepared	Content developed 0.+and endorsed	100K
	4.2 Face to Face consultations,	GOF, donor funded	MAW, MRMDDM, iTaukei Affairs (Ministry), CCD	6 months	Adverse weather conditions; Availability of vessels (maritime).	Successful consultations	Feedbacks taken	100k
	4.3 Development of curriculum on Tidal Barrier Technologies	Donor funded	MCS, Tertiary Institutions, MAW	1 Year	No specialized personnel to teach or develop curriculum.	Curriculum developed and included as part of engineering programs	Approved by tertiary institutions and subsequently offered	200K

## 2.1.4 Action Plan for Coastal Flood Hazard and Risk Assessment Mapping

### 2.1.4.1 Introduction

The coastal communities are vulnerable from coastal flooding and erosion and are exposed to high risk. It acts as an information system to enhance our understanding and awareness of coastal risk. Flood hazard maps are designed to increase awareness of the likelihood of flooding among the public, local authorities and other organizations. It is already proven that science-based flood hazard mapping and risk assessment can help local residents and authorities to minimize economic and environmental losses and should be included in the comprehensive flood-loss prevention and management planning programmes (Tingsanchali & Karim, 2010).

This valuable tool will assist in mapping out coastal regions which are more prone to flooding in future due to climate change. The use of LiDAR measurements in conjunction with changes in bathymetry and topographic data could provide useful flood hazard mapping and robust risk assessment that could steer away infrastructure developments from future climate hazard and could also be useful in planning national disaster risk reductions programs.

### 2.1.4.2. Ambition for TAP

To accelerate the adoption of this technology at a national level, it was realized through the Barrier Analysis and Enabling Framework report that a policy and regulations on Integrated Coastal Zone Management (ICZM) that would provide a clear mandate to a designated authority and that the policy could be streamlined into national adaptation efforts/plans and also in disaster risk management decisions as well. To achieve desirable outcomes for this technology national capacity building efforts are required. Hence the ambition for the TAP is as follows:

*“Developing coherent guiding policy, regulations and national capacity to strengthen risk informed decision towards sound coastal development planning, investment and long term development strategy.”*

### 2.1.4.3 Actions and Activities selected for Inclusion in the TAP

#### a) Summary of Barriers and measures to overcome barriers

In the workshop conducted on 13<sup>th</sup> and 14<sup>th</sup> December, 2021 it was discussed that the barriers related to Institutional, Economic and financial and technical barriers were of high importance as these impedes the successful implementation or diffusion of this technology. Table 33 discusses these identified barriers and measures to meet the specified ambition for the deployment/transfer and diffusion of this technology.

Table 33: Summary of barriers and measures for flood hazard and risk assessment mapping.

Categories of Barrier	Measures to overcome barriers
Economic and Financial	The huge investment cost (FJD 1 – 3 million) in terms of purchasing equipment to provide long term measurements, computer hardware and software, storage of data, training of local hydrologists and meteorologists and physical oceanographers could be made possible through accessing funds from the Green Climate Fund. The Government of Fiji should allocate their budgetary funds for flood hazard mapping and risk assessment activities to protect the coastal

	development. These funds could be used to recruit experts or train local people to build a pool of local experts in coastal mapping and risk assessment so that it can inform decision makers for an effective long-term planning.
Institutional and Governance	Strengthen the institutional capacity for good governance in coastal risk management. The GoF is to identify a national hub for flood hazard mapping and risk assessment. Coherent policy and regulations for coastal risk assessment need to be developed that ensures that EIA processes for coastal development incorporates science-based data for coastal risk assessments due to climate change and also to use science-based data to guide coastal adaptation solution. This policy should also guide multi-sectoral data sharing, providing clear mandate to a specific government ministry to coordinate and disseminate information to decision makers as required.
Technical	<p>To address the lack of human capacity in coastal mapping and monitoring the following measures are recommended:</p> <ul style="list-style-type: none"> <li>i. The tertiary institution to develop high level physical oceanography courses that would develop a skill set for coastal monitoring and coastal mapping. The courses could be developed in partnership with international universities known for such delivery of programs.</li> <li>ii. Allocate government funding for staffing that would see an appointment of a coordinator that will oversee data management and liaison between other relevant stakeholders. Funding will be required to hire few more hydrologists and physical oceanographers within the government ministry.</li> <li>iii. Providing opportunities for local experts to work alongside international consultants undertaking studies of coastal processes and mapping.</li> <li>iv. Always constantly seek training opportunities for local meteorologists, hydrologists and coastal scientists to upgrade their skills and learn new technologies available for coastal mapping and risk assessment.</li> </ul> <p>To obtain high resolution bathymetry and topographic and geodetic data using modern technologies such as LiDAR, MBES, GNSS and drones to generate precise coastal maps and flood hazard maps either through climate finance or through collaboration with international research institutes such as NIWA.</p>

**b) Actions selected for Inclusion in the TAP**

This section provides a list of narrative descriptions and reasonable arguments for each of the measures selected as actions to be included in the TAP for seawall construction. The measures considered to be used as actions are based on the economic and non-economic measures particularly relating to economic and technical barriers. Table 34 provides the list of actions and its narrative descriptions.

Table 34: Actions selected for Flood hazard and risk assessment mapping for inclusion in the TAP.

Barriers	Actions	Descriptions
Economic and Financial	Government to allocate budgetary funds and also access funds from Green Climate Fund (GCF).	Financial resources are required for effective implementation of the technology. This cost would mostly cover for providing more training opportunities to coastal scientists and obtaining data with modern technologies such as LiDAR, MBES, GNSS and drones. The operational cost is also high in terms of developing human capacity and specialized skillset base nationally.
Institutional and Regulatory	Develop coherent guideline towards high quality and consistent coastal risk mapping as well as policy and regulations.	This will ensure that legislative frameworks are in place, clear demarcation of roles and responsibilities and cooperation across ministries and sectors; designated national hub to support sharing of data and research.
Technical (data collection)	To obtain data using modern technologies such as LiDAR, MBES, GNSS and drones.	This section deals with obtaining cost effective highly accurate alternative to time consuming surveys/assessments, LiDAR (through aerial survey or UAVs) offers cross cutting benefits for key sectors and flown over areas where access is difficult or limited. This action captures improved data which enables better risk modelling for adaptation and disaster response.
Technical (training opportunities)	Provide more training opportunities for local meteorologists, hydrologists and coastal scientists.	This action deals with implementing an operational model that include a knowledge retention strategy to ensure sustainability of knowledge and capacities gained and a mandate of knowledge transfer.
Technical (Enhancing skillset)	Tertiary institution should develop high level physical oceanography for coastal monitoring and mapping.	Strengthen the enabling environment, identify, address and narrow existing gaps in the area of oceanography and coastal monitoring in Fiji by including appropriate modules/learning tools/learning modes in university curriculums and targeted investments through research opportunities in this space.

**c) Activities identified for implementation of selected actions**

This section aims to expand the identified actions into more specific activities. Table 35 presents a list of activities which need to be implemented to achieve each identified actions.



Table 35: Activities identified for implementation of selected actions for flood hazard and risk assessment.

Actions	Activities
<p>1.0 Develop coherent guideline towards high quality and consistent coastal risk mapping as well as policy and regulations.</p>	<p>1.1 Design a ToR to comprehensively incorporate a draft policy for coastal risk assessment.</p> <p>1.2 Engagement of consultant to prepare these documents.</p> <p>1.3 Organize 3 national stakeholder workshops and divisional consultations to collate feedback on review of policy and regulations.</p> <p>1.4 Submit for cabinet endorsement.</p>
<p>2.0 Government to allocate budgetary funds and also access funds from Green Climate Fund (GCF).</p>	<p>2.1 Mapping existing in-country mechanism to make risk informed decision.</p> <p>2.2 Identify priority coastal monitoring and resilience projects/develop robust concept notes.</p> <p>2.3 Map cost benefit analysis, assessment of risks and feasibility study.</p> <p>2.4 Preparation of project proposal with strong climate rationale to justify funding request.</p> <p>2.5 Review of proposals by internal and external stakeholders.</p> <p>2.6 Submit proposals for approval to a designated vetting authority/ accredited entity</p>
<p>3.0 To obtain data using modern technologies such as LiDAR, MBES, GNSS and drones.</p>	<p>3.1 Prepare rationale for using LiDAR data from aerial survey or UAVs to collect detailed near shore bathymetry and coastal data.</p> <p>3.2 Prepare Cost benefit analysis for applications of LiDAR, GNSS and drone survey where appropriate to generate improved data for modelling risks.</p> <p>3.3 Capacity development opportunities for technical units on capturing, processing and utilizing LiDAR and Drone data.</p> <p>3.4 Design solution for improved access to fundamental baseline and/or scientific data used as evidence basis to support rationale for funding.</p> <p>3.5 Design solution for improved access to fundamental baseline and/or scientific data used as evidence basis to support rationale for funding.</p>
<p>4.0 Provide more training opportunities for local meteorologists, hydrologists and coastal scientists.</p>	<p>4.1 Capacity needs mapping around hazard and risk.</p>

	<p>4.2 Reactivate existing networks such as Science Technology and Resources Network (STAR) and FGIMC.</p> <p>4.3 Taskforce for local meteorologists, hydrologists and coastal scientists from government, convene quarterly too bi-annually.</p> <p>4.4 Creation of knowledge hub.</p>
<p>5.0 Tertiary institution should develop high level physical oceanography for coastal monitoring and mapping.</p>	<p>5.1 Identify gaps in existing curriculums on physical oceanography for coastal monitoring and mapping through a review workshop with local and regional universities and tertiary institutions.</p> <p>5.2 Identify and develop modules to address gaps in coastal science information and technologies in tertiary curriculum pathways.</p> <p>5.3 Foster opportunities for scholarship and R&amp;D in coastal hazard/risk mapping.</p>

**d) Actions to be implemented as Project Ideas**

During the stakeholder consultation it was revealed that coastal hazard and risk assessment mapping needs data collection using modern technologies and there is a need to produce specialized people with specific skillset to obtain data and use it for risk informed decisions. There is also need to understand the country’s need for specialized risk data. Hence the following actions are proposed as project ideas:

- (i) To undertake a national stock-take of available mechanisms for risk informed decisions, identify priority coastal monitoring and resilience projects and develop robust concept notes for fund donors.
- (ii) To identify training needs and to have a development plan for upskilling local meteorologists, hydrologists and coastal scientists in the use of modern technologies to obtain high resolution data to provide accurate coastal mapping for flood hazard.
- (iii) To develop national capacity in acquiring these modern technologies.
- (iv) Developing curriculum and scholarships on physical oceanography for coastal monitoring and mapping hazards to develop local human resources capacity in the area and a better understanding of ICZM processes.

**2.1.4.4 Stakeholders and Timeline for implementation of TAP**

**a) Overview of Stakeholders for the implementation of the TAP**

The implementing agency of this technology will be the CCD with technical support provided by the SPC and FMS, Fiji Hydrographic Office (FHO), Ministry of Lands (Ariel Survey Unit). The National Disaster Management Office (NDMO) together with Ministry of i-Taukei affairs can provide information of what risk data is required for enhancing disaster preparedness. Fiji is one the countries in the Pacific that has the local capacity in the Naval ships to get multibeam echosounder data to map the seabed and this data could be made available through FHO.

**b) Scheduling and sequencing of specific activities**

Table below aims at describing the scheduling and sequencing of specific activities to be undertaken to achieve the actions identified for coastal flood and risk assessment mapping. The planning and implementation phase of the TAP is envisaged to be completed by mid of 2026, giving ample time to achieve the ambition of technology diffusion in the country.

Table 36: Scheduling, sequencing and stakeholders of specific activities for flood hazard and risk assessment.

Activity	Timeframe (Planning and Implementation)							Responsible Body or stakeholders
	End 2023	Mid 2024	End 2024	Mid 2025	End 2025	Mid 2026	End 2026	
1.1								CCD
1.2								CCD and consultants
1.3								CCD, NDMO, i-Taukei Affairs, FMS, and relevant stakeholders.
1.4								CCD, SG office
2.1								CCD, Consultant and taskforce.
2.2								CCD, Project development unit, consultants, climate finance advisors
2.3								CCD, Consultants, Climate finance advisors
2.4								Climate finance advisors, CCD and Climate Finance Advisors
2.5								CCD, WWF, Min of Transport, MSAF, Dep of Environment, Ministry of Agriculture, Ministry of Forestry; Ministry of Lands.
2.6								CCD, Climate finance advisors working with technical consultants
3.1								CCD ; SPC; Min of Lands (Aerial Survey Unit), Fiji Hydrographic Office (FHO)
3.2								SPC, CCD, Fiji Hydrographic Office (FHO)
3.3								Ministry of Lands (Aerial Survey Unit, MRD), SPC, CCD
3.4								Fiji Hydrographic Office (FHO), Ministry of Lands, SPC and USP Geospatial Science,
3.5								Ministry of Lands, IPC (gov. IT), SPC (PDH/NEXUS), FHO, CCD, Ministry of Finance, NDMO

4.1								FNU and USP, SPC, Ministry of Lands, FMS, NDMO
4.2								FNU and USP, SPC, Ministry of Lands, FMS, NDMO
4.3								Fiji Met Services, Ministry of Finance, Mineral Resources, SPC, IUCN, WWF, NDMO
4.4								Ministry of Civil Service, FNU, USP, UniFiji and SPC, NDMO and agencies above
5.1								FNU and USP, SPC, Ministry of Lands, FMS, NDMO
5.2								FNU and USP, SPC, Ministry of Lands, FMS, NDMO
5.3								FNU and USP, SPC, Ministry of Lands, FMS, NDMO

#### 2.1.4.5 Estimation of Resources needed for action and activities

##### a) *Estimation of capacity building needs*

The flood hazard and risk assessment technology is not a new technology in the country, however it requires extensive capacity building needs to enable the technology to provide sound and relevant information for decision making in terms coastal development, disaster risk reduction and disaster management. There needs to be a dedicated or a mandated unit within the government ministry that will coordinate activities regarding the ICZM and lead the coastal hazard mapping prioritizing the specific relevant data needed to guide development, disaster risk reduction and management. There is lack of expertise or human capacity in this particular field and also lack of modern technologies to provide high resolution data needed. There is no networks of meteorologists, oceanographers and coastal scientists and establishment of a knowledge hub for sharing data is very critical. The local universities do not offer specialized courses or programmes on tropical oceanography and there is a need to develop local skillset in this field. Hence bulk of the costings for the TAP is dedicated for these capacity building needs.

##### b) *Estimations of costs of actions and activities*

Table 37 provides the total costs of actions and activities to implement the TAP is approximately FJD 1.951M. It was noted that bulk of the costs were allocated for capacity building needs reflected in Action 4 and Action 5 and also funds required to prioritize coastal areas and developing concept note and proposal to secure sustainable funding for successful project implementation.

Table 37: Estimations of costs of actions and activities for flood hazard and risk assessment mapping.

<i>Actions</i>	<i>Activity</i>	<i>Cost (FJD)</i>	<i>Sub-total for Action (FJD)</i>	<i>Sources of Funding</i>
<b>Action 1</b>	Activity 1.1	1,000	<b>356,000</b>	GoF, current operating budget
	Activity 1.2	150,000		GoF, GCF
	Activity 1.3	200,000		GoF, GCF
	Activity 1.4	5000		GoF
<b>Action 2</b>	Activity 2.1	100,000	<b>450,000</b>	GoF, GCF
	Activity 2.2	100,000		GoF, GCF, World Bank
	Activity 2.3	100,000		GoF, GCF
	Activity 2.4	100,000		GoF, GCF
	Activity 2.5	30,000		GoF, GCF
	Activity 2.6	20,000		GoF, GCF
<b>Action 3</b>	Activity 3.1	30,000	<b>2,100,000</b>	GoF
	Activity 3.2	30,000		GoF
	Activity 3.3	2,000,000		GoF
	Activity 3.4	30,000		GoF
	Activity 3.5	10,000		GoF, GCF, GEF
<b>Action 4</b>	Activity 4.1	100,000	<b>445,000</b>	GoF, GCF, GEF
	Activity 4.2	25,000		GoF
	Activity 4.3	5000/year		GoF
	Activity 4.4	200,000		GoF, GCF
<b>Action 5</b>	Activity 5.1	30,000	<b>480,000</b>	GoF, World Bank, ADB
	Activity 5.2	200,000		GoF, World Bank, ADB
	Activity 5.3	200,000		GoF, World Bank, ADB
<b>Total</b>			<b>3,831,000</b>	

#### 2.1.4.6 Management Planning

##### *a) Risks and Contingency Planning*

There is a possibility that the TAP may not be implemented effectively due to following risks and therefore some contingency plans are proposed for the implementation of the TAP:

- (i) Access to sustainable funding: The technology is quite expensive in terms of building the local capacity needs and the modern technology required to obtain data. The contingency plan is to increase government budgetary allocations and also identify donor agency funds for implementing the TAP.
- (ii) Lack of institutional or organizational structures: there is no clear mandate or unit looking into coastal mapping and how does it fit in the national framework of adaptation plan. There have been some work carried out on an ad hoc basis and not targeted or the product is not specific or tailor-made to the needs of the country. This could be resolved through the implementation of policy and regulations on ICZM that will clearly demarcate the implementing or the focal point for technology implementation. The dedicated unit will have a thorough work plan with specific objectives and budgetary support and should be aligned to be one of the success indicators for the implementation of NAP.
- (iii) Lack of technical expertise: Human resources or capacity could be a major challenge in implementing this technology. The contingency plan is that government should invest in upskilling local expertise in the use of modern technologies and work with regional partners like SPC and development partner like MFAT and DFAT for knowledge sharing and retention.

##### *b) Next Steps*

Stakeholders suggested that to accelerate adaptation effort through development of coastal flood hazard and risk assessment tool for prioritized coastal sites in Fiji the following critical and immediate requirements need to be implemented:

- (i) Government needs to identify donors and blended funding mechanisms to provide more training opportunities to upskill our local expertise, scholarships to create a pool of skillset that is lacking in fields related to food hazard mapping and (critical requirement requirement).\_Strengthening Fiji's capacity to produce sound and actionable risk information/knowledge (includes monitoring, data management, etc.)
- (ii) Strengthening institutional capacity/arrangements to make risk informed decisions by taking a stock-take of what specific risk data is required and pooling resources together (critical).
- (iii) Develop a coastal mapping and risk assessment tool for identifying sites and guiding the concept and designs of seawall (immediate requirement)

Table 39: TAP overview table for flood hazard and risk assessment mapping.

TAP Overview Table								
<b>Sector</b>	Coastal Zones							
<b>Sub-sector</b>	Accommodation Approaches							
<b>Technology</b>	Flood Hazard and Risk Assessment Mapping							
<b>Ambition</b>	Developing coherent guiding policy, regulations and national capacity to strengthen risk informed decision towards sound coastal development planning, investment and long term development strategy.							
<b>Benefits</b>								
<b>Actions</b>	<b>Activities to be implemented</b>	<b>Sources of Funding</b>	<b>Responsible body and focal point</b>	<b>Time frame</b>	<b>Risks</b>	<b>Success Criteria</b>	<b>Indicators for monitoring of implementation</b>	<b>Budget Per Activity</b>
"Action 1 Develop coherent guideline towards high quality and consistent coastal risk mapping as well as policy and regulations.	Activity 1.1 Design a ToR to comprehensively incorporate a draft policy for coastal risk assessment.	GoF	CCD	End 2023	Delay due to government led initiative. Organizational risk.	ToR developed.	Working group established. Consultation to discuss the ToR.	1,000
	Activity 1.2 Engagement of consultant to prepare these documents.	GoF, GCF	CCD and consultants	Mid 2024	Delay in finding an expert in coastal protection policy	Consultant is hired	Consultant position advertised	150,000
	Activity 1.3 Organize 3 national stakeholder workshops and divisional consultations to collate feedback on review of policy and regulations	GoF, GCF	CCD, OPM, NDMO, i-Taukei Affairs, FMS, and relevant stakeholders.	End 2024	Lack of stakeholder commitment.	Consultations done and a draft policy and regulation is ready.		200,000
	Activity 1.4 Submit for cabinet endorsement	GoF	CCD, SG office	Mid 2025	Not endorsed in the cabinet.	Submission to cabinet.	Draft submitted to SG's office.	5000

Action 2 Government to allocate budgetary funds and also access funds from Green Climate Fund (GCF).	Activity 2.1 Mapping existing in-country mechanism to make risk informed decision.	GoF, GCF	CCD, Consultant and taskforce.	Mid 2024	Not getting feedbacks from all relevant stakeholders. Delay due to organizational barrier.	Mapping exercise done and gaps identified	Consultant hired to do mapping exercise.  Consultations undertaken.	100,000
	Activity 2.2 Identify priority coastal monitoring and resilience projects/develop robust concept notes	GoF, GCF, World Bank	Ministry of Finance, Project development unit, consultants, climate finance advisors	End 2024	Lack of dedicated personnel to develop proposals. Costing not done properly.	Projects identified.  Concept note developed.	Consultations for identification and proposal development. A unit identified for the task	100,000
	Activity 2.3 Map cost benefit analysis, assessment of risks and feasibility study	GoF, GCF	Min of Finance, Consultants, Climate finance advisors	Mid 2025	Organizational barrier	CBA done.	A personnel identified. Consultations done.	100,000
	Activity 2.4 Preparation of project proposal with strong climate rationale to justify funding request	GoF, GCF	Climate finance advisors working with technical consultants/Min of Finance and identified sector leads	End of 2025	Not strong scientific basis for project development	Project Proposal developed.	Consultant is hired.	100,000
	Activity 2.5 Review of proposals by internal and external stakeholders	GoF, GCF	Ministry of Finance, WWF, Min of Transport,	End 2025	Lack of Stakeholder commitment to	Proposal reviewed.	National stakeholder consultations done	30,000



			MSAF, Dep of Environment, Agriculture, Forestry; Lands)		provide critical feedbacks			
	Activity 2.6 Submit proposals for approval to a designated vetting authority/ accredited entity	GoF, GCF	Ministry of Finance CCD, Climate finance advisors working with technical consultants	Mid 2026	Delays within the government due to change in structure and priority.	Proposal submitted	Draft proposal reviewed.  Draft finalized	20,000
Action 3 To obtain data using modern technologies such as LIDAR, MBES, GNSS and drones.	Activity 3.1 Prepare rationale for using LiDAR data from aerial survey or UAVs to collect detailed near shore bathymetry and coastal data.	GoF	CCD ; SPC; Min of Lands (Aerial Survey Unit), Fiji Hydrographic Office (FHO)	End 2024	Lack of technical personnel	Rationale prepared to use modern techniques	Technical capacity enhanced. Consultations with data providers.	30,000
	Activity 3.2 Prepare Cost benefit analysis for applications of LiDAR, GNSS and drone survey where appropriate to generate improved data for modelling risks	GoF	SPC and Ministry of Finance(CCD/ UNOSAT), Fiji Hydrographic Office (FHO)	Mid 2025	Lack of technical personnel.	CBA prepared	Consultations done.	30,000
	Activity 3.3 Prepare rationale for specific use cases where the technology allows value added products to be generated and where they offer significant cost reductions over traditional survey methods	GoF	Ministry of Lands (Aerial Survey Unit, MRD), SPC, Min of Finance CCD/UNOSAT	End 2024	Organizational Barrier – no clear mandated unit	Rational on specific use prepared.	Consultations done.	30,000

	Activity 3.4 Capacity development opportunities for technical units on capturing, processing and utilizing LiDAR and Drone data	GoF	Fiji Hydrographic Office (FHO), Ministry of Lands, SPC and USP Geospatial Science,	Mid 2025	Organizational Barrier – no clear mandated unit	Capacity development opportunities identified.	Consultations done.  Developments plan done.	30,000
	Activity 3.5 Design solution for Improved access to fundamental baseline and/or scientific data used as evidence basis to support rationale for funding	GoF, GCF, GEF	Ministry of Lands, IPC (gov. IT), SPC (PDH/NEXUS ), FHO, CCD, Ministry of Finance, NDMO	End 2025	Lack of technical expertise.  Access to funds.	Improved access to data.  Data portal created.	Consultations with data providers and IT department.	100,00
"Action 4 Provide more training opportunities for local meteorologists , hydrologists ad coastal scientists.	Activity 4.1 Capacity needs mapping around hazard and risk.	GoF, GCF, GEF	FNU and USP, SPC, Ministry of Lands, FMS, NDMO	Mid 2024	Access to funds. Not prioritized in the work plan.	Capacity development plans are ready	Consultant hired and Consultations with relevant stakeholders	100,000
	Activity 4.2 Reactivate existing networks such as Science Technology and Resources Network (STAR) and FGIMC	GoF	FNU and USP, SPC, Ministry of Lands, FMS, NDMO	throughout	Lack of commitment from members.	Biannually meetings done.	Network established and made visible nationally.	25,000
	Activity 4.3 Taskforce for local meteorologists, hydrologists and coastal scientists from government, convene quarterly too bi-annually.	GoF	Fiji Met Services, Ministry of Finance, Mineral Resources, SPC, IUCN, WWF, NDMO	End 2024	Lack of commitment from members.	Biannually meetings done.	Network established and made visible nationally.	5000/year

	Activity 4.4 Creation of knowledge hub.	GoF, GCF	Ministry of Civil Service, FNU, USP, UniFiji and SPC, NDMO and agencies above	End 2025	Data Portal does not capture all the data. Not user friendly	Creation of online portal for data sharing.	Data collection is done. Portal is developed and trialed.	200,000
Action 5 Tertiary institution should develop high level physical oceanography for coastal monitoring and mapping.	Activity 5.1 Identify gaps in existing curriculum on physical oceanography for coastal monitoring and mapping through a review workshop with local and regional universities and tertiary institutions	GoF, World Bank, ADB	FNU and USP, SPC, Ministry of Lands, FMS, NDMO	End 2024	Curriculum review failed to recognize the need for ICZM inclusion.	Gaps in existing curriculum identified.	Representation and concerns raised in Programme Advisory committee.	30,000
	Activity 5.2 Identify and develop modules to address gaps in coastal science information and technologies in tertiary curriculum pathways.	GoF, World Bank, ADB	FNU and USP, SPC, Ministry of Lands, FMS, NDMO	End 2026	Local specialist unavailable to develop curriculum.	Curriculum developed	The position is advertised and recruited. Curriculum documents prepared and submitted for approval.	200,000
	Activity 5.3 Foster opportunities for scholarship and R&D in coastal hazard/risk mapping	GoF, World Bank, ADB	FNU and USP, SPC, Ministry of Lands, FMS, NDMO	End 2026	Access to funding, No interest to uptake scholarship.	Scholarship and R&D opportunities identified.	Scholarship is advertised and potential candidates selected.	200,000

## Chapter 3 Project Ideas

### Specific Project Ideas for Agriculture sector

The stakeholders looked at the proposed actions and selected an action on the basis of its significance in upscaling and faster diffusion of the technology in the country. Three project ideas have been identified for the agriculture sector and are as follows:

- Creating Composting facilities for producing nutrient rich Composts from agricultural wastes.
- Enhanced Research and Development Institutional Capacity to Introduce, Evaluate and adopt new improved and resilient varieties of rice, chilli and eggplant.
- Building resilient communities through sustainable management of landscape systems.

Each of these project ideas are described in detail below.

#### Project Idea 1

<b>Proposed Project Title: Creating Composting facilities for producing nutrient rich Composts from agricultural wastes</b>	
Introduction/Background	Soil health plays a pivotal role in improving and sustaining agricultural production. However, the soil health is found declined due to number of factors, but primarily due to climate change impacts. Climate change over a period of time resulted in increased soil and atmospheric temperature, periodic cyclone / flooding, sea water intrusion and frequent droughts. These impacts affected the soil health severely. Reduction in soil organic carbon content, poor nutrient status, prevalence of soil acidity, occurrence of soil salinity and alkalinity and severe soil erosion indicate that the soils' health is deteriorated alarmingly. Therefore, there is an urgent need to improve the soil health. Compost from agricultural and other biological wastes is known to improve and sustain soil health and agricultural production, besides mitigating climate change impacts.
Objectives	Establishment of Composting facilities to produce nutrient rich composts from agricultural and other biological wastes. The compost will be used for improving the soil health and thus crop yield.
What are the inputs and are they measurable?	<ul style="list-style-type: none"> <li>• Production of nutrients rich and value-added Composts</li> <li>• Improvement in soil health</li> <li>• Enhancement in crop yield (production)</li> <li>• Improvement in livelihoods of farmers</li> <li>• Sustainability in environmental health (clean and green environment)</li> </ul>
Relationship to the country's sustainable development priorities	It is directly related to agricultural production system in Fiji and addresses one of the important issues emanating from climate change impacts. The key strategy is to mitigate the climate change impacts through improving and sustaining soil health. Yes, it is a new development.

Project deliverables e.g. value/benefits/messages	Soil health is the basic for agricultural production. One of the benefits of this project would be the improvement in fertility and productivity (soil health) of 194768 ha of agricultural lands and 35000 ha of lands under sugarcane crop. Application of compost improves soil organic carbon, nutrients and soil physical properties, besides controlling soil erosion. Improvement in soil health will increase and sustain the agricultural production in Fiji.
Project scope and possible implementation	This project is nationally important as it addresses one of the key constraints of agricultural production impacted by the climate change. It will help to improve and sustain soil health and thus agricultural production which will enhance the livelihood of farmers in Fiji. It is linked to current project.
Project Activities	<ul style="list-style-type: none"> <li>• Creating Composting facilities</li> <li>• Set up soil health diagnostic labs and distribute Soil Health Cards</li> <li>• Establishment of Farmers Self Help Group</li> <li>• Production, distribution and application of nutrients rich composts</li> <li>• Creating awareness among farmers and capacity building</li> </ul>
Timelines	Five years
Budget/resources requirements	<ul style="list-style-type: none"> <li>• F\$ 2 million</li> <li>• Funding from the Fiji Government and/or Australian Centre for International Agricultural Research (ACIAR) / Asian Development Bank (ADB) / Green Climate Fund (GCF) of UNEP.</li> <li>• Resource Needed: Engaging Project Management Team (consisting of Project Manager, Technical Officers and support staffs) and Consultants.</li> </ul>
Measurement/evaluation	<ul style="list-style-type: none"> <li>• Soil health in the project / study areas will be continuously monitored through Soil Health Diagnostic Labs,</li> <li>• Agricultural production will be measured through crop yields</li> <li>• Farmer's income level and livelihood improvements will be assessed through socio-economic survey.</li> </ul>
Possible complications / challenges	<ul style="list-style-type: none"> <li>• Collection and transportation of agricultural and other biological wastes to the compost yards,</li> <li>• Quality and maturity of composts,</li> <li>• Farmers awareness and adoption of the technology,</li> </ul>
Responsibilities and Coordination	<ul style="list-style-type: none"> <li>• Ministry of Agriculture – creating composting facilities</li> <li>• SRIF – Technical assistance and conducting farmers awareness campaign</li> <li>• USP – Technical assistance and evaluation / monitoring mechanism.</li> </ul>

## Specific Project Idea 2:

<b>Proposed Project Title: Enhanced Research and Development Institutional Capacity to Introduce, Evaluate and adopt new improved and resilient varieties of rice, chilly and eggplant</b>	
Introduction/Background	Fiji government has plans for the rice sector to become self- sufficient by 2030 however rice grown in lower regions will be subjected to saltwater intrusion due to sea level rise and therefore more research is required in the development of saltwater tolerant rice variety. Also there is document cases in Fiji of bacterial wilt in eggplants and Anthracnose disease in chillies which subjected to be blinked to the impacts of climate. The project will see development of a climate controlled greenhouse, tissue culture lab and molecular plant breeding at Koronivia Research Station of Ministry of Agriculture.
Objectives	<ol style="list-style-type: none"> <li>1. Enhanced institutional capacity to introduce, evaluate and adoption of improved and resilient crop varieties through: <ul style="list-style-type: none"> <li>◦ Infrastructure improvement</li> <li>◦ Capacity building</li> </ul> </li> <li>2. Adoption of resilient crop varieties</li> </ol>
What are the inputs and are they measurable?	<ul style="list-style-type: none"> <li>• 2 Buildings constructed (CLIMATE CONTROLLED GREEN HOUSE MOLECULAR PLANT BREEDING LAB and TISSUE CULTURE LAB)</li> <li>• Researchers capacitated</li> <li>• 2 Tolerant Rice varieties released</li> <li>• 1 Chili and 1 Eggplant varieties released</li> <li>• Adoption of resilient varieties by farmers</li> </ul>
Relationship to the country's sustainable development priorities	<ul style="list-style-type: none"> <li>• Aligned to the current National development Plan and SDG.</li> <li>• Aligned to the National Agriculture Strategic Development Plan</li> </ul>
Project deliverables e.g. value/benefits/messages	<p>Rice growing lands are on coastal low lying area prone to floods and salt water intrusion. There is high incidence of pest and diseases due to changing climate.</p> <p>Improved research and development institutional capacity to introduce, evaluate and adoption of improved and resilient crop varieties would lead to:</p> <ul style="list-style-type: none"> <li>◦ Increased Food and nutrition security</li> <li>◦ Increased productivity</li> <li>◦ Increased export</li> <li>◦ Reduction in pesticide use</li> </ul>
Project scope and possible implementation	The project to be implemented at a national level and is feasible due to linkage in the national technology adaptation plan
Project Activities	<p>Technical Experts will be hired for specific activities:</p> <ol style="list-style-type: none"> <li>1. Planning Process and concept note development</li> <li>2. Construction</li> <li>3. Scientific Specialists</li> <li>4. Capacity building to maintain sustainability</li> <li>5. Operation of the facilities</li> </ol>

Timelines	Five years
Budget/resources requirements	FJD \$ 7 million – various donor agencies GCF, ADB, MFAT, DFAT
Measurement/evaluation	<ul style="list-style-type: none"> <li>• Number of resilient crop varieties released and adopted by farmers.</li> <li>• Number of farmers adopting resilient farmers.</li> <li>• Climate controlled greenhouse molecular plant breeding lab and tissue culture lab built.</li> <li>• 20 researchers capacitated.</li> </ul>
Possible complications / challenges	<ul style="list-style-type: none"> <li>• Funding availability</li> <li>• Political will</li> <li>• Availability of expertise</li> <li>• Researcher’s and farmers’ willingness</li> </ul>
Responsibilities and Coordination	<p>Concept Note development – UNOPS/CCD/MOA  Scoping and Preliminary Works – CCD/MOA  Securing Funding – CCD to Various Donors  Constructions – Contractors  Capacity Building – Experts/MoA  Research and Release of Resilient Crop varieties- MoA/SPC0-CEPACT, SRIF, Academic Institutions’</p>

Specific Project Idea 3:

<b>Proposed Project Title: Building resilient communities through sustainable management of landscape systems</b>	
<b>Introduction / Background</b>	<p>Deforestation through unsustainable agricultural practices and uncoordinated infrastructure development contributes to climate change and intensifies environmental problems for communities. As a result of unsustainable agricultural practices, the communities around the Nadroumai river catchment area have experienced increased flooding causing soil erosion leading to water sediments. To address this problem the Nadroumai Women’s Club (NWC) in partnership with government, SPC and ACIAR implemented a land management project using agro forestry a tool for rehabilitation. The project was able to expand areas under agroforestry to ten hectares. The work done by the NWC needs to be scaled out to neighboring communities within the catchment.</p>
<b>Objectives</b>	<p>The objectives of this project is therefore;</p> <ul style="list-style-type: none"> <li>• To promote agro forestry as a tool for land rehabilitation and enhance carbon sequestration.</li> </ul>

	<ul style="list-style-type: none"> <li>• to strengthen the capacity of the community based organizations such as the NWC to be the agent of change and to champion sustainable management of natural resources</li> <li>• to scaled out learnings to neighboring villages within the catchment</li> </ul>
<b>What are the outputs and are they measurable?</b>	The main output of this project is to expand agroforestry area from 10 to 20 hectares, reduce river sediments, strengthen partnerships, and generation of sustainable income opportunities for the communities.
<b>Relationship to the country's sustainable development priorities</b>	The project is aligned to National Development Plans, Agriculture
<b>Project deliverables e.g. value / benefits / messages</b>	The project will promote gender inclusivity in climate change adaptation programmes and will empower women to be trained in agro-forestry skills. These skills gained and its implementation will promote better livelihood for communities, reduce land and environment degradation and the community will become resilient to the impacts of climate change such as flooding.
<b>Project scope and possible implementation</b>	The project will be implemented along the Nadroumai water catchment in the province of Nadroga and the district of Cuvu. This includes eight local communities namely, Tilivalevu village, Vunatovau village, Nadroumai village, Voua village, Rukurukulevu village, Nakabuta village, Nabau village and Togovere village.
<b>Project activities</b>	<ol style="list-style-type: none"> <li>1. Biophysical and baseline surveys</li> <li>2. Land Use Plan for the catchment</li> <li>3. Rehabilitation of degraded lands through the establishing agro forestry plots</li> <li>4. Community trainings on resource management, agro forestry, project management, financial literacy</li> </ol>
<b>Timelines</b>	3 years
<b>Budget / resource requirements</b>	USD 2,000,000
<b>Measurement / evaluation</b>	<ul style="list-style-type: none"> <li>• Average household income increase.</li> <li>• Percentage increase in crop diversity.</li> <li>• Percentage decrease in water sediment</li> <li>• Number of women and youth trained in sustainable agroforestry practices.</li> <li>• Number of hectares under conservation practices (agroforestry, reforestation).</li> <li>• Number of women and youth involved in land use management plans development.</li> </ul>



<b>Possible complications / challenges</b>	<ul style="list-style-type: none"> <li>• Landowners consent</li> <li>• Supply of seedlings</li> <li>• Weather</li> <li>• Support from partners</li> </ul>
<b>Responsibilities and Coordination</b>	MoF – Reforestation MoA – Crop production, agronomy FNU – Baseline surveys ITaukei Affairs Board – community mobilization and consent SPC – Land Use planning and project co-ordination

## Specific Project Ideas for Coastal sector

The stakeholders looked at the proposed actions and selected an action on the basis of its significance in upscaling and faster diffusion of the technology in the country. It is noteworthy that the two project ideas selected will lay important primary information needed to implement the Seawall technology such as designs and sustainability of the seawall and also the effectiveness of cheaper nature based sea walls. Two project ideas have been identified for the coastal sector and are as follows:

- National Mangrove Mapping and Restoration Prioritization.
- To develop flood hazard maps to identify vulnerable high risk coastal communities in Fiji.

Each of these project ideas are described in detail below.

### Project Idea 1

<b>Proposed Project Title: National Mangrove Mapping and Restoration Prioritization</b>	
<b>Introduction / Background</b>	There is lack of national consensus on the baseline map of mangrove coverage and therefore this leads to impediments in advancing the upscaling of the mangrove rehabilitation and reforestation efforts in the country. The national mangrove mapping will assist in streamlining other government led initiatives such as 30 million trees and will also lead to the validation of GIS imaginary for mangroves. The mangrove mapping will drive restoration/rehabilitation and policy development. The baseline mangrove coverage will also assist in restoration prioritization and develop restoration plans.
<b>Objectives</b>	The objectives of this project is therefore; <ul style="list-style-type: none"> <li>• To develop national consensus on national mangrove baseline map.</li> <li>• To develop national mangrove restoration prioritization map.</li> <li>• To develop national mangrove restoration plan.</li> </ul>
<b>What are the outputs and are they measurable?</b>	The outputs of the project are national baseline mangrove maps and pilot sites for mangrove restoration identified.
<b>Relationship to the country's sustainable development priorities</b>	The project is aligned to national policies and initiatives: <ul style="list-style-type: none"> <li>• Climate Change Policy</li> <li>• Low Emissions Development Strategy</li> <li>• Green Growth Framework</li> <li>• National Adaptation Plan</li> <li>• National Biodiversity Strategies and Action Plans (NBSAP)</li> </ul>

	<ul style="list-style-type: none"> <li>• National Climate Finance Strategy</li> </ul>
<b>Project deliverables e.g. value / benefits / messages</b>	<p>The following will be the project deliverables:</p> <ul style="list-style-type: none"> <li>• Baseline Map on Mangrove coverage</li> <li>• Restoration Prioritization Map</li> <li>• Restoration Plan/ Guideline</li> </ul>
<b>Project scope and possible implementation</b>	<p>The project will be implemented at a national level and is linked to past and current projects undertaken by NGOs such as WWF and CI.</p>
<b>Project activities</b>	<p>The project activities mostly deals with roundtable meeting with stakeholders, involving GIS specialists for validation of data and hiring consultants/experts to develop prioritization(sites) and restoration plans.</p>
<b>Timelines</b>	<p>3 years</p>
<b>Budget / resource requirements</b>	<p>USD 1,000,000 Funded through national budget allocations, NGO donor funds, GCF, GEF/ADB multi-lateral funding, in-kind from communities (e.g. labor)</p>
<b>Measurement / evaluation</b>	<p>The success indicators that could be developed for monitoring are as follows:</p> <ul style="list-style-type: none"> <li>• Mangrove survival rates</li> <li>• Increased mangrove coverage</li> <li>• Increased community resilience</li> </ul>
<b>Possible complications / challenges</b>	<ul style="list-style-type: none"> <li>• Access to sustainable funding</li> <li>• Government leadership is required to drive this work</li> </ul>
<b>Responsibilities and Coordination</b>	<p>CCD to convene stakeholder roundtable meetings with other government agencies such Environment, Lands, Forestry and other NGOs such as SPC, GIZ, CI, WWF and IUCN. Local communities to drive restoration work. GIS specialist from MoF/MoL/CCD to provide technical support in mapping activities. CCD/ DoE to provide overall coordination and hiring of consultants to prepare mangrove mapping and restoration plans.</p>

## Project Idea 2

<b>Proposed Project Title: To develop flood hazard maps to identify vulnerable high risk coastal communities in Fiji</b>	
<b>Introduction / Background</b>	<p>Using meteorological data and tools such as Climate Resiliency and Vulnerability Assessment (CRVA) to identify high risk coastal communities susceptible to coastal flooding or combination of coastal and riverine flooding for areas beside major river mouths. The decision is based on the hydrological modelling a complex numerical analysis to develop a good flood hazard maps.</p>
<b>Objectives</b>	<p>The objectives of developing a flood hazard maps is to identify areas and prioritize sites for various coastal resilience projects.</p>

<b>What are the outputs and are they measurable?</b>	<ul style="list-style-type: none"> <li>• The output will be a decision based CRVA tool for coastal areas.</li> <li>• Identification of high risk sites (defining thresholds).</li> <li>• Measure risk through a MCDA tool and monitoring and evaluation through the adaptation impact tool (iA).</li> </ul>
<b>Relationship to the country's sustainable development priorities</b>	<p>The project is aligned to national policies and initiatives:</p> <ul style="list-style-type: none"> <li>• National Adaptation Plan for coastal communities</li> <li>• Disaster Risk Reduction through adaptation pathways.</li> </ul>
<b>Project deliverables e.g. value / benefits / messages</b>	<p>The following will be the project deliverables:</p> <ul style="list-style-type: none"> <li>• Guideline (formulating a risk matrix for the assessments)</li> <li>• Data (in-situ surveys supplemented by remote sensing/GIS mapping and analysis).</li> </ul> <p>The tool developed will identify communities to target, to effectively channel government resources.</p>
<b>Project scope and possible implementation</b>	<p>Preliminary assessments to be done using satellite data in addition to in-situ assessment component. This is a resource intensive although there are some data available from the cost benefit analysis from NbS and adaptation survey.</p>
<b>Project activities</b>	<p>Relevant in-situ assessments Collection of GIS data</p>
<b>Timelines</b>	<p>2024 - 2030</p>
<b>Budget / resource requirements</b>	<p>USD 1,000,000 Funded through national budget allocations, NGO donor funds, GCF, GEF/ADB multi-lateral funding, in-kind from communities (e.g. labor)</p>
<b>Measurement / evaluation</b>	<p>Consultation &amp; Consensus of target communities on the identified coastal adaptation intervention. Monitoring and Evaluation of the various adaptation interventions.</p>
<b>Possible complications / challenges</b>	<ul style="list-style-type: none"> <li>• Access to sustainable funding</li> <li>• Government leadership is required to drive this work</li> </ul>
<b>Responsibilities and Coordination</b>	<p>CCD to convene stakeholder roundtable meetings with other government agencies such Environment, Lands, Forestry and other NGOs such as SPC, GIZ, CI, WWF and IUCN. Local communities to drive restoration work. GIS specialist from MoF/MoL/CCD to provide technical support in mapping activities. CCD/ DoE to provide overall coordination and hiring of consultants to prepare mangrove mapping and restoration plans.</p>

## Chapter 3 Conclusions

This Technology Action Plan has been developed for these three prioritized technologies for two sectors. The three prioritized technologies for the agriculture sector are:

1. Agroforestry;
2. Integrated Nutrient Management; and
3. Improved Crop Varieties.

The three prioritized technologies for the coastal community sector are:

1. Mangrove Rehabilitation;
2. Seawalls; and
3. Flood Hazard and risk assessment mapping

The actions and activities in the action plan originated from BAEF which highlighted that Agriculture and coastal communities sector had common barriers such as economic and financial, institutional, regulatory, technical and information and awareness. The development of the action plans involved a series of consultation processes that ensured that the key stakeholders participated in the decisions making of formulating the plan. The measures identified in the BAEF for each technology was prioritized and was transformed into an actionable item that was perceived to be most significant or mandatory for upscaling and faster adoption and diffusion of the technology nationally.

The actions for respective technologies were demarcated into specific activities with specific stakeholder responsible bodies and the scheduling and sequencing of respective activities to achieve the technology deployment. The TAP also entailed the estimation of capacity building needs, estimations of costs, identification of risks, and contingency planning for respective actions and activities followed by immediate next steps required.

The TAP highlights activities pertaining to securing sustainable financing mechanism to achieve the preliminary technology diffusion targets identified. In addition to securing finance there were plans developed to increase the technical and institutional capacity to support and sustain upscaling of these technologies to provide enhanced resilience to the local communities from the impacts of climate change. It was also noted in the TAP the importance of the implementation policy and legal frameworks to provide better coordination and monitoring and evaluation of technology deployment.

In terms of the proposed project ideas for the agriculture sector, it was mostly to do with technical and institutional capacity building to provide sustained national efforts to deploy the technology successfully. For the agroforestry proposed project idea also takes into account gender inclusivity whereby Nadroumai Women's Club will be involved in upscaling Agroforestry practices in local communities for sustainable management of landscape systems. The proposed project ideas for the agriculture sector were:

- Creating Composting facilities for producing nutrient rich Composts from agricultural wastes.
- Enhanced Research and Development Institutional Capacity to Introduce, Evaluate and adopt new improved and resilient varieties of rice, chilli and eggplant.
- Building resilient communities through sustainable management of landscape systems.

The proposed project ideas for the coastal community sector is to develop effective maps or tools that could assist in decision making in identifying vulnerable communities to the impacts of sea level rising and storm surges causing coastal inundation and loss of land. It is imperative to have the national mangrove map to be updated to facilitate any restoration plans particularly in prioritizing area for restoration works. The flood hazard map and the national mangrove map could also play a pivotal role in deciding the design and effectiveness of nature based sea walls. The proposed project ideas for the coastal sector were:

- National Mangrove Mapping and Restoration Prioritization.
- To develop flood hazard maps to identify vulnerable high risk coastal communities in Fiji.



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## Appendix I: List of Stakeholders consulted

No.	Name	Gender	Organization	Designation	Email
<b><u>Coastal Sector</u></b>					
1	Nikeel Sharma	M	Conservation International Fiji	Blue Carbon Project Manager	<a href="mailto:nsharma@conservation.org">nsharma@conservation.org</a>
2	Isaac Rounds	M	Conservation International Fiji	Forest Ecologist	<a href="mailto:irounds@conservation.org">irounds@conservation.org</a>
3	Francis Mani	M	The University of the South Pacific	Consultant	<a href="mailto:francis.mani@usp.ac.fj">francis.mani@usp.ac.fj</a>
4	Deborah Sue	F	Ministry of Forestry	DFRAC	<a href="mailto:DeborahLSue@gmail.com">DeborahLSue@gmail.com</a>
5	Alfred Ralifo	M	Worldwide Fund for Nature	GSR - Programme Manager	<a href="mailto:aralifo@wwfpacific.org">aralifo@wwfpacific.org</a>
6	Herve D.	M	SPC	Team Leader - Oceanography	<a href="mailto:herveda@spc.int">herveda@spc.int</a>
8	Andrick Lal	M	SPC		<a href="mailto:andrickl@spc.int">andrickl@spc.int</a>
9	Marica Ratuki	F		Act Divisional Engineer	<a href="mailto:Marica.ratuki@moit.gov.fj">Marica.ratuki@moit.gov.fj</a>
10	Diana Sausauwai	F	Ministry of Finance	STO- P	<a href="mailto:Diana.sausauwai@finance.gov.fj">Diana.sausauwai@finance.gov.fj</a>
11	Josefa Saumailagi	M	MAW	Technical Officer	<a href="mailto:Josefa.saumailagi@waterways.gov.fj">Josefa.saumailagi@waterways.gov.fj</a>
12	Ravikash Reddy	M	CIU, MoF	STO-PC	<a href="mailto:Ravikash.reddy@finance.gov.fj">Ravikash.reddy@finance.gov.fj</a>
13	Anthony Turagavuki	M	MAW	Environment Officer	<a href="mailto:Anthony.turgavuli@waterways.gov.fj">Anthony.turgavuli@waterways.gov.fj</a>
14	Setoki Silivale	M	CIU, MoF	Act. Manager	<a href="mailto:Setoki.silivale@finance.gov.fj">Setoki.silivale@finance.gov.fj</a>
15	Hanisetoka Manueli	M	CIU, MoE	STO – C&S	<a href="mailto:Hanisetoka.manueli@finance.gov.fj">Hanisetoka.manueli@finance.gov.fj</a>
16	Leba Gaunavinaka	F	UNOSAT/CCD	Technical Expert	<a href="mailto:Leba.gaunavinaka@finance.gov.fj">Leba.gaunavinaka@finance.gov.fj</a>
<b><u>Agriculture Sector</u></b>					
1	Rocky Gucake	M	Ministry of Lands and Mineral Resources	SSAP	<a href="mailto:rocky.gucake@govnet.gov.fj">rocky.gucake@govnet.gov.fj</a>
2	Nazeea Bano	F	SRIF	Technical Officer	<a href="mailto:nazeeab@srif.org.fj">nazeeab@srif.org.fj</a>



3	Amit Raj Singh	M	SRIF	Technical Officer	<a href="mailto:amits@srif.org.fj">amits@srif.org.fj</a>
4	Dr. Mereia Fong	F	Ministry of Agriculture	PRO	<a href="mailto:Mereia.fong@fnu.ac.fj">Mereia.fong@fnu.ac.fj</a>
5	Dr. Amit Sukal	M	SPC - CePACT	Associate Scientist	<a href="mailto:amits@spc.int">amits@spc.int</a>
6	Penaia Mua	M	Ministry of Agriculture	PAO	<a href="mailto:pvosawai@yahoo.com">pvosawai@yahoo.com</a>
7	Prof. Santiago Mahimairaja	M	SRIF	CEO	<a href="mailto:rajaSM@srif.org.fj">rajaSM@srif.org.fj</a>
8	Guofu Luo	M	Ministry of Agriculture	Senior Research Officer	<a href="mailto:Guofo_luo@yahoo.com">Guofo_luo@yahoo.com</a>
9	Irene Chand	F	Ministry of Agriculture	TO	<a href="mailto:irenerozika@yahoo.com">irenerozika@yahoo.com</a>
10	Jalesi Mateboto	M	SPC – Land Resources Division	Community Forestry Specialist	<a href="mailto:JalesiM@spc.int">JalesiM@spc.int</a>
11	Deborah Sue	F	Ministry of Forestry	DFRAC	<a href="mailto:DeborahLSue@gmail.com">DeborahLSue@gmail.com</a>
12	Adi-Loraini Baleilomaloma	F	SPC – Land Resources Division	Forestry Technician	<a href="mailto:lorainib@spc.int">lorainib@spc.int</a>
13	Barbara Temo	F	Ministry of Agriculture	Principal Economic Planning Officer	<a href="mailto:Barbara.temo@moa.gov.fj">Barbara.temo@moa.gov.fj</a>