

Tanzania TNA -Technology Action Plan



UNITED REPUBLIC OF TANZANIA Technology Needs Assessment Climate Change Mitigation



Technology Action Plan and Project Ideas

Energy and Forestry Sector

Report III

November 2017



Tanzania TNA -Technology Action Plan

United Republic of Tanzania

TECHNOLOGY NEEDS ASSESSMENT FOR CLIMATE CHANGE MITIGATION

Technology Action Plan Report

Energy and Forestry Sectors

DISCLAIMER

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FOREWORD

Tanzania started the process of a Technology Needs Assessment (TNA) for climate change mitigation with a stakeholder's meeting in September, 2015. I am glad to report that this process has now been concluded and has resulted in the identification and prioritisation of technologies that Tanzania should mitigate climate change. With the help of her partners, Tanzania was keen to engage in the TNA process because the country has seen the reality of climate change for a number of years now. The rise in the frequency of droughts, floods and extreme temperatures, the increase in the unpredictability of rainfall during the rainy season and the increase in mean temperatures already wreak havoc on the livelihoods and general wellbeing of our people. To make matters worse, the occurrence of such climatic hazards is projected to increase. All our development efforts and the great score we have made over the past decades risk being reversed by climate change impacts. Clearly we cannot continue with business as usual. It is for this reason that Tanzania find it prudent to contribute to the global efforts to mitigate the climate change.

The United Republic of Tanzania has recognized this need for some time now and has been preparing the ground for action with regards to climate change mitigation and adaptation. In 2012 Tanzania developed a National Climate Change Strategy. This Strategy has been developed in response to the growing concern of the negative impacts of climate change and climate variability on the country's social, economic and physical environment. Its overall aim is to enhance the technical, institutional and individual capacity of the country to address the impacts of climate change. The Strategy covers adaptation, mitigation and cross-cutting interventions that will enable Tanzania the benefit from the opportunities available to developing countries in their efforts to tackle climate change.

A lot has already been done to respond to climate change and yet the threat remains huge that more needs to be done with even greater urgency. In conducting the TNA process, consultation with key stakeholders was the core approach taken at every stage. Stakeholders scored and identified the sectors and technologies that needed to be given priority in devising the needed actions. They went on to identify the barriers that would hinder the diffusion of the selected technologies and specified measures required to overcome the barriers. These stakeholder representatives came from civil society, the private sector, academia and government. The determination and desire to forge our effort together is an indication of how climate change mitigation and adaptation is such an important national issue and is of great concern to all who work to better the lives of our people.

The TNA process on climate change mitigation has produced three reports which should be read together as the unfolding narrative of its results:

1. Technology Needs Assessment Report - This report presents the methodology used in the TNA process, how sectors and technologies were identified and prioritized. For climate change mitigation, two sectors – Energy and Forest sectors – received the highest scores and were consequently selected for further analysis. In each of the two sectors, three technologies were prioritised and taken forward for barrier analysis.

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1. Barrier Analysis and Enabling Framework Report – This report documents the barriers to technology diffusion identified by stakeholders and their root causes. Measures and the enabling framework for technology diffusion in the respective sectors and for each technology are also detailed in this report.

2. Technology Action Plans – This TAP report provides the steps and actions required to take forward the identified measures in each sector and for each technology. Generally the actions needed to enhance diffusion of the technologies include a) Conduct research on economic feasibility of technologies, b) conducting awareness raising c) put in place financial incentives including lowering lending rates d) engaging development partners and making efforts to access global funds e) developing supportive policy and legislation and f) strengthening institution arrangements and collaboration.

This has been a lot of work and I am pleased at its successful conclusion. I am grateful to the stakeholders who participated in the process over a period of about two years. I thank our partners, the United Nations Environment Programme (UNEP) and the UNEP DTU Partnership (UDP) in collaboration with the Regional Centre Energy Research Centre, University of Cape Town and GEF for the financial support rendered to the TNA process in Tanzania. I wish to also recognize the work of the Consultants, Prof. Jamidu H.Y. Katima and Mr. Abdallah Shah, who facilitated the process and documented the outcomes from the stakeholder consultations into the reports mentioned above. It remains for all of us to work together to ensure that the results of this intense and elaborate process will result in tangible and practical initiatives on the ground. The Vice President's Office has made climate change a top priority in its work. I and my colleagues will therefore work very hard to ensure that the projects identified come to fruition. We need the continued support of everyone.

Hon. January Makamba (MP)

Minister of State, Vice President's Office (Union and Environment)

EXECUTIVE SUMMARY

The Technology Needs Assessment (TNA) for climate change mitigation in Tanzania had three (3) main deliverables namely; the TNA Report, the Barrier Analysis and Enabling Framework Report and the Technology Action Plans. The initial TNA report focused on the process of identifying, and prioritizing sectors and technologies for climate change mitigation in Tanzania. These technologies were subsequently taken to the barrier analysis stage. The Barrier Analysis and Enabling Framework report analysed the likely barriers to transfer the identified technologies and suggested measures to address them so as to enhance their diffusion. The third deliverable is this Technology Action Plans (TAPs) Report and Project Ideas which details the steps needed for each technology to diffuse the selected technologies. The TAP report is purely based on the content from the Barrier Analysis report. The TAP is a specific plan that describes the adoption and diffusion of the prioritized technologies aimed at enhancing the country's socio-economic development, environmental conservation as well as climate change mitigation and adaptation.

Energy sector

Under the Energy sector, the prioritised technologies were Mini and Micro Hydro, Sustainable use of biomass fuel and Solar PV.

This Technology Action Plan for the Energy Sector contains descriptions of three prioritized technologies – Mini-Hydropower, Compact Biodigester and large scale solar power.

The TAP describes the ambitions of the prioritized in terms of coverage and number of beneficiaries to be reached by 2030. Mini-hydropower, and Large Scale Solar are intended to benefit about 1,000,000 household each while the Compact Biogas Digester is targeting 100,000 households in urban centres.

Each of the three technologies has a section dedicated for a brief description of the barriers and measures for enhancing its adoption. The barriers include limited access to financial resources, low awareness, lack of reliable data and weak institutional capacity. Appropriate measures include elimination of factors limiting access to financial resources, conducting research, improving public awareness and strengthening institutional capacity.

For each technology, two actions (measures) have been selected to be included in the TAP. The actions are a) Conduct research on economic feasibility of technologies, b) conducting awareness raising c) put in place financial incentives including lowering lending rates d) engaging development partners and making efforts to access global funds e) developing supportive policy and legislation on biofuels. To each of the actions, a set of activities have been listed to be implemented in order to achieve the technology targets.

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The action plan goes further and sets the timeline and tentative budget and identifies key stakeholders to be involved in the planning and implementation process. Most of the activities will be implemented for the duration of 10 years and stakeholders with major responsibilities include Vice President's Office – Division of Environment, Ministry of Energy, TANESCO, REA, MDAs, NGOs and the private sector. Potential sources of funds have been identified to include the Government of Tanzania, Development Partners (e.g. UNDP) and MFIs (e.g. African Development Bank, The World Bank).

Capacity building needs have been identified for each technology and further linked to specific activities of selected actions. Also, the TAP has attempted to provide descriptions of potential risks likely to face the implementation of the actions and highlights key contingency actions. The risks include cost, scheduling, lack of political will and poverty. In addition, the TAP describes immediate requirements to proceed and critical steps for successful implementation of activities which will allow for the resources to be committed towards the achievement of the three technologies.

In this plan, project ideas have been identified for each of the three technologies. The objective of the project ideas for all technologies is to increase accessibility to electricity and promotion of biogas to replace LPG.

Forest sector

It is estimated that Tanzania has 48.1 million ha (481,000 km²) of forests and woodlands equivalent to an average of 1.1 ha per capita (NAFORMA 2015). This means that forests and woodlands occupy an equivalent to 38.3 % of the total land area. The sector presents a significant opportunity for realizing Tanzania's mitigation and adaptation objectives while generating socio-economic and environmental benefits.

This Technology Action Plan for the Forest Sector contains descriptions of three prioritized technologies – Sustainable Forest Management, Agroforestry and Sustainable Forest Management.

The TAP describes the ambitions of the prioritized technology in terms of coverage and number of beneficiaries to be reached by 2030. Sustainable Forest Management targets to benefit 30% of forest products by sustainably managing 2,861,494 ha. On the other hand, 30,000 households will be supported to maintain 20,000 ha of agroforestry in 5 regions. In addition, 100,000 communities in coastal areas will be targeted in conserving 50,000 ha and restoring 5,000 ha of mangroves.

Each of the three technologies has a section dedicated for a brief description of the barriers and measures for enhancing its adoption. The barriers include limited access to financial resources, low awareness and weak institutional capacity. Appropriate measures include elimination of factors limiting access to financial resources, improving public awareness and strengthening institutional capacity.

For each technology, two actions (measures) have been selected to be included in the TAP. The actions are a) Strengthening legal and regulatory enforcement and b) Improving profitability of the forest sector (SFM); a) eliminating disincentives in agroforestry and b) improving awareness on agroforestry (Agroforestry); and a) improving mangrove policy, legal and regulatory framework and

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b) increasing access to alternative economic opportunities for coastal people. To each of the actions, a set of activities have been listed to be implemented in order to achieve the technology targets.

The action plan goes further and sets the timeline and tentative budget and identifies key stakeholders to be involved in the planning and implementation process. Most of the activities will be implemented for the duration of 10 years and stakeholders with major responsibilities include MDAs, NGOs and the private sector. Key ministries responsible are the Vice President’s Office – Division of Environment, Ministry of Agriculture and Food Security, Ministry of Natural Resources and Management. Potential sources of funds have been identified to include the Government of Tanzania, Development Partners (e.g. UNDP) and MFIs (e.g. African Development Bank, The World Bank).

Capacity building needs have been identified for each technology and further linked to specific activities of selected actions. Also, the TAP has attempted to provide a description of potential implementation risks of the actions and highlights key contingency actions. The risks include cost, scheduling, lack of political will and poverty. Likewise, the TAP has described immediate requirements to proceed and critical steps to succeed which will allow for the resources to be committed towards the achievement of the three technologies.

In this plan, project ideas have been identified for each of the three technologies. The objective of the concept idea for Sustainable Forest Management is to improve the profitability of the forest sector. Whereas the objective of the concept idea for Agroforestry is to address existing disincentives and demonstrate the benefits of agroforestry; Sustainable Management of Mangroves project idea is aimed at promoting the use of sustainable approaches to coastal livelihoods. The project concepts have been developed into six project ideas – two for each of the three technologies.

The three technologies will be diffused through public awareness campaigns, financial assistance, strengthened enforcement of laws and regulations, harmonization of conflicting and overlapping laws and elimination of disincentives.

Table 1: Summary matrix for Compact Biogas Digester TAP

Sector	Energy			
Sub-sector	Biogas			
Technology	Compact Biogas Digesters for Urban Households			
Ambition	100,000 urban household			
Benefits	Mitigate GHG emission (183,000 tCO ₂ per year); Mitigation of deforestation saving of about 4,100 tCO ₂ sink per year			
Action	Activities to be implemented	Sources of funding	Time frame	Budget per activity
Establish a unit to oversee the implementation of the TAP				36,000

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Action 1: Establish economic feasibility of compact biodigester	Activity 1.1: Conduct economic (including market survey) feasibility of the biogas digester	GoT, Development partners	1-2 years	31,000
Action 2: Create awareness of both developer, and users of the technology	Activity 2.1 Develop awareness material targeting different stakeholders (i.e. Private Sector, Decision Makers, Users of Compact biodigester, financial institutions)	GoT, Development partners	1-2 years	10,000
	Activity 2.2: Develop a communication strategy Profile the target stakeholders particularly the adopters of the technology	GoT, Development partners	1-2 years	5,000
	Activity 2.3: Implement awareness campaign on compact biodigester	GoT, Development partners	1-2 years	20,000
Action 3: Enhance access to investment finances	Activity 3.1: Develop financial incentives to assist lowering the cost of compact biodigester	Government	1-2 years	20,000
	Activity 3.2: Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit	Development Partner	2-4 years	10,000

Table 2: Summary matrix for Mini-hydropower TAP

Sector	Energy			
Sub-sector	Electricity			
Technology	Mini-Hydropower Plant			
Ambition	1,000,000 households			
Benefits	Mitigate GHG emission (0.378 megaton per year)			
Action	Activities to be implemented	Sources of funding	Time frame	Budget per activity
Establish a unit to oversee the implementation of the TAP	Recruit staff Establish and equip the office	GoT	1 year	50,000
Action 1: Enhance access to financing	Activity 1.1 Develop financial incentives to assist lowering the cost of mini hydropower project (e.g. introduce subsidies, tax exemptions)	Government Private Sector	1.2 years	20,000
	Activity 1.2: Sensitise the policy makers on the importance of incentives and or subsidies for the electricity to compete with other fossil fuels	Government Private Sector Development Partners	1 year	10,000
	Activity 1.3: Lower commercial banks' lending rates	GoT	1-2 years	15,000

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	Activity 1.4: Establish a Renewable Energy Development Fund to enhance investment in RE	GoT Private Sector Development Partners	2 – 5 years	10,000
	Activity 1.5: Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit	Government Development Partners	1-2 years	5,000
	Activity 2.1: Develop specialized training aimed at building the capacities in relevant institutions – in areas of fabrication, installation, operation and maintenance of mini hydropower projects	Government Development partners	1-2 years	200,000
Action 2: Build / strengthen capacity of key stakeholders	Activity 2.2: Strengthen TANESCO to absorb more electricity generated from renewable energy sources	GoT Development Partner	1-2 years	500,000
	Activity 2.3: Strengthen capacity of Tanzania Meteorological Service – to generate reliable data for energy mix forecast and planning	Government Development Partners	1-4 years	500,000
	Activity 2.4: Strengthen inter-ministerial coordination	GoT	1-5year	5,000
Action 3: Establish mini-hydropower potential in the country	Activity 3.1: Conduct study on mini-hydropower potential to cover the entire country	GoT Development Partners	1-5 years	300,000
	Action 3.2: Develop a platform for sharing information on hydropower potential	GoT Development Partners	1-5 years	20,000

Table 3: Summary matrix for Large Scale Solar PV TAP

Sector	Energy			
Sub-sector	Electricity			
Technology	Large Scale Solar Power			
Ambition	120,000 households			
Benefits	Mitigate GHG emission (0.05 megaton per year)			
Action	Activities to be implemented	Sources of funding	Time frame	Budget per activity
Establish a unit to oversee the implementation of the TAP	Recruit staff Establish and equip the office	GoT	1 year	20,000

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Action 1: Enhance access to financing	Activity 1.1: Develop financial incentives to assist lowering the cost of solar power systems (e.g. introduce subsidies, tax exemptions)	Government Private Sector	1.2 years	10,000
	Activity 1.2: Sensitise the policy makers on the importance of incentives and or subsidies for the solar power based electricity to compete with other fossil fuels	Government Private Sector Development Partners	1 year	10,000
	Activity 1.3: Lower commercial banks' lending rates	GoT	1-2 years	15,000
	Activity 1.4: Establish a Renewable Energy Development Fund to enhance investment in RE	GoT Private Sector Development Partners	2 – 5 years	10,000
	Activity 1.5: Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit	Government Development Partners	1-2 years	5,000
Action 2: Build / strengthen capacity of key stakeholders	Activity 2.1: Develop specialized training aimed at building the capacities in relevant institutions – in areas of installation, operation and maintenance of solar power systems	Government Development partners	1-2 years	100,000
	Activity 2.2: Strengthen TANESCO to absorb more electricity generated from renewable energy sources	GoT Development Partner	1-2 years	500,000
	Activity 2.3: Strengthen inter-ministerial coordination	GoT	1-5 year	5,000

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Table 4: Summary matrix for Sustainable Forest Management (SFM)

Sector	Forestry			
Sub-sector	Forest Management			
Technology	Sustainable Forest Management			
Ambition	5,000,000 hectare			
Benefits	Mitigate GHG emission (193,000 tonnes per year)			
Sources of funding	URT Government, Development Partners, and Private Sector.			
Action	Activities to be implemented	Sources of funding	Time frame	Budget per activity
Action 1: Strengthen enforcement and compliance to legal and regulatory frameworks to support SFM	Activity 1.1 Carryout a survey to understand challenges faced by forest officers and develop plan to eliminate challenges and provide better working conditions.	URT Government, Development Partners, and Private Sector.	6 months	50,000
	Activity 1.2 Establish a body to oversee and regulate professionalism in forestry	Government URT, Development Partners, and Private Sector.	1 year	20,000
	Activity 1.3 Review and strengthen forest laws in order to tackle corruption and other malpractices forest sector.	URT Government, Development Partners, and Private Sector.	1 year	50,000
	Activity 1.4 Develop and implement a programme to strengthen prosecution and judicial system capacity try forest offences and crimes	URT Government, Development Partners, and Private Sector.	4 years	200,000
	Activity 1.5 Develop and implement a programme to raise public awareness on forest offences, laws and regulations	URT Government, Development Partners, and Private Sector.	4 years	150,000
Action 2: Develop sustainability benchmarks, principles and standards for sustainable forest management.	Activity 2.1 Decide on 10 forest areas to be supported and establish their baseline SFM status in relation to the internationally agreed criteria, indicators and elements of SFM.	URT Government, Development Partners, and Private Sector.	1 year	50,000
	Activity 2.2 Develop and implement management plans for minimum of 10 selected forests in both natural and plantation forests (Taking cognizance of internationally agreed criteria, indicators and elements of SFM)	URT Government, Development Partners, and Private Sector.	4 years	1,000,000
	Activity 2.3 Adopt (through, multiple stakeholders consultations, and engagement) and use the FLEGT framework as and instrument to improve forest value chain. This to include understanding existing and new market opportunities	URT Government, Development Partners, and Private Sector.	1 year	100,000
	Activity 2.4 Develop and use a social-cultural framework to enable inclusive or participatory SFM that take account	URT Government, Development	6 months	10,000

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	of the local communities and wider society.	Partners, and Private Sector.		
	Activity 2.5 Revive, Redesign and implement a national tree planting programmes and initiatives.	URT Government, Development Partners, and Private Sector.	4 years	1,000,000

Table 5: Summary matrix for Agroforestry

Sector	Forestry			
Sub-sector	Forest Management			
Technology	Agroforestry			
Ambition	500,000 households			
Benefits	Mitigate GHG emission (20 tons per ha per year)			
Sources of funding	URT Government, Development Partners, and Private Sector.			
Action	Activities to be implemented	Sources of funding	Time frame	Budget per activity
Action 1. Provide incentives to Improve awareness for the adoption and uptake of agroforestry.	Activity 1.1 Develop training and learning systems on the benefits of agroforestry and the value of agroforestry products. To include technical training to extension workers	URT Government, Development Partners, and Private Sector.	4 years	100,000
	Activity 1.2 Design and deliver extension services for agroforestry systems, to include public awareness campaigns, cross learning and exchange visits.	URT Government, Development Partners, and Private Sector	4 years	1000,000
	Activity 1.3 Review and improve research in agroforestry (including participatory learning and action research).	URT Government, Development Partners, and Private Sector.	4 years	500,000
	Activity 1.4 Build a market based systems (e.g. social enterprise) to enable farmers grow and sell seedlings and other agroforestry products to other farmers and wider markets	URT Government, Development Partners, and Private Sector	1.5 years	100,000
	Activity 1.5 Design and Operate Agroforestry facility, to provide technical assistance and funding for agoforestry promotion.	URT Government, Development Partners, and Private Sector	4 years	1,000,000

Table 6: Summary matrix for Mangrove Forest Conservation

Sector	Forestry			
Sub-sector	Mangroves			
Technology	Mangroves Conservation			
Ambition	70,000 ha			
Benefits	Mitigate GHG emission (98 tons/ha/year)			
Sources of funding	URT Government, Development Partners, and Private Sector			
Action	Activities to be implemented	Sources of funding	Time frame	Budget per activity

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Action 1: Improve mangrove conservation policy, legal and regulatory frameworks	Activity 1.1 Review and design integrated mangrove management plan	URT Government, Development Partners, and Private Sector	1 year	100,000
	Activity 1.2. Review and update laws and regulations governing management of mangrove forests including permitting and licencing systems	URT Government, Development Partners, and Private Sector	1 year	50,000
	Activity 1.3. Develop and implement law enforcement and compliance education programme.	URT Government, Development Partners, and Private Sector	4 years	20,000
	Activity 1.4. Review and strengthen the national institutional framework on mangroves management	URT Government, Development Partners, and Private Sector	4 years	20,000
	Activity 1.5. Implementation of the integrated mangrove management plan	URT Government, Development Partners, and Private Sector	4 years	1,000,000
Action 2: Increase access to alternative economic and livelihood opportunities	Activity 2.1. Invest and conduct research on sustainable alternative economic activities for people living in and around mangrove forests	URT Government, Development Partners, and Private Sector	4 years	200,000
	Activity 2.2. Conduct training to communities on sustainable alternative coastal livelihood approaches	URT Government, Development Partners, and Private Sector	4 years	100,000
	Activity 2.3. Design and implement training to support value addition and improvement of quality of community products.	URT Government, Development Partners, and Private Sector	4 years	100,000
	Activity 2.4. Design and adopt Improved marketing strategies of products to enable communities to access markets successfully	URT Government, Development Partners, and Private Sector	4 years	200,000
	Activity 2.5 Create or adopt a financing facility to provide financial support to communities to finance alternative livelihood activities, such as ecotourism. To include training and promotional materials	URT Government, Development Partners, and Private Sector	4 years	250,000

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Table 1: Summary matrix for Compact Biogas Digester TAP

Sector	Energy			
Sub-sector	Biogas			
Technology	Compact Biogas Digesters for Urban Households			
Ambition	100,000 urban household			
Benefits	Mitigate GHG emission (183,000 tCO ₂ per year); Mitigation of deforestation saving of about 4,100 tCO ₂ sink per year			
Action	Activities to be implemented	Sources of funding	Time frame	Budget per activity
Establish a unit to oversee the implementation of the TAP				36,000
Action 1: Establish economic feasibility of compact biodigester	Activity 1.1: Conduct economic (including market survey) feasibility of the biogas digester	GoT, Development partners	1-2 years	31,000
Action 2: Create awareness of both developer, and users of the technology	Activity 2.1 Develop awareness material targeting different stakeholders (i.e. Private Sector, Decision Makers, Users of Compact biodigester, financial institutions)	GoT, Development partners	1-2 years	10,000
	Activity 2.2: Develop a communication strategy Profile the target stakeholders particularly the adopters of the technology	GoT, Development partners	1-2 years	5,000
	Activity 2.3: Implement awareness campaign on compact biodigester	GoT, Development partners	1-2 years	20,000
Action 3: Enhance access to investment finances	Activity 3.1: Develop financial incentives to assist lowering the cost of compact biodigester	Government	1-2 years	20,000
	Activity 3.2: Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit	Development Partner	2-4 years	10,000

Table 2: Summary matrix for Mini-hydropower TAP

Sector	Energy			
Sub-sector	Electricity			
Technology	Mini-Hydropower Plant			
Ambition	1,000,000 households			
Benefits	Mitigate GHG emission (0.378 megaton per year)			
Action	Activities to be implemented	Sources of funding	Time frame	Budget per activity
Establish a unit to oversee the implementation of	Recruit staff Establish and equip the office	GoT	1 year	50,000

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the TAP				
Action 1: Enhance access to financing	Activity 1.1 Develop financial incentives to assist lowering the cost of mini hydropower project (e.g. introduce subsidies, tax exemptions)	Government Private Sector	1.2 years	20,000
	Activity 1.2: Sensitise the policy makers on the importance of incentives and or subsidies for the electricity to compete with other fossil fuels	Government Private Sector Development Partners	1 year	10,000
	Activity 1.3: Lower commercial banks' lending rates	GoT	1-2 years	15,000
	Activity 1.4: Establish a Renewable Energy Development Fund to enhance investment in RE	GoT Private Sector Development Partners	2 – 5 years	10,000
	Activity 1.5: Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit	Government Development Partners	1-2 years	5,000
	Activity 2.1: Develop specialized training aimed at building the capacities in relevant institutions – in areas of fabrication, installation, operation and maintenance of mini hydropower projects	Government Development partners	1-2 years	200,000
Action 2: Build / strengthen capacity of key stakeholders	Activity 2.2: Strengthen TANESCO to absorb more electricity generated from renewable energy sources	GoT Development Partner	1-2 years	500,000
	Activity 2.3: Strengthen capacity of Tanzania Meteorological Service – to generate reliable data for energy mix forecast and planning	Government Development Partners	1-4 years	500,000
	Activity 2.4: Strengthen inter-ministerial coordination	GoT	1-5year	5,000
Action 3: Establish mini-hydropower potential in the country	Activity 3.1: Conduct study on mini-hydropower potential to cover the entire country	GoT Development Partners	1-5 years	300,000
	Action 3.2: Develop a platform for sharing information on hydropower potential	GoT Development Partners	1-5 years	20,000

Table 3: Summary matrix for Large Scale Solar PV TAP

Sector	Energy
Sub-sector	Electricity

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Technology	Large Scale Solar Power			
Ambition	120,000 households			
Benefits	Mitigate GHG emission (0.05 megaton per year)			
Action	Activities to be implemented	Sources of funding	Time frame	Budget per activity
Establish a unit to oversee the implementation of the TAP	Recruit staff Establish and equip the office	GoT	1 year	20,000
Action 1: Enhance access to financing	Activity 1.1 Develop financial incentives to assist lowering the cost of solar power systems (e.g. introduce subsidies, tax exemptions)	Government Private Sector	1.2 years	10,000
	Activity 1.2: Sensitise the policy makers on the importance of incentives and or subsidies for the solar power based electricity to compete with other fossil fuels	Government Private Sector Development Partners	1 year	10,000
	Activity 1.3: Lower commercial banks' lending rates	GoT	1-2 years	15,000
	Activity 1.4: Establish a Renewable Energy Development Fund to enhance investment in RE	GoT Private Sector Development Partners	2 – 5 years	10,000
	Activity 1.5: Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit	Government Development Partners	1-2 years	5,000
Action 2: Build / strengthen capacity of key stakeholders	Activity 2.1: Develop specialized training aimed at building the capacities in relevant institutions – in areas of installation, operation and maintenance of solar power systems	Government Development partners	1-2 years	100,000
	Activity 2.2: Strengthen TANESCO to absorb more electricity generated from renewable energy sources	GoT Development Partner	1-2 years	500,000
	Activity 2.3: Strengthen inter-ministerial coordination	GoT	1-5 year	5,000

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Table 4: Summary matrix for Sustainable Forest Management (SFM)

Sector	Forestry			
Sub-sector	Forest Management			
Technology	Sustainable Forest Management			
Ambition	5,000,000 hectare			
Benefits	Mitigate GHG emission (193,000 tonnes per year)			
Sources of funding	URT Government, Development Partners, and Private Sector.			
Action	Activities to be implemented	Sources of funding	Time frame	Budget per activity
Action 1: Strengthen enforcement and compliance to legal and regulatory frameworks to support SFM	Activity 1.1 Carryout a survey to understand challenges faced by forest officers and develop plan to eliminate challenges and provide better working conditions.	URT Government, Development Partners, and Private Sector.	6 months	50,000
	Activity 1.2 Establish a body to oversee and regulate professionalism in forestry	Government URT, Development Partners, and Private Sector.	1 year	20,000
	Activity 1.3 Review and strengthen forest laws in order to tackle corruption and other malpractices forest sector.	URT Government, Development Partners, and Private Sector.	1 year	50,000
	Activity 1.4 Develop and implement a programme to strengthen prosecution and judicial system capacity try forest offences and crimes	URT Government, Development Partners, and Private Sector.	4 years	200,000
	Activity 1.5 Develop and implement a programme to raise public awareness on forest offences, laws and regulations	URT Government, Development Partners, and Private Sector.	4 years	150,000
Action 2: Develop sustainability benchmarks, principles and standards for sustainable forest management.	Activity 2.1 Decide on 10 forest areas to be supported and establish their baseline SFM status in relation to the internationally agreed criteria, indicators and elements of SFM.	URT Government, Development Partners, and Private Sector.	1 year	50,000
	Activity 2.2 Develop and implement management plans for minimum of 10 selected forests in both natural and plantation forests (Taking cognizance of internationally agreed criteria, indicators and elements of SFM)	URT Government, Development Partners, and Private Sector.	4 years	1,000,000
	Activity 2.3 Adopt (through, multiple stakeholders consultations, and engagement) and use the FLEGT framework as and instrument to improve forest value chain. This to include understanding existing and new market opportunities	URT Government, Development Partners, and Private Sector.	1 year	100,000
	Activity 2.4 Develop and use a social-cultural framework to enable inclusive or participatory SFM that take account	URT Government, Development	6 months	10,000

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	of the local communities and wider society.	Partners, and Private Sector.		
	Activity 2.5 Revive, Redesign and implement a national tree planting programmes and initiatives.	URT Government, Development Partners, and Private Sector.	4 years	1,000,000

Table 5: Summary matrix for Agroforestry

Sector	Forestry			
Sub-sector	Forest Management			
Technology	Agroforestry			
Ambition	500,000 households			
Benefits	Mitigate GHG emission (20 tons per ha per year)			
Sources of funding	URT Government, Development Partners, and Private Sector.			
Action	Activities to be implemented	Sources of funding	Time frame	Budget per activity
Action 1. Provide incentives to Improve awareness for the adoption and uptake of agroforestry.	Activity 1.1 Develop training and learning systems on the benefits of agroforestry and the value of agroforestry products. To include technical training to extension workers	URT Government, Development Partners, and Private Sector.	4 years	100,000
	Activity 1.2 Design and deliver extension services for agroforestry systems, to include public awareness campaigns, cross learning and exchange visits.	URT Government, Development Partners, and Private Sector	4 years	1000,000
	Activity 1.3 Review and improve research in agroforestry (including participatory learning and action research).	URT Government, Development Partners, and Private Sector.	4 years	500,000
	Activity 1.4 Build a market based systems (e.g. social enterprise) to enable farmers grow and sell seedlings and other agroforestry products to other farmers and wider markets	URT Government, Development Partners, and Private Sector	1.5 years	100,000
	Activity 1.5 Design and Operate Agroforestry facility, to provide technical assistance and funding for agoforestry promotion.	URT Government, Development Partners, and Private Sector	4 years	1,000,000

Table 6: Summary matrix for Mangrove Forest Conservation

Sector	Forestry			
Sub-sector	Mangroves			
Technology	Mangroves Conservation			
Ambition	70,000 ha			
Benefits	Mitigate GHG emission (98 tons/ha/year)			
Sources of funding	URT Government, Development Partners, and Private Sector			
Action	Activities to be implemented	Sources of funding	Time frame	Budget per activity

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Action 1: Improve mangrove conservation policy, legal and regulatory frameworks	Activity 1.1 Review and design integrated mangrove management plan	URT Government, Development Partners, and Private Sector	1 year	100,000
	Activity 1.2. Review and update laws and regulations governing management of mangrove forests including permitting and licencing systems	URT Government, Development Partners, and Private Sector	1 year	50,000
	Activity 1.3. Develop and implement law enforcement and compliance education programme.	URT Government, Development Partners, and Private Sector	4 years	20,000
	Activity 1.4. Review and strengthen the national institutional framework on mangroves management	URT Government, Development Partners, and Private Sector	4 years	20,000
	Activity 1.5. Implementation of the integrated mangrove management plan	URT Government, Development Partners, and Private Sector	4 years	1,000,000
Action 2: Increase access to alternative economic and livelihood opportunities	Activity 2.1. Invest and conduct research on sustainable alternative economic activities for people living in and around mangrove forests	URT Government, Development Partners, and Private Sector	4 years	200,000
	Activity 2.2. Conduct training to communities on sustainable alternative coastal livelihood approaches	URT Government, Development Partners, and Private Sector	4 years	100,000
	Activity 2.3. Design and implement training to support value addition and improvement of quality of community products.	URT Government, Development Partners, and Private Sector	4 years	100,000
	Activity 2.4. Design and adopt Improved marketing strategies of products to enable communities to access markets successfully	URT Government, Development Partners, and Private Sector	4 years	200,000
	Activity 2.5 Create or adopt a financing facility to provide financial support to communities to finance alternative livelihood activities, such as ecotourism. To include trtraining and promotional materails	URT Government, Development Partners, and Private Sector	4 years	250,000

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ABBREVIATIONS AND ACRONYMS

ABPP	Africa Biogas Partnership Programme
AGENDA	Agenda for Environment and Sustainable Development
AFREA	Alberta Federation of Rural Electrification Association
ARTI	Appropriate Rural Technology Institute
BoT	Bank of Tanzania
BoQ	Bill of Quantities
CARMATECH	Centre For Agriculture Mechanization And Rural Technology
CBO	Community Based Organisation
CBFM	Community-Based Forest Management
CDM	Clean Development Mechanism
CIF	Climate Investment Funds
CPF	Collaborative Partnership on Forests
CTI	Confederation of Tanzania Industries
CO ₂	Carbon Dioxide
DADPs	District Agricultural Development Plans
DC-AC	Direct Current – Alternate Current
DGIS	Netherlands Directorate-General of Development Cooperation
DTU	Danmarks Tekniske Universitet
ERC	Energy Research Centre
EWURA	Energy and Water Utility Regulatory Authority
EU	European Union
FAO	Food and Agricultural Organisation
FBO	Faith Based Organisation
FCC	Fare Competition Commission
FiT	Feed-in-Tariffs
FLR	Forest Landscape Restoration
GEF	Global Environment Facility
Gg	Gigagrams
GHG	Green House Gases
GoT	Government of Tanzania
GPS	Global Positioning System
GTZ	German Organisation for Technical Cooperation
GWh	Gigawatt hour
HDPE	High-density polythene
Hivos	Humanist Institute for Development Cooperation
INDCs	Intended Nationally Determined Contributions
IUCN	International Union for Conservation of Nature
JFM	Joint Forest Management
kg	Kilogram
kJ/kg	Kilo Joule per Kilogram
kW	Kilo Watt
kWh/m/day	Kilo Watt hour per meter per day
LPG	Liquefied Petroleum gas

MALF	Ministry of Agriculture, Livestock and Fisheries
MCA	Multi- Criteria Analysis
MDAs	Ministry Departments and Agencies
MOE	Ministry of Energy
MFI	Multilateral Finance Institutions
MFP	Ministry of Finance and Planning
MITI	Ministry of Industries, Trade and Investments
MNRT	Ministry of Natural Resources and Tourism
MTPY	Metric Tonne Per Year
Mt C ha ⁻¹	Metric Tonne Carbon per Hectare
MV	Medium Voltage
MW	Mega Watt
MWe	Mega Watt electric
MWh	Mega Watt Hour
MWp	Mega Watt Power
NAFORMA	National Forestry Resources Monitoring and Assessment
NEP	National Environmental Policy
NG	Natural Gas
NGOs	Non-Governmental Organisations
NTFPs	Non-timber forest products
PES	Payments for Ecosystem Services
PPP	Public-Private-Partnership
PSMP	Power Sector Master Plan
PV	Photo Voltaic
RALG	Regional Administration and Local Governments
R&D	Research and Development
RE	Renewable Energy
REA	Rural Energy Agency
REDD	Reducing emissions from deforestation and forest degradation
REDF	Renewable Energy Development Fund
SCF	Strategic Climate Fund
SDGs	Sustainable Development Goals
Sida	Swedish International Development Cooperation Agency
SFM	Sustainable Forest Management
SPP	Small Power producers
SPPA	Small Power Purchase Agreement
SREP	Scaling-Up Renewable Energy Programme in Low Income Countries
SSMP	Sustainable Solar Market Packages
SNV	Netherlands Development Organization
TANESCO	Tanzania Electric Supply Company Ltd.
TAPs	Technology Action Plans
TaTEDO	Tanzania Traditional Energy Development Organisation
TCCIA	Tanzania Chamber of Commerce, Industries and Agriculture
TEDAP	Tanzania Energy Development And Access Expansion Project
TFS	Tanzania Forest Service Agency

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TIC	Tanzania Investment Centre
TMA	Tanzania Metrological Agency
tCO ₂ /y	Tonne of Carbon Dioxide per year
TNA	Technology Needs Assessment
TRA	Tanzania Revenue Authority
TPSF	Tanzania Private Sector Foundation
t/y	Tonne per Year
TZS	Tanzania Shilling
UDSM	University of Dar es Salaam
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNGA	United Nations General Assembly
UNIDO	United Nations Industrial Development Organisation
UNFCCC	United Convention on Climate Change
UNGA	United Nations General Assembly
URT	United Republic of Tanzania
USA	United States of America
USAID	United States Agency for International Development
USD	United Stated Dollar
VETA	Vocational Education Training Authority
VPO	Vice President's Office
WB	World Bank

CHAPTER 1: TECHNOLOGY ACTION PLAN AND PROJECT IDEAS FOR ENERGY

1.1. TAP for Energy Sector

The Technology Needs Assessment (TNA) for Tanzania for climate change mitigation has three (3) main deliverables namely; TNA Report, Barrier Analysis and Enabling Framework Report and Technology Action Plans. The initial TNA report (URT, August 2016) focused on the process of identifying, and prioritizing sectors and technologies to be taken to the barrier analysis stage under the Energy sector and Forestry sector. The selected technologies for the energy sector were Mini and Micro Hydro, Sustainable use of biomass fuel and Solar PV.

The second deliverable– Barrier Analysis and Enabling Framework report – analysed the likely barriers to the transfer and diffusion of the prioritised technologies and suggested measures to address the identified barriers. Its main aim was to assess and find ways to overcome barriers facing the transfer and diffusion of technologies for climate change mitigation in Tanzania in the Energy Sector. The third deliverable is this Technology Action Plans (TAPs) Report and Project Ideas which details the activities needed and for each technology to widely diffuse the selected technologies. The TAP report is mostly based on the content from the Barrier Analysis report.

1.1.1. Sector overview

The role of the sector in GHG emissions

The study on sources and sinks of Greenhouse Gases published in the Initial National Communication in 2003 (URT, 2003), established that the GHG emissions in 1990 was about 55,208 GgCO₂ eq. Land use changes and Forestry sector made the largest contribution i.e. 53%, following by agriculture (33%) and energy (13%) (URT, 2003). Table 7 shows the emissions of GHG from the energy sector

Table 7: GHG Emission in the Energy Sector (URT, 2003)

Fuel combustion	Emissions of Carbon Dioxide (CO ₂) in Gigagrams (Gg) (1990)
Stationary Combustion in Industry	559
Thermal Power Generating Plants	74
Mobile Combustion	1,124
Activities Others (fossil fuels in households)	265
Total	2022

Source: Initial National Communication 2003

The 2010 estimated emission, based on linear change of energy trend and assuming similar energy mix, is about 5283 Gg.

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The INDC development process identified priority sectors for mitigation through a review of various climate change and economic development sector documents. The INDC identified mitigation priority sectors as Energy, Transport, Forestry and Waste management. These were presented to TNA stakeholders during the sector prioritization workshop held on 20th November 2015. Energy and Forest were prioritised for further work

Existing Regulatory tools

Tanzania has in place policies and laws that may be used to promote the mitigation of climate change from energy sector. Table 8 summarises the relevant policies and Laws.

Table 8: The Existing Policies and Laws in the Energy Sector

Existing Policies/ Laws	When Enacted	Main Content
Policies		
Environmental Policy	1997	<p>The National Environmental Policy (NEP) is the overarching policy that sets broad goals for environmental protection and committing Tanzania to sustainable development. The policy provides the framework for the formulation of plans, programmes and guidelines for the achievement of sustainable development. Relevant sections include:</p> <ul style="list-style-type: none"> a) Sections 28 and 29 - require that technologies used should be those that generate no or low waste or protect environment, use resources efficiently are less polluting etc. b) Section 52 - advocates for the sound management of the impacts of energy development and use in order to minimise environmental degradation. c) Section 52(b) - advocates for promotion of sustainable renewable energy resources and d) 52(d) - advocates for energy efficiency and conservation.
Energy Policy	2000	<ul style="list-style-type: none"> a) It aims to establish efficient energy production, procurement, transportation, distribution and end-use systems in an environmentally sound and sustainable manner. b) It promotes the use of renewable energy. c) It advocates for the establishment of an institutional framework with conceptual, administrative and financial resources to mobilise, co-ordinate and guide the development of renewable energy.
Zanzibar Environmental Policy	2013	<ul style="list-style-type: none"> a) It acknowledge that Climate change is one of the biggest global problems posing challenges to sustainable livelihoods and economic development b) It promotes use of renewable energy, energy efficient appliances, affordable energy sources such as biomass etc.
c) Laws		
Environmental Management Act, Cap 191	2004	<ul style="list-style-type: none"> • Section 64 promotes the use of renewable sources of energy by, among other things, creating incentives for the promotion of renewable sources of energy. • Section 75, requires the Minister in consultations with

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Existing Policies/ Laws	When Enacted	Main Content
		relevant sector Ministries to (a) take measures to address climate change, particularly the impact of climate change and adaptation measures (b) issue guidelines periodically to Ministries and any other institutions in order to address climate change and its impacts as a result of global warming.
The Zanzibar Environmental Management Act	2015	<ul style="list-style-type: none"> Establishes a climate change unit in each Ministry and Local Government Authority which is responsible for environmental and climate change issues.
Electricity Act	2008	It promotes use of indigenous energy resources
Strategies and Plans		
Scaling-Up Renewable Energy Programme (SREP) Investment Plan for Tanzania	2013	<ul style="list-style-type: none"> Special attention is given to increasing energy access using renewable energy resources which are abundantly available throughout the country The role of SREP is to catalyse large scale deployment of renewable energy technologies in addressing the issue of energy poverty for our country and communities through its contribution in delivering energy from geothermal and other renewable energy resources
Tanzania Climate Change Strategy	2012	<ul style="list-style-type: none"> The goal of the Tanzania Climate Change Strategy is to enable Tanzania to effectively adapt to climate change and participate in global efforts to mitigate climate change with a view to achieving sustainable development
Zanzibar Climate Change Strategy	2014	<ul style="list-style-type: none"> Because of vulnerability of Zanzibar to Climate Change the Climate change strategy is focussing on adaptation

Current technology profile

Currently, Tanzania has an installed power generation capacity of only about 1,500 MW, distributed as shown in Table 9:

Table 9: Current technology profile

Sources of Electric Power Generation		Installed Capacity	
		(MW)	Percentage
Renewable Energy	Hydropower	556	37.3%
	Biomass & waste	19	1.3%
	Imports (for now all are hydropower)	14	0.9%
	Sub Total	589	39.5%
Fossil Fuel	Natural gas	594	39.8%
	Diesel and oil	322	21.6%
Sub Total		916	61.4%
Total Installed Capacity		1,491 MW	100%

Prioritised technologies

The prioritized technologies for the sector are (1) **Mini and Micro Hydropower** (2) **Sustainable use of biomass fuel (in which there were sub-technologies** - Co-Firing of Biomass with fossil fuels in Cement Industry, Compact Biogas Digester for urban Households and Improved charcoal stoves) and (3) Solar PV (small scale systems and large scale systems). The barrier analysis showed that co-firing of biomass and household charcoal stoves do not make economic sense since they had negative Net Present Value. Therefore these technologies were not included in this TAP.

The Compact Biogas Digester for Urban Households

The Compact Biogas Digesters for Urban Households are aimed at helping the urban households to partially substitute imported liquefied Petroleum gas (LPG) or kerosene used for cooking with biogas. The Compact biogas digesters will also minimize charcoal use which is exerting pressure on natural forests. This will in turn conserve the CO₂ sink. Use of a compact biogas digester which could be accommodated in an urban household is recommended for this purpose. The feed stock for the biogas digester would be household domestic waste.

Mini and Micro Hydropower

Renewable energy exploitation in the country is still at an initial stage. Out of estimated 315 MW small hydro potential in Tanzania less than 20.5 MW have been exploited at four installed power plants. The Ministry of Energy (MOE) through Rural Energy Agency (REA) has been funding studies for small hydro power plants. TANESCO has already signed Letters of Intent for six small hydro projects with a combined capacity of 29.9 MW. The MOE is currently carrying out small hydro feasibility studies in eight regions of Morogoro, Iringa, Njombe, Mbeya, Ruvuma, Rukwa, Katavi, and Kagera. GVEP International, in partnership with REA is supporting the development of six mini hydro mini-grids with total capacity in the 7.4- 8.8 MW range. EU is financing the Yovi Hydro Power project and Sustainable Community-Based Hydro Power Supply; and UNIDO is co-funding the development of six mini-grids based on mini/micro hydropower. Use of mini / micro hydropower will be suitable in rural areas where there is no national grid, where majority of people are using wood fuel in inefficient traditional three stone cook stoves.

The Solar PV

Tanzania has high levels of solar energy, ranging between 2800 – 3500 hours of sunshine per year and a global radiation of between 4 to 7 kWh/m/day. Solar photovoltaic energy is uniquely useful in rural areas not served by the National grid to provide basic services such as irrigation, refrigeration, communication and lighting, but also can be utilised in urban areas to minimise the use of fossil based electricity. The pollution problem of photovoltaic is very much lower than the standard fossil-fuel power plant.

1.1.2. Action Plan for Biogas Digesters for Urban Households

1.1.2.1. Introduction

The majority of energy used by households for cooking in the urban centres is charcoal and liquefied petroleum gas. The average LPG use in 2016 stood at 4.4 thousand barrels per day (EWURA, 2017). Tanzanians also consume about 1 million tonnes of charcoal per year, the majority of which is produced using an archaic and extremely inefficient earth mound technique. It is claimed that Tanzania is losing about 700 acres of forest every day, and charcoal production also contributes significantly to this. The result of this is the generation of about 183,000 tCO₂ per year from LPG and loss of about 4,100 tCO₂ sink per year.¹

Therefore the Compact Biogas Digesters for Urban Households are aimed at helping the urban households to partially replace imported liquefied Petroleum gas (LPG) or kerosene and charcoal used for cooking with biogas, thereby mitigating the above impacts.

1.1.2.2. Ambition of the TAP

This action plan is based on a deployment of 100,000 urban household units replacing 9,000 tonnes of LPG per year, 328,500 t/y of unsustainable charcoal² or fire wood per day in 5 to 10 years. The focus will be in the Cities where 95% of households use charcoal and LPG daily.

1.1.2.3. Actions and Activities selected for inclusion in the TAP

Summary of barriers to Biogas Digesters

The Barrier Analysis stage identified several barriers that may derail the diffusion of the technology. These were grouped under economic and financial barriers, non-financial barriers, and policy and legal barriers, social cultural and behaviour barriers. The following sections expounds on these barriers and measures proposed to address them.

Economic & financial barriers

Inadequate awareness on Economic and financial feasibility of the technology: compact biogas digester technology is not a common technology and as such awareness on the benefits of compact biogas digester (both investors and users) is low. Attracting investors in this technology and mobilising critical mass of people to use the technology as a way of attracting investors is a major challenge that needs to be tackled.

High capital cost: The up-front cost of a biogas system is higher than for LPG, since an LPG bottle plus a single burner stove costs only TZS 70,000/- (approx. USD 31) whereas the compact biogas plant plus a biogas stove costs about TZS 500,000/- (approx. USD 227). However, the operational cost for biogas is zero if the plant uses only food wastes. Over the lifetime of the digester, this is much cheaper than LPG, which costs about TZS 14,000/- assuming that a 15kg LPG Cylinder can be used for 60 days. The situation will even be in favour of the charcoal stove since it costs less than USD5 and about USD1.5 per day to operate.

¹ Assuming 270 trees per acres and 22kg of CO₂ sequestration per tree

² ***Tanzania burns one million tons of charcoal each year, which amounts to clearing more than 300 hectares (about 750 acres) of forest every day to produce charcoal.***

Difficulty to access finance: Compact biodigester is not a common technology; as such commercial banks in Tanzania are not keen to finance them. Furthermore, the current bank lending rates are exorbitantly high (on average 23%), which are not user friendly to private borrowers. For these reasons, the commercial banks do not have enthusiasm in providing required finances for compact biodigester project and the lenders are not willing to borrow money at such high interest rates for the projects that may prove burdensome to sustain.

Non-Financial barriers

Information & awareness barriers: Private sector and potential users of technology are not informed of economic viability of this technology.

Policy, legal and regulatory barriers

Externalities of fossil fuel firing not internalized: both LPG and charcoal prices do not include environmental costs as such their prices are very low compared with compact biodigester.

Social cultural and behavioural barriers

Convenience to and acceptability by consumers: Although kitchen wastes such as vegetable peelings also can be used as feed material, the use of such materials causes two difficulties:

- a) Need to be first macerated using a device such as hand-operated meat mincer prior to feeding the digester.
- b) Fibrous materials are slow to digest and take a longer resident time in the digester slowing down the digestion process and resulting in inadequate gas generation. For the above two reasons, the uptake of this technology is expected to be low if measures to address these barriers are not put in place.

Summary of measures to overcome the barriers to Biogas Digeters

The following measures were identified to mitigate barriers.

Economic and financial measures

- a) **Inadequate awareness on Economic and Financial feasibility of the technology:** Relevant state institutions such as CARMATEC, University of Dar es Salaam, Ardhi University, TaTEDO etc. should be encouraged to carry out financial feasibility studies of compact biodigester and publicize study results. Technical and financial assistance for these studies may be sought from donor agencies. These studies should address all relevant externalities.
- b) **High capital costs:** In a short term reduce or eliminate Government taxes on imports; concessions in the form of tax reduction or waivers would be an incentive for easy diffusion of the compact biogas technology. In a longer term promote local fabrications and constructions of the technology. Donor agencies having a mandate to promote these technologies in developing countries need to consider providing funds to private sector institutions, particularly those manufacturing the technology locally, on concessionary terms to access these technologies.

- c) **Difficulties to access finance:** Provide incentives to reduce borrowing costs. MOE should work with the Ministry of Finance and Planning to identify supportive legislation interventions that may promote use of renewable technologies including biogas digesters.

Non-financial measures

Private sector not informed or invited to participate: In order to address the above barrier, it is recommended that the relevant state institutions such as CARMATEC, University of Dar es Salaam (UDSM), Ardhi University, TaTEDO etc. conduct economic and financial feasibility studies of these technologies and make the study results available to the private sector.

Policy, legal and regulatory measures

Externalities of fossil fuel firing not internalized: Externalities such as the impacts on environment, impact on agriculture due to acidification of agricultural land etc. are not included in the “costs” of generation. As these external costs are not considered, use of LPG and unsustainable charcoal appears to be very much cheaper than that of renewable sources. It is recommended that for comparison purposes, the compact biogas digester should be subsidised.

Technical measures

Technology not fully developed for compact biogas digester technology to a level of public acceptance: Relevant R&D Institutions should carry out further research to address technical impediments such as inadequate of mixing, optimum resident time, proper sealing of the biodigester, optimum amount of water to be used, pressure regulation etc.³ Furthermore, research is required to identify additional raw materials to supplement the household leftovers.

Social, culture and behaviour measures

Convenience and acceptability of compact biogas digester by consumers not evaluated: Relevant government institutions should develop communication strategy, awareness materials and promotional strategies to ensure public acceptance of compact biogas digesters.

Actions selected for inclusion in the TAP

- a) Establish feasibility of compact biodigester: At the moment the market for compact biogas biodigester is not known. Investors will need assurance that the business is feasible before they engage themselves. This study will not remove the necessity of the investor to carry out their own feasibility study
- b) Create awareness of both developer, and users of the technology: It is important that users as well as inventors are aware of not only the potential of the technology but also the benefits of the technology
- c) Enhance access to financing: Current lending rates are a major deterrent to investors to enter into long term financing arrangement from the commercial banks.

Activities for implementing the above actions

³³ <https://noharm-us Canada.org/.../573-Tech%20Specs-Biogas%20Digesters-final.doc> (Accessed on 06th February 2017)

Table 10 Provides a summary of activities that need to be implemented under the TAP for each action listed above.

Table 10: Activities to be implemented to enhance diffusion of biogas digesters

Action	Activities
1. Establish feasibility of compact biodigester	1.1. Conduct economic feasibility of the biogas digester 1.2. Carry out market survey to identify potential adopters and their willingness to adopt the technology
2. Create awareness of both developer, and users of the technology	2.1. Develop awareness material targeting different stakeholders (i.e. Private Sector, Decision Makers, Users of Compact biodigester, financial institutions) 2.2. Develop a communication strategy Profile the target stakeholders particularly the adopters of the technology 2.3. Implement awareness campaign on compact biodigester
3. Enhance access to financing	3.1. Develop financial incentives to assist lowering the cost of compact biodigester 3.2. Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit

Actions to be implemented as project Ideas

Two of the above actions (namely feasibility study and awareness raising) will be considered for implementation as project ideas. The two actions were selected during the barrier analysis and measures identification stage as per TAP preparation guidelines.

1.1.2.4. Stakeholders and Timelines for Implementation of the TAP

Stakeholders

Table 11 provides a list of stakeholders to implement different activities

Table 11: List of activities and respective stakeholders to implement them

SN	Activities	Responsible body
1.	Conduct economic feasibility of the biogas digester	University of Dar es Salaam Ardhi University CARMATEC
2.	Carry out market survey to identify potential adopters and their willingness to adopt the technology	University of Dar es Salaam Ardhi University
3.	Develop awareness material targeting different stakeholders (i.e. Private Sector, Decision Makers, Users of Compact biodigester, financial institutions)	NGOs (AGENDA, TaTEDO)
4.	Develop a communication strategy Profile the target stakeholders particularly the adopters of the technology	Ministry of Energy NGOs (AGENDA, TaTEDO)

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SN	Activities	Responsible body
5.	Implement awareness campaign on compact biodigester	NGOs (AGENDA, TaTEDO)
6.	Develop financial incentives to assist lowering the cost of compact biodigester	Ministry of Energy Ministry of Finance and Planning
7.	Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit	Ministry of Energy Ministry of Finance and Planning Vice Presidents Office

Roles of stakeholders

The roles of stakeholders are shown in Table 12

Table 12: Roles of different stakeholders

SN	Stakeholder	Role
1.	Ministry of Energy	Responsible for energy policies Oversees energy projects Sourcing for funds to implement the technology Responsible to present energy strategies and programmes to cabinet Promotes renewable energies
2.	Vice President Office is	Focal Point of the United Nations Convention on Climate Change Sourcing funds from climate funds and Global Environmental Facility Responsible for environmental policies and environmental management
3.	Ministry of Finance and Planning	Responsible for financial policies including incentives
4.	Ministry of Foreign Affairs and East Africa Cooperation	Responsible for foreign relations
5.	University of Dar es Salaam,	Responsible for teaching, research and development
6.	Ardhi University,	Responsible for teaching, research and development
7.	CARMATEC NGOs	Responsible for research and development
8.	NGOs (AGENDA, TaTEDO)	Responsible for awareness creation Promotion of technology

Scheduling and sequencing of specific activities

Table 13 describes the sequence and timing of specific activities and responsibilities.

Table 13: Scheduling of activities

Action	Activity	Planning	Implementation	Responsible body
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Action	Activity	Planning		Implementation		Responsible body
		Start	End	Start	End	
Establish feasibility of compact biodigester	Conduct economic feasibility of the biogas digester	2019	2019	2019	2019	UDSM ARU CARMATEC
	Carry out market survey to identify potential adopters and their willingness to adopt the technology					UDSM ARU CARMATEC
Create awareness of both developer, and users of the technology	Develop awareness material targeting different stakeholders (i.e. Private Sector, Decision Makers, Users of Compact biodigester, financial institutions)	2019	2019	2019	2019	NGOs (AGENDA, TaTEDO)
	Develop a communication strategy Profile the target stakeholders particularly the adopters of the technology	2019	2019	2019	2019	NGOs (AGENDA, TaTEDO)
	Implement awareness campaign on compact biodigester			2019	2020	NGOs (AGENDA, TaTEDO)
Enhance access to financing	Develop financial incentives to assist lowering the cost of compact biodigester	2019	2019	2019	2019	MOE MFP
	Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit	2019	2019	2019	2022	MOE MFP VPO

1.1.2.5. Estimation of Resources Needed for Action and Activities

In order for the technology diffusion to succeed and to be sustained there is a need to build capacity of local manufacturers particularly artisans, installers and fabricators. In order to ensure accelerated diffusion there will be a need train the trainers to ensure replication of training programmes in as many Regions as possible.

The activities that will be conducted and cost implication are shown in Table 14.

Table 14: Cost implication for implementing the identified activities

SN	Activity	Estimated Cost (USD)	Source of Funds	Justification
1.	Establish a unit to oversee the	36,000	GoT,	Recruit at least

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SN	Activity	Estimated Cost (USD)	Source of Funds	Justification
	implementation of the TAP		Development partners	two people; conduct training on CBD; Office furniture
2.	Conduct economic feasibility of the biogas digester	20,000	GoT	Engage a researcher;
3.	Carry out market survey to identify potential adopters and their willingness to adopt the technology	11,000	GoT, Development partners	Develop survey instruments, conduct survey, stakeholder meetings
4.	Develop awareness material targeting different stakeholders (i.e. Private Sector, Decision Makers, Users of Compact biodigester, financial institutions)	10,000	GoT, Development partners	Prepare awareness raising materials, print the materials, disseminate the materials
5.	Develop a communication strategy Profile the target stakeholders particularly the adopters of the technology	5,000	GoT, Development partners	Engage a consultant; implement the strategy
6.	Implement awareness campaign on compact biodigester	20,000	GoT, Development partners	Conduct awareness campaign, TV and Radio programmes
7.	Develop financial incentives to assist lowering the cost of compact biodigester	20,000	GoT	Conduct meetings; develop cabinet paper;
8.	Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit	10,000	GoT	Develop position paper, conduct meetings;
	Total	132,000		

1.1.2.6. Management Planning

Potential risks

Table 15 provides the possible risks and possible measures to address the risks to ensure that the implementation of technology is not derailed.

Table 15: Overview of risk categories and possible contingencies

Risk item view of risk categories and possible contingencies	Description	Contingency action
Cost Risks	There is no cost risk for this technology	NA
Scheduling Risks	Delays in putting in place policies that will facilitate the diffusion of the technology. These policy on incentives, policy on Renewable Energy. Delays in conducting feasibility study	Conduct high level discussion with the Vice President to support the intervention Sensitise Parliamentary Committee on Environment to push for these policy Develop MoU with respective R&D to ensure timely delivery of feasibility study
Performance Risks	A technology does not perform as planned e.g. it does not generate enough biogas to justify the replacement of LPG	Develop contract with supplier of technology to provide after sale service Develop a platform to collect complaints on the technology to ensure the complaints are attended to

Potential next steps

Table 16 provides a summary of next steps to facilitate the implementation of the project.

Table 16: Summary of steps to be taken to implement the project

Immediate Requirements:	A project manager within the Vice President’s Office should be appointed and must be funded, and assigned full-time and provided with the following tools and resources: e.g. access to a financial analyst and cost estimation expertise; and, planning, scheduling and “project management” hardware and software, and other immediate activities required.
Critical Steps:	Awareness raising is critical as changing peoples habits from using charcoal to biogas; or LPG to biogas might be a hindrance to fast diffusion of the technology

1.1.3. Action Plan for Mini Hydropower

1.1.3.1. Introduction

About 75 percent of Tanzanians live in rural areas, and almost 95 percent of them do not have access to electricity. Lack of access is exacerbated by the fact that majority of these communities are far away from the national grid. To support equitable rural development and to improve economy

and quality of life of rural people, the GoT has committed to an aggressive rural electrification program. The 2012 PSMP Update is planning towards 50 percent electricity coverage of the population by 2025 and 78 percent by 2035. Providing electricity to the rural population is challenging compared to urban areas. It affects many more people, and because of the low population density and dispersed nature of settlements, comes at a high cost, even though these people are the least able to afford to pay for electricity services.

Given the dispersed nature of rural populations and low densities, electricity access will have to be accomplished using a combination of grid extension, mini- and micro-grids, and stand-alone systems. A preliminary investigation has mapped the population distribution in relation to the MV grid network and characterized the distribution of population by density and identified the population best served by extending the TANESCO grid, served through mini-grids and those best served through solar PV micro-grids and stand-alone systems. The mini-grids may be powered by a range of energy sources, such as small hydro, biomass, biogas, solar, wind and hybrids.

1.1.3.2. Ambition of the TAP

This technology is intended to establish installed power generation capacity of 100MW which is equivalent to 876,000MWh per year. Assuming that the majority of the people will be using 100kW per month, about 1,000,000 people can access electricity. The benefits that will be accrued from this effort include: avoiding powering these off grid communities using diesel powered electricity. This will avoid about 0.378 megatons per year of CO₂ emission; minimising use of kerosene (in 2013 Tanzania used 53,000tonnes of kerosene). About 5% of households use kerosene for cooking and lighting, being the second to Charcoal. Cost wise LPG is the most expensive (TZS 31,874 per month), Charcoal (TZS 30,611/- per month) and Kerosene (TZS 18,156/- per month). Electricity is currently used by 0.3% of the households for cooking, which can be attributed to limited access. As such improved access to electricity may increase the number of households that use electricity particularly if the barriers associated with this technology are addressed.

1.1.3.3. Actions and Activities selected for inclusion in the TAP

Summary of barriers to mini hydropower project

Barrier Analysis and Enabling Framework – identified several barriers that may derail the diffusion of the technology. These were grouped under economic and financial barriers, non-financial barriers, technical barriers, policy, legal and regulatory barriers. The following sections expounds on these barriers and measures proposed to address them.

Economic and financial barriers

High investment costs of the equipment, and distribution network: While renewable energy projects promise to be attractive for private sector participation because of their size and the availability of renewable energy sources in the area, they are still perceived to be expensive, as a result of: (i) High pre-investment and transaction costs, high cost of resource assessment and feasibility studies, limited number of projects, lack of competition (ii) high risks: currency depreciation, payment risks, resource uncertainty, Long duration for pre-investment activities, financial closure and construction, may delay the actual investment.

a) Difficulty to access finance: This may be attributed to the following:

- i. Currently TANESCO as a sole off-taker of electricity generated by independent power producers. Because of financial difficulties TANESCO is not paying the generators on time as such some generators are not current with their bank loan repayment. This state of affair does not encourage banks to lend more money to RE
- ii. The majority of mini-hydropower potential are found in rural areas and they will be serving areas with no main grid. The majority of clients will be communities with limited ability to pay for electricity services. This will not attract bankers to lend money to people intending to invest in such projects.
- iii. Availability of cheap fuel (wood, charcoal and kerosene) will compound the difficulty of using electricity
- iv. The rate of return from these projects is much lower than some of the other projects such as tourism or trading.
- v. The bankers appear to have reluctance to consider the project itself as the co-lateral for the loan and insist on immovable property such as land or building as co-lateral.

A combination of these factors makes access of mini and Micro scale hydropower projects to financing difficult.

b) Economic viability not well understood: The economic viability of Micro hydro power projects is not well understood. This could be attributed to a number of reasons, namely

- i. Lack of information and uncertainty on grid extension plans reduces the incentive to develop mini-grid projects, including supply of renewable electricity to TANESCO isolated grids
- ii. Although there is already identified potential hydropower sites, there is lack of long term hydrological data for these sites
- iii. Lack of data or reliable data and information on quality and duration of the resource exacerbate uncertainty of the resource. Hence the utility and developers have apathy towards investing in these ventures.

c) Low purchasing power of the rural communities: Much of Tanzania does not have access to grid electricity supply. The Rural Electrification Investment Prospectus study which estimated the split of the population by electrification options indicates that about 50 % of the population in rural areas may best be served using mini-grid and off-grid means – if the 2025 goal of electrifying 50% of population is to be achieved. However, distribution to households, which in general terms will be low energy users, is likely to be marginally economic in many circumstances. Therefore the limited ability to pay in rural areas for electricity services is considered to be a major disincentive.

Non-financial barriers

a) Limited human and institutional capacity: Alternative energy technologies, apart from the use of traditional biomass, are a new topic in Tanzania education system. Young professionals entering the power sector do not have sufficient knowledge on these technologies. Therefore, there is limited expertise in Tanzania for undertaking feasibility studies, detailed design, construction, etc. of the mini-hydropower projects. Furthermore, since mini and micro-hydropower sites are found in rural areas, it is difficult to find qualified staff willing to be posted in rural areas.

- b) **Insufficient information and data:** Although it is often stated that Tanzania has significant hydro potential that could be considered in a least cost expansion plan, there is insufficient information and data to more precisely estimate the true potential. This lack of long term hydrological data blurs attractiveness of mini/micro-hydropower projects development.
- c) **Easily accessible and low/no cost supplies of fuel wood:** As long as the majority of people continue to have access to low/no cost supplies of fuel wood from forests, where extraction enforcement is lacking, incentive to use electricity, particularly for cooking, will remain low. This is a further disincentive to invest in these mini / micro hydropower plants.
- d) **Inadequate weather related information:** The weather related information generated by the Tanzania Metrological Agency (TMA) is aimed at catering to the routine forecasting aspects. Impact of variation of weather and climate on mini and Micro hydropower resources cannot be made with needed accuracy. The energy sector needs continuous and very much updated data. Unless the resources of TMA are enhanced such vital information cannot be generated on behalf of the energy sector.

Technical barriers

- a) **Technology not widely available:** There is still a low number of mini / micro hydropower project commercially operating in Tanzania. As such there is still limited experience on the challenges faced by the operators to run these facilities in the rural setting.
- b) **Poor infrastructure - Electricity grid limitations, telecommunication, road and railway networks:** Unfortunately Micro and mini hydropower sources are found in remote areas where infrastructure particularly roads, is not developed. Increasing the share of renewable energy in the system would require the construction and operation of new renewable energy based power projects in the locations where these resources are available. This would involve transporting of heavy machinery to these locations. To facilitate these activities, the road and railway networks need to be enhanced.
- c) **Complexity of technology:** At any given instance the rate of total energy generation in the system should be equal to that of the total energy consumed from the system. If this balance is not maintained, the stability of the system would be seriously affected. As the population served and there might be no entity to off take excess electricity it requires a complex operational procedure to maintain the required stability, unless the technology is fitted with electronic load control to dump artificial load.

Policy, legal and regulatory barriers

Inadequate inter agency coordination: Complex and unclear processes for land use decisions, water rights namely poor catchment management and water use conflicts, environmental regulations, physical infrastructure planning, public private partnerships, taxation regimes and business licensing. Another crucial issue is what happens when the national grid is extended to the mini-grid served areas; as the mini-grid Small Power Purchase Agreement (SPPA) is no longer applicable; and a lower tariff main grid SPPA is in force. Thus Uncertainty on the future direction of power sector hampers stakeholders' investment planning. Presently, the PSMP baseline plan has limited role for renewable energy other than for large hydro, reflecting the inadequacy of data and unavailability of power planning methods that can more effectively integrate a wide range of renewable energy options,

especially distributed generation. Lack of information and uncertainty on grid extension plans reduces the incentive to develop mini-grid projects, including supply of renewable electricity to TANESCO isolated grids. Also, inadequate coordination and planning information sharing among GoT entities, private sector and development Partners, communities, NGOs, etc. makes the diffusion of mini/micro hydropower difficult. Renewable energy project preparation and approval process takes considerable time, due to complexities of bureaucratic requirements, and as smaller projects take a disproportionately longer time to bring to financial closure.

Summary of measures to overcome the barriers

The following measures were identified to mitigate these barriers.

Economic and financial measures

- a) **Non-conventional (renewable) energy options are perceived as more expensive as externalities of conventional technologies are not internalized:** Costs of technology options should include the externalities during generation planning. The internalisation may be in form of Pigouvian tax (a **tax** levied on any market activity that generates negative externalities (costs not internalized in the market price).⁴Possible instruments to internalise external environmental costs are emission taxes, full costs adders⁵ or the trading of emission permits.
- b) **High capital cost:** Remove or minimise Government taxes (e.g. value added tax, Exercise duty, import tax) on local fabrications and constructions. In order to increase the contribution by Micro hydro projects, the capital costs of these projects needs to be low enough to attract private sector investments in these projects. The following options may be considered:
 - i. The government should consider providing incentives in the form of reduced⁶ or no taxes on the imports, construction and fabrication of these power plants.
 - ii. Expand REA matching grant support programs. Offer Transaction Advisory Services by “Bundling” provision of transaction services to obtain economies of scale and to incentivize large, more experienced companies to participate. Provide cost shared assistance including possibly converting it to equity/debt on successful financial closure.
 - iii. Reduce risks by better resource assessments; bundling transaction advisory services to gain economies of scale; disseminate good practice information; increase access of developers to credible technology information and to low cost methods.
- c) **Donor agencies to consider providing investment funds on concessionary terms:** Donor agencies having mandate to promote RE technologies in developing countries need to consider providing required funds on concessionary terms to private sector institutions to enable them to access these technologies. Such funding, if necessary, may be channelled through the government treasury and through commercial banks; The Government should establish a renewable energy development funds to enhance investment in RE; Encourage Community Based Organisation (CBO) and Faith Based Organisation (FBO) to invest in RE projects.
- d) **Difficulty to access finance:** Following Measures should be considered

⁴www.plan.be/admin/uploaded/200605091448061.WP9803en.pdf (accessed on 6th February 2017)

⁵ Adders act as a surcharge to internalize external costs in the planning of fuels costs. The adder represents an amount per unit of emission that is added hypothetically to the private costs

⁶ The level of reduction should be commensurate to the intended purpose of making the mini / micro hydropower attractive to investment

- i. Offer long term financing and/or risk mitigation.
- ii. Support private-public partnerships.
- iii. Build capacity of commercial banks to lend to renewable energy projects.
- iv. Increase access to long term financing through commercial banks. Offer partial risk guarantee instruments to cover off-taker, currency and other commercial risks that foreign equity partners may require.
- v. The Government should engage with Development Partners and TANESCO to help solve current operational problems facing TANESCO, such as clearing the outstanding debts of the independent power producers, small power producers; reducing transmission losses etc.
- vi. Use output-based grants to buy-down a portion of the capital cost of off-grid services.
- vii. Micro-finance organizations could be used to provide financing, coupled with technical assistance and technology transfer.

e) Economic viability not well understood: Following Measures should be considered:

- i. Relevant state institutions should conduct feasibility studies and publicize study results
- ii. Necessary funds should be provided to conduct such studies.

f) Low purchasing power of the rural communities: Promote credit and/or pay-as-you-go solutions that allow households to spread payments of for electricity services over time. This will address lack of incentive to switch to hydropower. Currently households use high cost fuels (in this case charcoal)⁷when compared with electricity. The money saved from high cost fuel could be used to pay for the credit.⁸

Non-financial measures

a) Insufficient information and data: Following Measures should be considered:

- i. Relevant state institutions should generate and share information on mini / Micro hydropower potential in Tanzania.
- ii. Necessary funds should be provided to conduct such studies: Seek technical and financial assistance from the donor community for these studies which should include all relevant externalities of the technology concerned.

b) Easily accessible and low/no cost supplies of fuel wood: Compute true cost of using forest products. This may be used to provide subsidies to communities to switch to low cost and clean hydropower.

c) Inadequate weather related information: TMA should be provided with relevant instruments and other resources to provide required weather related information to the energy sector.

d) Lack of experts in relevant institutions: Provide required training for officials of relevant institutions.

e) Limited human and institutional capacity: Following measures may be considered:

⁷ A sack of charcoal (about 60 kg) cost TZS80,000/- and this can last for two weeks for an average family. The same electricity can be used by the average family for one month

⁸ This approach has been used successfully by Mwenga Hydropower in Tanzania to expand its distribution network

- i. Provide expanded specialized training to build the capacities on fabrication and installation of technology.
- ii. Support partnerships with international firms through South-South and North-South exchanges. Develop implementation models that can deliver services more efficiently.
- iii. Expand hydro resource characterization for mini-grids. Make information easily accessible to developers.

Technical Measures

- a) **Technology not commonly available:** Provide study tours for relevant government officials for exposure to functional mini/Micro hydropower plant technologies within and outside Tanzania to learn the opportunities and challenges experienced by the operators of the technologies.
- b) **Poor infrastructure – Telecommunication, road and railway network:** Provide necessary funds to improve relevant infrastructure facilities.
- c) **Complexity of technology:** Provide adequate exposure to relevant officials to get familiarized with these technologies

Policy, Legal and Regulatory Measures

Inadequate inter agency coordination: Strengthening the inter agency coordination

Actions selected to be included in the TAP

- a) Enhance access to financing: Current lending rates are a major deterrent to investors to enter into long term financing arrangement from the commercial banks
- b) Build / strengthen capacity of key stakeholders: development of a sustainable hydropower regime require intervention of different players including ministries, training institutions, NGOs. All these have different capacity challenges which need to be addressed.
- c) Establish mini-hydropower potential in the country: information on hydropower potential should be developed, be known to different stakeholders.

Activities to be implemented to implement the above actions

Table 17 shows activities needed to implement the above actions.

Table 17: List of activities to implement the mini-hydropower project

Action	Activities
1. Enhance access to financing	1.1. Develop financial incentives to assist lowering the cost of mini hydropower project (e.g. introduce subsidies, tax exemptions) 1.2. Sensitise the policy makers on the importance of incentives and or subsidies for the electricity to compete with other fossil fuels 1.3. Lower commercial banks’ lending rates 1.4. Establish a Renewable Energy Development Fund to enhance investment in RE 1.5. Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit
2. Build / strengthen capacity of key	2.1. Develop specialized training aimed at building the capacities in relevant institutions – in areas of fabrication, installation, operation and maintenance of mini hydropower projects

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stakeholders	2.2. Strengthen TANESCO to absorb more electricity generated from renewable energy sources 2.3. Strengthen capacity of Tanzania Meteorological Service – to generate reliable data for energy mix forecast and planning 2.4. Strengthen inter-ministerial coordination
3. Establish mini-hydropower potential in the country	3.1. Conduct study on mini-hydropower potential to cover the entire country 3.2. Develop a platform for sharing information on hydropower potential

Actions to be implemented as project ideas

One out of three actions, namely, capacity building will be considered for implementation as project idea. This was selected during barrier analysis and measures identification stage as per TAP guidelines.

1.1.3.4. Stakeholders and timeframe for implementation of TAP

Stakeholders

Table 18 provides a list of stakeholders to implement different activities

Table 18: List of activities and respective stakeholders to implement them

SN	Activities	Responsible body
1.	Develop financial incentives	Ministry of Finance and Planning Ministry of Energy
2.	Sensitise the policy makers on the importance of incentives and or subsidies	Ministry of Energy NGOs (AGENDA, TaTEDO)
3.	Lower commercial banks' lending rates	Ministry of Finance and Planning Bank of Tanzania Commercial Banks
4.	Establish a Renewable Energy Development Fund to enhance investment in RE	Ministry of Energy Development Partners
5.	Engage in dialogue with development partners	Ministry of Energy Ministry of Finance and Planning Vice Presidents Office Ministry of Foreign Affairs and East Africa Cooperation
6.	Develop specialized training	University of Dar es Salaam Dar es Salaam Institute of Technology Dar es Salaam Vocational Training
7.	Strengthen TANESCO	Ministry of Energy TANESCO Ministry of Finance and planning Development Partners
8.	Strengthen capacity of Tanzania Meteorological Service	Ministry of Works, Transport and Communication Tanzania Meteorological Agency
9.	Strengthen inter-ministerial coordination	Ministry of Energy
10.	Conduct study on mini-hydropower	University of Dar es salaam

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SN	Activities	Responsible body
	potential to cover the entire country	Ministry of Water and Irrigation Ministry of Energy Water Basin Boards
11.	Develop a platform for sharing information on hydropower potential	University of Dar es salaam Ministry of Water and Irrigation Ministry of Energy Water Basin Boards

Roles of stakeholders

The roles of stakeholders are shown in Table 19.

Table 19: Roles of different stakeholders

SN	Stakeholder	Role
1.	Ministry of Energy	Responsible for energy policies Oversees energy projects Sourcing for funds to implement the technology Responsible to present energy strategies and programmes to cabinet Promotes renewable energies
2.	Vice President Office is	Focal Point of the United Nations Convention on Climate Change Sourcing funds from climate funds and Global Environmental Facility Responsible for environmental policies and environmental management
3.	Ministry of Finance and Planning	Responsible for financial policies including incentives Responsible to negotiate loans for funding TANESCO projects
4.	Ministry of Foreign Affairs and East Africa Cooperation	Responsible for foreign relations
5.	University of Dar es Salaam,	Responsible for teaching, research and development. Responsible to teach engineers Responsible to conduct research on river hydrology
6.	Dar es Salaam Institute of Technology	Responsible for teaching technicians
7.	Dar es Salaam Vocational Training Institute	Responsible for teaching artisans
8.	NGOs (AGENDA, TaTEDO)	Responsible for awareness creation Promotion of technology
9.	Ministry of Water and Irrigation	Responsible for developing policies on water resources management
10.	Water Basin Boards	Responsible for management of water resources Responsible to issue water use permits Responsible for developing river hydrology
11.	TANESCO	The sole off-taker of electricity
12.	Tanzania Meteorology	Responsible for weather forecast

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SN	Stakeholder	Role
	Agency	
13.	Bank of Tanzania	Responsible for regulating commercial banks

Scheduling and sequencing of specific activities

Table 20 describes the sequence and timing of specific activities and responsibilities.

Table 20: Scheduling of activities

Action	Activity	Planning		Implementation		Responsible body
		Start	End	Start	End	
Enhance access to financing	Develop financial incentives	2019	2019	2019	2022	MFP, MOE
	Sensitise the policy makers on the importance of incentives and or subsidies	2019	2019	2019	2020	MOE NGOs (AGENDA, TaTEDO)
	Lower commercial banks' lending rates	2019	2019	2019	2020	MFP BoT Commercial Banks
	Establish a Renewable Energy Development Fund	2019	2019	2020	2024	MOE DPs
	Engage in dialogue with development partners					MOE, MFP VPO, MFAEAC
Build / strengthen capacity of key stakeholders	Develop specialized training	2019	2019	2019	2020	UDSM, DIT DVTI
	Strengthen TANESCO	2019	2019	2019	2020	MOE TANESCO MFP DPs
	Strengthen capacity of Tanzania Meteorological Service	2019	2019	2019	2022	MWTC TMA
	Strengthen inter-ministerial coordination	2019	2019	2019	2024	MOE
Establish mini-hydropower potential in the country	Conduct study on mini-hydropower potential to cover the entire country	2019	2019	2020	2024	UDSM MoWI MOE Water Basin Boards
	Develop a platform for	2020	2020	2020	2024	UDSM

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Action	Activity	Planning		Implementation		Responsible body
	sharing information on hydropower potential					MoWI MOE Water Basin Boards

1.1.3.5. Estimation of Resources Needed for Action and Activities

In order for the technology diffusion to succeed and to be sustained there is a need to build capacity of local manufacturers particularly artisans, installers and fabricators. In order to ensure accelerated diffusion there will be a need train the trainers to ensure replication of training programmes in as many Regions of Tanzania as possible.

The activities that will be conducted and cost implication are shown in Table 21.

Table 21: Cost implication for implementing the identified activities

SN	Activity	Estimated Cost (USD)	Source of Funds	Justification
1.	Establish a unit to oversee the implementation of the TAP	50,000	GoT, Development partners	Recruit at least two people; conduct practical training on MDP; Office furniture
2.	Develop financial incentives	20,000	GoT	Engage a researcher;
3.	Sensitise the policy makers on the importance of incentives and or subsidies	10,000	GoT,	Develop sensitisation materials, Conduct meetings
4.	Lower commercial banks' lending rates	15,000	GoT,	Engage consultant to study appropriate lending rate; conduct stakeholders meeting
5.	Establish a Renewable Energy Development Fund	10,000	GoT, Development partners	Engage a consultant to study modalities of establishing and operating a fund, stakeholder

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SN	Activity	Estimated Cost (USD)	Source of Funds	Justification
				meetings
6.	Engage in dialogue with development partners	5,000	GoT, Development partners	Develop position paper, hold meetings
7.	Develop specialized training	200,000	GoT	develop training materials, pay tuition fees and subsistent allowances
8.	Strengthen TANESCO	500,000	GoT	Implement Power Sector Reform Strategy
9.	Strengthen capacity of Tanzania Meteorological Service	500,000	GoT, Development partners	Procure specific forecast and modelling equipment
10.	Strengthen inter-ministerial coordination	5,000	GoT	Conduct meetings
11.	Conduct study on mini-hydropower potential to cover the entire country	300,000	GoT, Development partners	Field costs, equipment hire, data harvest
12.	Develop a platform for sharing information on hydropower potential	20,000	GoT	Data depository facility
	Total	1,635,000		

1.1.3.6. Management Planning

Potential risks

Table 22 provides the possible risks and possible measures to address the risks to ensure that the implementation of technology is not derailed.

Table 22: Summary of possible risks and contingency action to mitigate them

Risk Item	Description	Contingency action
Cost Risks	TANESCO, being the sole off-taker of electricity, inability to pay for electricity generated from mini-hydropower will work against more investment in mini hydropower	The government has already started discussing with development partners including World Bank to get funds to offset TANESCO debt to make sure TANESCO is efficient and reliable
	Inadequate competent local personnel may mean employing	Currently TDTC is conducting some trainings – but at a small scale – rolling out these training

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Risk Item	Description	Contingency action
	<p>personnel which may take longer to get employment permits</p> <p>Dry spells may impact electricity generation – hence negatively impacting return on investment</p>	<p>will use this experience</p> <p>TMA is currently providing forecasts but need to be strengthened</p>
Availability of Government Contribution risk	Moneys from GEF can only be given with government co-funding	<p>During project preparation all potential in kind contributions will be established</p> <p>Use Environmental Fund to co-finance GEF project</p>
Scheduling Risks	<p>Delays in putting in place policies that will facilitate the diffusion of the technology. These policy on incentives, policy on Renewable Energy.</p> <p>Delays in conducting feasibility study</p> <p>Delays in restructuring TANESCO</p>	<p>Conduct high level discussion with the Vice President to support the intervention</p> <p>Sensitise Parliamentary Committee on Environment to push for these policy</p> <p>Develop MoU with respective R&D to ensure timely delivery of feasibility study</p> <p>The Ministry of Energy to ensure respective institutions (TANESCO, MOE, EWURA) complete their assigned activities under the Energy Sector Reform Strategy according to the specified timelines</p>
Performance Risks	Dry spells may impact electricity generation	TMA is currently providing forecasts but need to be strengthened

Potential next steps

Table 23 provides a summary of next steps to facilitate the implementation of the project.

Table 23: Summary of steps to be taken to implement the project

Immediate Requirements:	<ol style="list-style-type: none"> a) The Vice President’s office needs to convene a meeting with other key players (i.e. MOE, MFP, MoWI etc.) to share the outcomes of the TAP project b) MOE to prepare a cabinet paper to ensure the outcomes of this TNA receive government blessing for implementation c) MOE together with the key players need to integrate this TAP into the national energy master plan d) After agreeing on the implementation plan MOE needs to appoint a task manager e) MOE should develop include budget line for funding TAP activities f) MOE should capacitate the office of Task Manager to start working on the implementation of the TAP
Critical Steps:	<ol style="list-style-type: none"> a) Getting Cabinet approval to roll out the TAP b) RE Policy need to be finalised to guide the investment in this area c) Incentive Policy and other supportive regulations (e.g. rules on feed-in tariffs, rules on Net Metering) must be drafted, endorsed and passed to enable the private sector run-of-river small hydroelectric projects, which are presently limited to state-owned concessions

1.1.4. Action Plan for Solar PV

1.1.4.1. Introduction

The potential for solar PV based electricity generation in Tanzania is very large. However, the development of this technology at large scale has not been implemented in Tanzania due to overdependence of hydropower in the past and natural gas based power currently. Furthermore there has not been any project developed to feed the electricity into the national grid apart from the use of household based solar PV. There is also frequent and rapid variations in the level of outputs of solar based power plants, as it can only efficiently generate power when there is clear sunshine (no dust cover and not in the night). The cost of storing electricity generated via solar power to mitigate the fluctuations in outputs is currently prohibitive. Many developed countries have resolved this problem by adjusting the demand of energy in the system and output levels of hydropower plants to match the variations in the outputs of solar PV power plants. Such adjustments are feasible only by incorporating Smart Grid/ Smart Meter technologies.

The power plant will consist of the following basic elements: PV solar panels/modules (arranged in arrays); PV module mountings; regulators; DC-AC inverters; Electricity distribution boxes; Cabling; Earthing systems; and Electrical substation.

1.1.4.2. Ambition of the TAP

The ambition for this technology is to install 100MW of solar PV capacity (which translates to 12,000MWh per month assuming 50% efficiency and 8 hours for solar insolation). Assuming that the average household uses about 100 kWh per month, 120,000 people could be supplied with solar electricity. The benefits that will be accrued from this effort include: avoiding powering these off grid communities using diesel powered electricity. This will avoid about 0.05 megatons per year of CO₂ emissions; minimising use of kerosene and charcoal. Furthermore, electricity will reduce fuel cost of the users. For example at 100kW families will use TZS 10,000/- per month while the cost of LG is about TZS 31,874 per month, charcoal is about TZS 30,611/- per month) and kerosene is about TZS 18,156/- per month.

1.1.4.3. Actions and Activities selected for inclusion in the TAP

Summary of barriers to large scale solar power

The Following are the barriers identified for solar PV technology:

- a) **Non-conventional renewable energy options are perceived as more expensive as externalities of conventional technologies are not internalized:** The Electricity Supply Industry Reform Strategy 2015 – 2025 (URT, 2014) envisage the contribution from solar will only be about 100MW out of 10,798MW (by year 2025), with hydropower, natural gas and coal contributing 9,459MW. The decision to use three sources, particularly natural gas and coal, are based only the financial benefits analysis which ignores all externalities such as the effects on human health, damage to the agricultural land, climate change etc. If these costs are internalized, the cost of generation of electricity using non-conventional renewable sources would be at par with the cost of fossil based electricity.
- b) **High capital cost:** A basic barrier to the development of solar energy technology in Tanzania is the high initial capital costs, including high installation costs with long payback times. High

initial costs may also reflect high-risk perceptions of financial institutions and a general lack of appropriate financing instruments as well as financial sectors not being ready to finance projects considered to be risky. Although there are some incentives on import or local manufacturing of solar devices in the country e.g., import duty on solar system is only 5%, most of solar projects are being promoted by donors such as the World Bank. This challenge further becomes more pronounced in the country because of the high transaction costs since most solar projects are decentralized and within the small scale range. The solar energy projects thus become too costly in the long-run and the local banks in Tanzania consider them too risky investments. The banks are prefer investments with quick returns and hence consider long-term solar projects too risky to finance.

- c) **Operation and maintenance costs:** Solar technologies have been viewed as the energy supply option for the remote and rural poor areas in the country. Currently, the operation and maintenance costs of rooftop solar systems are high in the country, due largely to lack of skilled technical personnel. Similar barriers may be true for solar power plants.
- d) **Difficulty to access finance:** Renewable energy based electricity generation projects such as solar require large capital investments. Since there is no large solar power project that is connected to the national grid and hence lack of experience with the technology, local banks may not be easily convinced that such projects are viable. Another reason that may make the banks reluctant to finance such projects is the lower rate of return from such investment compared to other projects such as trading. Moreover the difficulty of getting payment of the sold electricity from the monopoly/sole Power distributor (TANESCO) makes the bankers nervous.
- e) **Economic viability not examined:** The economic viability of integrating solar power projects with the national grid using smart grid technologies with the view to enhance the share of renewable energy in the energy mix has not been carried out in Tanzania. Hence the utility and developers may not be having convincing data and information to rely on.

Non-financial barriers

- a) **Low level awareness of the renewable energy:** The level of awareness about the technological possibilities and immense socio-economic and environmental benefits derivable from solar energy among the citizens and decision-makers is relatively low in Tanzania. The majority still look at solar energy in terms of roof top solar systems, as currently there is no large scale solar power plant operating in Tanzania. The current flow of information about the development, various applications, dissemination and diffusion of solar energy resources and technologies are also inadequate. This may result in poor confidence of the technology among the public, private and financing sectors on the adoption of solar energy technologies.

Institutional and organizational capacity barriers

Poor Financial Position of the Off-taker: TANESCO is the only off-taker for all electricity that has to be fed in the central grid. TANESCO has been dogged by the tendencies of not paying suppliers of electricity in good time. This increases the financial risk of solar energy projects.

Technical barriers

- a) **Variability and intermittency of radiation:** Solar energy is a variable resource and its availability as an energy source fluctuates. Much of Tanzania has a very sunny climate with many places averaging from seven to ten hours of sunshine a day except during the rainy season (Tanzania Meteorological Agency, 2015).
- b) **Grid unreliability:** The transmission network is a weak link in the electricity supply chain in the Tanzania (TANESCO, nd.). The current transmission capacity of the national grid is less than 5,700GWh and the current transmission losses are reported to be about 6% (World Bank Group 2016). In addition, utility-scale solar power plants are often located more remotely than fossil-fuelled plants due to the requirement for large land areas in rural locations. At the moment, the country's national grid is not designed to handle intermittent electricity generating system.

Policy, legal and regulatory barriers

- a) **Government policy and incentives:** Policies instituted by the government have not supported the profitable exploitation of renewable energy resources (generally and particularly solar energy) for any intending investors. For example the National Power Master Plan is estimating that the renewable energy will only contribute 3% in the energy mix (URT, 2013). Also the proposed FiT incorporated into energy policies in Tanzania of 0.30USD/kWh is considered by investors to be unattractive (Hansen *et al.*, 2014). However, it should be noted that this is higher than 0.12USD/kWh being paid to independent generators in the case of Kenya.⁹
- b) **Ineffective quality control of products:** Absence of national technical standards and effective quality control units in the country were identified as a major challenge to the adoption of renewable energy in households. This absence is due to lack of appropriate training and skilled personnel. Most of the solar products are imported from China. There are no existing standards and specifications regulating these products; products are also without trade mark certificates and certificates of analysis from manufacturers (most of the products in the market have no brand name). This has led to an influx of large quantities of substandard/poor quality solar components; systems are also poorly installed by technicians with inadequate expertise. Confidence in the technology has thus been undermined since the high initial cost of investment into these products cannot be justified.
- c) **Competition with other land uses:** Land issues may be very complicated especially when the intending project to be sited on such land, is non-governmental. Thus, there may be a major challenge in siting and securing of permits for solar power plants in new locations. Most land in rural communities is for agriculture and ownership of such land may also be with families or communities. Since solar projects on a large scale will involve private participation, land acquisition procedures may be a major barrier to solar applications.

Summary of identified measures to mitigate the barriers

The enabling measures identified by the barrier analysis exercise are:

⁹<http://www.mckayadvocates.com/2016/11/kenyas-policy-shift-set-to-spur-growth-of-solar-energy/>

Economic and financial measures

- a) **Non-conventional renewable energy options are perceived as more expensive as externalities of conventional technologies are not internalized:** Costs of technology options should include the externalities during generation planning
- b) **High capital cost:**Government taxes on importation to be reduced or eliminated; Donor agencies to consider providing adequate funds on concessionary terms.
- c) **Operation and maintenance costs:** Following interventions should assist to lower the costs of O&M: Remove VAT and import duty from imported spare parts, put in place fiscal incentives to encourage foreign companies to build O&M skills locally.
- d) **Difficulty to access finance:** Ministry of Energy should consider establishing a Fund to provide low interest finances for Renewable Energy and Energy Efficient projects; Donor agencies to consider providing adequate funds on concessionary terms; Access to UNFCCC Mitigation Funds (Climate Funds Update 2016)
- e) **Economic viability not examined:**Relevant state institutions should conduct feasibility studies and publicize study results; Seek technical and financial assistance from the donor community for these studies which should include all relevant externalities of the technology concerned.

Non-financial measures

- a) **Low level awareness of the renewable energy:**Consistent awareness creation
- b) **Poor Financial Position of the Off-taker:** Implement Electricity Supply Industry Reform Strategy (URT, 2014)

Technical measures

- a) **Variability and intermittency of radiation: implement as many solar energy project as possible** to take advantage of the Law of Large Numbers.

The law of Large Numbers is a probability theorem, which states that the aggregate result of large number of uncertain process becomes more predictable as the total number of processes increases. Applied to renewable to renewable energy, the Law of Large Numbers dictates that the combined output of every solar panel connected to the grid is far less volatile than the output of an individual generator.

- b) **Grid unreliability:** Measures: Implement Electricity Supply Industry Reform Strategy (URT, 2014).

Political, legal and regulatory measures

- a) **Government policy and incentives:** Put in place favourable and supportive renewable energy policy; Reduce political and regulatory investment risk to promote diffusion of the technology.
- b) **Ineffective quality control of products:** Establish and enforce quality standards for solar energy equipment
- c) **Competition with Land use:** The Tanzania Investment Centre should identify suitable sites for solar power projects and acquire such land and register the land under its data bank.

Actions selected for inclusion in the TAP

- a) Enhance access to financing: Current lending rates are a major deterrent to investors to enter into long term financing arrangement from the commercial banks
- b) Build / strengthen capacity of key stakeholders: development of a sustainable solar power industry require intervention of different players including ministries, training institutions, NGOs. All these have different capacity challenges which need to be addressed.

Activities to be implemented to implement the above actions

Table 24 shows activities needed to implement the above actions.

Table 24: List of activities to implement the mini-hydropower project

Action	Activities
1. Enhance access to financing	1.1. Develop financial incentives to assist lowering the cost of solar power systems (e.g. introduce subsidies, tax exemptions) 1.2. Sensitise the policy makers on the importance of incentives and or subsidies for the solar power based electricity to compete with other fossil fuels 1.3. Lower commercial banks' lending rates 1.4. Establish a Renewable Energy Development Fund to enhance investment in RE 1.5. Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit
2. Build / strengthen capacity of key stakeholders	2.1. Develop specialized training aimed at building the capacities in relevant institutions – in areas of installation, operation and maintenance of solar power systems 2.2. Strengthen TANESCO to absorb more electricity generated from renewable energy sources 2.3. Strengthen inter-ministerial coordination

Actions to be implemented as project ideas

The second action (i.e. building capacity of stakeholders) will be considered for implementation as project idea. This was selected during barrier analysis and measures identification stage as per TAP guidelines.

1.1.4.4. Stakeholders and timeframe for implementation of TAP

Stakeholders

Table 25 provides a list of stakeholders to implement different activities

Table 25: List of activities and respective stakeholders to implement them

SN	Activities	Responsible body
1.	Develop financial incentives	Ministry of Finance and Planning Ministry of Energy
2.	Sensitise the policy makers on the importance of incentives and or subsidies the technology	Ministry of Energy NGOs (AGENDA, TaTEDO)
3.	Lower commercial banks' lending rates	Ministry of Finance and Planning Bank of Tanzania Commercial Banks
4.	Establish a Renewable Energy Development Fund to enhance investment in RE	Ministry of Energy Development Partners
5.	Engage in dialogue with development partners	Ministry of Energy Ministry of Finance and Planning Vice Presidents Office Ministry of Foreign Affairs and East Africa Cooperation
6.	Develop specialized training	University of Dar es Salaam Dar es Salaam Institute of Technology Dar es Salaam Vocational Training
7.	Strengthen TANESCO	Ministry of Energy TANESCO Ministry of Finance and planning Development Partners
	Strengthen inter-ministerial coordination	Ministry of Energy

Roles of stakeholders

The roles of stakeholders are shown in Table 26.

Table 26: Roles of different stakeholders

SN	Stakeholder	Role
1.	Ministry of Energy	Responsible for energy policies Oversees energy projects Sourcing for funds to implement the technology Responsible to present energy strategies and programmes to

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SN	Stakeholder	Role
		cabinet Promotes renewable energies
2.	Vice President Office is	Focal Point of the United Nations Convention on Climate Change Sourcing funds from climate funds and Global Environmental Facility Responsible for environmental policies and environmental management
3.	Ministry of Finance and Planning	Responsible for financial policies including incentives Responsible to negotiate loans for funding TANESCO projects
4.	Ministry of Foreign Affairs and East Africa Cooperation	Responsible for foreign relations
5.	University of Dar es Salaam,	Responsible for teaching, research and development. Responsible to teach engineers
6.	Dar es Salaam Institute of Technology	Responsible for teaching technicians
7.	Dar es Salaam Vocational Training Institute	Responsible for teaching artisans
8.	NGOs (AGENDA, TaTEDO)	Responsible for awareness creation Promotion of technology
9.	TANESCO	The sole off-taker of electricity
10.	Bank of Tanzania	Responsible for regulating commercial banks

Scheduling and sequencing of specific activities

Table 27 describes the sequence and timing of specific activities and responsibilities.

Table 27: Scheduling of activities

Action	Activity	Planning		Implementation		Responsible body
		Start	End	Start	End	
Enhance access to financing	Develop financial incentives	2019	2019	2019	2022	MFP, MOE
	Sensitise the policy makers on the importance of incentives and or subsidies	2019	2019	2019	2020	MOE NGOs (AGENDA, TaTEDO)
	Lower commercial banks' lending rates	2019	2019	2019	2020	MFP BoT Commercial Banks
	Establish a Renewable Energy Development Fund	2019	2019	2020	2024	MOE DPs
	Engage in dialogue with development partners	2019	2019	2019	2020	MOE, MFP VPO, MFAEAC

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Action	Activity	Planning		Implementation		Responsible body
		2019	2019	2019	2020	
Build / strengthen capacity of key stakeholders	Develop specialized training	2019	2019	2019	2020	UDSM, DIT DVTI
	Strengthen TANESCO	2019	2019	2019	2020	MOE TANESCO MFP DPs
	Strengthen inter-ministerial coordination	2019	2019	2019	2024	MOE

1.1.4.5. Estimation of Resources Needed for Action and Activities

In order for the technology diffusion to succeed and to be sustained there is a need to build capacity of local installers, maintainer and operators of the solar power system. In order to ensure accelerated diffusion there will be a need train the trainers to ensure replication of training programmes in as many Regions of Tanzania as possible.

The activities that will be conducted and cost implication are shown in Table 28.

Table 28: Cost implication for implementing the identified activities

SN	Activity	Estimated Cost (USD)	Source of Funds	Justification
1.	Establish a unit to oversee the implementation of the TAP	20,000	GoT, Development partners	Recruit at least two people; conduct practical training on solar power systems; Office furniture
2.	Develop financial incentives	10,000	GoT	Engage a consultant to study effective incentives
3.	Sensitise the policy makers on the importance of incentives and or subsidies	10,000	GoT,	Develop sensitisation materials, Conduct meetings
4.	Lower commercial banks' lending rates	15,000	GoT,	Engage consultant to study appropriate lending rate; conduct stakeholders meeting
5.	Establish a Renewable Energy Development Fund	10,000	GoT, Development partners	Engage a consultant to study modalities of establishing and operating a fund, stakeholder meetings

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SN	Activity	Estimated Cost (USD)	Source of Funds	Justification
6.	Engage in dialogue with development partners	5,000	GoT, Development partners	Develop position paper, hold meetings
7.	Develop specialized training	100,000	GoT	develop training materials, pay tuition fees and subsistent allowances
8.	Strengthen TANESCO	500,000	GoT	Implement Power Sector Reform Strategy
9.	Strengthen inter-ministerial coordination	5,000	GoT	Conduct meetings
	Total	675,000		

1.1.4.6. Management planning

Potential risks

Table 39: Activities and timeline to be performed

SN	Timeframe in Months	Activity
1.	01-06	Conduct economic feasibility (including market survey) of the biogas digester
2.	01-06	Develop awareness material targeting different stakeholders
3.	06-12	Develop a communication strategy Profile the target stakeholders particularly the adopters of the technology
4.	12 - 24	Implement awareness campaign on compact biodigester
5.	01-48	Monitoring and Evaluation

provides the possible risks and possible measures to address the risks to ensure that the implementation of technology is not derailed.

Table 29: Summary of possible risks and contingency action to mitigate them

Risk Item	Description	Contingency action
Cost Risks	TANESCO, being the sole off-taker of electricity, inability to pay for electricity generated from renewable resources will work against more investment in solar power systems	The government has already started discussing with development partners including African Development Bank to get funds to offset TANESCO debt to make sure TANESCO is efficient and reliable
Availability of Government Contribution risk	Moneys from GEF can only be given with government co-funding	During project preparation all potential in kind contributions will be established Use Environmental Fund to co-finance GEF

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Risk Item	Description	Contingency action
		project
Scheduling Risks	Delays in restructuring TANESCO may affect confidence of investors hence delays in investments	The Ministry of Energy to ensure respective institutions (TANESCO, MOE, EWURA) complete their assigned activities under the Energy Sector Reform Strategy according to the specified timelines
Performance Risks	Solar energy is not available on 24 hours basis. As such there may be low energy when it is needed most (i.e. during the night)	EWURA has developed Net Metering Rules which will enable the generators to send their power to the Grid when the demand is low and get power from the grid when the demand is high

Next steps

Table 30 provides a summary of next steps to facilitate the implementation of the project.

Table 30: Summary of steps to be taken to implement the project

Immediate Requirements:	<ul style="list-style-type: none"> a) The Vice President's office needs to convene a meeting with other key players (i.e. MOE, MFP etc.) to share the outcomes of the TAP project b) MOE to prepare a cabinet paper to ensure the outcomes of this TNA receive government blessing for implementation c) MOE together with the key players need to integrate this TAP into the national energy master plan d) After agreeing on the implementation plan MOE needs to appoint a task manager e) MOE should include budget line to fund TAP activities f) MOE should capacitate the office of Task Manager to start working on the implementation of the TAP
Critical Steps:	<ul style="list-style-type: none"> a) Getting Cabinet approval to roll out the TAP b) RE Policy need to be finalised to guide the investment in this area c) Incentive Policy and other supportive regulations (e.g. rules on feed-in tariffs, rules on Net Metering) must be drafted, endorsed and passed to enable the private sector to invest in solar power projects

1. Project ideas and technology action plans will be distributed to the relevant institutions identified as implementing agencies for the specific technology. There by encourage them to incorporate the findings in their annual action plans in order to mainstream the actions and obtain funds through national budget as appropriate.
2. Planning to conduct a Donor Forum who are working with the Ministry of Environment to seek financial assistance to carry out the projects.
3. Liaise with international funds (GEF/UNEP/Green Climate Fund etc) to seek funding for development of project proposals based on project ideas and implementation of the potential projects.

1.2. Project Ideas for Energy Sector

1.2.1. Brief summary of the Project Ideas for Energy Sector

The following project idea in the energy sector were identified on the basis of their contribution to socio-economic development and climate change mitigation potential. Further they were prioritised among a list of other technologies with the assistance of Multi-Criteria Analysis. The target group for Solar PV and mini-hydropower plant are communities living in areas where there is no national grid connection these comprise of rural households, schools, health and market centres and other institutions. For the compact biodigester technology, the target for the diffusion of the technology is the urban dwellers that are mainly using charcoal and LPG for cooking. The objective of concept idea for Solar PV and mini-hydropower technologies is to increase electricity access, while the objective of the Compact biodigester is to promote its widespread use amongst urban dwellers in order to cut down the use of charcoal and LPG for cooking. Diffusion of the three technologies will be done through public awareness campaigns, technical capacity building and financial assistance to the target users and/or promoters of the technologies.

1.2.2. Specific Project Idea

1.2.2.1. Specific Project idea: Building National Capacity to promote the diffusion of large scale Solar PV in Tanzania

1.2.2.1.1. Introduction and Background

Tanzania has high levels of solar energy, ranging between 2800 – 3500 hours of sunshine per year and a global radiation of between 4 to 7 kWh/m /day. Solar resources are especially good in the central portions of the country. This makes it naturally a suitable country for the application of solar energy as a viable alternative to conventional energy sources if efficiently harnessed and utilized.

To date about 6 MWp of solar PV electricity has been installed countrywide for various applications in schools, hospitals, health centres, police posts, street lighting, telecommunication small enterprises, and households. More than 50 percent of the capacity is being utilised by households in peri-urban and rural areas. There is potential to increase its diffusion rate especially in rural areas where 95% of the population is not connected to the grid.

The GoT, through REA, as well as various donors have supported a number of solar PV programs targeting off grid areas where it is lower cost than using generators or kerosene for lighting. Among these are the following:

- a) REA: Sustainable Solar Market Packages (SSMP) provide off grid solar electricity for public facilities and households: SSMP in Rukwa Region under implementation to benefit 80 villages; and new SSMP packages are being prepared for five more regions (eight districts).
- b) REA: Establishment of a number of Vocational Education Training Centres (VETA) to provide technical support and training for systems design, installation, maintenance and repair.
- c) REA: is developing and delivering a wide array of modern solar lighting products for rural households, businesses, schools and clinics. In the most recent call for proposals, specific The Lighting Rural Tanzania competitive grant programme supports private enterprises efforts were made to encourage female developers, and programs that supported women's energy needs.
- d) Oikos East Africa (NGO): Schools in Oldonyo Sambu and Ngarenanyuki wards in Arumeru district to promote the use of renewable sources of energy.
- e) Millennium Challenge Corporation: Solar PV systems are being installed in 45 secondary schools, 10 health centres, 120 dispensaries, municipal buildings and businesses across 25 village market centres currently without access to the electricity grid in the Kigoma Region using the SSMP approach.
- f) Sida and UNDP: Business development services are provided to solar companies in 16 regions. These include technical and marketing training for solar retailers, technicians and Solar PV systems are being installed in all primary and secondary vocational school instructors); marketing and awareness, networking among solar industry stakeholders; and policy and institutional support for the implementation of national quality control standards.
- g) European Union: Standbic Bank and subsidy from REA. 15,000 solar home systems are being financed through association Members in Lake Victoria Region with micro-financing form.

As a technology in the energy sector, Solar PV was prioritized during the TNA by key stakeholders. The project will involve promotion of country-wide diffusion of Large Scale Solar PV. This is expected to result in wide application of Solar Power technology as a way of increasing renewable energy in the national grid. The projects were developed through a participatory process involving the Mitigation Working Groups and key stakeholders (Annex I).

1.2.2.1.2. Objectives

The major objective of this project idea is to promote wide application and diffusion of large scale solar PV technology through capacity building / strengthening of key stakeholders. It is expected that through this activity, investment in large scale solar PV will be enhanced.

1.2.2.1.3. Outputs

The project is targeting to realise the following outputs:

- a) Specialised training for (i) artisans (ii) technicians (iii) engineers are in place by year 2020
- b) TANESCO is fully un-bundled by year 2021
- c) Inter-ministerial coordination plan is developed by year 2019

Relationship to the Country's sustainable Development Priorities

At present, Tanzania relies heavily on use of fossil fuels (NG) as sources of energy to meet her increasing energy needs. In order to achieve the goal of low carbon society, Tanzania is expected to pursue an energy mix that greatly relies on carbon-neutral energy sources such as solar and other renewables. The implementation and use of renewables will increase Tanzania's energy security besides mitigating climate change associated with droughts and floods in the country. This is in line with Tanzania's vision 2025 and the national energy policy of 2015; Rural Electrification Act 2005; Electricity Act 2008; the National Climate Change Response Strategy 2012; and the Scaling-Up Renewable Energy Programme (SREP) 2013.

1.2.2.1.4. Project Deliverables

The project benefits include the following:

- a) Training: three training curricular (i.e. at vocational level, technician level and engineers level; 100 artisan; 50 technicians and 20 engineers will be trained in different aspects of solar PV.
- b) Three franchise of energy sector, namely generation, transmission and distribution will be operational
- c) Improved coordination in energy sector development due to improved coordination which will in turn reduce the time spent to initiate investment projects

Social and health benefits include:

- a) Improved investment in solar PV will enhance electricity access
- b) Improved access to electricity will directly result in health benefits
- c) Improved access to electricity will directly result in reduction of GHG emissions.

1.2.2.1.5. Project scope and possible implementation, Feasibility and Linkage to Current or Past Projects

Although there is a sizable number of small-scale solar installations in Tanzania there is inadequate number of trained people to install, repair and maintain them. This situation will also be true for large scale solar power plants. Experience has shown that many projects have focused on the technology or 'hardware' itself and fail to address the development of 'software' or the knowledge base to make the technology work. This includes the transfer of experience, knowledge, skills and practices in a process called 'capacity building' and training. Lack of training becomes very evident when systems fail or have their lifespan drastically reduced due to user error, abuse, or poor installation. For this reason training of different cadres within the technology development chain will be essential if the large solar power projects have to be sustained.

A well designed and executed training program at different level alone will not determine the success or sustainability of a technology transfer project. Problems that are due to poor communications, inadequate facilities or equipment, financial constraints, bad organization, poor institutional or organizational / coordination capacity will not go away with a good training program. Strengthening coordination can help to avoid duplication of efforts and may lead to more efficient use of scarce resources. Coordination can also catalyze joint

decision-making and, in the longer term, result in more coherent energy national policies. For these reasons the issue of strengthening coordination and building capacity of the off-taker through implementation power sector reform structure and road map will be important.

The above activities will complement the activities that are either already implemented or are in the process of being implemented. Following are some of the interventions already made:

- a) Several private firms have expressed interest in investing in 50-100 MWp of solar PV.
- b) NextGen Solawazi has signed a SPPA with TANESCO to supply electricity from 2 MWp of PV to an isolated grid.
- c) TANESCO has also signed a Letter of Intent for a 1 MWp isolated grid-tied PV project.
- d) The government has also put in place an enabling framework aimed at removing barriers related to the implementation of renewable energy (URT, 2013).¹⁰
- e) Government, through the REA and various donors, has supported a number of solar PV programmes that target off-grid areas where the cost of lighting from solar is less than from a diesel generator or kerosene. As an example, the Sustainable Solar Market Package (SSMP) is a contracting mechanism that bundles the supply, installation and maintenance of PV systems for public facilities (e.g. schools and clinics) with requirements and incentives for commercial sale to households, businesses and other nongovernmental customers in a defined geographical area. Another example is REA's Lighting Rural Tanzania competitive grant programme (financed under AFREA and TEDAP), which supports private enterprises in developing new business models to supply affordable energy in rural areas. This project is linked to current government's efforts to increase electricity access to about 75% by year 2020 to ensure sustainable socio-economic development.

1.2.2.1.6. Project Activities and Budget

The project will be implemented by the Ministry of Energy in collaboration with the private sector and Non-Government Organizations (NGOs), development partners and the beneficiaries. The following activities will be supported:

- a) Conduct specialised training for (i) artisans (ii) technicians (iii) engineers are in place by year 2020
 - Conduct training needs assessment
 - Development suitable curricula for artisans, technicians and engineers
 - Pilot these curricula

- b) TANESCO is fully un-bundled by year 2021
 - Strengthen institutional framework and operational efficiency of the power sub-sector;
 - Enhance competition and private sector participation in the power sub-sector;
 - Improve governance through PFM reforms.

¹⁰ URT (2013). Scaling up of Renewable Energy Programme

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Table 31: Project Activities and Budget

Activity	Target Group	Main actors	Cost in US Dollars '000,000	Justification
Conduct specialised training for (i) artisans (ii) technicians (iii) engineers are in place by year 2020				
Conduct training needs assessment	TANESCO, REA, Small Independent Power Producers	University of Dar es Salaam Dar es Salaam Institute of Technology Dar es Salaam Vocational Training Centre	0.03	- Engage three co for the different l
Development suitable curricula for artisans, technicians and engineers	University of Dar es Salaam Dar es Salaam Institute of Technology Dar es Salaam Vocational Training Centre	University of Dar es Salaam Dar es Salaam Institute of Technology Dar es Salaam Vocational Training Centre	0.1	- Engage three - Conduct stake curricula - Conduct need - Process accre
Pilot these curricula	Students	University of Dar es Salaam Dar es Salaam Institute of Technology Dar es Salaam Vocational Training Centre	0.15	- train 100 voc - train 50 tech - Train 20 engi
TANESCO is fully un-bundled by year 2021				
Strengthen institutional framework and operational efficiency of the power sub-sector	TANESCO	Ministry of Energy Ministry of Finance and Planning (MFP) VPO	10	Prepaid meters installed Installation of s transformers to Update TANESCO preparation for 20 MOE and TA renewable ener 20 MOE and TA and planning
Enhance competition and private sector participation in the power sub-sector;	Private Sector	MOE TANESCO EWURA	5	Streamline insti
Improve governance through power sector reform.	TANESCO	MOE MFP EWURA	30	Debt Managem Finance created Options study o prior to unbund
Inter-ministerial coordination plan is developed by year 2019				
Identify key stakeholder ministries	MOE, MITI, MFP, VPO MoFEA	MOE	0.005	Hire Consultant to identify and review
Review their mandate as far as energy development is	MOE, MITI, MFP, VPO MoFEA	MOE		

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Activity	Target Group	Main actors	Cost in US Dollars '000,000	Justification
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concerned				
Develop a coordination mechanism	MOE, MITI, MFP, VPO MoFEA	MOE	0.01	Hire Consultant to coordinating mechanism Conduct meeting

Monitoring and Evaluation	Project management unit	MOE, private sector, NGOs and the project beneficiaries	0.008	
Total			45,303	

Timelines

Table 32: Activities and timeline to be performed

SN	Timeframe in Months	Activity
1.	01-03	Conduct training needs assessment
2.	03-12	Development suitable curricula for artisans, technicians and engineers
3.	12 - 48	Pilot these curricula
4.	01 - 24	Strengthen institutional framework and operational efficiency of the power sub-sector
5.	06 - 24	Enhance competition and private sector participation in the power sub-sector
6.	06 - 48	Improve governance through power sector reform.
7.	01 - 03	Identify key stakeholder ministries
8.	03 - 06	Review their mandate as far as energy development is concerned
9.	06 - 12	Develop a coordination mechanism
10.	01-60	Monitoring and Evaluation

1.2.2.1.7. Measurement / Evaluation

Table 33 shows indicators of progress. A monitoring and evaluation system will be put in place to monitor the project achievements on quarterly basis. The project will have a project steering committee chaired by the Ministry of Energy. Other members will comprise representatives from the relevant government institutions, R&D institutions, academia, financial institutions, media, NGOs and project beneficiaries. The Project Steering Committee will be responsible for monitoring project implementation and will receive project progress reports from the Project Manager on quarterly basis.

Table 33: Indicators of progress

SN	Activity	Indicator of Progress
1.	Conduct training needs assessment	Training needs assessment reports
2.	Development suitable curricula for artisans, technicians and engineers	Training curricula in place
3.	Pilot these curricula	Number of students trained
4.	Strengthen institutional framework and operational efficiency of the power sub-sector	Improved performance in Key Performance indicators e.g. billing efficiency, revenue collection efficiency, new customer connections, transmission losses, uncollected revenue etc.
5.	Enhance competition and private sector participation in the power sub-sector	Number of private sector investments
6.	Improve governance through power sector reform.	Un-bundled TANESCO into generation, transmission and distribution
7.	Identify key stakeholder ministries	Report of key stakeholders
8.	Review their mandate as far as energy development is concerned	Report on mandates
9.	Develop a coordination mechanism	Approved coordination mechanism

1.2.2.1.8. Possible Complications/Challenges

The biggest challenge is to get funding for the project. Other challenges include convincing the private sector, NGOs and development partners to support the project. In order to overcome these challenges the Ministry of Energy will establish a dedicated project unit to ensure there is a close follow up of all project activities. The challenges will be reported to the project Steering Committee so that solutions can be found in good time.

1.2.2.1.9. Responsibilities and Coordination

The project will be coordinated by the Ministry of Energy in collaboration with the interested stakeholders. These include the following: R&D institutions Academia Print and electronic media institutions The Tanzania Bureau of Standards; Tanzania Revenue Authority, Customs Department, Immigration Department Service providers: financial institutions; NGOs, industry Project beneficiaries.

1.2.2.2. Specific Project idea: Capacity Building to Promote Diffusion of Mini Hydropower Projects

1.2.2.2.1. Introduction and Background

The assessed potential of small hydropower resources (up to 10 MW) is 315 MW. Installed, grid-connected, small-hydro projects contribute only about 15 MW. Most of the developed small-hydro projects are owned by private entities and are not connected to the national electricity grid. Five sites in the 300 kW–8,000 kW range are owned by TANESCO. Faith-based groups own more than 17 plants with 15 kW-800 kW capacity and an aggregate capacity of 2 MW.

As a technology in the energy sector, Mini-Hydropower was prioritized in the TNA by key stakeholders. The project will involve promotion of country-wide diffusion of mini hydropower technologies. This is expected to result in wide application of electricity by rural household and institutions such as schools, health clinics and markets not connected to the grid. Again, due to high frequency of power blackouts across the country, excess electricity from these mini-hydropower plants may be connected to the national grid if the costs of doing so allow. The projects were developed through a participatory process involving the Mitigation Working Groups and key stakeholders (Annex I).

1.2.2.2.2. Objectives

The major objective of this project idea is to promote wide application and diffusion of mini hydropower technology through capacity building / strengthening of key stakeholders. It is expected that through this activity, investment in large mini hydropower will increase.

1.2.2.2.3. Outputs

The project is targeting to realise the following outputs:

- a) Specialised training for (i) artisans (ii) technicians (iii) engineers are in place by year 2020
- b) TANESCO is fully un-bundled by year 2021
- c) Inter-ministerial coordination plan is developed by year 2019

1.2.2.2.4. Relationship to the Country's sustainable Development Priorities

At present, Tanzania relies heavily on use fossil fuels (NG) as sources of energy to meet her increasing energy needs. In order to achieve the goal of low carbon developed society, Tanzania is expected to pursue an energy mix that greatly relies on carbon-neutral energy sources such as mini-hydropower and other renewables. The implementation and use of renewables will increase Tanzania's energy security besides mitigating climate change associated with droughts and floods in the country. This is in line with Tanzania's vision 2025 and the national energy policy of 2015; Rural Electrification Act 2005; Electricity Act 2008; the National Climate Change Response Strategy 2012; and the Scaling-Up Renewable Energy Programme (SREP) 2013.

1.2.2.2.5. Project Deliverables

The project benefits include the following:

- a) Training: three training curricular (i.e. at vocational level, technician level and engineers level; 100 artisan; 50 technicians and 20 engineers will be trained in different aspects of mini hydropower fabrication, installation, operation and maintenance.
- b) Three unbundled entities of energy sector, namely generation, transmission and distribution will be operational
- c) Improved coordination in energy sector development due to improved coordination which will in turn reduce the time spent to initiate investment projects

Social and health benefits include:

- a) Improved investment in mini hydropower will enhance electricity access
- b) Improved access to electricity will directly result in health benefits
- c) Improved access to electricity will directly result in reduction of GHG emissions.

1.2.2.2.6. Project scope and possible implementation, Feasibility and Linkage to Current or Past Projects

Although there are a number of micro and mini hydropower projects in Tanzania there is inadequate number of trained people to fabricate, install, operate, repair and maintain them. Experience has shown that many of the existing projects have focused on the technology or 'hardware' itself and have not addressed the development of 'software' or the knowledge base to make the technology work. This includes the transfer of experience, knowledge, skills and practices. Lack of training becomes very evident when systems fail. For this reason training of different cadres within the technology development chain will be essential for the technology to be sustainable.

Furthermore the project will address capacity needs of the off-taker i.e. TANESCO with intention of improving efficiency and financial management. Coordination can also catalyze joint decision-making and, in the longer term, result in more coherent energy national policies. For this reason the issue of strengthening coordination and building capacity of the off-taker through implementation power sector reform structure and road map will be important.

The above activities will complement the already ongoing efforts to promote investment in the mini hydropower sector.

- a) Currently mini-hydro projects, with a combined capacity of 20.5 MW have signed SSPA with TANESCO. In addition, TANESCO has signed letters of intent for six small hydro projects with a combined capacity of 29.9 MW.
- b) Several small hydro projects are also being developed as isolated mini grids and the MOE is conducting small hydro feasibility studies in eight regions: Morogoro, Iringa, Njombe, Mbeya, Ruvuma, Rukwa, Katavi and Kagera.
- c) Development partners are supporting several mini-micro grid projects throughout the country. It can be seen that the mini-hydropower potential is yet to be developed to its full potential. This project is linked to current government's efforts to increase electricity access to about 75% by year 2020 to ensure sustainable socio-economic development.

1.2.2.2.7. Project Activities and Budget

The project will be implemented by the Ministry of Energy in collaboration with the private sector and Non-Government Organizations (NGOs), development partners and the beneficiaries. The following activities will be supported:

- a) Conduct specialised training for (i) artisans (ii) technicians (iii) engineers are in place by year 2020
 - Conduct training needs assessment
 - Development suitable curricula for artisans, technicians and engineers
 - Pilot these curricula
- d) TANESCO is fully un-bundled by year 2021
 - Strengthen institutional framework and operational efficiency of the power sub-sector;
 - Enhance competition and private sector participation in the power sub-sector;
 - Improve governance through PFM reforms.
- e) Inter-ministerial coordination plan is developed by year 2019
 - Identify key stakeholder ministries
 - Review their mandate as far as energy development is concerned
 - Develop a coordination mechanism

The total project budget is USD 50,303¹¹ million. Details of the project budget are indicated in the Table 34.

¹¹ The budget has been developed based on assumption that these project ideas may not be implemented at the same time

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Table 34: Project Activities and Budget

Activity	Target Group	Main actors	Cost in US Dollars '000,000	Justification
Conduct specialised training for (i) artisans (ii) technicians (iii) engineers are in place by year 2020				
Conduct training needs assessment	TANESCO, REA, Small Independent Power Producers	University of Dar es Salaam Dar es Salaam Institute of Technology Dar es Salaam Vocational Training Centre	0.03	- Engage three consultants for the different levels
Development suitable curricula for artisans, technicians and engineers	University of Dar es Salaam Dar es Salaam Institute of Technology Dar es Salaam Vocational Training Centre	University of Dar es Salaam Dar es Salaam Institute of Technology Dar es Salaam Vocational Training Centre	0.1	- Engage three consultants - Conduct stakeholder consultations - Conduct needs assessment - Process accreditation
Pilot these curricula	Students	University of Dar es Salaam Dar es Salaam Institute of Technology Dar es Salaam Vocational Training Centre	0.15	- train 100 vocational students - train 50 technicians - Train 20 engineers
TANESCO is fully un-bundled by year 2021				
Strengthen institutional framework and operational efficiency of the power sub-sector	TANESCO	Ministry of Energy Ministry of Finance and Planning (MFP) VPO	15	Prepaid meters installed Installation of smart transformers to reduce losses Update TANESCO regulations preparation for unbundling 30 MOE and TANESCO renewable energy strategy 30 MOE and TANESCO and planning
Enhance competition and private sector participation in the power sub-sector;	Private Sector	MOE TANESCO EWURA	5	Streamline institutional arrangements
Improve governance through power sector reform.	TANESCO	MOE MFP EWURA	30	Debt Management Finance created Options study on unbundling
Inter-ministerial coordination plan is developed by year 2019				
Identify key stakeholder ministries	MOE, MITI, MFP, VPO MoFEA	MOE	0.005	Hire Consultant to identify and review
Review their mandate as far as energy development is	MOE, MITI, MFP, VPO MoFEA	MOE		

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Activity	Target Group	Main actors	Cost in US Dollars '000,000	Justification
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concerned				
Develop a coordination mechanism	MOE, MITI, MFP, VPO MoFEA	MOE	0.01	Hire Consultant to coordinating mechanism Conduct meeting

Monitoring and Evaluation	Project management unit	MOE, private sector, NGOs and the project beneficiaries	0.008	
Total			50,303	

Timelines

Table 35: Activities and timeline to be performed

SN	Timeframe in Months	Activity
1.	01-03	Conduct training needs assessment
2.	03-12	Development suitable curricula for artisans, technicians and engineers
3.	12 - 48	Pilot these curricula
4.	01 - 24	Strengthen institutional framework and operational efficiency of the power sub-sector
5.	06 - 24	Enhance competition and private sector participation in the power sub-sector
6.	06 - 48	Improve governance through power sector reform.
7.	01 - 03	Identify key stakeholder ministries
8.	03 - 06	Review their mandate as far as energy development is concerned
9.	06 - 12	Develop a coordination mechanism
10.	01-60	Monitoring and Evaluation

1.2.2.2.9. Measurement / Evaluation

Table 36 shows indicators of progress. A monitoring and evaluation system will be put in place to monitor the project achievements on quarterly basis. The project will have a project steering committee chaired by the Ministry of Energy. Other Members will comprise representatives from the relevant government institutions, R&D institutions, academia, financial institutions, media, NGOs and project beneficiaries. The Project Steering Committee will be responsible for monitoring project implementation and will receive project progress reports from the Project Manager on quarterly basis.

Table 36: Indicators of progress

SN	Activity	Indicator of Progress
1.	Conduct training needs assessment	Training needs assessment reports
2.	Development suitable curricula for artisans, technicians and engineers	Training curricula in place
3.	Pilot these curricula	Number of students trained
4.	Strengthen institutional framework and operational efficiency of the power sub-sector	Improved performance in Key Performance indicators e.g. billing efficiency, revenue collection efficiency, new customer connections, transmission losses, uncollected revenue etc.
5.	Enhance competition and private sector participation in the power sub-sector	Number of private sector investments
6.	Improve governance through power sector reform.	Un-bundled TANESCO into generation, transmission and distribution
7.	Identify key stakeholder ministries	Report of key stakeholders

SN	Activity	Indicator of Progress
8.	Review their mandate as far as energy development is concerned	Report on mandates
9.	Develop a coordination mechanism	Approved coordination mechanism

1.2.2.2.10. Possible Complications/Challenges

The biggest challenge is to get funding for the project. Other challenges include convincing the private sector, NGOs and development partners to support the project.

1.2.2.2.11. Responsibilities and Coordination

The project will be coordinated by the Ministry of Energy in collaboration with the interested stakeholders. These include the following: R&D institutions Academia Print and electronic media institutions The Tanzania Bureau of Standards; Immigration Department; Service providers: financial institutions; NGOs, industry Project beneficiaries.

1.2.2.3. Specific Project idea: Promotion of Diffusion of Compact Biogas Digester

1.2.2.3.1. Introduction and Background

The compact biodigester plants are made from cut-down high-density polythene (HDPE) water tanks, which are adapted using a heat gun and standard HDPE piping. The standard plant uses two tanks, with volumes of typically 0.75 m³ and 1 m³. The smaller tank is the gas holder and is inverted over the larger one which holds the mixture of decomposing feedstock and water (slurry). An inlet is provided for adding feedstock, and an overflow for removing the digested residue. A pipe takes the biogas to the kitchen, where it is used with a biogas stove. The gas holder gradually rises as gas is produced, and sinks down again as the gas is used for cooking. Weights can be placed on the top of the gas holder to increase the gas pressure.

Compact Biogas Digesters for Urban Households are aimed at helping the urban households to partially replace imported liquefied Petroleum gas (LPG) or kerosene used for cooking with biogas. The Compact biogas digesters will also minimize charcoal use which is exerting pressure on natural forests. This will in turn conserve the CO₂ sink. Use of a compact biogas digester which could be accommodated in an urban household is recommended for this purpose. The feed stock for the biogas digester would be household domestic waste and/or dried and powdered (energy plant) leaves to be made available in user-friendly packs from the grocery shops.

As a technology in the energy sector, compact biodigester was prioritized by key stakeholders. The project will involve promotion of the diffusion of compact biodigester technology. This is expected to result in reduces use of LPG and Charcoal for cooking in urban areas. The projects were developed through a participatory process involving the Mitigation Working Groups and key stakeholders (Annex I).

1.2.2.3.2. Objectives

The major objective of this project idea is to promote wide application and diffusion of compact biodigester technology, through carrying feasibility study of the technology and awareness raising of the potential users of the technology.

1.2.2.3.3. Outputs

A technology feasibility report will be produced

Awareness of about 100,000 households will be raised by 2020.

1.2.2.3.4. Relationship to the Country's sustainable Development Priorities

At present, Tanzania relies heavily on use fossil fuels as sources of energy to meet her increasing energy needs. In order to achieve the goal of low carbon society, Tanzania is expected to pursue an energy mix that greatly relies on low carbon energy sources such biogas. While combustion of biogas produces carbon dioxide (CO₂), a greenhouse gas, the carbon in biogas comes from plant matter that fixed this carbon from atmospheric CO₂. Thus, biogas production is carbon-neutral. This technology is in line with Tanzania's vision 2025 and the national energy policy of 2015; and the National Climate Change Response Strategy 2012. However, feasibility of such large scale compact biogas biodigesters project has not been carried out, furthermore the potential users of the technology may need to be sensitised before the take up the technology, hence this project idea.

1.2.2.3.5. Project Deliverables

The project benefits include the following:

- a) About 100,000 of biogas units will be installed
- b) Capacity of about 500 fabricators will be built (based on assumption of about 3 people are needed to construct 1 compact biodigester, for about 1.5 days).¹²
- c) Fabrication, installation and maintenance skills will be transferred skills and Employment creation.
- d) 9,000 tonnes of LPG are imported annually for use by the target group.

Social and health benefits include:

- a) Improved health: reduce health impacts associated with charcoal use.
- b) Mitigation of climate change. About 2,956 mill tCO₂e per year emission will be avoided.

1.2.2.3.6. Project scope and possible implementation, Feasibility and Linkage to Current or Past Projects

The project will be implemented in Dar es Salaam. However there have been other efforts to promote biogas use, though the efforts were focussing on large scale systems. Such past initiatives include:

- a) Domestic biogas technology was introduced by Small Industries Development Organisation (SIDO) in 1975. A number of other NGOs joined in the promotion of the technology. However, CAMARTEC (later in cooperation with GTZ) accelerated awareness and dissemination, particularly in the northern regions of the country. It is estimated that about

¹² http://en.howtopedia.org/wiki/How_to_Build_the_ARTI_Compact_Biogas_Digestor?

5500 biogas digester are currently in operation.¹³ Through its involvement, CAMARTEC established itself as a reputable knowledge centre on biogas in Tanzania as well as internationally.

- b) Tanzania is one of six African countries benefiting from a regional, donor assisted, programme on domestic biogas. The Africa Biogas Partnership Programme (ABPP) is a joint venture between the Netherlands Directorate-General of Development Cooperation (DGIS), the Netherlands Development Organization (SNV) and Humanist Institute for Development Cooperation (Hivos), whose objective is to build about 10,000 bio-digesters by year 2017.¹⁴ However these installations are based on large scale biogas digesters and mainly targeting institutions and rural communities. The compact bio-digesters are new and these are targeting urban centres.

1.2.2.3.7. Project Activities and Budget

The project will be implemented by the Ministry of Energy in collaboration with the private sector and Non-Government Organizations (NGOs), development partners and the beneficiaries. The following activities will be supported:

Table 37: Summary of project activities

1. Establish feasibility of compact biodigester	1.1. Conduct economic feasibility (including market survey) of the biogas digester
2. Create awareness of both developer, and users of the technology	2.1. Develop awareness material targeting different stakeholders (i.e. Private Sector, Decision Makers, Users of Compact biodigester, financial institutions) 2.2. Develop a communication strategy Profile the target stakeholders particularly the adopters of the technology 2.3. Implement awareness campaign on compact biodigester

The total project budget is US dollars 131,000. Details of the project budget are indicated in the Table

38

and

Table

39.

¹³cidt.org.uk/wp-content/uploads/2015/11/Biogas-technical-note_V3_20150825.docx

¹⁴www.snv.org/.../10000-biogas-plants-be-installed-tanzania-support-government-norw

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Table 38: Project Activities and Budget

Activity	Target Group	Main actors	Cost in US Dollars '000,000	Justification
Establish feasibility of compact biodigester				
Conduct economic feasibility (including market survey) of the biogas digester	Dar es Salaam City	MOE University of Dar es Salaam	0.015	- Engage a consultant to conduct a market survey of compact biodigesters
Create awareness of both developer, and users of the technology				
Develop awareness material targeting different stakeholders	Private Sector, Decision Makers, Users of Compact biodigester, financial institutions, users of the technology	MOE MITI University of Dar es Salaam	0.015	Engage a consultant to develop awareness material
Develop a communication strategy Profile the target stakeholders particularly the adopters of the technology	Private Sector, Decision Makers, Users of Compact biodigester, financial institutions, users of the technology	MOE University of Dar es Salaam	0.001	Engage a consultant to develop a communication strategy
Implement awareness campaign on compact biodigester	Private Sector, Decision Makers, Users of Compact biodigester, financial institutions, users of the technology	MOE AGENDA TaTEDO	0.1	Conduct radio, TV, and focused group discussions
Total			0.131	

Table 39: Activities and timeline to be performed

SN	Timeframe in Months	Activity
6.	01-06	Conduct economic feasibility (including market survey) of the biogas digester
7.	01-06	Develop awareness material targeting different stakeholders
8.	06-12	Develop a communication strategy Profile the target stakeholders particularly the adopters of the technology
9.	12 - 24	Implement awareness campaign on compact biodigester
10.	01-48	MonitoringandEvaluation

1.2.2.3.9. Measurement / Evaluation:

A monitoring and evaluation system will be put in place to monitor the project achievements on quarterly basis. The project will have a project steering committee chaired by the Ministry of Energy. Other Members will comprise representatives from the relevant government institutions, R&D institutions, academia, financial institutions, media, NGOs and project beneficiaries. The Project Steering Committee will be responsible for monitoring project implementation and will receive project progress reports from the Project Manager on quarterly basis.

Table 40: Indicators of progress

SN	Activity	Indicator of Progress
1.	Conduct economic feasibility (including market survey) of the biogas digester	Feasibility report
2.	Develop awareness material targeting different stakeholders	Awareness materials developed
3.	Develop a communication strategy Profile the target stakeholders particularly the adopters of the technology	Printed communication strategy
4.	Implement awareness campaign on compact biodigester	Number of biodigester installed

1.2.2.3.10. Possible Complications/Challenges

The biggest challenge is to get funding for the project. Other challenges include convincing the private sector, NGOs and development partners to support the project.

1.2.2.3.11. Responsibilities and Coordination

The project will be coordinated by the Ministry of Energy in collaboration with the interested stakeholders. These include the following: R&D institutions Academia Print and electronic media institutions. The Tanzania Bureau of Standards; Service providers: NGOs, industry Project beneficiaries.

CHAPTER 2: TECHNOLOGY ACTION PLAN FOR FOREST SECTOR

2.1 TAP for the Forestry Sector

2.1.1 Sector overview

Tanzania mainland has a total area of 945,087 km² of which 886,037 km² are land surface and the remaining is water. The country has a population of 43.6 million people (census 2012). It is estimated that Tanzania has 48.1 million ha (481,000 km²) of forests and woodlands equivalent to an average of 1.1 ha per capita (NAFORMA 2015). This means that forests and woodlands occupy an equivalent to 38.3 % of the total land area. These forests contain 3.3 billion m³ of wood, which is equivalent to an average of 37.9m³/ha or 74.4m³ per person. Out of the total forest land 16 million ha are in reserved forests, 2 million ha are forests in national parks and 30.1 million ha are unprotected forests in General Land.

Forest vegetation in Zanzibar covers about 63,908 ha, equivalent to 23.7% of the total land area. Zanzibar’s forests form part of the East Africa Coastal Forests Eco-region, one of the world’s 200 biodiversity hotspots. Deforestation rates are estimated to be at least 1% per annum.

The Forest Sector is grappling with deforestation and forest degradation as a major socioeconomic and environmental challenge. This is evidenced by the fact that Tanzania loses about 400,000ha of forests annually due to various reasons, which include unsustainable agricultural practices, forest fires and unsustainable charcoal production (NAFORMA 2015).

About 13 national policies and legislations (see Table 41) affect forest resource management, as well as in the capabilities of forests to address climate change.

Table 41: Relevant Policies and Acts for the Forest Sector

S/N	Name of Policy / Act	When enacted	Main Objective
1.	National Forest Policy	1998	To enhance the conservation and management of natural resources for the benefit of present and future generations
2.	National Fisheries Sector Policy	1997	To promote the conservation, development and sustainable management of fisheries resources for the benefit of present and future generations
3.	Land Policy	1998	To promote and ensure secure land tenure system and encourage optimal use of land resources
4.	National Environmental Policy	1997	To enhance the integration of environmental concerns into decision making processes from the local to the national level
5.	Forest Act	2002	To sustainably manage forests resources
6.	National Environmental Act	2004	To enhance the protection, conservation and management of the environment
7.	Tanzania Wildlife Management Act	2013	To protect and conserve wildlife resources and its habitats

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S/N	Name of Policy / Act	When enacted	Main Objective
8.	Village Land Act	1999	To manage and administer land in villages
9.	Land Act	1999	To manage land other than the village land and to settle land disputes
10.	Zanzibar Forest Resources Conservation and Management	1996	To strengthen community participation in forest management programmes in the islands
11.	Zanzibar Environmental Policy	1992	To promote for the conservation and protection of environment and efficient utilization of natural resource assets for sustainable development
12.	Zanzibar National Forest Policy	1999	To conserve and develop forest resources
13.	National REDD+ Strategy	2013	To facilitate well-coordinated and effective implementation of REDD+ related policies, processes and activities

Three technologies – Sustainable Forest Management, Agroforestry and Conservation of Mangroves, were prioritised in the Forest Sector under the TNA based on their potential to enhance the ability of the forestry sector to significantly contribute to mitigation of climate change while delivering on adaptation benefits. These technologies have the potential to reduce vulnerability and enhance the resilience of forest ecosystems and people.

Sustainable forest management aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations (UNGA, 2008). The approach encompasses both natural and planted forests in all geographic regions and climatic zones, and all forest functions, managed for conservation, production and multiple purposes, to provide a range of forest ecosystem goods and services at the local, national, regional and global levels (CPF, 2012).

Agroforestry is a technology (also a land use system) in which trees, shrubs, palms, bamboos are intentionally planted on the same piece of land as agricultural crops (and/or animals) with the aim of enhancing food supply, income and health (FAO, 2015). Agro-forestry systems can be categorized into the following major categories:

- Agro-silviculture (trees with crops),
- Agri-silvipasture (trees with crops and livestock), and
- Silvo-pastoral (trees with pasture and livestock) systems.

Mangroves are predominantly tropical trees and shrubs growing on sheltered coastlines, mudflats and river banks in several locations of the world. Mangroves grow to reach a maximum height of 30m. Tanzania has 158,100 ha of mangrove forests with growing stock of 49m³ha⁻¹ (MNRT 2015). In Tanzania, Mangroves occur along the continental coast and in Zanzibar Islands. The largest mangrove stand is located at the Rufiji River Delta. Other areas with larger areas of Mangroves include Tanga, Kilwa and the estuaries of Ruvu, Wami, Pangani and Ruvuma Rivers. Mangrove species found in the country are *Acrostichum aureum*, *Avicennia marina*, *Ceriops tagal*, *Lumnitzera racemosa* and *Rhizophora mucronata* (FAO, 2005). Given that mangroves are protected ecosystems

in Tanzania this should be an ecosystem that receives substantial investment and attention in management and restoration.

The mangroves ecosystems have the attribute of being resilient to change. Thus, to sustainably manage mangroves, it requires that they are harvested within their rate of natural rate of regeneration and that the quantity of waste discharged should be within their assimilative capacity (Barbier, 1993).

2.1.2 Action plan for sustainable forest management

2.1.2.1 Introduction

The United Nations General Assembly (UNGA, 2008) states that “Sustainable forest management is a dynamic and evolving concept aims to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations.”

Sustainable Forest Management has been selected due to its ability to generate adaptation and mitigation benefits, accessibility, social acceptability, economic viability and financial affordability, sustainability, replicability, and that the technology is in harmony with the existing national policies

Examples of benefits generated by SFM include:

- i. Economic: increased household income and national revenues from the sale of timber and Non-Timber Forest Products (NTFPs).
- ii. Social: Provision of goods such as food, building material, medicine, fuel for cooking and heating; and services as such as cultural and religious arenas
- iii. Environmental: prevention of land degradation and desertification, biodiversity and habitat conservation, mitigation of droughts and floods
- iv. Climate change mitigation and reduction of vulnerability e.g. through ecosystem-based adaptation strategies

2.1.2.2 Ambition for the TAP

The ambition for Sustainable Forest Management is described in the box 1 below:

Box 1: Ambition - Scale of implementation of Sustainable Forest Management

SFM will cover 16,610 ha of forestland in central government owned forests, 3,107,351 ha local government managed forests, 21,975,094 ha in villages managed forests, and 3,515,889 ha in private forests under sustainable management benefiting 30% of users of forest products by the year 2030.

2.1.2.3 Actions and Activities selected for inclusion in the TAP

Summary of barriers to sustainable forest management

One of the major barriers to the adoption of SFM is the long term nature of forest management investments. Returns from SFM are essentially long term when compared to other economic activities that deliver direct, short term benefits. Thus, over short periods, unsustainable practices are viewed to be more profitable. Therefore, most investors have little financial incentive to invest in sustainable forest management.

Equally important, inadequate financing in SFM activities limits the adoption and scaling up of the technology. In terms of national fiscal allocation, the forest sector is not a high priority in the country development agenda. The forest budget is less than 1% of the national budget (Kiimu, n.d.). Also, unlike agriculture, energy and water, the sector experiences inadequate investments from the private sector leading to a limited number of privately owned forests.

In evaluating the benefits of forest investments, decision makers, often relying on conventional economic approaches, have a tendency of excluding livelihood and environmental benefits generated by forest ecosystems. Forest resources are undervalued in decision making because of the tendency to favour forest management regimes and market development opportunities that focus only on maximizing large-scale, commercial (usually extractive, and often unsustainable) benefits (Emerton, 2012).

The forest sector is negatively affected by the presence of economic disincentives (e.g. taxes, subsidies, lack loans or poor credit arrangements, high interest rates) which stimulate productivity, employment and income in other sectors by improving viability and returns (Mogaka et al., 2001). As a result, sectors like agriculture, industry, mining, water and energy which are considered lucrative promise quick returns have attracted and enjoyed financial sector support, thus catalysing their expansion and intensification at the expense of forests.

Forest stakeholders' particularly local communities have limited awareness on sustainable forest management particularly on forest resource assessment, fire control, nursery management, and appropriate reforestation techniques. This is due to low literacy, inadequate awareness campaigns and limited access to forest extension services. All these lead to unsustainable forest resources management.

The capacity of forest institutions to promote and implement SFM is limited. These institutions have limited number of skilled staff and are financially constrained due to a high dependence on donor funds and relatively lower budgetary allocation. Also, limited availability of facilities and equipment for supporting sustainable forest management activities adds up to staffing and financing challenges.

Mechanisms for sharing benefits arising from forest management are either lacking or not implemented. There still is lack of, clear guidelines on benefit sharing between the government and local communities have been absent. On the other hand, benefits from forest resource management

are captured by the few elites thus discouraging community participation in natural resource management.

The degradation of forest resources in Tanzania is on the rise despite the presence of laws and regulations due to weak enforcement and poor compliance to the laws. A combination of factors such as lax attitude, corruption as well as inadequate funds and personnel weaken law enforcement. Another cause is limited political support and sometimes political interference make the enforcement of laws difficult in some areas. Another related issue is limited awareness amongst magistrates and judges on environmental laws. This is not to exclude limited capacity of public investigators to prosecute forest related crimes.

Communities and private investors have little motivation to engage in sustainable forest management or to comply with forest laws due to difficulties in securing land rights and tenure. All land in Tanzania is owned by the state and this presents a risk of losing it to the state whenever that part of land is need for national development projects or investments, and such land is not fairly compensated. On the other hand, there exist insecure tree tenure rights arising from overbearing government agencies powers in regulating forest harvesting outside forest reserves, such as powers to ban on forest harvesting or cutting trees.

A number of ministries are involved in the management of land, forest, and water resource, these includes Ministry of Natural Resources and Tourism, Ministry of Lands and Human Settlement, Ministry of Agriculture and Food Security, Ministry of Water and the Division of Environment in the Vice President's Office. In several cases, these institutions are challenged with low capacity in coordinating their work to support sustainable forest management.

Summary of measures to overcome barriers

Increasing access to financial resources is critical for promoting and strengthening sustainable forest management for state and privately owned forests. This can be achieved by lobbying for increased budgetary allocation and disbursement for the forest sector, carrying out fundraising activities for forest conservation projects as well as attracting Public-Private Partnerships (PPP) and exploiting international financing mechanisms (e.g. REDD+ and Green Climate Fund and Adaptation fund)

Profitability of SFM can be enhanced by promoting the adoption of management for multiple benefits including timber production, land conservation, production of non-timber forest products, for example honey production, mushroom collection, raw materials for handicrafts, and ecotourism services. Other measures include addressing market failures, increasing access to emerging economic opportunities and markets; and creating new markets for forest goods and services, including payment for ecological services.

Addressing the understanding of under-valuation of forest resources in decision making will be realized by carrying out advocacy and awareness raising campaigns to inform decision makers of the linkages between forests and rural livelihoods and the national economy. In addition, sharing information on the benefits and costs of SFM with decision makers and empowering communities to participate in decision making about forest resources are key measures for enhancing the valuation of forest resources.

Existing economic incentives, for other land based sectors, discourages farmers and the private sector from engaging in sustainable management of forest resources. Eliminating or adjusting disincentives such as unfair tax rates, subsidies, and loans/credit arrangements is critical to enhancing the adoption of SFM (Emerton, 2012). This will require review of a number of laws, policies and guidelines. Better incentives will help to increase the profitability of and farmer engagement in sustainable forest management and overcome the barriers to local market participation.

Improving awareness on sustainable forest management is crucial for its adoption. Relevant measures include rolling out awareness and communication campaigns, providing technical training to foresters and land resources managers, disseminating information through community radios and distributing brochures, flyers and leaflets. The focus of awareness campaigns may include the benefits of forests in sustaining rural livelihoods and the economy, forest conservation, reforestation, forest assessment, sustainable harvesting, etc.

Strengthening the institutional and authorities forest management institutions at central and local governments' levels is important for driving SFM forward. Potential activities include providing tailored technical training to foresters, recruiting skilled foresters, and providing institutions with required facilities for forest assessment and monitoring.

Un-equitable sharing of benefits undermines the participation of communities in conservation initiatives. Measures considered appropriate to address this are designing and operationalizing clear benefit sharing mechanisms under joint forest management arrangements, directing a large share of forest revenues back to the forestry sector, addressing elite capture, improving transparency and accountability on forest revenues and combating corruption in the sector.

Weak enforcement and compliance to forest laws has resulted in the degradation and deforestation of forests in Tanzania. Factors contributing to weak enforcement poor compliance should be addressed through the provision of incentives to law enforcers based on their efforts, combating all forms of corruption at all levels, increasing access to resources for patrolling, mobilizing political will and support for law enforcement, raising awareness on existing laws to boost compliance amongst communities. Others include engaging local communities in enforcing laws and raising the awareness of public prosecutors, magistrates and judges to effectively prosecute and try forest offences and environmental crimes.

Clear tenure rights are a critical incentive for communities to engage in sustainable forest management. Measures important in this regard, include embarking on policy advocacy to develop policies geared towards land rights formalization and protection of traditional land rights holders. Important are also supporting registration and recording of land rights for communities engaged in SFM as a way of increasing assurance and preventing elite capture; and designing and implementing flexible mechanisms for temporary and permanent transfers of rights to increase opportunities for capturing the full value of SFM investments.

Ministries with a stake in forest resources should work together to promote sustainable management of forest resources. Policy coordination will be strengthened by improving inter-sectoral planning and collaboration through regular meetings and sharing of information. Another key measure is to enable the forest and beekeeping division to strengthen its forest management and conservation role at national and local government level.

Actions selected for inclusion in the TAP

Measures identified for inclusion in the TAP are described below and the activities to deliver these measures are detailed in Table 42:

1. Strengthening legal and regulatory enforcement

Strengthening legal and regulatory enforcement is intended to control deforestation and forest degradation resulting from illegal forest practices and encroachment into forest areas. This measure is necessary for protecting forest resources from illegal harvesting, encroachment and related activities. It is relatively cheap as it requires using existing law enforcement personnel (additional personnel may be required) and resources, with minimum addition of resources. The measure is effective in enhancing sustainable management of forest resources

2. Improve profitability of the forest sector

In order to attract more stakeholders and encourage them to engage and invest in SFM, a prerequisite is improving the profitability of SFM. Improving the profitability of the forest sector is crucial for ensuring that communities adopt and continue with SFM in the face of competing land uses. The effectiveness of this measure is enhanced when communities are trained in undertaking profitable and conservation oriented initiatives, value addition of forest products and accessing new markets. The measure is somewhat cheap as it requires a few capacity building events and may make use of available local entrepreneurship trainers and forest experts.

Table 42: Activities identified for implementation of selected actions

This table summarises the actions and list of activities to be implemented in order to accomplish the actions under the sustainable forest management technology.

Action 1	Action 1: Strengthen enforcement and compliance to legal and regulatory frameworks to support SFM: through undertaking of professional challenges and needs survey, reviewing and strengthening laws, strengthen judicial system to combat forest offences, and implementation forest laws awareness programme.
ACTIVITIES:	
Activity 1.1	Carryout a survey to understand challenges faced by forest officers and develop plan to eliminate challenges and provide better working conditions.
Activity 1.2	Establish a body to oversee and regulate professionalism in forestry
Activity 1.3	Review and strengthen forest laws in order to tackle corruption and other malpractices in forest sector.
Activity 1.4	Develop and implement a programme to strengthen prosecution, judicial system and regulatory frameworks and capacity to combat forest offences.
Activity 1.5	Develop and implement a programme to raise public awareness and engage communities in enforcing forest laws and regulations.
Action 2	Action 2: Develop and implement sustainability benchmarks, principles and standards for sustainable forest management: through Identification of forests to be supported and establishment of SFM Baseline, development and implementation of management plans, development of social cultural framework and implementation of national tree

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	planting programme.
	Action 2: Develop and implement sustainability benchmarks, principles and standards for sustainable forest management.
Activity 2.1	Design criteria to choose 10 forest areas to be supported and establish their baseline SFM status in relation to the internationally agreed criteria, indicators and elements of SFM.
Activity 2.2	Develop and implement management plans for minimum of 10 selected forests in both natural and plantation forests (Taking cognizance of internationally agreed criteria, indicators and elements of SFM)
Activity 2.3	Adopt and use the FLEGT framework as an instrument to improve forest value chain. Including understanding existing and new market opportunities
Activity 2.4	Develop and use a social-cultural framework to enable inclusive or participatory SFM that takes account of the local communities and wider society.
Activity 2.5	Revive, Redesign and implement a national tree planting programmes and community forestry initiatives

Actions to be implemented as Project Ideas

Both actions – strengthening legal and institutional framework of the sector; and improving the profitability of the forest sector, will be considered for implementation as project ideas. The two actions were selected during the barrier analysis and measures identification stage as per TAP preparation guidelines.

2.1.2.4. Stakeholders and Timeline for implementation of TAP

Table 43: Overview of Stakeholders for the implementation of the TAP

SN	Activity	Responsible body
1.	Carryout a survey to understand challenges faced by forest officers and develop plan to eliminate challenges and provide better working conditions.	Ministry of Natural Resources and Tourism (MNRT)
2.	Establish a body to oversee and regulate professionalism in forestry	Tanzania Forest Services
3.	Review and strengthen forest laws in order to tackle corruption and other malpractices forest sector.	MNRT and Ministry of Justice Constitutional Affairs and Good Governance (MJCG)
4.	Develop and implement a programme to strengthen prosecution, judicial system and regulatory frameworks capacity to combat forest offences.	MNRT, PORALG and MJCG)
5.	Develop and implement a programme to raise public awareness and engage communities in enforcing forest laws and regulations.	MNRT FBD
6.	Design criteria to choose 10 forest areas to be supported and establish their baseline SFM status in relation to the internationally agreed criteria, indicators and elements of SFM.	MNRT TFS
7.	Develop and implement management plans for minimum of 10 selected forests in both natural and plantation forests (Taking cognizance of internationally agreed criteria, indicators and elements of SFM).	MNRT TFS
8.	Adopt and use the FLEGT framework as and instrument to improve forest value chain. Including understanding existing and new market opportunities.	MNRT and Ministry of Industry, Trade and Investment (MITI)
9.	Develop and use a social-cultural framework to enable inclusive or participatory SFM that take account of the local communities and wider society.	MNRT TFS, FBD
10.	Revive, Redesign and implement a national tree planting programmes and community forestry initiatives.	MNRT, VPO Environment, PORALG

The roles of key stakeholders are detailed in the

Table 44:

Table 44: Roles and responsibilities

S/N	Stakeholder	Responsibility
1.	Vice President's Office – Division of the Environment	Coordination / oversight of implementation
2.	Ministry of Natural Resources and Tourism	Lead Ministry in the implementation of SFM
3.	Ministry of Industry, Trade and Investment	Address marketing issues related to SFM Enabling Environment for Private Sector Investments in Forestry/Forest Industries
4.	Tanzania Forest Services	Providing technical assistance Enabling Environment for Private Sector Investments in Forestry/Forest Industries
5.	Forest and Beekeeping Division (FBD)	Oversight in Forest Laws, Regulations and Policies development and enforcement
6.	Regional Secretariats of the selected five regions of Tanzania.	Coordination and linking local government and central government with the implementation of the technology
7.	Local Governments	Implementing technology at the local level (communities)
8.	NGOS	Implementing technology at the local level (communities)
9.	Communities	Selection and adoption of the technology
10.	Private Sector	Investing in Forestry and Forest Industries technologies

Scheduling and sequencing of specific activities

The Table 45 and Table 46 describes the sequence and timing of specific activities and responsibilities as well as the nature and scale of the activity

Table 45: Actions scheduling

SN	Activity	Responsible body
1.	Carryout a survey to understand challenges faced by forest officers and develop plan to eliminate challenges and provide better working conditions.	Ministry of Natural Resources and Tourism (MNRT)
2.	Establish a body to oversee and regulate professionalism in forestry	Tanzania Forest Services
3.	Review and strengthen forest laws in order to tackle corruption and other malpractices in forest sector.	MNRT and Ministry of Justice Constitutional Affairs and Good Governance (MJCG)
4.	Develop and implement a programme to strengthen prosecution, judicial system and regulatory frameworks capacity to combat forest offences.	MNRT, PORALG and MJCG)
5.	Develop and implement a programme to raise public awareness and engage communities in enforcing forest laws and regulations.	MNRT FBD
6.	Design criteria to choose 10 forest areas to be supported and establish their baseline SFM status in relation to the internationally agreed criteria, indicators and elements of SFM.	MNRT TFS
7.	Develop and implement management plans for minimum of 10 selected forests in both natural and plantation forests (Taking cognizance of internationally agreed criteria, indicators and elements of SFM).	MNRT TFS
8.	Adopt and use the FLEGT framework as and instrument to improve	MNRT and Ministry of

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SN	Activity	Responsible body
	forest value chain. Including understanding existing and new market opportunities.	Industry, Trade and Investment (MITI)
9.	Develop and use a social-cultural framework to enable inclusive or participatory SFM that take account of the local communities and wider society.	MNRT TFS, FBD
10.	Revive, Redesign and implement a national tree planting programmes and community forestry initiatives.	MNRT, VPO Environment, PORALG

Table 46: Actions scheduling

Action	Activity	Planning		Implementation		Responsibility
		Start	End	Start	End	
1.	Carryout a survey to understand challenges faced by forest officers and develop plan to eliminate challenges and provide better working conditions.	2019	2019	2019	2020	MNRT
2.	Establish a body to oversee and regulate professionalism in forestry	2019	2020	2020	2021	TFS
3.	Review and strengthen forest laws in order to tackle corruption and other malpractices in forest sector.	2020	2020	2020	2021	MNRT – FBD
4.	Develop and implement a programme to strengthen prosecution, judicial system and regulatory frameworks capacity to combat forest offences.	2020	2020	2021	2030	RALG
5.	Develop and implement a programme to raise public awareness and engage communities in enforcing forest laws and regulations.	2020	2020	2021	2030	TFS
6.	Design criteria to choose 10 forest areas to be supported and establish their baseline SFM status in relation to the internationally agreed criteria, indicators and elements of SFM.	2020	2020	2020	2020	TFS
7.	Develop and implement management plans for minimum of 10 selected forests in both natural and plantation forests (Taking cognizance of internationally agreed criteria, indicators and elements of SFM).	2020	2020	2021	2030	TFS
8.	Adopt and use the FLEGT framework as and instrument to improve forest value chain. Including understanding existing and new market opportunities.	2020	2021	2022	2026	TFS
9.	Develop and use a social-cultural framework to enable inclusive or participatory SFM that take account of the local communities and wider society.	2020	2021	2022	2030	TFS
10.	Revive, Redesign and implement a national tree planting programmes and community forestry initiatives.	2019	2020	2021	2030	TFS

2.1.2.5 Estimation of Resources Needed for Action and Activities

Estimation of capacity building needs

Capacity building needs required for the implementation of Sustainable Forest Management include:

- Training on project management, financial management, market development, marketing, monitoring and evaluation.

- Technical support (consultancies)
- Facilities (hardware and soft ware) e.g. computers, GIS tools
- Training materials

Table 47: Resource needs for SFM Activities needs

Action	Activity	Resource needs
1.	Carryout a survey to understand challenges faced by forest officers and develop plan to eliminate challenges and provide better working conditions.	Human Resources, funds, working facilities/equipments, transport
2.	Establish a body to oversee and regulate professionalism in forestry	Human Resources and Funds
3.	Review and strengthen forest laws in order to tackle corruption and other malpractices forest sector.	Funds, Human Resources, facilities like vehicles, GPS,
4.	Develop and implement a programme to strengthen prosecution, judicial system and regulatory frameworks capacity to combat forest offences.	Training materials, advocacy materials, Human Resources
5.	Develop and implement a programme to raise public awareness and engage communities in enforcing forest laws and regulations.	Funds, training /awareness materials, Human Resources
6.	Design criteria to choose 10 forest areas to be supported and establish their baseline SFM status in relation to the internationally agreed criteria, indicators and elements of SFM.	Human Resources, funds, Training /awareness materials, facilitators
7.	Develop and implement management plans for minimum of 10 selected forests in both natural and plantation forests (Taking cognizance of internationally agreed criteria, indicators and elements of SFM).	Technical support, training materials, Human Resources
8.	Adopt and use the FLEGT framework as and instrument to improve forest value chain. Including understanding existing and new market opportunities.	Funds, technical assistance, training materials, facilities like motorbikes, manpower Technical support, training materials, Human Resources
9.	Develop and use a social-cultural framework to enable inclusive or participatory SFM that take account of the local communities and wider society.	Funds, technical support, training materials, technology, Human Resources
10.	Revive, Redesign and implement a national tree planting programmes and community forestry initiatives.	Funds, facilities , Human Resources

The cost of actions and activities

The estimated costs of undertaking sustainable forest management actions and activities are provided in **Table 48**. It is envisaged that the funds be sourced from Government of Tanzania, Development Partners and Private sector stakeholders.

Table 48: Estimations of costs of SFM actions and activities

Action	Activity	Costs (\$)	Justification
1.	Carryout a survey to understand challenges faced by forest officers and develop plan to eliminate challenges and provide better working conditions.	50 000	The survey will be nationwide and to cover assessment of both social, professional and geographical challenges that forest managers face.
2.	Establish a body to oversee and regulate professionalism in forestry	20 000	Forest for the establishment of a new institution will be required.
3.	Review and strengthen forest laws in order to tackle corruption and other malpractices forest sector.	50 000	
4.	Develop and implement a programme to strengthen prosecution, judicial system and regulatory frameworks capacity to combat forest offences.	200 000	Longterm engagement with Judicial required. to support not only SFM but Tanzania forestry in broad terms.
5.	Develop and implement a programme to raise public awareness and engage communities in enforcing forest laws and regulations.	150 000	Awareness programmes need to be longterm. Thus longterm sustainable financing will be required.
6.	Design criteria to choose 10 forest areas to be supported and establish their baseline SFM status in relation to the internationally agreed criteria, indicators and elements of SFM.	50 000	This is linked to activity 7 below.
7.	Develop and implement management plans for minimum of 10 selected forests in both natural and plantation forests (Taking cognizance of internationally agreed criteria, indicators and elements of SFM).	1 000 000	substantial financial inputs for management plan required. Need to monitor and review the implementation planning process.
8.	Adopt and use the FLEGT framework as an instrument to improve forest value chain. including understanding existing and new market opportunities.	100 000	FLEGT framework will require significant initial financial resources injection before it becomes self financing.
9.	Develop and use a social-cultural framework to enable inclusive or participatory SFM that take account of the local communities and wider society.	10 000	
10.	Revive, Redesign and implement a national tree planting programmes and community forestry initiatives.	1,000 000	This is supposed to be a nationwide undertaking, in which men and women will be involved to in tree planting and caring for a 10 years period.

2.1.2.6 Management Planning:

The actions and activities identified for different technologies of the TAP are further analysed against potential risks, and the contingency actions to mitigate the risks are identified. They are presented in details in Table 49.

Risks and Contingency Planning: This section provides an overview of identified risks and contingency plans which are analysed in Table 49.

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Table 49 Potential risks and their mitigation

Action	Activity	Risk Item Description	Contingency actions
1.	Carryout a survey to understand challenges faced by forest officers and develop plan to eliminate challenges and provide better working conditions.	Assessments of weak performances of forest officers: Law enforcers may have a negative attitude towards the project (lack of cooperation), invalid stakeholder expectations	Develop a better internal communication strategy to <ul style="list-style-type: none"> • avoid false expectations agree on the nature of incentives to be provided
2.	Establish a body to oversee and regulate professionalism in forestry	Strengthening professionalism: Low interest from forest officers who may not want a regulatory body	Educate the officers on the value and importance of having a professional body.
3.	Review and strengthen forest laws in order to tackle corruption and other malpractices forest sector.	Low capacity and interest in legal reform: Low interest from forest officers who may want status quo to continue.	As part of the communication strategy, promote awareness on the side effects of corruption in the forest sector
4.	Develop and implement a programme to strengthen prosecution, judicial system and regulatory frameworks capacity to combat forest offences.	low capacity and interest in legal reform: No willingness to improve legal and regulatory framework.	Advocate for the importance of joint efforts in law enforcement Advocate for the improvement of legal and regulatory framework Encourage prosecutors to participate in capacity building programmes
5.	Develop and implement a programme to raise public awareness and engage communities in enforcing forest laws and regulations.	Low interest and unwillingness to participate and engage in law enforcement:.	As part of communication strategy and extension plan, encourage the public to participate in awareness activities Encourage communities to engage in law enforcements. Provide the necessary training and incentives to attract communities in law enforcement initiatives.
6.	Design criteria to choose 10 forest areas to be supported and establish their baseline SFM status in relation to the internationally agreed criteria, indicators and elements of SFM.	Choice of forest areas may be political influenced	The Ministry responsible to handle the decision in a way that ensure the professional need supersede any other interest, by providing strong leadership.
7.	Develop and implement management plans for minimum of 10 selected forests in both natural and plantation forests (Taking cognizance of internationally agreed criteria, indicators and elements of SFM).	Management planning process: Planning capacity may be low and the quality of plans may suffer.	Design and deliver management planning refresher course prior to the development process. Create policies that will encourage private sector investment in forestry sector Include technical assistance in the management planning process.
8.	Adopt and use the FLEGT framework as an instrument to improve forest value chain. Including understanding existing and new market opportunities.	FLEGT framework development: This may face resistance especially that Tanzania does not officially export forest products to Europe.	Effectively engage stakeholders, ensure adequate education is provided to stakeholders on FLEGT
9.	Develop and use a social-cultural framework to enable inclusive or participatory SFM that take account of the local communities and wider society.	Social Cultural Framework for SFM: Low adoption rate for sustainable production alternatives, sustainable production alternative may fail	Document best practices and lessons on sustainable production alternatives
10.	Revive, Redesign and implement a national tree planting programmes and community forestry initiatives.	National tree planting programme: May be politically hijacked, and thus may become a rhetorical exercise and little long term substance	Make this a continuous undertaking and encourage planning, advancement and sustainability to be handled by professionals

Next Steps: An essential condition, resource, and means for a critical capability to be fully operational

Table 50: Next steps

Immediate requirements	Critical requirements
Develop a comprehensive programme on SFM to deliver on the activities and actions, this include provision of adequate personnel, stakeholder consultation processes	Ensure policy environment and legal framework are supportive of SFM. Identification of stakeholders and potential partners to drive SFM processes.
A dedicated team is developed to carry out the staff survey and data analysis, produce the results to eliminate staff challenges and improve work conditions.	Appointment of people with Skills, knowledge, and commitment to carryout the survey. Allocation of adequate financial resources to support the survey processes.

2.1.3 Action Plan for Agroforestry

Agro-forestry is an approach that integrates the production of trees and agricultural crops or animals on the same piece of land.

Agro-forestry systems can be categorized into the following major categories:

- Agro-silviculture (trees with crops),
- Agri-silvipasture (trees with crops and livestock), and
- Silvo-pastoral (trees with pasture and livestock) systems.

The benefits resulting from agroforestry include:

- Social – improved food security, employment creation, livelihood diversification
- Economic – e.g. increases household income, reduces expenditure for industrial fertilizers and pesticides, increased access affordable fuelwood and construction materials
- Environmental – absorbs pollutants, carbon sequestration, better access to ecosystem services, reduction of soil erosion, improvement of soil fertility, improved water quality

Agroforestry has been selected due to its ability to generate adaptation and mitigation benefits, accessibility by the rural poor, economic viability, sustainability, replicability, and that the technology is in harmony with the existing policy.

2.1.2.2 Ambition for the TAP

Box 2: Ambition - Scale of implementation of Agroforestry

“The total number of targeted households for the transfer and diffusion of agroforestry is 500,000 who will be supplied with 200,000,000 agroforestry tree seedlings for maintaining 300,000 ha of agroforestry in 5 regions of Tanzania by the year 2030

2.1.2.3 Actions and Activities selected for inclusion in the TAP

In this section, a summary of barriers and measures to overcome the barriers to adoption of agroforestry technology are discussed.

Summary of barriers to the adoption of agroforestry

Difficulties in accessing financial resources: There are limited opportunities for accessing financial resources for investing in agroforestry. Financial institutions are not motivated to provide loans and credits to non-commercial projects or investments with long gestation period. Therefore farmers have limited financial means to invest in agroforestry and end up not investing in agroforestry at all. Agroforestry receives very little funds as a share from agriculture and forestry funds (Place et al, n.d.)

High initial investment costs: Agroforestry involves high up-front costs emanating from the procurement of inputs such as high quality seeds, herbicides and labour. Given limited access to financial resources, farmers have comparatively low purchasing capacity to opt for high quality tree seeds. Likewise, the cost of herbicides to control pests and disease is expensive and out of reach for

most of rural poor. Agrochemicals are both expensive and scarce, they also require additional equipment and knowledge to apply them.

Limited markets: Agroforestry products and services have a limited market. As a result there is low demand and consequently low markets available for agroforestry products and services. In addition, limited market availability leads to poor viability of the technology. It has been observed that well-developed product markets that could reward small-holder farmers with premium prices for their farm produce is missing in Tanzania (Kitalyi et al, n.d.).

Limited access to quality germplasm: Farmers have limited access to high quality agroforestry germplasm due to many reasons including poor seed distribution channels, presence of poor quality seed germplasm in the market, low willingness to pay for high quality seeds, and high cost of high quality agroforestry seeds. Local seed markets are flooded with low quality seeds that are collected locally by local entrepreneurs who have limited knowledge on seed selection.

Low level of awareness of agroforestry among farmers: There is inadequate awareness amongst farmers on different agroforestry approaches including their benefits. Factors behind limited awareness of agroforestry approaches and benefits are inadequate awareness raising campaigns and sensitization meetings as well as limited access to training programmes and lack of agroforestry demonstration plots. Another critical factor is limited availability of agroforestry communication materials in user friendly languages and poor reading culture within the society.

Limited access to extension services: There is limited access to extension services due to several inter-related factors namely inadequate extension staff, limited technical expertise amongst extension staff and inadequate extension visits. In several areas of Tanzania, there are few trained agroforestry extension staff but only the so called agricultural and livestock extension staff posted at the ward level. The number of extension workers is inadequate to serve a whole ward of three to five villages which are usually far apart. Extension workers do not usually receive technical exposure or tailored agroforestry training, yet are entrusted with assisting farmers with the adoption and implementation of agroforestry.

Farmers continued preference to traditional farming practices: Farmers tend to adhere to traditional farming practices and are resistant to adopting a new technology like agroforestry. Reasons for this include suspicion and misconceptions about agroforestry, limited evidence on the performance and effectiveness of agroforestry, as well as natural tendency to resist change. The suspicions and misconceptions are caused by lack of knowledge resulting from inadequate awareness. This may also be due to inadequate efforts to develop and disseminate communication materials targeting local communities.

Under-resourced institutions: Institutions from the local to the national level are under-resourced – facing challenges of inadequate skilled extension workers, inadequate financial resources and limited means of transport. The presence of insufficient number of skilled extension workers means that only a small proportion of farmers are likely to be reached by the extension services. Limited access to funds also translates to the inability of respective institutions to carry out activities aimed

at promoting agroforestry including awareness and sensitization meetings, establishment of demonstration plots and dissemination of communication materials.

Limited direct short term benefits: Agroforestry has limited ability to deliver direct and short term benefits. Many of the benefits arising from agroforestry are indirect – in terms of ecosystem services that are not easily quantified, valued or sold. For example, agroforestry helps to enhance soil fertility and control soil erosion – services that are often unrecognized by and tradable in markets. On the other hand, the benefits of agroforestry are realized in the medium to the long term i.e. 5 – 10 years.

Insecure land or tree tenure: Unclear or insecure land and tree tenure is a key disincentive to the adoption and upscaling of agroforestry. There is evidence that state ownership of land and reallocation programmes undermines long term land investments in places. In addition, current drives by the government to attract large scale foreign investors have worked to increase land tenure insecurity in many rural communities. The Forest policy regulates the harvesting, cutting or sale of tree products and certain tree species thereby inhibiting the planting of trees.

Unavailability of credits and subsidies for agroforestry products: Unlike other activities in the country that have price floors and subsidies for specific inputs, this does not apply to agroforestry and farmers are discouraged to adopt agroforestry. Government support for agriculture exists; unfortunately agroforestry rarely or never features as an agricultural enterprise for support. Low interest credit is available for agriculture but agroforestry is excluded because it is considered to fall under forestry. Market information systems for agroforestry products, unlike other agricultural commodities, are yet to be improved and tree products are largely ignored.

Inadequate Policy and Political level attention: Generally, agroforestry receives minor attention in forestry and agriculture policy and legal documents. Accordingly, in the face of climate change, agroforestry has emerged as a key option for climate change adaptation and mitigation giving it a place in environmental ministries, themselves not implementers but policy coordinators. Unfortunately, there is limited inter-sectoral planning and resource sharing amongst the three ministries – forestry, agriculture and environment.

Summary of measures to overcome barriers

Innovative Financing: Unlocking barriers to financing agroforestry requires the identification of innovative measures. These include: relaxing collateral requirements on credits by banks and financial institutions, lowering interest rates on loans and credits and exploiting international funding mechanisms e.g. REDD+

Research and support to reduce of investment costs: High investment costs on agroforestry can be addressed by applying a combination of measures such as provision of low tax agroforestry inputs (e.g. seeds, herbicides and implements) as well as building farmers' capacity to access payments for ecosystem services and promoting the provision of financial instruments such as microcredits or index insurances

Increased Market Access: Increasing access to markets for agroforestry goods and services is crucial for enhancing the adoption and continued use of agroforestry. Key measures required to increase access to markets are value addition for agroforestry products and services, enhancement of market opportunities for agroforestry and establishment of local agroforestry cooperatives for pooling resources to access markets.

Improving access to seeds and other inputs: In order to improve farmers' capacity to access high quality seeds, the cost of high quality tree seeds should be subsidized as the case with annual crop seeds. Also, the distribution of tree seeds should be improved in order to reach farmers at the local level. Other measures to be considered are the development of systems and structures for managing the multiplication and distribution of tree seeds, engaging communities in the collection and production of tree seeds, creating a demand for new agroforestry systems (e.g. fertilizer trees), and increasing access to information regarding the quality and source of agroforestry germplasm

Strengthen capacity on promotion of agroforestry knowledge and skills: Inadequate knowledge on appropriate agroforestry approaches and their values undermines the adoption and use of agroforestry. The capacity of national and local institutions should be strengthened in order to be able to promote agroforestry. This will be achieved by building the technical knowledge of foresters, agro-foresters, agronomists and agriculturalists through technical training as well as facilitate learning through study tours and exchange visits. In addition, recruiting more skilled extension workers and fundraising for agroforestry will work to support the promotion of agroforestry.

Measures such as the provision of technical training to extension workers, organization of sensitization and awareness meetings on agroforestry, study tours, agroforestry demonstration plots, educational farm visits are critical to improving stakeholders' awareness on agroforestry leading to increased adoption rates. Another important strategy is the development and dissemination of a manual on agroforestry practices and important indigenous tree species.

Relevant measures for enhancing the provision of extension services are building the capacity of extension workers through technical training, recruiting skilled extension workers to fill human resource gaps and motivating extension workers by improving their working conditions. Another important measure is organizing workshops, study tours and site visits for extension workers aimed at improving their knowledge and skills on agroforestry.

Promotion of use of fast growing varieties: Tackling barriers related to the limited ability of agroforestry to deliver direct and short term benefits demands that certain measures are put in place. These include the promotion of the production and use of fast maturing agroforestry varieties, promotion of high value but short term agroforestry varieties and increasing market access for agroforestry products

Improving farming practices and approaches: A shift from adherence to traditional farming practices and approaches is fundamental to the adoption of agroforestry practices amongst communities. A combination of measures is need to address this technological lock in – namely increasing awareness about the benefits of agroforestry, supporting exchange visits and study tours, documenting and disseminating lessons learned and best practices on agroforestry as well as

promoting the use of agroforestry demonstration plots and validating local ecological knowledge and integrating it into technical knowledge

Strengthen tenure rights: Unclear and insecure tenure rights often undermine the adoption and investment in agroforestry. This barrier can be addressed by a combination of measures such as promoting land right formalization (land titling) as well as developing regulations/guidelines to protect traditional land rights holders and supporting the registration of land rights for communities engaged in agroforestry

Promote agroforestry at policy and political levels: Key measures to improve inter-sectoral planning and coordination of agroforestry include development of a clear policy and legal framework to provide guidance on agroforestry, initiating joint planning and implementation of agroforestry projects and institutionalizing agroforestry as part of the official programme of activities in the ministries responsible for agriculture, livestock, forestry and environment. Likewise, enhancing communication and information sharing across relevant sectors are critical steps for addressing institutional barriers to the promotion of agroforestry.

Actions selected for inclusion in the TAP

The main measures selected to be include in the TAP is:

i. **Provide incentives to Improve awareness, uptake and adoption of agroforestry.**

Providing incentives is critical for improving awareness, adoption and wide scale use of agroforestry practices. Key incentives include strengthening the provision of agroforestry extension services, demonstrating the benefits of agroforestry including the value of agroforestry products, providing subsidies for tree seeds and nursery establishment, relaxing collateral requirements for agroforestry loans and credits, and creating markets for agroforestry products. Increasing, public awareness on agroforestry is important for ensuring that communities adopt and continue using agroforestry practices. The effectiveness of this measure is enhanced when communities are aware of different agroforestry approaches and their associated benefits as well as value addition to agroforestry and there is access to markets.

Activities identified for implementation of selected actions

This section provides a description of specific activities that will enable the operationalization of the selected actions (Table 51).

Table 51: Summary of actions and activities for agroforestry project

Action 1	Provide incentives to Improve awareness, uptake and adoption of agroforestry. Incentives for uptake and adoption of agroforestry would include provision of soft loans for investment in agroforestry, relaxing collateral requirements for loans and credits, creating markets and for agroforestry products. The awareness could be increased through various means including provision of technical training to extension workers, organization of awareness campaigns for the promotion of agroforestry through.
ACTIVITIES:	Action 1. Provide incentives to Improve awareness, adoption and uptake of agroforestry.

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Activity 1.1	Develop training and learning systems on the benefits of agroforestry and the value of agroforestry products. To include technical training to extension workers
Activity 1.2	Design and deliver extension services for agroforestry systems, to include public awareness campaigns, cross learning, exchange visits, as well as production and dissemination of manual on agroforestry practices and tree.
Activity 1.3	Review and improve research in agroforestry (including participatory learning and action research).
Activity 1.4	Build a market based system to enable farmers grow and sell seedlings and other agroforestry products to other farmers and wider markets.
Activity 1.5	Design and Operate Agroforestry funding facility, to provide technical assistance and funding through soft loans for agroforestry promotion.

Actions to be implemented as Project Ideas

The actions under agroforestry will be implemented as project ideas as it has been selected from the barrier analysis and measures identification stage. These include:

- Eliminating adverse incentives on agro-forestry practices
- Improving public awareness of agroforestry

The justification for selecting the two actions has been described under Actions selected for inclusion in the TAP

2.1.3.4. Stakeholders and Timeline for implementation of TAP

Overview of Stakeholders for the implementation of the TAP

This section describes the identified stakeholders roles in driving this action as required for each of the Actions to be implemented (Table 52).

Table 52: Stakeholders and their roles

S/N	Stakeholder	Responsibility
1.	Vice President's Office – Division of the Environment	Policy coordination
2.	Ministry of Agriculture and Food Security	Coordinating the the implementation of agroforestry
3.	Ministry of Natural Resources and Tourism	Support research in agroforestry, define the species to be used, provide quality seeds, contribute in development and provision of extension messages
4.	Tanzania Forest Services	Providing technical assistance
5.	Tanzania Forestry Research Institute	Conduct research on suitable agroforestry trees
6.	Sokoine University of Agriculture	Conducting research on agroforestry
7.	Tanzania Tree Seed Agency	Providing tree seed varieties
8.	Regional Government Secretariat	Coordination and linking local government and central government with the implementation of the technology
9.	Local Governments	Facilitate the implementation at the local level
10.	NGOS	Facilitate the implementation at the local level
11.	Communities	Adopting and implementing agroforestry

Scheduling and sequencing of specific activities

Table 53 describes the sequence and timing of specific activities and identifies responsible organizations

Table 53: Schedule of activities

SN	Activity	Planning		Implementation		Responsible
		Start	End	Start	End	
1.	Develop training and learning systems on the benefits of agroforestry and the value of agroforestry products. To include technical training to extension workers	2019	2019	2020	2030	MNRT
2.	Design and deliver extension services for agroforestry systems, to include public awareness campaigns, cross learning, exchange visits, as well as production and dissemination of manual on agroforestry practices and tree.	2019	2019	2020	2030	MNRT
3.	Review and improve research in agroforestry (including participatory learning and action research).	2020	2020	2020	2030	MNRT
4.	Build a market based system to enable farmers grow and sell seedlings and other agroforestry products to other farmers and wider markets.	2020	2020	2021	2030	MNRT
5.	Design and Operate Agroforestry facility, to provide technical assistance and funding through soft loans for agoforestry promotion.	2019	2020	2021	2026	MNRT

2.1.3.5 Estimation of Resources Needed for Action and Activities

Estimation of capacity building needs

Capacity building needs required for the implementation of actions and activities under agroforestry include:

- Training – extension services.
- Technical support (consultancies)
- Agroforestry inputs (e.g. seeds)
- Training materials

Estimations of costs of actions and activities

The section below provides an estimation of the costs to implement the two actions under agroforestry. Estimations are based on data from economic analysis performed during the cost and benefits analysis of agroforestry.

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Table 54: Costs estimates

Action	Activity	Costs(\$)	Sources of funds
1.	Develop training and learning systems on the benefits of agroforestry and the value of agroforestry products. To include technical training to extension workers	100 000	Government of URT and Development Partners (Multilateral and / or Bilateral)
2.	Design and deliver extension services for agroforestry systems, to include public awareness campaigns, cross learning, exchange visits, as well as production and dissemination of manual on agroforestry practices and tree.	100 000	Government of URT and Development Partners (Multilateral and / or Bilateral)
3.	Review and improve research in agroforestry (including participatory learning and action research).	5000	Government of URT and Development Partners (Multilateral and / or Bilateral)
4.	Build a market based system (e.g a social enterprise) to enable farmers grow and sell seedlings and other agroforestry products to other farmers and wider markets.	200 000	Government of URT and Development Partners (Multilateral and / or Bilateral)
5.	Design and Operate Agroforestry facility, to provide technical assistance and funding through soft loans for agroforestry promotion.	500 000	Government of URT and Development Partners (Multilateral and / or Bilateral)

2.1.3.6 Management Planning

Risks and Contingency Planning

Below in Table 55 are the identified key risks and the associated contingency actions for agroforestry project.

Table 55: Risks and their mitigation

S/N	Activity	Risk item	Description	Contingency actions
1.	Develop training and learning systems on the benefits of agroforestry and the value of agroforestry products. To include technical training to extension workers	Cost risks	An activity costs more than originally Planned	Include reasonable contingency in cost budget.
2.	Design and deliver extension services for agroforestry systems, to include public awareness campaigns, cross learning, exchange visits, as well as production and dissemination of manual on agroforestry practices and tree.	Scheduling risks	An activity takes longer to complete than originally planned	Perform and implement the outcomes of critical path analysis
3.	Review and improve research in agroforestry (including participatory learning and action research).	Performance	Research take longer to yield results	Integrate and communicate the results from past research into the current programme to build continuity research programme.
4.	Build a market based system to enable farmers grow and sell seedlings and other agroforestry products to other farmers and wider markets.	Political	Lack of political support and inadequate acceptance of market approaches in agroforestry.	Use experts to design and communicate the systems to various stakeholders.
5.	Design and Operate Agroforestry facility, to provide technical assistance and funding through soft loans for agroforestry promotion.	Technical	The facility terms and condition not understood and not easily accepted.	Use experts to design and communicate on the funding facility role and function

Next Steps

Below is a description of a) immediate requirements to proceed and b) critical steps to succeed.

Table 56: Next steps for the implementation of agroforestry project

Immediate requirements	Critical requirements
A Coordinator within the Vice President’s Office – Division of Environment is identified and assigned full-time and provided with the required funds and tools/ resources	Improve legal and regulatory frameworks to address subsidies, higher interest rates and tight collateral requirements
Create technical group for stakeholder leadership to include NAFRAC, ICRAF, SUA, Ministry of	Resources to facilitate the process

Immediate requirements	Critical requirements
Agriculture, and MNRT-FDB	

2.1.4 Action Plan for Sustainable Management of Mangrove Forests

Mangrove conservation and restoration involve the following activities:

- Demarcation and protection of selected mangrove sites
- Collection of plant propagules from a sustainable source
- Preparation of the restoration site for planting
- Direct planting of plant propagules at regular intervals at an appropriate time of year
- Establishment of nurseries to stockpile seedlings for future planting
- Planting dune grasses that have a high potential to provide a stable, protective substrate for mangroves to establish their root systems

The benefits of Mangroves include the following:

- Carbon sequestration - e.g. a mangrove forest that had not been disturbed for about ten years contained 978.73 Mt C ha⁻¹ (128.92 Mt C ha⁻¹ above ground biomass and 849.81Mt C ha⁻¹ soil carbon stock) (Mang'ora, 2015).
- Provision of habitats for marine and terrestrial flora and fauna
- Serve as nursery sites for aquatic species (e.g. fish, shellfish) and enhance their productivity
- Natural buffers against storms and cyclones in coastal areas.
- Reduction of coastal erosion.
- Buffers buffer coastal waters from contamination, sedimentation and nutrient enrichment.
- Supply a bundle of ecosystem goods e.g. wood products, fodder, honey, fish, prawns, etc.
- Source of materials used for medicine, dyes, insecticides, etc.

2.1.2.2 Ambition for the TAP

Box 3: Ambition - Scale of implementation of Mangrove forest management and conservation

“By 2030, the target is to conserve 50,000 ha of mangroves and restore 5,000 ha of mangroves with benefits from the technology aimed to reach 100,000 coastal communities in five districts of Tanzania”

2.1.2.3 Actions and Activities selected for inclusion in the TAP

Summary of barriers and measures to overcome barriers

Below is a short description of the identified barriers and measures to meet the specified ambition for transfer and diffusion of the management and conservation of Mangrove forests. The section summarises analysis from the barrier analysis and enabling framework report.

Summary of barriers and measures to overcome barriers

High dependence on mangroves by coastal communities: There is high dependence on mangrove forest products for meeting basic needs amongst residents of coastal areas as a result of limited economic opportunities. As a result most of community members engage in destructive activities such as shifting cultivation, unsustainable extraction of timber and wood fuels, uncontrolled salt mining and prawn farming – leading to the degradation of mangrove resources. For example,

shifting agriculture for flood irrigated rice farming has caused the clearance of mangroves in Rufiji Delta. Efforts to discourage coastal communities from engaging in the above activities are fruitless given the absence of alternative economic opportunities.

Inadequate financing: In spite of being legally protected forests, mangroves are not accorded high recognition by decision makers. The low budget that is allocated for forestry, 1% of the national budget, is split to finance conservation activities in all types of forests including mangroves. On the other hand, financing from the private sector for sustainable management of mangroves has not been realized. Finance mechanisms such as payments for ecosystem systems have not been accessed to support the management of mangroves. Limited financing of mangroves sub-sector limits the planning and the implementation of priority actions to conserve, rehabilitate and restore mangroves.

Little incentives to communities to engage in conservation: Traditionally, mangroves in the coastal areas of Tanzania have been used for poles (domestic and export), timber for fences, houses, boats, fish traps and fuelwood. They have been the source of employment and income for coastal communities (Mang'ora, 2011). However, due to their legal status as reserved forests, mangroves are out of reach for most communities. As a result, communities are legally restricted to access benefits accruing from mangroves. People feel that there are no incentives or benefits to conserve mangroves under such management scenarios.

The status of mangroves as reserved forests implies that the major responsibility for their conservation, rehabilitation and restoration rests with the Government. This means that community participation in sustainable management of mangroves is quite limited. This is exemplified by the absence of participatory natural resource management approaches (Community Based Forest Management and Joint Forest Management) in the mangrove sub-sector unlike other coastal and terrestrial forests. Mangrove forests are cleared and degraded in the sight of adjacent communities – who lack power and mandates to intervene in the reserved forests.

Conversion of mangrove forest lands to other uses: In recent years, mangroves are increasingly being converted to uses with a high potential to generate direct marketable goods like aquaculture, farms, salt evaporation ponds, ports, hotels and housing developments. The leading factor in the conversion of many mangroves ecosystems is because the full value of mangrove products and services are more often not rightly understood, unrecognized and neglected in the development process. Essentially, this is due to the difficulty in estimating the value of the non-market ecosystem services (Salem and Mercer, 2012).

Overlapping and conflicting interpretation of laws and policies: Mangrove management in Tanzania is one of the sub-sectors which have experienced conflicting and overlapping management due to sectoral approaches. Each of the responsible Ministries (Land, Natural Resources, Mining, and Trade) is required to develop its own strategy and guidelines to implement existing laws. Examples of conflicting and overlapping situations as pointed out by Mang'ora (2011) include issuance of licences for salt mining licences in mangrove reserves (Commissioner of Minerals), land titles (Commissioner of Lands), salt extraction (Ministry of industries and trade). Although mangroves are designated as

protected reserves by the Forest Division, the Fisheries Division issues permits for development of prawn farms in the mangroves.

Inadequate data to support management of mangrove forests: For better planning and management of mangroves, availability and access to adequate and reliable information is critical. Traditionally, planning for mangrove management has relied upon historic data - historic flood and storm intensity and frequency, which is insufficient in the face of climate change. Sustainable management of mangroves suffers from lack of baseline information necessary for informing planning and management actions (Macintosh and Ashton, 2003). In addition, inadequate information prevails on the trends and patterns in resource use and economic development, land use and ownership and infrastructure (Mang'ora, 2011).

Limited awareness of factors that support successful management of mangrove forests: Different groups of stakeholders, including communities and practitioners, have limited awareness and understanding regarding key factors to be considered for successful conservation, rehabilitation and restoration of mangroves. Limited awareness is caused by inadequate awareness raising campaigns. On the other hand, practitioners have limited awareness on the assessment of mangrove status, mainly due to lack of technical training. Decision makers also have limited understanding on the linkages between mangrove ecosystems and resources (and coastal livelihoods) such as fish/fishing (Mang'ora, 2011)

Weak law enforcement and compliance: Laws and regulations for managing mangroves are poorly enforced. Key reasons behind weak enforcement include lax attitude amongst law enforcers, corruption, inadequate skilled staff, limited availability of funds for patrols and related law enforcement activities and limited accessibility due to remoteness and inadequate vehicles (Mang'ora, 2011; Francis and Bryceson, n.d.). Other factors include insufficient political support (and political interference) from politicians in technical matters (Mang'ora, 2011; Francis and Bryceson, n.d.).

Summary of measures to overcome barriers

Training on sustainable livelihood approaches: To ensure that coastal communities have access to alternative economic opportunities, it is extremely important to conduct training on sustainable livelihood approaches focusing on existing livelihood strategies e.g. fishing, crop production, salt mining and prawn farming. Other important measures to be considered include introduction of environmentally friendly initiatives (e.g. ecotourism), value addition to products as well as expanding access to markets and improving marketing strategies of products.

Provision and increased access to finance for mangrove management: Proposed activities to increase access to financial resources for managing mangroves are lobbying for increased budgetary allocation, promoting Payments for Ecosystem Services (PES) schemes for waste discharges into wetlands in coastal areas and scaling up REDD+ in mangrove areas. Equally important is the promotion of tourism in marine parks and reserves to increase revenues that could be used for the management of marine ecosystems including mangroves

Enhanced community participation: Ensuring access to benefits from mangroves amongst adjacent communities works to inject a sense of ownership and motivates local communities to participate in conservation and management activities. Access rights to mangrove resources between the government and adjacent communities should be renegotiated. In addition, the provision of incentives for community based management of mangroves such as payments based on patrols should be enhanced. Moreover, to ensure benefits from mangroves trickle down to adjacent communities, efforts should be made to eliminate elite capture of mangrove benefits and to invest in the development of ecotourism infrastructures in coastal areas.

Increased and effective community participation, without which sustainable management of mangroves cannot be achieved, will be enhanced by piloting the implementation of participatory forest management approaches (e.g. JFM and CBNRM) and supporting community mangrove initiatives. Accordingly, communities should be engaged in carrying out patrols in reserved mangroves and in planning, implementation and monitoring of mangrove conservation. Also, local natural resource governance structures should be strengthened.

Economic Valuation of Mangrove Resources: Specific measures to improve the economic valuation of mangroves include raising awareness of decision makers and planners on the linkages between mangrove forests and the economy (including rural livelihoods); performing comparable economic analyses in choosing between sustainable management of mangroves and development options; and promoting research on mangrove based ecosystem goods and services.

Promote integrated approach in mangrove management: Key actions to be carried out to address conflicting and overlapping jurisdiction include the promotion of integrated approach for managing mangrove resources (forests, fisheries and minerals) and harmonizing conflicting laws and regulations on mangrove management (including harmonizing the issuance of permits and licences of land, mining and prawn farming) in mangrove areas. Similar measures to address conflicting and overlapping jurisdiction include establishing an inter-sectoral steering committee and possibly developing a comprehensive stand-alone Mangrove Policy to adequately address mangrove related priorities, challenges and opportunities

Increased collection, analysis and sharing of Mangrove management data: To achieve effective and sustainable management of mangrove forests, there is a need to increase access to information by carrying out widespread assessment and research to acquire baseline data (e.g. growth rate, standing biomass/volume, phenology, etc.) and developing local and national scenarios of future development, climate change and environmental degradation. It is also important to document, assess and integrate indigenous knowledge and management practices into mangrove conservation projects and to identify reference mangrove sites for providing long-term data on mangrove growth and development.

Training and knowledge management: Relevant measures for enhancing awareness of local communities, decision makers and practitioners on the sustainable management of mangroves include conducting public awareness campaigns (including distribution of relevant communication products), provision of technical training to practitioners on approaches and tools for the assessment of mangroves status and organizing workshops to improve decision makers'

understanding on mangrove benefits. Additionally, it is critical to incorporate sustainable management of mangroves into education curricula as well as to develop learning platforms for sharing information and develop and disseminate relevant publications and apps (e.g. “World Mangrove ID” App).

Strengthening law enforcement: Strengthening enforcement of laws and regulations for managing and protecting mangroves will require the implementation of the following measures: **a)** increasing community understanding on policy, legal and institutional frameworks for the management of mangroves, fighting corruption in the forest sector and advocating for increased community participation in the management of mangroves. **b)** Likewise, incentivizing law enforcers, enhancing human resource capacity, increasing access to facilities for patrols and **c)** mobilizing political support for law enforcement are part of key measures for strengthening law enforcement to sustainably manage mangroves.

Actions selected for inclusion in the TAP

Based on the barrier analysis and enabling framework, two actions were selected for consideration in the TAP. Below is a description of the two measures and associated activities to be implemented under Sustainable Forest Management.

Under Sustainable Management of Mangroves, the selected actions are:

i. Improve mangrove conservation policy, legal and regulatory frameworks

Improving mangrove’s policy, legal and regulatory frameworks is centrally important for addressing conflicting and overlapping jurisdiction and ensuring effective community participation in the sustainable management of mangrove resources. This measure will enhance inter-sectoral planning and collaboration in the management of mangrove resources. To be successful, it depends on stakeholder involvement in the process.

ii. Increase access to alternative economic and livelihood opportunities

Increasing access to alternative economic opportunities is so important in reducing the dependence on mangrove resources amongst coastal communities, thus enhancing the integrity of mangrove ecosystems. It is a measure that is a relatively cost-effective and contributes to the maintenance of mangrove ecosystems through the adoption of conservation oriented economic opportunities. Compared to other measures, it is ranked higher because it reduces the pressure on mangrove resources exerted by adjacent communities.

Activities identified for implementation of selected actions

This section provides a transition from action to activities – Table 57 is a list activities to be implemented under Sustainable Management of Mangroves.

Table 57: Activities for implementation of actions

Action 1	Action 1: Improve mangrove conservation policy, legal and regulatory frameworks: through the promotion of an integrated approach for managing mangrove resources; harmonization of conflicting policies, laws and regulations; harmonization of mangrove related permitting and licensing; establishment of an inter-sectoral steering committee; and development of a stand-alone Mangrove Policy
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Action 2	Action 2: Increase access to alternative economic and livelihood opportunities: through training on sustainable livelihood approaches, value addition, increased access to markets, improving marketing strategies, and promotion of environmentally friendly initiatives such as ecotourism
ACTIVITIES:	Action 1: Improve mangrove conservation policy, legal and regulatory frameworks:
Activity 1.1	Review existing and design new integrated mangrove management plan
Activity 1.2	Review and update laws and regulations governing management of mangrove forests including permitting and licencing systems
Activity 1.3	Develop and implement law enforcement and compliance education programme.
Activity 1.4	Review and strengthen the national institutional framework on mangroves management
Activity 1.5	Implementation of the integrated mangrove management plan.
ACTIVITIES:	Action 2: Increase access to alternative economic and livelihood opportunities
Activity 2.1	Invest and conduct research on sustainable alternative economic activities for people living in and around mangrove forests
Activity 2.2	Conduct training to communities on sustainable alternative coastal livelihood approaches.
Activity 2.3	Design implement training to support value addition and quality improvement to community products.
Activity 2.4	Design and adopt Improved marketing strategies of products to enable communities access markets successfully
Activity 2.5	Create or adopt a financing facility to provide financial support to communities to adopt alternative livelihood activities, such as ecotourism.
Activity 2.6	Promote environmentally friendly initiatives such as ecotourism

Actions to be implemented as Project Ideas

The two actions that have been described above will be selected for further development as project ideas. The justification for their selection has been made under section on *Actions selected for inclusion in the TAP*. The actions are:

- Improve mangrove's policy, legal and regulatory frameworks
- Increase access to alternative economic opportunities

2.1.2.5 Stakeholders and Timeline for implementation of TAP

A list of stakeholders who have been considered to have a key role in the implementation of Sustainable Management of Mangroves and their specific roles is presented in Table 58.

Table 58: stakeholders and their responsibilities

S/N	Stakeholder	Responsibility
1.	VPO-Division of Environment	Policy coordination
2.	Ministry of Fisheries and Livestock	Collaborator in the coordination for the implementation of Sustainable Management of Mangroves
3.	Ministry of Natural Resources and Tourism	Lead organization in coordinating the implementation of Sustainable Management of Mangroves
4.	Marine Parks and Reserves	Providing technical assistance
5.	Institute of Marine Science	Conducting research on mangroves and coastal livelihoods
6.	Regional Government Secretariat	Coordination and linking local government and central government with the implementation of the technology
7.	Local Governments	Facilitate the implementation at the local level
8.	NGOS	Facilitate the implementation at the local level
9.	Communities	Adopting and implementing the technology

Scheduling and sequencing of specific activities

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The Table 59 provides sequence and timing to implement the two actions under Sustainable Management of Mangroves.

Table 59: Sequence and timing of specific activities,

Action	Activity	Planning		Implementation		Responsibility
		Start	End	Start	End	
1.	Review existing and design new integrated mangrove management plan	2019	2020	2022	2030	MNRT
2.	Review and update laws and regulations governing management of mangrove forests including permitting and licencing systems	2019	2019	2019	2020	MNRT
3.	Develop and implement law enforcement and compliance education programme.	2020	2020	2021	2030	MNRT
4.	Review and strengthen the national institutional framework on mangroves management	2020	2020	2020	2021	RALG
5.	Implementation of the integrated mangrove management plan.	2020	2020	2021	2023	MNRT
6.	Invest and conduct research on sustainable alternative economic activities for people living in and around mangrove forests	2020	2020	2020	2030	MNRT
7.	Conduct training to communities on sustainable alternative coastal livelihood approaches.	2020	2020	2021	2030	MNRT
8.	Design implement training to support value addition and quality improvement to community products.	2020	2020	2021	2030	MNRT
9.	Design and adopt Improved marketing strategies of products to enable communities access markets successfully	2020	2020	2021	2030	MNRT
10.	Create or adopt a financing facility to provide financial support to communities to finance alternative livelihood activities, such as ecotourism.	2020	2021	2022	2030	MNRT
11.	Promote environmentally friendly initiatives such as ecotourism	2222	2222	2222	2030	MNRT

2.1.2.5 Estimation of Resources Needed for Action and Activities

Estimation of capacity building needs:

Capacity building needs required for the implementation of Sustainable Management of Mangroves include:

- Training on marketing, sustainable production approaches, alternative income generating activities
- Technical support (consultancies)
- Training materials

Estimations of costs of actions and activities:

Table 60 provides an estimation of the costs to implement the two actions under Sustainable Management of Mangroves. Estimates are based on data from economic analysis performed during the cost and benefits analysis of Sustainable Management of Mangroves. The sources of funds for implementing actions will include, Government of Tanzania, Development Partners (multilateral and bilateral) and other stakeholders.

Table 60: Costs estimation

SN	Activity	Costs (\$)
1.	Review existing and design new integrated mangrove management plan	100 000
2.	Review and update laws and regulations governing management of mangrove forests including permitting and licencing systems	50 000
3.	Develop and implement law enforcement and compliance education programme.	20 000
4.	Review and strengthen the national institutional framework on mangroves management	20 000
5.	Implementation of the integrated mangrove management plan.	1, 000 000
6.	Invest and conduct research on sustainable alternative economic activities for people living in and around mangrove forests	200 000
7.	Conduct training to communities on sustainable alternative coastal livelihood approaches.	100 000
8.	Design implement training to support value addition and quality improvement to community products.	10 000
9.	Design and adopt Improved marketing strategies of products to enable communities' access markets successfully.	20 000
10.	Create or adopt a financing facility to provide financial support to communities to finance alternative livelihood activities, such as ecotourism.	150 000
11.	Promote environmentally friendly initiatives such as ecotourism: To include training, preparation of promotional materials, dissemination, support on investments.	100 000

2.1.4.6 Management Planning

Risks and Contingency Planning

Below in Table 61 is a description of key risks identified and the associated contingency plan. Table 61 provides risks threatening the actions and and contingency measures to mitigate against the risks . The key mitigation measure for the action is to ensure that policy and political buy in and acceptance of the action at all levels of the government.

Table 61: Risk and their mitigation

S/N	Activity	Risk item Description	Contingency actions
1.	Review existing and design new integrated mangrove management plan	Cost: An activity costs higher than originally planned	Develop realistic budget based on data and evidence and Including provision of contingency in the budget. Strong financial management.
2.	Review and update laws and regulations governing management of mangrove forests including permitting and licencing systems	Time: The process may take too long and outlive the project.	Make efforts to generate interests from all stakeholders to understand the need for the review
3.	Develop and implement law enforcement and compliance education programme.	Rejection of Review Process: If review process fail it may be difficult to justify the programme	Plan and manage the review process so that it technically and politically acceptable.
4.	Review and strengthen the national institutional framework on mangroves management	Inertia: Dangers of upsetting the status quo and institutional comfort zones may slow the review process	Ensure all the affected parts to see the need from national interest perspective rather than single institution interest
5.	Implementation of the integrated mangrove management plan.	Fiduciary: Inadequate or untimely delivery of funds	Adequate fundraising and management for the project
6.	Invest and conduct research on sustainable alternative economic activities for people living in and around mangrove forests	Fiduciary: Funds not allocated for research.	Show decision makers the importance of research and find ways of accessing international funds
7.	Conduct training to communities on sustainable alternative coastal livelihood approaches, such as ecotourism	Low Buy In: Communities may not be willing to undertake sustainable or alternative approaches	Identify activities that can really make a difference to peoples life.
8.	Design and implement training to support value addition and quality improvement to community products.	Technical: The training may not be used or poorly designed and delivered	Look for good quality trainers and training developers.
9.	Design and adopt Improved marketing strategies of products to enable communities' access markets successfully.	Technical: Communities not producing enough products to attract markets for long term.	Identify activities that can really make a difference to peoples life. Strengthen capacity of communities to produce quality goods and services for the markets
10.	Create or adopt a financing facility to provide financial support to communities to finance alternative	Technical: The lack of willingness to set a fund specifically targeting	Work with decision makers to see the value for money from setting the facility.

	livelihood activities, such as ecotourism.	ecotourism in coast areas.
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Next Steps

Below in Table 62 is a description of a) immediate requirements to proceed and b) critical steps to succeed. The identification of immediate and critical requirements will allow for the resources to be committed towards the achievement of the goals of Sustainable Management of Mangroves.

Table 62: Immediate requirement and critical input

Immediate requirements	Critical steps
The Ministry of Natural Resources and Tourism to initiate an Integrated mangrove conservation and management planning process	The relevance of the integrated mangrove forest management programme should start with convincing and acceptance at technical, policy and political level. So the most important step is to provide awareness and understanding of the programme among the key stakeholders.

2.2 Project Ideas for the Forest Sector

2.2.1 Brief summary of the Project Ideas for the Forest Sector

Project ideas in the forest sector were identified based on their place in enhancing socio-economic development as well as mitigation of and adaptation to climate change. The target group for the transfer and diffusion of Sustainable Forest Management are forest managers and users at community level as well as the government, private sector and other non-state actors engaged in forest management.

For the case of agroforestry, the target group for the transfer and diffusion of the technology are subsistence farmers who are potential users of agroforestry practices and producers of agroforestry products. These are often a group of people who engaged in unsustainable farming practices including shifting cultivation. With regard to sustainable management of mangroves, the target group for the transfer and diffusion of mangrove conservation, rehabilitation and restoration is the coastal communities adjacent to mangroves. These are subsistence fishers, salt miners, farmers and guardians of mangroves where they derive important ecosystems services and products for sustaining their livelihoods.

The objective of the project idea of Sustainable Forest Management is to improve the profitability of the forest sector, whereas the objective of the Agroforestry project idea is to address existing disincentives and demonstrate the benefits of agroforestry. On the other hand the project idea for mangrove management and conservation is aimed at promoting the use of sustainable approaches to coastal livelihoods.

The three technologies will be diffused through public awareness campaigns, financial investment, strengthened enforcement of laws and regulations, harmonization of conflicting and overlapping laws and elimination of disincentives.

2.2.2 Specific Project Ideas

2.2.2.1. Sustainable Forest management

Project idea 1: Strengthening legal and regulatory enforcement

- Background

Tanzania loses about 400,000ha of forests annually due to various factors including unsustainable agricultural practices, forest fires and unsustainable charcoal production (MNRT 2015). The underlying causes of the above are: a) weak enforcement of laws and regulations leading to illegal harvesting of forest resources and encroachment into conserved forests; b) limited public awareness on forest policy, legal and regulatory frameworks; d) poor governance and corruption; and e) limited capacity of forest institutions from the local to the national.

- Description of the Project

The proposed law enforcement project will be implemented in five regions of Tanzania which are rich in forest resources. The project will set out to address deforestation and forest degradation due to unsustainable activities. At the end, the project is intended to result in the enhancement of forest resources. This project will contribute to SDGs related to sustainable management of natural resources and good governance. It is aligned to current strategies in natural resource management.

- Objectives of the proposed project are:

- To improve understanding of existing laws and regulations
- To strengthen forest governance structures to enforce laws
- To improve legal and regulatory framework in order to deter forest offences and crimes
- To enhance the capacity of law enforcers to prosecute and try forest related crimes

- Outputs of the project of the project are:

- Forest dependent communities, forest managers and political leaders in the selected five regions have better understanding and appreciation of existing forest laws and regulations.
- Forest governance structures in the five regions have improved to manage forest resources Improved capacity of
- Revised penalties and fines with the potential to deter forest offences and crimes
- Forest dependent communities in the five regions have participation in the enforcement and compliance to forest laws and regulations

- Project Deliverables and activities

- Enhanced compliance to laws and bylaws: Training communities on forest laws and regulations
- Enhanced integrity of forest resources: Providing technical training to forest officers on enforcing laws and regulations

- Reduced corruption in the forest sector: Reviewing fines and penalties related to forest crimes and offences to make them deterrent.
- Improve the capacity to prosecute and try environmental crimes: Training laws enforcers and judges / magistrates in trying and prosecuting forest offences respectively.
- Increased community participation in the enforcement of laws and regulations: Train communities to engage actively in the enforcement of laws and regulations including taking part in patrols

– Timelines

The proposed project will be implemented for the period of three years

– Budget/Resource requirements

The budget of this project is shown in the Table 63:

Table 63: Budget for sustainable forest management

S/N	Activity	Budget (\$)		
		Year 1	Year 2	Year 3
1.	Training communities on forest laws and regulations	50 000	50 000	50 000
2.	Providing technical training to forest officers on enforcing laws and regulations and local	300 000	50 000	50 000
3.	Reviewing fines and penalties related to forest crimes and offences to make them deterring.	20 000	10 000	10 000
4.	Training laws enforcers and judges / magistrates in trying and prosecuting forest offences respectively. Raise public awareness on forest laws and regulations	100 000	50 000	50 000
5.	Train communities to engage actively in the enforcement of laws and regulations including taking part in patrols	50 000	50 000	50 000
6.	Improve the capacity to prosecute and try environmental crimes.	50 000	50 000	50 000

– Measurement/Evaluation

Monitoring and evaluation will be performed by reviewing project reports, site visits and interview with key stakeholders. Specific indicators will be developed to measure the success of law enforcement in curbing illegal activities and encroachment into forest resources.

Examples of the indicators include:

- Number of recorded forest offences is reduced by more than 50%
- Number of cases against forest offences successfully prosecuted.
- Percentage of illegal harvested products in reduced by more than 50%

Possible Complications/Challenges

- Poor cooperation amongst stakeholders due to varying interest and inadequate motivation: To address this challenge it will require a number of actions. These include, mapping of stakeholders and create a system of continuous communication, dialogues and engagement. It may also be necessary to run a system of resource sharing.
- Political indifference or interference: addressing this challenge, will require continuous engagement with and encouragement of political system at every level. Continuous and incessant education to elected officials and influential leaders to understand the value of mangrove conservation and sustainable management.

Project idea 2: Improving the profitability of the forest sector

1. Background

The project to improve the profitability of the forest sector will be implemented in five selected regions of Tanzania. Target population will be communities adjacent to forest resources and people, private companies and state agencies involved in sustainable management of forest resources.

The project will contribute to sustainable natural resource management, enhancement of rural livelihoods and increased income / revenues from the forest sector. As such the Project will contribute to the realization of Sustainable Development Goals (SDGs) of sustainable management of forest resources, increased household income and reduced poverty, and inevitably the forests will be contributing carbon sequestration.

2. Objectives

The objectives of the proposed project are:

- a. To promote sustainable management of forest resources
 - b. To promote the adoption of sustainable production of alternatives None Timber forest Products e.g. honey, mushroom, and eco-tourism
 - c. To establish efficient value chains and link to markets for forest products through training
 - d. To enable value addition of forest products
 - e. To provide efficient sink for atmospheric carbon.
3. Expected outputs
- a. About 500 000 ha of selected forests are sustainably managed.
 - b. About 5000 forest dependent men and women Improve marketing skills for forest products including carbon and None Timber Forest Products.
4. Project activities
- a. Organise activities to provide skills and capabilities to communities in sustainable management of forest resources.
 - b. Provide training and technical assistance in Promotion of adoption of profitable and sustainable production alternatives
 - c. Build capacity to promote value-addition and marketing of forest products.
 - d. Provide facilities that encourage investment in forestry and forest industries technologies

5. Timelines

The project will be implemented for four years

6. Budget/Resource requirements

Table 64: Budget for improving forest sector profitability as a catalyst for afforestation

S/N	Activity	Budget (\$)			
		Year 1	Year 2	Year 3	Year 4
1.	Organise activities to provide skills and capabilities to communities in sustainable management of forest resources.	100 000	300 000	300 000	100 000
2.	Provide training and technical assistance in Promotion of adoption of profitable and sustainable production alternatives	300 000	100 000	100 000	800 000
3.	Build capacity to promote value-addition and marketing of forest products.	5000 000	200 000	50 000	50 000
4.	Provide facilities that encourage Investment in forestry and forest industries technologies	100 000	2000 000	250 000	1 00 000

7. Measurement/Evaluation

Monitoring and evaluation will be performed by reviewing project reports, site visits and interview with key stakeholders. Specific indicators will be developed to measure the success of increasing profitability in forest resources management. The indicators could include, number of investors in forest management trained in profitable forest management; and number of investors who have been trained in improved marketing and value addition

8. Possible Complications/Challenges

- Poor cooperation amongst stakeholders due to lack of interest and motivation
- Lack of political will / political interference

9. Responsibilities and Coordination

- Ministry of Natural Resources and Tourism -
- Tanzania Forest Services
- Local government authorities
- NGOs
- Private sector

2.2.2.2. Agroforestry

Project Idea 1: Provide incentives for promoting the adoption of agroforestry

1. Background

The project will work to address adverse incentives limiting the adoption and scaling up of agroforestry. The disincentives include high collateral requirement for agricultural loans and credits, high interest rates, lack of subsidies on agroforestry and lack of recognition of tree fertilizer in national agricultural programmes and lack of recognition of fertilizer tree in national agricultural programmes. This project will contribute to the achievement of SDG in terms of sustainable environmental management, sustainable production and more indirectly on enhanced food security.

2. Objectives

The objectives of the project are:

- To identify various incentives for promoting agroforestry amongst policy makers and planners
- To eliminate barriers related to financial access
- To integrate agroforestry tree fertilizer into agricultural programmes
- To advocate for the provision of subsidies for agroforestry related investments as the case with monoculture agriculture.

3. Outputs

- 50 000 farmers practicing agroforestry have better access to financial resources
- 400,000,000 nitrogen fixing agroforestry trees are integrated into agricultural fertilizer programmes
- 50 000 farmers are aware of and potential access to incentives to encourage agroforestry related investments.

4. Project activities

The proposed activities are:

- a. Advocate for the lowering of interest rates for investments in agroforestry
- b. Advocate for the relaxation of collateral requirements for loans and credits
- c. Promote through demonstration and theoretical teaching the synergy between nitrogen fixing trees and mineral fertilizer
- d. Integrate seeds of nitrogen fixing trees in national agricultural programmes
- e. Provide subsidies for agroforestry inputs
- f. Create funding facility to support investment environment in agroforestry

5. Timelines

The project will be implemented over three years

6. Budget/Resource requirements

Table 65: Budget for idea to provide incentives for promoting the adoption of agroforestry

S/N	Activity	Costs(\$)		
		Year 1	Year 2	Year 3
1.	Improve policy makers and planners awareness on the benefits of agroforestry	50 000	50 000	50 000
2.	Advocate for the lowering of interest rates for investments in agroforestry and advocate for the relaxation of collateral requirements for loans and credits	15 000	15 000	15 000
3.	Integrate nitrogen fixing trees in national agricultural programmes and Promote the synergy between nitrogen fixing trees and mineral fertilizer.	350 000	300 000	250 000
4.	Provide subsidies for agroforestry inputs	500 000	200 000	100 000
5.	Create a funding facility to support investment in in agroforestry	200 000	200 000	200 000
	Total	1 115 000	765 000	615 000

7. Measurement/Evaluation

Monitoring and evaluation will be performed by reviewing project reports, site visits and interview with key stakeholders. Specific indicators will be developed to measure the success of in promotion uptake and adoption of agroforestry. The indicators could include number of policy makers and planners engaged in increasing awareness of agroforestry, number of policy markets and planners trained in modern agroforestry, number and type of nitrogen fixing tree species used in the programme.

8. Possible Complications/Challenges

- Low uptake of agroforestry practices: This can be addressed through the advanced planning of the activities and including education to targeted groups. Careful selection of geographical areas to send the interventions, looking at the historical factors such as past performance and responses.

9. Responsibilities and Coordination

- Ministry of Agriculture and Food Security
- Local government authorities
- NGOs
- Private sector
- Department of Forestry
- Tanzania Forest Services
- Agroforestry Centre

Project idea 2: Improve public awareness on agroforestry

1. Background

Inadequate awareness on the benefits of agroforestry is one of the key barriers to the adoption and diffusion of agroforestry. Farmers have continued to practice unsustainable farming practices combined with intensive use of chemical fertilizers leading to the degradation of land and water resources. The project will be located in regions with high agroforestry potential and areas already practising agroforestry. The project will contribute to Sustainable environmental management and improved food security

2. Objectives

- To improve awareness on the relevant approaches and benefits of agroforestry
- To build capacity of extension workers to promote agroforestry

3. Outputs

- 500 000 farmers have Improved understanding on the benefits of agroforestry
- 200 policy makers and planners including politicians have Improved understanding on the benefits of agroforestry amongst
- Better understanding of the benefits of agroforestry
- Increased understanding on agroforestry practices
- Increased capacity of extension agents to promote agroforestry

4. Project activities

- Provide technical training to extension workers: including farmer field schools, workshops and public media programmes
- Organize public awareness campaigns on the approaches and benefits of agroforestry to increase farmers’ awareness on the benefit of agroforestry.
- Conduct training for policy makers and planners to increase awareness on the benefits of agroforestry
- Promote cross learning through study tours and exchange visits
- Establish agroforestry demonstration plots
- Disseminate a manual on agroforestry practices and tree species
- Disseminate modern agroforestry skills and knowledge to a wider farmer audience
- Support increased educational farm visits for farmers

5. Timelines

The project will be implemented for four years

6. Budget/Resource requirements

Table 66: Budget for idea to improve public awareness on agroforestry

S/N	Activity	Costs(\$)			
		Year 1	Year 2	Year 3	Year 4
1.	Provide technical training to extension workers, policy makers and farmers	100 000	50 000	50 000	50 000
2.	Organize public awareness campaigns on agroforestry	50 000	50 000	50 000	50 000
3.	Promote cross learning through study tours and	10 000	50 000	50 000	10 000

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S/N	Activity	Costs(\$)			
		Year 1	Year 2	Year 3	Year 4
	exchange visits				
4.	Establish agroforestry demonstration plots	50 000	200 000	10 000	10 000
5.	Develop and Disseminate a manual on agroforestry practices and tree species	200 000	20 000	20 000	20 000
6.	Disseminate skills and knowledge of modern agroforestry to wider farmer audience	50 000	50 000	20 000	20 000
7.	Support increased educational farm visits for farmers	100 000	50 000	20 000	20 000
	Total	560 000	470 000	220 000	180 000

7. Measurement/Evaluation

Monitoring and evaluation will be performed by reviewing project reports, site visits and interview with key stakeholders. Specific indicators will be developed to measure awareness in agroforestry and the consequent behaviour change. The examples of indicators could, number of people understanding accessing information and agroforestry concepts, number of people practicing agroforestry in the farm management, types of agroforest messages developed and conveyed.

8. Possible Complications/Challenges

- Poor cooperation amongst stakeholders due to lack of interest and motivation
- Farmers adherence to traditional farming practices

9. Responsibilities and Coordination

- Ministry of Agriculture and Food Security
- Local government authorities
- NGOs
- Private sector

2.2.2.3. Sustainable Management of Mangroves

Project Idea 1: Increase access to alternative economic opportunities

1. Background

Limited access to economic opportunities drives many coastal communities into poverty. Also, these communities depend heavily on mangroves and other natural resources to sustain their livelihoods. Due to limited access to mangroves because they are reserved forests, adjacent communities engage in illegal harvesting of mangroves hence the degradation of the latter. The proposed project will work to provide alternative but sustainable economic opportunities for coastal communities adjacent to mangroves in five regions along the coast. This project will have a positive implication on sustainable environmental management, improved livelihood strategies, poverty reduction and increased household income levels.

2. Objectives

- a. To improve understanding of sustainable livelihood strategies for coastal communities.

- b. To raise communities awareness on sustainable mangrove management and conservation approaches
- c. To promote value addition of products produced by coastal communities
- d. To improve marketing strategies for products
- e. To establish strong linkages to markets

3. The outputs are

- a. 50 000 people living near mangrove forests are supported to improve their livelihoods through supplementary means and sustainable management approaches
- b. 5 000 people supported increase add value mangrove based and farm products
- c. 5 000 people are given better market access.
- d. Value chain of at least two mangrove products is studied, understood and used to support people in mangrove areas to access markets.

4. Project activities

The project will set out to implement the following:

- a. Identification of alternative economic activities relevant for men and women who live near mangrove forests.
- b. Carry out a socioeconomic assessment of to improve understanding of sustainable livelihood strategies used by men and women who live near mangrove forests.
- c. Conduct training on sustainable and environmentally friendly approaches to coastal livelihoods.
- d. Provide technical assistance to promote value addition of products produced by coastal communities
- e. To improve marketing strategies and establish linkages to markets for mangrove forest products and products from alternative economic activities.

5. Timelines

The project will be implemented for four years

6. Budget/Resource requirements

Table 67: Budget for idea to Increase access to alternative economic opportunities

S/N	Activity	Costs (\$)			
		Year 1	Year 2	Year 3	Year 4
1.	Identification of alternative economic activities relevant for men and women who live near mangrove forests.	100 000	0	0	0
2.	Carry out a socioeconomic assessment of to improve understanding of sustainable livelihood strategies used by men and women who live near mangrove forests.	100 000	0	0	0
3.	Conduct training on sustainable and	50 000	50 000	50 000	50 000

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S/N	Activity	Costs (\$)			
		Year 1	Year 2	Year 3	Year 4
	environmentally friendly approaches to coastal livelihoods				
4.	Support investment in alternative economic activities including promoting value addition to local products and Establish linkages to markets.	50 000	50 000	50 000	50 000
5.	To improve marketing strategies and establish linkages to markets for mangrove forest products and products from alternative economic activities.	40 000	20 000	20 000	20 000

7. Measurement/Evaluation

Monitoring and evaluation will be performed by reviewing project reports, site visits and interview with key stakeholders. Specific indicators will be developed to measure the success alternative economic activities for men and women around mangroves. The indicators will include, number of new economic activities accepted and adopted by communities, number of communities members who have engaged in the alternative economic activities and marketing strategies used to promote community products.

8. Possible Complications/Challenges

- Limited knowledge and capabilities on value addition to the products: This can be addressed by providing training and funding equipment to help add value to the produces.
- Communities many not accept the newly introduced alternative or maybe there are not new alternative economic activities to be introduced.

9. Responsibilities and Coordination

- Ministry of Natural Resources and Tourism
- Local government authorities
- NGOs
- Private sector

Project Idea 2: Improve mangrove’s conservation policy, legal and regulatory frameworks

1. Background

Policy, legal and regulatory framework for mangrove management has many conflicting and overlapping aspects. The proposed project will work to identifying conflicting and overlapping laws (and subsequently institutions) with a view of harmonizing them. This will also lead to the harmonization of permitting and licensing systems. It will thus target policy makers as well as law interpreters and enforcers. At the end, it is expected that the project will improve inter-sectoral coordination in the management of mangrove resources. The project will enhance sustainable environmental management and good governance of natural resources.

2. Objectives

- a. To improve understanding on mangrove related policies, laws and regulations
- b. To identify overlapping and conflicting laws and regulations
- c. To advocate for the legal and regulatory revisions
- d. To improve inter-sectoral planning, coordination and implementation

3. Outputs

- a. At least 1000 men and women who live near mangrove forests including political leaders have better understanding of mangrove laws and regulations
- b. The interpretations of the laws that are deemed conflicting or overlapping are Harmonization and adjusted.

4. Project activities

- a. Training on existing laws and regulations in the mangroves sub-sector
- b. Reviewing laws and regulations to identify conflicting and overlapping mandates
- c. Review and harmonize existing laws and regulations
- d. Establish or strengthen an inter-sectoral committee for planning and implementing mangrove related initiatives.

5. Timelines

The project will be implemented for three years

6. Budget/Resource requirements

Table 68: Budget for idea to Increase access to improve mangrove conservation

S/N	Activity	Budget (\$)		
		Year 1	Year 2	Year 3
1.	Training on existing laws and regulations in the mangroves sub-sector	50 000	50 000	50 000
2.	Reviewing laws and regulations to identify conflicting and overlapping mandates in order to harmonize laws and regulations affecting mangrove management.	50 000	50 000	50 000

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S/N	Activity	Budget (\$)		
		Year 1	Year 2	Year 3
3.	Establish or strengthen an inter-sectoral committee for planning and implementing mangrove related initiatives.	20 000	10 000	10 000
4.	Strengthen mangrove management policy and systems	100 000	50 000	50 000

7. Measurement/Evaluation

Monitoring and evaluation will be performed by reviewing project reports, reviewing of new laws and interview with key stakeholders. Specific indicators will be developed to measure the success of Improve mangrove's conservation policy, legal and regulatory frameworks. The indicators could include number of men and women trained in mangrove laws; and number of laws that have their interpretation reviewed and harmonised.

1. Possible Complications/Challenges

- Resistance or interference from among stakeholder not seeing the need for reviewing and changing mangrove related laws and policies.
- Protracted process of policy revision: To address this challenge, it will require engagement with Ministry of Natural Resources so as to take leadership in the policy review process.

2. Responsibilities and Coordination

- Ministry of Natural Resources and Tourism
- Local government authorities
- NGOs
- Private sector

CHAPTER 3: CROSS CUTTING ISSUES

3.1. Introduction

Action plans have been elaborated for the six prioritised technologies, three in energy sector and three in the forest sector. There are some crosscutting issues that may need common interventions. This chapter discusses such crosscutting issues:

An important measure that cuts across most of the selected technologies is the review of national policies to address price competitiveness. For example, financial measures hinge mainly on the need for government action to reduce cost of supply of inputs or materials and equipment for the technologies. This can be done at the macro level through reduction in lending interest rates to less than 20%, reduction of import duties, stabilization of the exchange rate and institution of tax relief incentives to suppliers of these materials and equipment.

Common barriers to the adoption of the technologies include High cost of the technologies as a result of high cost of labour, technical services, equipment and materials; Inadequate funding for sustaining the technologies due to insufficient public investment and private participation, including contributions from external agencies; Inadequate community and local (district) level capacity, including technical and financial management expertise, to keep the technologies functional; Limited integration of the technologies in policy plans resulting in their poor diffusion and adoption; Lack of cultural acceptance of change so communities are not motivated to adopt the technologies wholeheartedly; Inadequate community development specialists and logistics to design and implement appropriate community educational and awareness-raising programs in beneficiary communities. Common interventions are listed in section 3.2.

Another major barrier is Incoherent government policy on climate change to drive the adoption of the technologies. Some technologies are targeting rural communities who have low absorption capacity of the technologies because of their lack of regular income and therefore ability to afford. Thus, government actions in promoting and facilitating the diffusion and adoption of these technologies are paramount. In addition, the capacities of beneficiary communities to adopt and manage the technologies both for their well-being and for sustainability are prerequisites. Strengthening research and development (R&D) and extension linkages is also important to enable effective flow of information from research into use. This is necessary to address the knowledge gap of the user communities and technology promoters. In both the sectors of energy and forest, the national research system continues to work on prevailing technology needs. However, the gap between the system and the user ends is a major barrier to diffusion. This has to be addressed as a national policy.

Prioritization of climate change as an important development and cross-cutting issue, has implications for the sustainability of the energy and forest sectors; and subsequent development of strategies and /or mechanisms to increase productivity whilst building resilience within the sector. This will provide opportunity for prioritizing these technologies for promotion, adoption and uptake. It should lead to increased budgetary allocation in support of the diffusion of the technologies and the facilitation of the involvement of external agencies with requisite know-how and other resources.

Stable macro-economy that continues to grow with a GDP rate of not less than 7 per cent is expected to perform better with improved energy access. This will enable the continuous recognition of the importance of energy sector to the national development and will provide opportunity for addressing issues e.g. reforming the energy sector to enhance productivity of the sector.

3.2. Cross-cutting Issues

The enabling framework to address the common barriers include investment in research and development, training and human and organizational capacity building, information and education, awareness raising, strengthening of institutional collaboration and infrastructure, setting of appropriate policies (incentives or disincentives), enforcement, relevant policy support, financial services and promotion of public-private partnership.

Table 69: Summary of cross cutting barriers and proposed enabling measures

Cross cutting Barriers	Cross cutting Enabling measures
Economic and financial	<ul style="list-style-type: none"> Enhance access to finances for investment through subsidies, lowering of taxes, lending rates etc.
Technical	<ul style="list-style-type: none"> Embark of capacity building of coordinating institutions, R&D institutions, Vocational Training Institutions, technicians etc.
Information and awareness	<ul style="list-style-type: none"> Conduct awareness campaigns to all stakeholders including adopters of technologies
Policy, legal and regulatory	<ul style="list-style-type: none"> Develop appropriate policies to promote renewables and forest management, climate change mitigation etc.

CHAPTER 4: SUMMARY AND CONCLUSIONS

The Technology Action Plan (TAP) report provides a comprehensive description of the action plan for mitigation technologies identified under the energy and forest sectors. It presents the results of the process, which has led to a selection of several options for groups of measures described in the barrier analyses and enabling framework report. Under the energy sector, the three prioritised technologies were mini hydropower, compact biodigester and solar PV. It is proposed to establish a Pilot Project on Climate Change and energy access to cater for the issues observed in the main report with the pilot projects.

For forest the three top technology options were (i) sustainable forest management; (ii) agroforestry; (iii) sustainable mangrove conservation, rehabilitation and restoration. It is proposed to establish a programme of Forest for Climate Resilient Communities. The programmes will have to take a broad based approach to ensure that all three options are included. This will mean that the programme will cover forest areas in high forest areas, dry woodlands and coastal mangroves. Essentially the above project ideas are the components of this major programme.

The TAP report has also dealt with crosscutting issues which among others include common barriers to all the technologies identified under both sectors. In the energy sector common barriers were identified with opportunities for synergies in terms of enhancing measures to overcome them, even though there were some differences in some details. The first related to the high cost of materials and equipment for technology diffusion and implementation. Building materials are expensive because of the huge infrastructure deficit the country faces.

The second and third common barrier was the lack of technical skills and experience necessary in the designing of the technologies, and lack of skills in the construction of the technologies. It was suggested that this was due to the low number of people being trained in the necessary skills due to various reasons including high cost of training equipment.

In the forest sector the common barriers identified are grouped into financial and non-financial barriers. Financial barriers include inadequate budgetary allocation and tardiness in budget delivery. On the side of non-financial barriers, these include the institutional challenges, weaknesses in policy and legal frameworks, as well as weak law enforcement and compliance. There are also challenges with skills in some areas and the need for people inclusion as other barriers

Table 70 to Table 75 provide summaries of TAPs

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Table 70: Summary matrix for Compact Biogas Digester TAP

Sector		Energy						
Sub-sector		Biogas						
Technology		Compact Biogas Digesters for Urban Households						
Ambition		100,000 urban household						
Benefits		Mitigate GHG emission (183,000 tCO ₂ per year); Mitigation of deforestation saving of about 4,100 tCO ₂ sink per year						
Action	Activities to be implemented	Sources of funding	Responsible body and focal point	Time frame	Risks	Success criteria	Indicators for Monitoring of implementation	Budget per activity
Establish a unit to oversee the implementation of the TAP								36,000
Action 1: Establish economic feasibility of compact biodigester	Activity 1.1: Conduct economic (including market survey) feasibility of the biogas digester	GoT, Development partners	UDSM ARU CARMATEC	1-2 years	Delays in concluding feasibility study	Uptake of biogas digesters	Quarterly progress reports Feasibility study report Market survey report	31,000
Action 2: Create awareness of both developer, and users of the technology	Activity 2.1 Develop awareness material targeting different stakeholders (i.e. Private Sector, Decision Makers, Users of Compact biodigester, financial institutions)	GoT, Development partners	MOE NGOs	1-2 years	None	Uptake of biogas digesters	Awareness materials	10,000
	Activity 2.2: Develop a communication strategy Profile the target stakeholders	GoT, Development partners	MOE NGOs	1-2 years	None	Uptake of biogas digesters	Printed communication strategy	5,000

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	particularly the adopters of the technology							
	Activity 2.3: Implement awareness campaign on compact biodigester	GoT, Development partners	MOE NGO	1-2 years	None	Uptake of biogas digesters	Program of implementation	20,000
	Activity 3.1: Develop financial incentives to assist lowering the cost of compact biodigester	Government	MFP MOE	1-2 years	Delays in approving financial incentives policy	Present this activity to the cabinet	Reports to Quarterly steering committee meetings	20,000
Action 3: Enhance access to investment finances	Activity 3.2: Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit	Development Partner	MOE VPO	2-4 years	None	Sponsorship level from development partners	Minutes of meetings	10,000

Table 71: Summary matrix for Mini-hydropower TAP

Sector	Energy							
Sub-sector	Electricity							
Technology	Mini-Hydropower Plant							
Ambition	1,000,000 households							
Benefits	Mitigate GHG emission (0.378 megaton per year)							
Action	Activities to be implemented	Sources of funding	Responsible body and focal point	Time frame	Risks	Success criteria	Indicators for Monitoring of implementation	Budget per activity
Establish a unit to oversee the implementation of the TAP	Recruit staff Establish and equip the office	GoT	MOE	1 year	None		A working implementation unit	50,000

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Action 1: Enhance access to financing	Activity 1.1 Develop financial incentives to assist lowering the cost of mini hydropower project (e.g. introduce subsidies, tax exemptions)	Government Private Sector	MOE MFP	1.2 years	None	Number of projects implemented	Documented incentives	20,000
	Activity 1.2: Sensitise the policy makers on the importance of incentives and or subsidies for the electricity to compete with other fossil fuels	Government Private Sector Development Partners	MOE	1 year	None	Number of projects implemented	Number and type of incentives in place	10,000
	Activity 1.3: Lower commercial banks' lending rates	GoT	MOE MFP BoT	1-2 years		Number of projects implemented	Bank lending rates	15,000
	Activity 1.4: Establish a Renewable Energy Development Fund to enhance investment in RE	GoT Private Sector Development Partners	MOE MFP BoT	2 – 5 years		Amount of money available to support projects	Existence of the Fund	10,000
	Activity 1.5: Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit	Government Development Partners	MOE MFP BoT	1-2 years	None	Amount of support received	Minutes	5,000
Action 2: Build / strengthen capacity of key stakeholders	Activity 2.1: Develop specialized training aimed at building the capacities in relevant	Government Development	MOE	1-2 years	None	Number of trained students	Developed curricula	200,000

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	institutions – in areas of fabrication, installation, operation and maintenance of mini hydropower projects	partners	UDSM DIT DVTI					
	Activity 2.2: Strengthen TANESCO to absorb more electricity generated from renewable energy sources	GoT Development Partner	MOE MFP TANESCO	1-2 years	Delay in getting funds Lack of political will	Improved efficiency	Unbundled TANESCO	500,000
	Activity 2.3: Strengthen capacity of Tanzania Meteorological Service – to generate reliable data for energy mix forecast and planning	Government Development Partners	MOE MFP MCTC TMA	1-4 years	Delay in getting funds Equipment costing more than the money available	Improved quality of data	Type, quantity and quality of data issued by TMA Equipment procured	500,000
	Activity 2.4: Strengthen inter-ministerial coordination	GoT	MOE VPO	1-5year	None	Improved coordination	Minutes of the coordination	5,000
Action 3: Establish mini-hydropower potential in the country	Activity 3.1: Conduct study on mini-hydropower potential to cover the entire country	GoT Development Partners	UDSM MoWI MOE	1-5 years	Delay in getting funds Equipment costing more than the money available	Prioritise equipment	National Map on mini-hydropower potential	300,000

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	Action 3.2: Develop a platform for sharing information on hydropower potential	GoT Development Partners	MOE	1-5 years	Not making database accessible	Sensitise TMA on importance of having such data	Open access meteorological database	20,000
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Table 72: Summary matrix for Large Scale Solar PV TAP

Sector	Energy							
Sub-sector	Electricity							
Technology	Large Scale Solar Power							
Ambition	120,000 households							
Benefits	Mitigate GHG emission (0.05 megaton per year)							
Action	Activities to be implemented	Sources of funding	Responsible body and focal point	Time frame	Risks	Success criteria	Indicators for Monitoring of implementation	Budget per activity
Establish a unit to oversee the implementation of the TAP	Recruit staff Establish and equip the office	GoT	MOE	1 year	None		A working implementation unit	20,000
Action 1: Enhance access to financing	Activity 1.1: Develop financial incentives to assist lowering the cost of solar power systems (e.g. introduce subsidies, tax exemptions)	Government Private Sector	MOE MFP	1.2 years	None	Number of projects implemented	Documented incentives	10,000
	Activity 1.2: Sensitise the policy makers on the importance of incentives and or subsidies for the solar power based electricity to compete with other	Government Private Sector Development Partners	MOE	1 year	None	Number of projects implemented	Number and type of incentives in place	10,000

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	fossil fuels							
	Activity 1.3: Lower commercial banks' lending rates	GoT	MOE MFP BoT	1-2 years		Number of projects implemented	Bank lending rates	15,000
	Activity 1.4: Establish a Renewable Energy Development Fund to enhance investment in RE	GoT Private Sector Development Partners	MOE MFP BoT	2 – 5 years		Amount of money available to support projects	Existence of the Fund	10,000
	Activity 1.5: Engage in dialogue with development partners to provide subsidies for the technology as it contributes to global benefit	Government Development Partners	MOE MFP BoT	1-2 years	None	Amount of support received	Minutes	5,000
Action 2: Build / strengthen capacity of key stakeholders	Activity 2.1: Develop specialized training aimed at building the capacities in relevant institutions – in areas of installation, operation and maintenance of solar power systems	Government Development partners	MOE UDSM DIT DVTI	1-2 years	None	Number of trained students	Developed curricula	100,000
	Activity 2.2: Strengthen TANESCO to absorb more electricity generated from renewable energy sources	GoT Development Partner	MOE MFP TANESCO	1-2 years	Delay in getting funds Lack of political will	Improved efficiency	Unbundled TANESCO	500,000

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	Activity 2.3: Strengthen inter-ministerial coordination	GoT	MOE VPO	1-5year	None	Improved coordination	Minutes of the coordination	5,000
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Table 73: Summary matrix for Sustainable Forest Management (SFM)

Sector	Forestry							
Sub-sector	Forest Management							
Technology	Sustainable Forest Management							
Ambition	5,000,000 hectare							
Benefits	Mitigate GHG emission (193,000 tonnes per year)							
Action	Activities to be implemented	Sources of funding	Responsible body and focal point	Time frame	Risks	Success criteria	Indicators for Monitoring of implementation	Budget per activity
Action 1: Strengthen enforcement and compliance to legal and regulatory frameworks to support SFM	Activity 1.1 Carryout a survey to understand challenges faced by forest officers and develop plan to eliminate challenges and provide better working conditions.	URT Government, Development Partners, and Private Sector.	MNRT, FBD	6 months	The cost implication of the survey result may be too high and not be accepted by the employers	Forest officers have better work conditions including incentives and awards	Survey has been carried out The survey report has been produced and worked upon	50,000
	Activity 1.2 Establish a body to oversee and regulate professionalism in forestry	Government URT, Development Partners, and Private Sector.	MNRT, FBD	1 year	The establishment if such regulatory body may not be a popular	Professionalism in forestry has	Appointment of a team to form the professional body The team has developed the	20,000

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				decision and could be a long legal process		proposal. The body is formed and functional	
Activity 1.3 Review and strengthen forest laws in order to tackle corruption and other malpractices forest sector.	URT Government, Development Partners, and Private Sector.	MNRT, FBD	1 year	The legal review process can be a long process that outlive this plan	Forest laws are current and responding to the societal needs	Law review process is happening.	50,000
Activity 1.4 Develop and implement a programme to strengthen prosecution and judicial system capacity try forest offences and crimes	URT Government, Development Partners, and Private Sector.	MNRT, FBD	4 years	The cost of such undertaking could mean that only a small proportion of judicial officials are trained.	Forest offences are adequately prosecuted. Forest crimes significantly reduced	Training programme for the judicial officials is developed The training programme implemented	200,000
Activity 1.5 Develop and implement a programme to raise public awareness on forest offences, laws and regulations	URT Government, Development Partners, and Private Sector.	MNRT, FBD	4 years	This requires to be a long term undertaking that this plan may not be able ensure its	Increased public awareness and understanding of forest laws and regulations	Awareness programme on forest laws developed The awareness programme implemented	150,000

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					sustainabili ty			
Action 2: Develop sustainability benchmarks, principles and standards for sustainable forest management.	Activity 2.1 Decide on 10 forest areas to be supported and establish their baseline SFM status in relation to the internationally agreed criteria, indicators and elements of SFM.	URT Government, Development Partners, and Private Sector.	MNRT, TFS	1 year	This process may be politically influenced and thus technical rational may be overruled.	Forests are managed under sustainable forest management approach.	Decision on forests to be put sustainable managed is made. The baseline status of the forests is established.	50,000
	Activity 2.2 Develop and implement management plans for minimum of 10 selected forests in both natural and plantation forests (Taking cognizance of internationally agreed criteria, indicators and elements of SFM)	URT Government, Development Partners, and Private Sector.	MNRT, TFS	4 years	This technical process may take long time and continue beyond the lifetime of the programme	Management plans are developed and implemented	Management Plans development or review is undertaken.	1,000,000
	Activity 2.3 Adopt (through, multiple stakeholders consultations, and engagement) and use the FLEGT framework as an instrument to improve forest value chain. This to include understanding existing and new	URT Government, Development Partners, and Private Sector.	MNRT, TFS	1 year	This may be scuppered please those used to informality of and weaknesses in timber trade.	FLEGT is adopted as an instrument in forest management and forest products trading.	The FLEGT framework development and adoption process initiated. The framework is implemented and assists in improving forest management and	100,000

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	market opportunities						forest trade.	
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	Activity 2.4 Develop and a use a social-cultural framework to enable inclusive or participatory SFM that take account of the local communities and wider society.	URT Government, Development Partners, and Private Sector.	MNRT, TFS	6 months		The SFM approach is inclusive of neighbouring communities	The SFM approach development entails social and cultural framework	10,000
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	Activity 2.5 Revive, Redesign and implement a national tree planting programmes and initiatives.	URT Government, Development Partners, and Private Sector.	MNRT, TFS	4 years	This can remain as a political rhetoric and not followed up professionally.	Tree planting is an important national activity	The programme is operational The planted trees are well maintained and managed.	1,000,000
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Table 74: Summary matrix for Agroforestry

Sector	Forestry							
Sub-sector	Forest Management							
Technology	Agroforestry							
Ambition	500,000 households							
Benefits	Mitigate GHG emission (20 tons per ha per year)							
Action	Activities to be implemented	Sources of funding	Responsible body and focal point	Time frame	Risks	Success criteria	Indicators for Monitoring of implementation	Budget per activity
Action 1. Provide incentives to Improve awareness for the adoption and uptake of agroforestry.	Activity 1.1 Develop training and learning systems on the benefits of agroforestry and the value of agroforestry products. To include technical training to extension workers	URT Government, Development Partners, and Private Sector.	MNRT, TFS, NAFRAC	4 years	The training may not change the land use systems of target communities.	Renaissance of importance of Agroforestry knowledge	Agroforestry training programmes for farmers developed. Agriculture and forest extension officers are trained in Agroforestry`	100,000
	Activity 1.2 Design and deliver extension services for agroforestry systems, to include public awareness campaigns, cross learning and exchange visits.	URT Government, Development Partners, and Private Sector	MNRT, TFS, NAFRAC	4 years	The funding for a desired expansive extension programme	Forestry and agriculture extension services in selected areas prominently include agroforestry knowledge in their services.	Extension officers are enabled to deliver agroforestry knowledge and skills.	1000,000

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<p>Activity 1.3 Review and improve research in agroforestry (including participatory learning and action research).</p>	<p>URT Government, Development Partners, and Private Sector</p>	<p>MNRT, TFS, NAFRAC</p>	<p>4 years</p>	<p>The financing for long term research in Agroforestry may not be forthcoming</p>	<p>Agroforestry Research plan developed or reviewed. Agroforestry research plan implemented is inclusive and adaptive.</p>	<p>The Natural Forest Resources and Agroforestry Centre is enabled to develop the plan and undertake research on agroforestry. The research results are transformed to become advise to farmers and agroforestry practitioners</p>	<p>500,000</p>
<p>Activity 1.4 Build a market based systems (e.g. social enterprise) to enable farmers grow and sell seedlings and other agroforestry products to other farmers and wider markets</p>	<p>URT Government, Development Partners, and Private Sector</p>	<p>MNRT, TFS, NAFRAC</p>	<p>1.5 years</p>	<p>Funding may not be available to timely production and dissemination of the manual.</p>	<p>communities and individuals include agroforestry their farm management practices</p>	<p>The Agroforestry manual is produced and disseminated</p>	<p>100,000</p>
<p>Activity 1.5 Design and Operate Agroforestry facility, to provide technical assistance and funding for agoforestry promotion.</p>	<p>URT Government, Development Partners, and Private Sector</p>	<p>MNRT, TFS, NAFRAC</p>	<p>4 years</p>	<p>Operation alisation of the facility may take long time</p>	<p>The facility is operational and benefits the intended beneficiaries</p>	<p>The facility is researched, developed, funded and operationalised.</p>	<p>1,000,000</p>

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Table 75: Summary matrix for Mangrove Forest Conservation

Sector	Forestry							
Sub-sector	Mangroves							
Technology	Mangroves Conservation							
Ambition	70,000 ha							
Benefits	Mitigate GHG emission (98 tons/ha/year)							
Action	Activities to be implemented	Sources of funding	Responsible body and focal point	Time frame	Risks	Success criteria	Indicators for Monitoring of implementation	Budget per activity
Action 1: Improve mangrove conservation policy, legal and regulatory frameworks	Activity 1.1 Review and design integrated mangrove management plan	URT Government, Development Partners, and Private Sector	MNRT - TFS	1 year	Management planning process may take longer and cost more than budget.	Functional management plan developed timely	Formation of a team to carry out the management planning. The process of reviewing and design of management plan ongoing.	100,000
	Activity 1.2. Review and update laws and regulations governing management of mangrove forests including permitting and licencing systems	URT Government, Development Partners, and Private Sector	MNRT - FBD	1 year	Law Review process can take longer the scheduled	Laws governing mangroves updated and conflicts with other laws eliminated.	The process of law review is operating. New licencing and permit system is operation and enforced and complied to	50,000

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Activity 1.3. Develop and implement law enforcement and compliance education programme.	URT Government, Development Partners, and Private Sector	MNRT – FBD and TFS	4 years	Education programme may be short-lived and not effective.	Education and awareness programme effectively changing communities and other mangroves stakeholders	Various educational methods and materials developed and delivered. Target audience identified.	20,000
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Activity 1.4. Review and strengthen the national institutional framework on mangroves management	URT Government, Development Partners, and Private Sector	MNRT - FBD and TFS	4 years	Resistance to change may derail the institutional strengthening processes.	Mangrove management institutions are reformed and effective.	Personnel are motivated to work in mangrove conservation. Communities participate in mangrove management.	20,000
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Activity 1.5. Implementation of the integrated mangrove management plan	URT Government, Development Partners, and Private Sector	MNRT - TFS	4 years	Resources may not be available on time for the plan implementation	Management Plan is finalised on time and Implemented	Management plan prescriptions delivered. Mangrove forest quality improved.	1,000,000
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Action	Activities to be implemented	Sources of funding	Responsible body and focal point	Time frame	Risks	Success criteria	Indicators for Monitoring of implementation	Budget per activity
Action 2: Increase access to alternative economic and livelihood opportunities	Activity 2.1. Invest and conduct research on sustainable alternative economic activities for people living in and around mangrove forests	URT Government, Development Partners, and Private Sector	MNRT - TFS	4 years	Research projects may take long time to provide result and lose their utility.	Sustainable alternative economic activities Identified and supported	Research plan developed. Socioeconomic researchers carry out the research The research recommendation are practical and profitable activities	200,000
	Activity 2.2. Conduct training to communities on sustainable alternative coastal livelihood approaches	URT Government, Development Partners, and Private Sector	MNRT - TFS	4 years	The training provided may not lead to desired behavioural changes	The training provided will encourage and enable communities to engage in alternative livelihoods	The trainers are identified. The training is designed and delivered	100,000
	Activity 2.3. Design and implement training to support value addition and improvement of quality of community products.	URT Government, Development Partners, and Private Sector	MNRT - TFS	4 years	Value additions to community products may not be enough to	The communities invest improving quality	Facility to support and enable community to add value to their products	100,000

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				reduce dependence on Mangrove forests	of their products. Support to enable communities to add value to their products is provided	operationalised.	
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Activity 2.4. Design and adopt Improved marketing strategies of products to enable communities to access markets successfully	URT Government, Development Partners, and Private Sector	MNRT - TFS	4 years	Communities may consider new products and approach as complementary not alternative to their mangrove harvesting work.	Marketing strategies and activities are successful	Communities are supported and enabled to access markets for their products.	200,000
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Activity 2.5 Create or adopt a financing facility to provide financial support to communities to finance alternative livelihood activities, such as ecotourism. To include training and promotional materials	URT Government, Development Partners, and Private Sector	MNRT - TFS	4 years	Funding for alternative livelihood projects may not be available timely	Facility is serving the interest of the communities and communities use it.	Programme to establish facility is implemented. Facility operationalised and accessible by the communities.	250,000
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Annex I. List of stakeholders involved and their contacts

List of stakeholders involved in the development of TAP.

Energy Work - Group

S/No.	Names	Institutions	Contact
1	Maxmilian Mahangila	Vice President's Office	mahangila@yahoo.com
2	Prof. Jamidu Katima	Energy - Consultant	jkatima@katima.org
3	Said Athumani	Vice President's Office	saidathumani@gmail.com
4	Fokas Daniel	Tanzania Electrical and Supply Company Ltd (TANESCO)	fokas.daniel@tanesco.co.tz
5	Dr Isack Legonda	University of Dar es salaam	legondai@gmail.com
6	Mathew Matimbwi	TAREA	info@tarea-tz.org
7	Sospeter Kerefu	National Development Corporation	sbjkerefu@hotmail.com
8	Josephine Gobry	Water Development Management Institute	jgobry@yahoo.com
9	Erick Fussi	Rufiji Basin Development Authority	effussi@gamail.com

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Forest Work – Group

S/No.	Names	Institutions	Contact
1	Mariam Mrutu	Tanzania Forest Services	mariam.mrutu@tfs.go.tz
2	Maria Kapina	Tanzania Forest Services	marykapina@yahoo.com
3	Dr. Anthony Kimaro	ICRAF – Dar es salaam	a.kimaro@cgiar.org
4	J. M. Daffa	WWF - Tanzania	idaffa@wwftz.org
5	Emmanuel Msoffe	Ministry of Natural Resource and Tourism	emmanuelmsoffe@yahoo.com
6	Dr. Suzana Augustino	Sokoine University of Agriculture	sanhemati@yahoo.com
7	Bettie Luwuge	Tanzania Forest Conservation Group	bluwunge@tfcg.or.tz
8	Maxmilian Mahangila	Vice President's Office	mahangila@yahoo.com
9	Joseph Kihale	Vice President's Office	kihale@gmail.com
10	Twaha Twaibu	Ministry of Natural Resources and Tourism	twaiibu1965@yahoo.com
11	Abdallah Shah	Forest - Consultant	abdallasha62@yahoo.com