

**Table A-31 Responsibility and coordination**

Work Breakdown Structure and Work Package of Measures and Incentives	Responsibility and Coordination		
	Coordinating	Implementing	Contributing
Development of national task force and expert workgroup M1 Establishment of Unified Peat Re-Mapping national task force M2 Establishment of expert workgroup for Unified Peat Re-Mapping I1 Development of inter ministerial task force and expert workgroups I2 Self capacity building arrangement for inter ministerial expert workgroups I4 Financial schemes for M1,M2,M3	Ministry of Forestry	DG of Forest Planning of Ministry of forestry  Bakosurtanal	<ul style="list-style-type: none"> <li>■ Ministry of Finance</li> <li>■ BPPT</li> <li>■ Soil Research Institute</li> <li>■ Forest Research Institute</li> <li>■ CIFOR</li> <li>■ Universities</li> </ul>
Development of CMM models and prototypes M3 Prototype Development of Unified Peat Re-Mapping by means of international capacity building I4 Financial schemes for M4			
Development of network of sub national TTD reference stations M5 Establish a network of TTD reference stations and provide them with adequate facilities (Field station, building, equipments, software, and the like) for prototyping carbon measurement I3 Regulation for facilitation of TTD Reference stations and supporting facilities I4 Financial schemes for,M4			

## National Capacity Building on Technology for Carbon measurement and monitoring (PROJECT IDEA)

### Introduction/Background

Carbon measurement and monitoring technology, in the context of CHG mitigation of Forest and Peat Sectors, deals with integrating knowledge, tools, and institutional framework aimed at facilitating two in one measurements: timber standing stock inventory and peat deposit survey. This integrated measurement technology would facilitate proper estimation of carbon stock by combining the results of conventional forest inventory (above ground biomass) and the result of peat survey (below ground biomass). Within the context of TTD (Technology Transfer and Diffusion) facilitated by 'Innovation System' approach, the above-mentioned technologies need to be integrated in the form of technology prototype. This marks the completion of the first chain of innovation process –research and development (R&D) – continuing to move into the initial phase of the second innovation chain –technology diffusion. This initial phase of diffusion – referred to as 'take-off' – is marked by transfer of technology from 'innovators' to 'early adopters'. Within this phase the reliability, practicality and financial feasibility of the technology is demonstrated and is recognized as phases of very difficult and critical to overcome.

The results of problem tree analysis revealed that the starter problem for TTD process of Peatland Water Management Technology is lack reference project of viable, credible and reliable Peatland Water Management. To assess possible solutions for overcoming barriers, a logical framework analysis was applied to objective trees. The results of logical framework solution are presented in Table A-32.

**Table A-32 Recommended solution based on logical framework analysis for overcoming barriers of technology transfer and diffusion (TTD) of peatland water management technology**

Technology Transfer and Diffusion of Peatland Water Management Technology Goal: To Achieve Zero Risk of Peatland Degradation, peatland fire, and Peat Forest Fire	
Maturing R&D	Technology Diffusion
Objective Establishment of reference project of viable, credible, and reliable peatland water management	Objective Provide effective water management for “Low Carbon” peat management on HTI, plantation estate, and irrigated farmland
Recommended Solutions	
Maturing R&D Phase	Technology Diffusion Phase
<b>Policy Action:</b> Establish a “National Demonstrator” project to demonstrate the reliability, practicality and financial feasibility of newly invented peat water management technology. <b>Mode of Action:</b> International Capacity Building for a national expert consultation workgroup through the development of an operational, reliable, credible, and feasible prototype of peat water management carried out on national demonstrator TTD Reference stations.	<b>Policy Action:</b> Establish a “Collaborative Learning” program for technology diffusion to transfer and operationally implement the newly invented prototyped of peatland water management technology. <b>Mode of Action:</b> On the Job Training for personnel of KPH, HTI, HPH, and other local stakeholders carried out on national demonstrator TTD reference stations followed by a certain time period of trial and adjustment in their areas. The program is designed and implement by national expert consultation workgroup

The results suggest two inseparable key actions: (1) establish national demonstrator supported by (2) an international capacity building program be the solutions to overcome the difficulty nature of “take off”, i.e., from the phase of maturing R&D to the phase of technology diffusion. These key actions are inseparable to each other. The first key action is an infrastructure for performing the second key action by which a newly invented technology is developed from a prototype development program.

Recognizing the critical nature of “take off” phase of TTD and considering the two inseparable key actions, an international capacity building project aimed to facilitate the success of “take off” phases from “innovators” to “early adopters” shall be developed and implemented, supported by adequate and proper international resources.

### **Purpose and Objectives**

The purpose of this project is to build and improve capability of national innovation system to perform TTD of peatland water management technology, which is specifically aimed to facilitate the ‘innovators’ and the ‘early adopters’ to perform “take off” successfully and be achieved through a framework of International Capacity Building program comprises two pathways: bilateral/multilateral R&D arrangements and an international training program.

Recognizing the purpose of the project, this project idea should facilitate the achievement of the following objectives:

**Ultimate Objective:** development and establishment of a Reference Project dedicated for the demonstration of reliability, practicality and financial feasibility of newly invented peatland water management technology

**Specific Objectives:**

- 5) Development and establishment of “National Demonstrator” in the forms of a network of sub national TTD reference stations, demonstrating reliability, practicality and financial feasibility of newly invented peatland water management technology.
- 6) Arrangement and Implementation of an International Capacity Building program for in the form of “innovators” as well as “early adopters” in the form of cooperation on the modelling and prototype development of reliable, credible, and feasible peatland water management technology carried out on the “national demonstrator”.

**Relationship to the country’s sustainable development priorities**

In the context of climate change, forests are recognized as a source or a sink of greenhouse gases, particularly CO<sub>2</sub>. Such recognition is documented in the Indonesia Climate Change Sectoral Roadmap – ICCSR (BAPPENAS 2009). In this document, Ministry of Forestry proposed several key mitigation measures by implementing some selected BMPs (Best Management Practice) of SFM (Sustainable Forest Management) aimed for sink enhancement and emission reduction from forestry sector. The summary of the key mitigation measures are as follows:

Sink enhancement: Forest rehabilitation activities mostly on protection forest and watershed; Development of industrial plantations (HTI), plantations with private entrepreneurs and communities (HTR) on production forest; Stimulate plantations outside forest lands for rehabilitation or wood production; Management of natural secondary forests in production, protection and conservation forests.

Emission reduction: Improved silviculture and logging activities in productive natural forest; reducing emissions from forest land conversion particularly on peat forest land; Reducing emissions from illegal logging and fire.

The ICCSR document also revealed that the key mitigation measures are implemented by so-called KPH-HTI-SFM scenario. This scenario is characterized by heavy investments on the establishment of hundreds of newly developed Forest Management Units (KPH) in order to guarantee significant improvement of sustainable forest management (SFM) of all state forests: natural forests, rehabilitated forest, and productive plantation. Within the first period of Forestry Sector’s roadmap (2010 – 2019) 244 newly developed KPHs will be established and by the end of second period (2020-2029) a total number of 344 KPHs will be established. Mitigation efforts in this scenario are based on a mix of activities:

- 4) Industrial forest plantations (HTI) established on dry land, where KPH have been developed;
- 5) Emission reduction enhancement comes from better sustainable forest management (SFM) of production, conservation and protection forests under the KPHs; and
- 6) Some modest REDD activities during the first period of 2010-2014.

Peatland Water Management (PWM) Technology is expected to support better SFM, in terms of providing key mitigation measures with method, manual, tools, and skill for regulated irrigation and or drainage channel to avoid over drainage condition to happen (Table A-33). Such supports will be implemented in this International Capacity Building program, specifically by building and improving capability of national innovation system to perform TTD of PWM technology. And such a capacity building program will facilitate the ‘innovators’ and the ‘early adopters’ to perform “take off” successfully led the PWM technology operational in all of the newly established KPH.

**Table A-33 Key Mitigation Measures as prioritized SFM (Sustainable Forest Management) and Expected support from Peatland Water Management (PRM) Technology.**

Key Mitigation Measures			Expected Support of CMM Technology
Sink Enhancement	Aforestation/Reforestation:		Regulated irrigation/ drain-age/ channel networks and or vegetation belts to avoid over-drainage of HTI areas, facilitating sink enhancement of peat swamp
	<ul style="list-style-type: none"><li>Gerhan/RHL</li><li>One Mill tree program</li><li>HTI</li><li>HTR</li></ul>	<ul style="list-style-type: none"><li>HR</li><li>Community Forest</li><li>Village Forest</li><li>Natural Forest</li></ul>	
	Improve Sustainable Forest Management (SFM) to Increase stock on degraded forest: <ul style="list-style-type: none"><li>Stock enhancement on protected forest</li><li>Stock enhancement on conservation forest</li></ul>		
Emission Reduction	Increase of Protection forest land under SFM		Regulated channel networks and or vegetation belts to avoid over-drainage of agriculture land and plantation estate areas, facilitating emission reduction of peatlands
	Increase of Conservation forest land under SFM		
	Prevention of forest fire		
	Management of productive natural forest		
	Reduction of forest fire		
	Low Carbon Peatland Management <ul style="list-style-type: none"><li>Enforce strict compliance by existing forest and plantation concessions on &gt;3m peat</li><li>zero burning for land clearing</li><li>water management to reduce subsidence and carbon emissions from oxidation</li></ul>		

### Project Deliverables

The main deliverable of this project would be an operational “National Demonstrator” to demonstrate the reliability, practicality and financial feasibility of newly invented peatland water management (PWM) technology. This National Demonstrator for PWM technology comprises three technology components as follows:

1. Hardware: a network of sub national TTD reference stations
2. Software: PWM models and prototypes, regulation for PWM
3. Org-ware: Inter-Institutional national task force and expert workgroup

### Project Scope and Possible Implementation

By inferring the purpose of this project, the scope of this project can be defined as follows:

1. Build and improve capability of national innovation system to perform TTD
2. Facilitate the 'innovators' and the 'early adopters' to perform "take off"
3. International Capacity Building program in modelling and prototyping by means of Bilateral/multilateral R&D arrangements and international training program

By this definition, the scope of this project shall be structured and implemented according to logical framework of purpose, outcome, program, work breakdown structure (WBS) and work package confined by measures and incentives of the R&D maturation up to early phases of technology diffusion of the TTD-curved as graphically illustrated in Figure A-23.

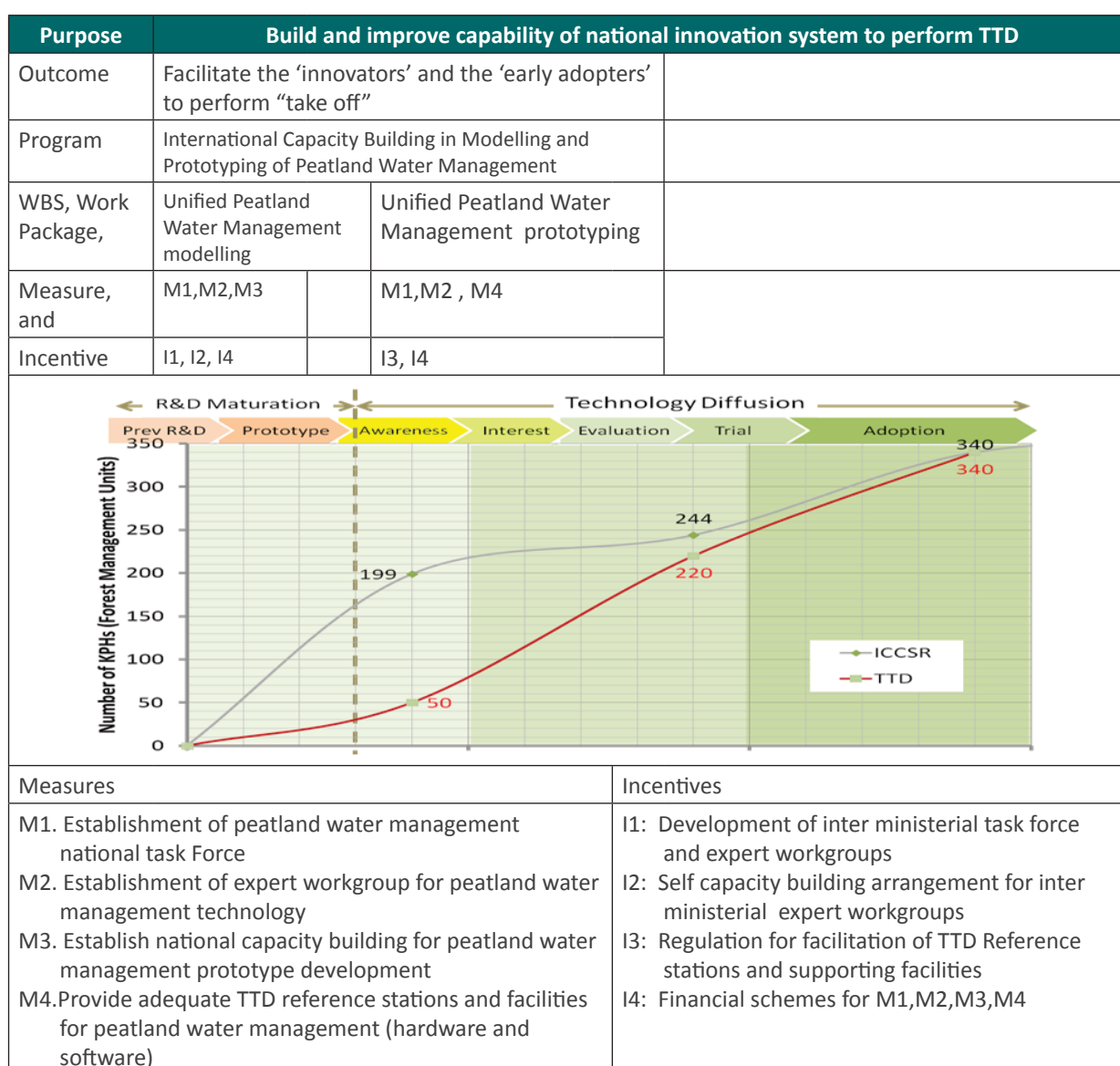


Figure A-23 Logical framework and scope of project.

Viewing from a broader scope of the whole objective tree of TTD processes of peatland water management technology, the scope of this project shall be related and perfectly matched with the scope of Sub-National Collaborative Learning Project (Figure A-24.).

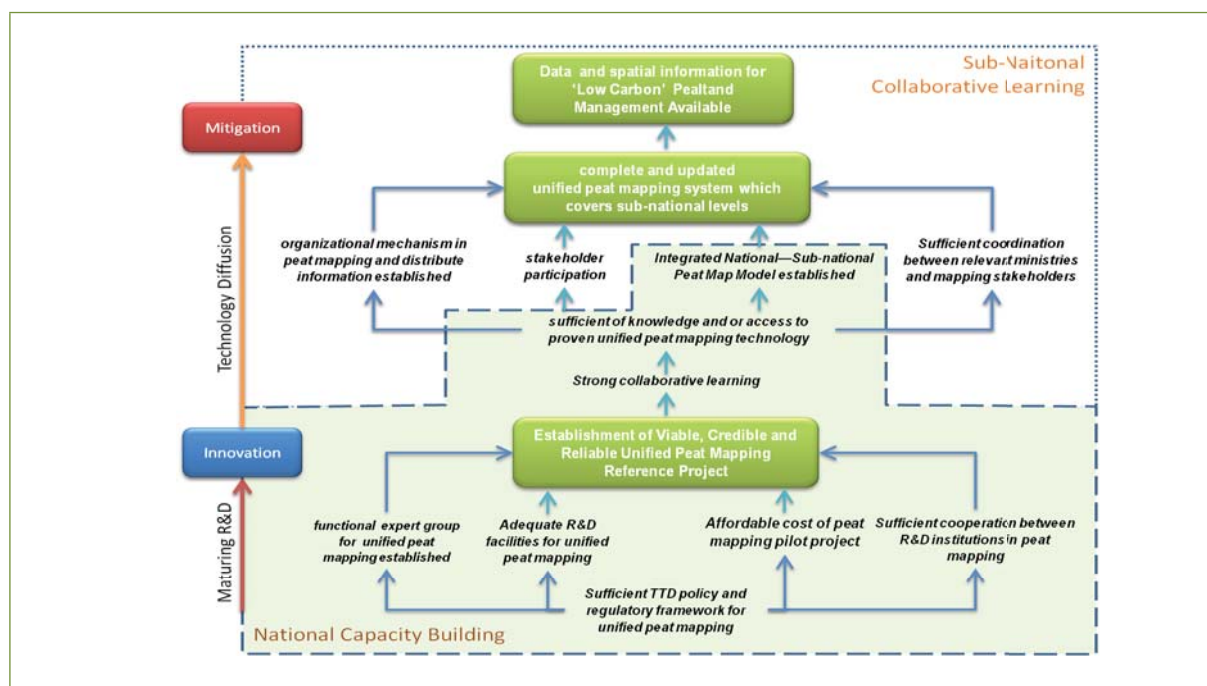


Figure A-24 Scope of project and the objective tree: shall be related and perfectly matched with the sub-national collaborative learning project

### Timelines and Geographical Extent

This project is designed as a national multiyear program, whose timeline and geographical extent for the achievement of its WBS and work packages are presented in Table A-34.

Table A-34 Timeline and geographical extent

Work Breakdown Structure (WBS) and Work Package of Measures and Incentives	Time Line			
	Year 1	Year 2	Year 3	Year 4
Development of national task force and expert workgroup				
M1 Establishment of peatland water management technology national task Force	>>>>			
M2 Establishment of expert workgroup of peatland water management technology	>>>>			
I1 Development of inter ministerial task force and expert workgroups	>>>>			
I2 Self capacity building arrangement for inter ministerial expert workgroups	>>>>			
I4 Financial schemes for M1,M2,M3				
Development of CMM models and prototypes				
M3 Prototype Development of peatland water management technology by means of international capacity building	sumatra	sumatra	kalimantan	papua
I4 Financial schemes for M4		kalimantan	papua	
	>>>>	>>>>	>>>>	>>>>
Development of network of sub national TTD reference stations				
M4 Establish a network of TTD reference stations and provide them with adequate facilities (Field station, building, equipments, software, and the like) for prototyping unified peat re-mapping	sumatra	sumatra	kalimantan	papua
		kalimantan	papua	
	>>>>	>>>>	>>>>	>>>>
I3 Regulation for facilitation of TTD Reference stations and supporting facilities	>>>>			
I4 Financial schemes for,M4				

## Resource and Budget Requirements

Resources and budget required for the achievement of WBS and work packages of this project of both national and international sources are listed in Table A-35.

## Measurement/Evaluation

To measure whether the purpose of this project is accomplished and the objectives of this project are accomplished, evaluations of accomplishment of each work package shall be carried out accordingly. The evaluations are proposed to be carried out in two phases: intermediate and final program reviews.

The intermediate review shall be carried out in three steps as follows:

1. Initial review: evaluation of conditions of work packages ready to start
2. Detail review: evaluation of a work packages complied with technical requirements
3. Critical review: evaluation of work packages are timely delivered or need rescheduling

**Table A-35 Resources and budget**

Work Breakdown Structure (WBS) and Work Package of Measures and Incentives		Resources	Budget	
			National	International
Development of national task force and expert workgroup				Hundred thousands of USD
M1	Establishment of Peatland Water Management Technology national task Force	National expert, meeting, workshop, seminar	PM	
M2	Establishment of expert workgroup for Peatland Water Management Technology	National and International expert, meeting, training course, and workshop	PM	PM
I1	Development of inter ministerial task force and expert workgroups	Policy and regulation, meeting, workshop, and seminar	PM	
I2	Self capacity building arrangement for inter ministerial expert workgroups	Policy and regulation, meeting, workshop, and seminar	PM	PM
I4	Financial schemes for M1,M2	Policy and Regulation, meeting, workshop, international cooperation	PM	
Development of CMM models and prototypes				Mill of USD
M3	Prototype Development of Peatland Water Management Technology by means of international capacity building	National and international experts, International and national training course, on the shelf and previous R&D models and prototypes	PM	PM
I4	Financial schemes for M3	Policy and regulation, meeting, seminar, international cooperation	PM	

Table A-35 (Continued)

Work Breakdown Structure (WBS) and Work Package of Measures and Incentives		Resources	National	Budget International
Development of network of sub national TTD reference stations				Mill of USD
M4	Establish a network of TTD reference stations and provide them with adequate facilities for prototyping carbon measurement	Field station, building, equipments, computer hardware, modelling software, workshops, seminar	PM	PM
I3	Regulation for facilitation of TTD Reference stations and supporting facilities	Policy and regulation, meeting, seminar, international cooperation	PM	PM
I4	Financial schemes for,M4	Policy and regulation, meeting, seminar, international cooperation	PM	PM
TOTAL BUDGET				Ten Mill of USD

The final review shall be carried out at the end of completion of each work package to evaluate the accomplishment of the purpose and the objectives of this project. The scheme of this review is presented in Table A-36.

Table A-36 Scheme of final program review

Work Breakdown Structure and Work Package of Measures and Incentives	Indicator of achievement
Development of national task force and expert workgroup M1 Establishment of Peatland Water Management Technology national task force M2 Establishment of expert workgroup for Peatland Water Management national task force I1 Development of inter ministerial task force and expert workgroups I2 Self capacity building arrangement for inter ministerial expert workgroups I4 Financial schemes for M1,M2,M3	Strategic agenda implemented
	Working agenda implemented
	Formal regulation implemented
	Formal regulation implemented
	Formal regulation implemented
Development of CMM models and prototypes M3 Prototype Development of Peatland Water Management technology by means of international capacity building I4 Financial schemes for M3	Model implemented
	Formal regulation implemented
Development of network of sub national TTD reference stations M4 Establish a network of TTD reference stations and provide them with adequate facilities (Field station, building, equipments, software, and the like) for prototyping carbon measurement I3 Regulation for facilitation of TTD Reference stations and supporting facilities I4 Financial schemes for,M4	Network of reference station are in operation
	Formal regulation implemented
	Formal regulation implemented

### Possible Complications/Challenges

The idea of this project assumes that the barriers of TTD processes are overcome within current framework of condition in favorable current enabling environments. Any alterations on the current framework condition and enabling environments will lead to possible complication of the implementation of this project. A risk analysis on the following possible threads of complication needs to be carried out prior to the implementation of this project.

- A. National Policy Action and Priorities
  1. Change of priorities in national development plan
  2. Change of priorities in related sectors strategic plan:
    - a. Ministry of Forestry
    - b. Ministry of environment
    - c. Ministry of Agriculture
    - d. Ministry of Research and Technology
  3. Current status and projected trend of the implementation of Climate Change action plan and recommendations:
    - a. Indonesia Second National Communication (Ministry of Environment)
    - b. Indonesia Climate Change Sectoral Roadmap (Bappenas)
    - c. Indonesia's greenhouse gas abatement cost curve (DNPI)
- B. International Support
  - Status, implementation, and implication of REDD program for Indonesia
  - Status, results, and implications of previous and current International projects associated with climate change and carbon trade

### Responsibilities and Coordination

The purpose of this project is obvious, i.e., building and improving national capability of innovation system to perform TTD of carbon measurement and monitoring technology. This implies strong coordination of among involving related national institutions. The coordination model coordinating, implementing, and contributing institutions, based on the structure logical frameworks of WBS and work packages may be defined as follows (Table A-37).

**Table A-37 Responsibility and coordination**

Work Breakdown Structure and Work Package of Measures and Incentives	Responsibility and Coordination		
	Coordinating	Implementing	Contributing
Development of national task force and expert workgroup M1 Establishment of Unified Peat Re-Mapping national task force M2 Establishment of expert workgroup for Unified Peat Re-Mapping I1 Development of inter ministerial task force and expert workgroups I2 Self capacity building arrangement for inter ministerial expert workgroups I4 Financial schemes for M1,M2,M3	Ministry of Forestry	Ministry of forestry	■ Water Resources Research Institute ■ Ministry of Finance ■ BPPT ■ Soil Research Institute ■ Forest Research Institute ■ CIFOR ■ Universities
Development of CMM models and prototypes M3 Prototype Development of Unified Peat Re-Mapping by means of international capacity building I4 Financial schemes for M4		Ministry of Public Work	
Development of network of sub national TTD reference stations M5 Establish a network of TTD reference stations and provide them with adequate facilities (Field station, building, equipments, software, and the like) for prototyping carbon measurement I3 Regulation for facilitation of TTD Reference stations and supporting facilities I4 Financial schemes for,M4			