



LAO PEOPLE'S DEMOCRATIC REPUBLIC

Technology Needs Assessment

Technology Action Plan for Climate Change Adaptation

Supported by



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DISCLAIMER

This action plan for developing and deploying adaptation technologies and practices for climate and disaster resilience in the water resources and agriculture sector in Lao PDR. The development goals and targets, actions, activities, budget and sources of funding results are entirely outputs from the coordinator, consultant and reviewers, and should not be attributed in any manner to the Global Environment Facility (GEF), which funded the production of this publication.

Contents

| | |
|--|-----------|
| List of Tables | 6 |
| Abbreviations..... | 9 |
| Foreword | 11 |
| Executive Summary..... | 12 |
| Chapter 1: Technology Action Plan for Climate Change Adaptation in the Water Resources Sector..... | 14 |
| 1.1 Action Plan for an Early Warning System | 15 |
| 1.1.1 Early Warning System | 15 |
| 1.1.2 Development goals | 16 |
| 1.1.3 Selection of Actions and Activities for the TAP | 16 |
| 1.1.4 Identify Stakeholders and Determine Timelines | 21 |
| 1.1.5 Resources estimation | 23 |
| 1.1.6 Management Planning | 26 |
| 1.1.7 Summary Overview of the Action Plan for an End-to-End Early Warning System..... | 28 |
| 1.2 Action Plan for Developing and Sustaining a Disaster Impact Reduction Fund..... | 36 |
| 1.2.1 Disaster Impact Reduction Fund..... | 36 |
| 1.2.2 Development goals..... | 36 |
| 1.2.3 Selection of Actions and Activities for the TAP..... | 36 |
| 1.2.4 Identify Stakeholders and Determines Timelines | 40 |
| 1.2.5 Resources Estimation | 41 |
| 1.3.1 Management Planning | 43 |
| 1.3.2 Summary Overview of the Action Plan for Disaster Impact Reduction Fund..... | 45 |
| 1.3 Action Plan on River Basin Management for Climate Change Adaptation..... | 50 |
| 1.3.3 River Basin Management | 50 |
| 1.3.4 Development goals | 51 |
| 1.3.5 Selection of Actions and Activities for the TAP | 51 |
| 1.3.6 Identify Stakeholders and Determines Timelines | 55 |
| 1.3.7 Estimate Resources..... | 57 |

| | | |
|------------|--|------------|
| 1.3.8 | Management Planning | 59 |
| 1.3.9 | Summary Overview of the River Basin Management Action Plan for Adaptation | 62 |
| 1.4 | Action Plan for Climate Resilient Water Supply System | 70 |
| 1.4.1 | Climate Resilient Water Supply System | 70 |
| 1.4.2 | Development goals | 70 |
| 1.4.3 | Selection of Actions and Activities for the TAP on Resilient Water Supply System..... | 71 |
| 1.4.4 | Identify Stakeholders and Determines Timelines | 74 |
| 1.4.5 | Resource Estimation | 76 |
| 1.4.6 | Management Planning | 77 |
| 1.4.7 | Summary Overview of the Action Plan for Resilient Water Supply System | 79 |
| | Chapter 2 Technology Action Plan for Climate Change Adaption in Agriculture Sector | 86 |
| 2.1 | Action Plan for Livestock Disease Prevention and Control-Surveillance | 86 |
| 2.1.1 | Livestock Disease Prevention and Control | 86 |
| 2.1.2 | Development goals | 87 |
| 2.1.3 | Selection of Actions and Activities for the TAP | 87 |
| 2.1.4 | Identify Stakeholders and Determines Timelines | 91 |
| 2.1.5 | Resources estimation | 92 |
| 2.1.6 | Management Planning | 94 |
| 2.1.7 | Summary Overview of the Action Plan for Livestock Disease Prevention and Control | 96 |
| 2.2 | Action Plan for Agricultural Development Subsidy Mechanism | 103 |
| 2.2.1 | Agricultural Development Subsidies..... | 103 |
| 2.2.2 | Development goals | 103 |
| 2.2.3 | Selection of Actions and Activities for TAP on Agricultural Subsidy Mechanism | 103 |
| 2.3.3 | Identify Stakeholders and Determines Timelines | 106 |
| 2.3.4 | Resources estimation..... | 107 |
| 2.3.5 | Management Planning | 108 |
| 2.3.6 | Summary Overview of the Action Plan for Agricultural Subsidy Mechanism..... | 110 |
| 2.3 | Action Plan for Crop Diversification | 115 |
| 2.3.1 | Crop Diversification..... | 115 |

| | | |
|------------|--|------------|
| 2.3.2 | Development goals | 115 |
| 2.3.3 | Selection of Actions and Activities for Crop Diversification Development and Deployment 115 | |
| 2.4.3 | Identify Stakeholders and Determine Timelines | 118 |
| 2.4.4 | Resources estimation | 120 |
| 2.4.5 | Management Planning | 121 |
| 2.4.3 | Summary Overview of the Action Plan for Crop Diversification | 123 |
| 2.5 | Action Plan for Climate Resilient Rural Infrastructure | 131 |
| 2.5.1 | Climate Resilient Rural Infrastructure..... | 131 |
| 2.5.2 | Development goals | 131 |
| 2.5.3 | Selection of Actions and Activities for TAP on Climate Resilient Rural Infrastructure ... | 131 |
| 2.5.4 | Identify Stakeholders and Determines Timelines | 135 |
| 2.5.5 | Estimate Resources..... | 137 |
| 2.5.6 | Management Planning | 138 |
| 2.5.7 | Summary Overview of the Action Plan for Climate Resilient Rural Infrastructure..... | 140 |
| | Chapter 3 Project Ideas..... | 149 |
| | 3.1 Project Ideas on Climate Change Adaptation Technologies and Practices in the Water Resources Sector | 149 |
| | 3.2 Project Ideas on Climate Change Adaptation Technologies and Practices in the Agriculture Sector | 153 |
| | Chapter 4: Conclusion | 157 |
| | Annex 1 List of the Participants and Contributors to the Action Plan Development | 158 |
| | Annex 2 Assessment of Measures to Include as Actions in the TAP in the Water Resources Sector | 161 |
| | Annex 3 Assessment of Measures to Include as Actions in the TAP in the Agriculture Sector..... | 170 |
| | Annex 4 Identifying timeframe and stakeholders for implementing TAPs in the Water Resources Sector | 179 |
| | Annex 5 Identifying timeframe and stakeholders for the implementing TAPs in the Agriculture Sector | 185 |
| | References..... | 193 |

List of Tables

| | |
|--|----|
| Table 1 EWS development and management gaps | 15 |
| Table 2 Barriers and measures to overcome barriers to EWS | 17 |
| Table 3 Measures and sub-measures Selected as actions to include in the Action Plan | 18 |
| Table 4 Identifying activities for the actions | 20 |
| Table 5 Key stakeholders on early warning system | 21 |
| Table 6 Capacity building requirements for implementation of the tap | 23 |
| Table 7 Estimated costs for implementation of the action plan | 25 |
| Table 8 Potential funding sources and donors | 26 |
| Table 9 Overall risks and contingency plan | 26 |
| Table 10 Specific risk of each action and contingency plan | 26 |
| Table 11 Key success criteria and indicators for monitoring of the action plan implementation | 28 |
| Table 12 Summary action plan for an end-to-end early warning system | 29 |
| Table 13 Barriers on the development and sustainability of disaster impact reduction fund | 36 |
| Table 14 Measures Selected as Actions for inclusion in the tap on disaster Impact reduction fund | 37 |
| Table 15 Identified activities for actions on disaster reduction fund | 39 |
| Table 16 Key stakeholders to disaster reduction fund | 40 |
| Table 17 Capacity building needs for development and management of disaster reduction fund | 41 |
| Table 18 Total cost for implementation of the TAP on disaster reduction fund | 42 |
| Table 19 Specific Risks of actions and Contingency Planning | 43 |
| Table 20 Success Criteria and Indicators for Monitoring of the Implementation | 44 |
| Table 21 Summary overview of the action plan on disaster reduction fund | 46 |
| Table 22 IWRM Cycle-Elements and Performance Gaps | 50 |
| Table 23 Barriers and Measures to Overcome Barriers on RBM-IWRM | 52 |
| Table 24 Selected measures to include in rbm action plan for climate change adaptation | 53 |
| Table 25 Identified activities for rbm action plan for climate change adaptation | 54 |
| Table 26 Key stakeholders in river basin management | 55 |
| Table 27 Capacity needs for rbm for climate change adaptation | 57 |
| Table 28 Estimated cost for the TAP implementation | 59 |

| | |
|---|-----|
| Table 29 Specific risk of actions and contingency planning | 59 |
| Table 30 Success Criteria and Indicators for Monitoring of the Implementation | 61 |
| Table 31 Summary overview of rbm action plan for climate change adaptation and disaster resilience | 63 |
| Table 32 Barriers on the development and sustainability of climate resilient water supply system | 71 |
| Table 33 Selected measures for climate resilient water supply system | 72 |
| Table 34 Selected activities for climate resilient water supply system action plan | 73 |
| Table 35 Key stakeholders in climate resilient water supply | 74 |
| Table 36 Capacity needs for climate resilient water supply system | 76 |
| Table 37 Estimate Costs for Actions and Activities | 77 |
| Table 38 Specific Risks of actions and Contingency Planning | 77 |
| Table 39 Success Criteria and Indicators for Monitoring of the Implementation | 78 |
| Table 40 summary overview of the action plan on climate resilient water supply system | 80 |
| Table 41 the livestock disease epidemics surveillance-LDES and performance gaps | 87 |
| Table 42 Barriers and measures for effectively prevention and control of livestock disease | 88 |
| Table 43 Selected Measures to include in the action plan on livestock disease prevention and control | 88 |
| Table 44 Selected activities for the action plan on livestock disease prevention and control | 90 |
| Table 45 key stakeholders in livestock disease prevention and control | 92 |
| Table 46 Capacity needs for livestock disease prevention and control | 93 |
| Table 47 Estimate Costs for Actions and Activities | 94 |
| Table 48 Specific Risks of Actions and Contingency Planning | 94 |
| Table 49 Success Criteria and Indicators for Monitoring of the Implementation | 96 |
| Table 50 Summary overview of the action plan on livestock disease prevention and control | 97 |
| Table 51 Barriers and measures to deploy agriculture subsidy mechanism | 104 |
| Table 52 Selected measures for include in tap on agriculture subsidy mechanism | 104 |
| Table 53 Selected activities for the action plan on agriculture subsidy mechanism for climate and disaster resilience | 105 |
| Table 54 Key stakeholders in the agriculture subsidies | 106 |
| Table 55 Capacity needs for agriculture subsidies | 107 |
| Table 56 Estimation of Costs for Actions and Activities | 108 |
| Table 57 Specific risks of actions and Contingency Planning | 108 |

| | |
|---|-----|
| Table 58 Success Criteria and Indicators for Monitoring of the Implementation | 110 |
| Table 59 Summary overview of the action plan on agriculture subsidies for climate and disaster resilience | 111 |
| Table 60 Barriers and measures to develop and deploy crop diversification | 115 |
| Table 61 Selected measures for the action plan on crop diversification | 116 |
| Table 62 Selected activities for the action plan on crop diversification | 117 |
| Table 63 Key stakeholders in the crop diversification development and management | 119 |
| Table 64 Capacity needs for crop diversification | 120 |
| Table 65 Estimate Costs for Actions and Activities | 121 |
| Table 66 Specific Risks of actions and Contingency Planning | 121 |
| Table 67 Success Criteria and Indicators for Monitoring of the Implementation | 122 |
| Table 68 Summary overview of the action plan on crop diversification | 124 |
| Table 69 Barriers to fully, effectively and sustainably develop climate resilient rural infrastructure | 132 |
| Table 70 selected measures for action plan on climate resilient rural infrastructure | 133 |
| Table 71 selected activities for action plan on climate resilient rural infrastructure | 134 |
| Table 72 key stakeholders in the climate resilient rural infrastructure | 136 |
| Table 73 capacity needs for climate resilient rural infrastructure | 137 |
| Table 74 Estimate Costs for Actions and Activities | 138 |
| Table 75 Specific risks of actions and Contingency Planning | 138 |
| Table 76 Success Criteria and Indicators for Monitoring of the Implementation | 139 |
| Table 77 summary overview of the action plan on climate resilient rural infrastructure | 141 |
| Table 78 End-to-end early warning project idea | 149 |
| Table 79 Climate resilient river basin development and management project idea | 151 |
| Table 80 Climate change adaptation and disaster resilient infrastructure project idea | 153 |
| Table 81 Project idea: Enhancing resilience of crop production and commercialisation through crop diversification | 155 |

Abbreviations

| | |
|--------|---|
| AusAID | The Australian Agency for International Development |
| ADB | Asian Development Bank |
| ADPC | Asian Disaster Preparedness Centre |
| AIT | Asian Institute of Technology |
| CC-TWG | Climate Change Technical Working Group |
| CWSH | Centre for Water Sanitation and Hygiene |
| COP | Conference of the Parties |
| DoI | Department of Irrigation |
| DoA | Department of Agriculture |
| DRW | Department of Water Resources |
| EIA | Environmental Impact Assessment |
| ESMP | Environmental and Social Management Plan |
| FAO | Food and Agriculture Organization (of the United Nations) |
| FoE | Faculty of Environment |
| FoF | Faculty of Forestry |
| FoWRE | Faculty of Water Resources and Engendering |
| GEF | Global Environment Facility |
| GFDRR | the Global Facility for Disaster Reduction and Recovery |
| GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit (German Agency for International Cooperation) |
| GOL | Government of Lao PDR |
| IPCC | Intergovernmental Panel on Climate Change |
| IUCN | International Union for Conservation of Nature |
| JICA | Japan International Cooperation Agency |
| kfW | Kreditanstalt für Wiederaufbau (German Development Bank) |
| MAF | Ministry of Agriculture and Forestry |
| MEM | Ministry of Energy and Mines |
| MOF | Ministry of Finance |
| MONRE | Ministry of Natural Resource and Environment |
| MPI | Ministry of Planning and Investment |
| MPH | Ministry of Public Health |
| NAFRI | National Agriculture and Forestry Research Institute |
| NEC | National Environment Committee |
| NGOs | Non-Government Organizations |
| NUOL | National University of Laos |
| NSAP | National Strategy and Action Plan on Climate Change |
| NSCCC | National Steering Committee on Climate Change |
| NUOL | National University of Laos |
| ODA | Official Development Assistance |
| DPCC | Disaster Prevention and Control Committee |

| | |
|--------|---|
| SNC | Second National Communication |
| TAP | Technology Action Plan |
| TNA | Technology Needs Assessment |
| UNDP | United Nations Development Programme |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UNISDR | the United Nations Office for Disaster Risk Reduction |
| WMO | the World Meteorological Organization |

Foreword

We have learned that, to be adaptive to changing climate and resilient to hazards, we must research, develop, pilot and diffuse technologies and practices regularly. Lao PDR, under the financial support of the Global Environment Facility (GEF), implemented the TNA programme during 2011 and 2013 (phase I), and 2015-2018 (phase II). The TNA phase I focused on the prioritization of climate change mitigation and adaptation technologies, and as a result, 8 technologies or practices under 2 important sectors: agriculture and water resources were selected as priority technologies to enhance climate change adaptation in Lao PDR. The TNA phase II focused on Barrier Analysis and Enabling Framework (BAEF) and Technology Action Plans (TAPs) including Project Ideas (PIs) of the prioritised adaptation technologies. The Ministry of Natural Resources and Environment (MoNRE), particularly Department of Climate Change (DCC) took lead in the formulation of the BAEF and TAPs employing participatory approach and consultation with relevant organizations, especially the Ministry of Agriculture and Forestry (MAF) and technical working group on climate change (TWG-CC). Importantly, the report and action plans were reviewed by United Nations Environment Programme (UNEP)-Denmark Technical University (DTU) or UNEP-DTU and Asian Institute of Technology (AIT).

In my capacity as the National Project Director for preparing Technical Need Assessment (TNA) for Lao PDR, I confirm that the BAEF and TAPs are in accordance with Laos's context and the government's national priorities including strategic sectors, programmes, the Nationally Determined Contribution (NDC), national plans and commitment to the United Nations Framework Convention on Climate Change (UNFCCC).

I am pleased to endorse the BAEF reports and TAP. I would also like to express sincere thanks to the GEF for financial support, and UNEP-DTU and AIT for technical support.

Sincerely,

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Ministry of Natural Resources and Environment

Executive Summary

A technology action plan (TAP) is needed for technology transfer as described in the Articles 4.3, 4.5 and 4.7 of the United Nations Framework on Climate Change Convention (UNFCCC). This TAP was developed following the prioritisation of climate change adaptation technologies or practices and a Barrier Analysis and Enabling Framework (BAEF), which are first and second stages of the Technology Needs Assessment (TNA), and pre-requisite for TAP. The prioritisation of adaptation technologies and BAEF were led by the Ministry of Natural Resources and Environment (MoNRE), particularly Department of Climate Change (DCC) and relevant organisations, especially the Ministry of Agriculture and Forestry (MAF). The technology prioritisation resulted in selection of the following eight adaptation technologies and practices for enhancement of climate change adaptation and disaster resilient capacity in the water and the agriculture sector.

1. Early warning system
2. Disaster impact reduction fund
3. River basin management
4. Climate-resilient water supply system
5. Livestock disease prevention and control
6. Agricultural development subsidy mechanism
7. Climate-resilient rural infrastructure
8. Crop diversification

The BAEF of the eight technologies was conducted based on barrier analysis processes: barrier identification, screening, decomposition, analysis of root causes and prioritisation of the key barriers, and stakeholder's consultations including consultation with climate change technical working group (CC-TWG) and broader stakeholders. BAEF showed that, although barriers were varied, the common barriers are financial and economic barriers such as 1) insufficient financial resources and support for development and deployment, 2) high investment cost, 3) insufficient access to finance and effective financing mechanisms for developing, deploying and sustaining the eight technologies. Non-financial and economic barriers that are common the technologies are: 1) insufficient technical knowledge and skills to develop and deploy the technologies in an effective and sustainable manners, 2) insufficient legal framework and enforcement, and 3) inadequate information and awareness, 4) insufficient tools, technologies, best practices and reference projects. The measures to overcome the barriers were also identified following the analysis and accordingly. The measures are as follows:

1. Increase financial resources including improve the public budgeting, resources mobilisation, access to finance, and improve financing mechanisms and effectiveness of financial resources management,
2. Improve organisational capacity including coordination among stakeholders and human resources,
3. Develop and enhance enforcement of polices on environmentally friendly technologies including climate change and disaster resilient technologies, integrated and sustainable development,

4. Improve and develop tools, technologies, best practices and reference projects,
5. Research and develop information and increase awareness about climate change impacts and disasters, cost-effective tools, best technologies and practices, and reference projects for effective and sustainable development and deployment of the eight technologies for climate change adaptation and disaster resilience.

This technology action plans (TAP) was developed based on BAEF through a consultation process, which was facilitated by the Department of Climate Change (DCC) including the TNA project team. Based on the BAEF, particularly the barriers and measures; actions and activities, funding sources, responsible organisations, timeframe, risks, budget, and success criteria and indicators for M&E for the TAP were identified, assessed, selected. Importantly, once the TAP was drafted by DCC including TNA project team, it was brought for discussion in the stakeholder consultations in March and November 2017. Furthermore, it was reviewed and approved by CC-TWG and leadership of the Ministry of Natural Resources and Environment (MoNRE) as well as by Asian Institute and Technology (AIT) and UNEP-DTU following the consultation meetings and TAP improvements.

The TAP consists of actions and activities, funding sources, responsible organisations, timeframe, risks, success criteria and indicators for M&E and budget for the implementation. Overall, the most important actions are improvement of capacity building and access to financial supports and resources for development and deployment of the eight technologies or practices including implementation of the TAPs. In total, US\$ 189.91 million are needed for the implementation of the TAP, which is a part of or pilot phase of climate change adaptation and disaster resilience enhancement in the water resources and the agriculture sector, between 2018 and 2020. In addition, to be effectively adapt to climate change and increase resilience to disasters, legal framework, coordination, awareness and information about climate change and hazards and best technologies and practices in the eight areas are also needed to be improved.

Chapter 1: Technology Action Plan for Climate Change Adaptation in the Water Resources Sector

Water resources sector is one of the most vulnerable sectors to climate change, and water related hazards such as floods and drought are the most devastated hazards being faced by the Lao PDR. Floods occur almost every year, and drought is once in every few years. On an average, floods caused economic loss and damage of about US\$ 100 million per year (MLSW, 2012; GFDRR, 2014). However, ISDR et al., (2012) estimated that the economic loss and damage resulting from climate-related disaster, on average, would be up to US\$ 278 million per year between now and 2029.

To address these problems, the government has taken several actions, especially development of a legal framework, institutional capacity, finance, and technical facilities for floods, drought prevention and control. Regarding the legal and institutional framework, Lao PDR has Laws on environmental protection (2013), water resources (2017), metrological and hydrological affairs (2017) which define measures and institutional arrangements to cope with the water related hazards. Law on climate change and decree on the national committee for hazard prevention and control are being developed and expected to be in place by 2018. The strategy and action plans on climate change have been in place since 2009 and 2013, respectively. In addition, the National Water Resources Strategy to the year 2025 and in the Action Plan 2016 to 2020-NWRSAP was formulated in 2016 and envisages a “coordinated, optimized and sustainable development and use of water resources, protection of the environment and improvement of social well-being.” There are twelve action plans in the strategy, and two of them are on flood and drought, water risk management, and climate change adaptation.

Lao PDR, despite the actions and efforts, is facing number of financial and economic, institutional, human resources, information, legal and technical barriers and poverty to effectively and sustainably develop and manage water resources to coping with water related hazards and conflicts, maintain water balance and ecosystems, and ensure adequate water supply for the following development targets.

- Hydropower production of 15,000 MW by 2025 and beyond (MEM, 2011; MPI, 2015),
- Industrial processing and manufacturing in industrial zones, urban expansion, transport and tourism industries,
- 82% and 100% of population gets access to safe drinking water by 2020 and 2030 respectively; 77.5% and 100% of population gets access to water hygiene and sanitation by 2020 and by 2030, respectively (WSP & WB, 2014).
- Production of rice and crops in 4 million hectares; production of meat, fish and eggs of 487,500 and 711,000 tons by 2020 and 2025, respectively (MPI, 2015),

This technology action plan (TAP) aims at enhancing climate change adaptation and disaster resilience in the water sector. Particularly, it defines plan for preparation and full implementation of the four-

following adaptation technologies and practices which were identified as a priority for enhancing climate change adaptation and disaster resilience in the water sector ¹.

- 1) End-to-end early warning system (EWS),
- 2) Disaster reduction fund,
- 3) River basin management, and
- 4) Climate resilient water supply system

The action plan defines development targets, actions and activities, stakeholders, resources and timeframe for the implementation of the activities for preparation of the development and implementation of the technologies and practices. It was formulated following Barriers Analysis and Enabling Framework (BAEF)² which is prerequisite for TAP. In addition, the TAP was finalised through focus group discussions and stakeholder consultation meetings, which were held in March and November 2017 (the list of stakeholders is in Annex 1) and reviewed by Asian Institute and Technology (AIT) and UNEP-DTU.

1.1 Action Plan for an Early Warning System

1.1.1 Early Warning System

An Early warning system (EWS), in general, is a system of hazard monitoring and forecasting, risk assessment and informing people at risk and relevant organisations to be prepared and enabled to take timely action to reduce disaster risks in advance of hazardous events. Overall, an effective or “end-to-end” and “people-centred” EWS includes an effective organisation performing 4 interlinked components of EWS namely risk knowledge, monitoring and forecast, warning dissemination and response, under a standard operational procedure (SOP) (ISDR, 2004).

Lao PDR has an EWS, but it is still basic and there are gaps regarding the four main components of the EWS (Table 1), leading to low effectiveness of EWS performance.

TABLE 1 EWS DEVELOPMENT AND MANAGEMENT GAPS

| EWS components | Status of EWS and Development or Performance Gaps |
|---|---|
| Institutional and organizational capacity | <ul style="list-style-type: none"> - Ineffective coordination amongst the EWS responsible agencies. The Standard Operating Procedures (SOPs) that provide guidelines for coordination among stakeholders have not been approved or enforced - EWS operation centres or unites at do not exist. - Limited technical staff or experts to oversee EWS at national and local level including at the communities. |
| Risk Knowledge | <ul style="list-style-type: none"> - Limited research and information about the hazards patterns, trends, risks |

¹ These four adaptation technologies or practices were identified as priorities for climate change adaption in the water sector under Technology Needs Assessment (TNA) (MoNRE, 2013).

² The BAEF is a separate report (MoNRE, 2017).

| | |
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| | <p>and EWS best technologies and practices.</p> <ul style="list-style-type: none"> - Hazard profiles and maps were developed in 2010, but some data is inaccurate and not downscaled to local levels. - Indigenous knowledge on weather forecasting and traditional hazard coping measures have not been fully explored and used. |
| Hazard Detection, Monitoring and Warning | <ul style="list-style-type: none"> - Inadequate hydro-met stations and networks. Gauge-to-gauge model for floods is only available at Mekong River. - Observation and monitoring technologies such as C-band Doppler radar and satellites are only available and cover in Vientiane capital area. Additional radar is required for the northern and southern region. - No warning categories and SOP |
| Dissemination and Communication | <ul style="list-style-type: none"> - Telecommunication, TV and radio programs have not been fully deployed to serve EWS. It is not clear which tools are the most effective for which communities. - Format, warning message and information are not simplified and standardised. - Monitoring and feedback mechanism and procedure to ensure whether the warning is reached and understood by relevant organizations and communities or not have not been standardised. |
| Community Response | <ul style="list-style-type: none"> - Response or emergency plan including test and drills are not fully developed and implemented by stakeholders and at-risk communities. |

1.1.2 Development goals

The development goals or target of EWS is to upgrade the existing EWS to become an effective end-to-end early warning system (EWS), which provides more effective, accurate and real-time disaster detection, warnings and strengthen national and local authorities including communities in 13 provinces, 45 districts and 160 villages that are at risk of floods, landslide and storms to effectively and timely response to the warnings.

1.1.3 Selection of Actions and Activities for the TAP

The selection of actions to be included in the TAP was conducted following the Barriers Analysis and Enabling Framework (BAEF), especially identified barriers and measures to overcome barriers on the EWS. The barriers that hinder EWS development and operation, and measures to address them were summarised in section 1.1.3.1. The details of the actions and activities selection were described in sections 1.1.3.2 and 1.1.3.3, respectively.

1.1.3.1 Barriers and Measures to Overcome Barriers to Early Warning System

BAEF concluded that there are nine important barriers to fully and sustainably develop and manage EWS. Those barriers and measures are in the six areas: financial and economic, institutional capacity and human resources, information and awareness, technical, legal framework and other. To address

the problems, eleven measures including nine sub-measures were also identified to overcome the barriers according (Table 2).

TABLE 2 BARRIERS AND MEASURES TO OVERCOME BARRIERS TO EWS

| Category | Barriers | Measures to overcome barriers |
|--|--|---|
| Financial and economic | 1. National-public budget shortfall for EWS | 1. Improve the national-public budget and investment in EWS: a. Maintain or enhance the government investment in EWS b. Improve effectiveness of public budgeting c. Improve resources mobilisation, access and cooperation with donors and private sector d. Improve financial aids effectiveness e. Increase public revenue-improve economic sector growth and revenue collection f. Implement measure 2, 8 and 9 |
| | 2. High investment cost of EWS | 2. Reduce and alleviate EWS cost: a. Reduce tax for importing EWS equipment and tools b. Enhance international cooperation and access to supports c. Increase co-funding including public-private investment |
| Institutional/organisational capacity and human skills | 3. Insufficient institutional framework or EWS centre | 3. Increase EWS centres |
| | 4. Insufficient human resources (HR) to sustainably develop and manage EWS | 4. Improve institutional and HR development (HRD) system 5. Increase staff's knowledge and skills in all aspects of EWS: technical, financial-economic, legal and organisational framework, communication and response through trainings and various capacity buildings |
| | 5. Ineffective coordination amongst stakeholders | 6. Improve coordination amongst stakeholders, particularly by improvement and endorsement of the EWS standard operation procedure (SOP) |
| Information and awareness | 6. Insufficient information and awareness of the responsible organisations and communities at risk about hazards and EWS in, especially best practices on technical, financial-economic, legal and institutional framework, effective communication and response | 7. Improve the information and awareness of the responsible organisations and communities at risk |
| Technical | 7. Inadequate tools, basic | 8. R&D of tools, basic infrastructure and facilities |

| Category | Barriers | Measures to overcome barriers |
|-----------------|---|---|
| | infrastructure and facilities | 9. Implement measure 1, 5, 7 and 8 |
| Legal framework | 8. Insufficient legal framework on EWS, especially policy and regulation to define clear responsibilities of stakeholders, mainstreaming EWS in the sectoral policies and effective enforcement of the policies | 10. Improve legal framework and enforcement of policies or regulation on EWS, especially mainstreaming EWS in the sectoral policies and enhancing effectiveness of the policies enforcement |
| Others | 9. Unsustainable settlement and defective land use planning | 11. Enhance sustainable settlement including integrated land uses and resilient town planning |

1.1.3.2 Selection of Actions

Selection of actions for the TAP based on the BAEF, particularly the barriers and measures outlined in the Table 2. The actions were selected from the measures. The measures to be included as actions in the TAP were assessed and prioritised against five evaluation criteria: relevance, effectiveness, efficiency, impact and sustainability (Annex 2) by stakeholders including the climate change working group (Annex 1), using scoring and expert judgment technique. The measure which obtained first to fourth top score were selected. As a result, 10 or all measures have been selected as actions for the TAP (Table 3), except the measure 2. However, some sub-measure of the action 1: 1b and 1e were excluded as they are quite broad, and importantly addressed in the national and provincial socioeconomic development plan, which facilitated by MPI and MOF. The sub-measure 1a, 1c and 1d were grouped to form the action 1 as they are relevant and share similarity including activities. So, do the measure 4 and 5; 6 and 10; 3, 8 and 11, they were merged. Finally, that there are only 5 actions to include in the TAP (Table 4).

TABLE 3 MEASURES AND SUB-MEASURES SELECTED AS ACTIONS TO INCLUDE IN THE ACTION PLAN

| Category | Measures to overcome barriers | Measures selected as actions Description |
|------------------------|---|--|
| Financial and economic | 1. Improve the national-public budget and investment in EWS: a. Maintain or enhance the government investment in EWS b. Improve effectiveness of public budgeting c. Improve resources mobilisation, access and cooperation with donors and private sector d. Improve financial aids effectiveness e. Increase public revenue-improve economic sector growth and revenue collection f. Implement measure 2, 8 and 9 | v. The measures 1a, 1c and 1d. The measures 1a, 1c and 1e gained 1 st top score or 1 st priority group, while 1b and 1e were in the 2 nd priority group of measure (Annex 2). The measures 1a and 1c have direct and possibly significant impact on EWS financing. The 1e will address effectiveness, transparency and creditworthiness, which is perceived to be critical for sustainable financing. The measure 1b and 1e are quite broad, and they are addressed in the national and provincial socioeconomic development plan, which facilitated by MPI and MOF. The measure 1f is implemented under the measure 2, 8 and 9. |

| Category | Measures to overcome barriers | Measures selected as actions Description |
|--|---|--|
| | <p>2. Reduce and alleviate EWS cost:</p> <p>a. Reduce tax for importing EWS equipment and tools</p> <p>b. Enhance international cooperation and access to supports</p> <p>c. Increase co-funding including public-private investment</p> | <p>X. The measures 2a received lower score (Annex 2). It would have a trade-off or impact on the national or the government income, while the government's budget is shortfall and has immediate need to secure all revenue.</p> <p>The measure 2b is addressed in the 1c. The measure 2c is also addressed in 1c and the measure 10.</p> |
| Institutional/ organisational capacity and human skills | <p>3. Increase EWS centres</p> | <p>√. but incorporated in the measure 8.</p> <p>The measures also received 1st top score, since the lack of EWS centre, especially at local levels is perceived to be a key problem for EWS. However, this measure was incorporated or implemented under the measure 8</p> |
| | <p>4. Improve institutional and HR development (HRD) system</p> <p>5. Increase staff's knowledge and skills in all aspects of EWS: technical, financial-economic, legal and organisational framework, communication and response through trainings and various capacity buildings</p> | <p>√. The measure 4 and 5.</p> <p>The measure 5 gained 1st top score, due to it is a determinant of EWS development and operation. Although the measure 4 gained 3rd top score or priority, and may not have direct impact on EWS, it is important to ensure sustainable HRD. So, the measure 4 should implemented along with the measure 5.</p> |
| | <p>6. Improve coordination amongst stakeholders, particularly by improvement and endorsement of the EWS standard operation procedure (SOP)</p> | <p>√. but addressed under the measure 10.</p> <p>This measure gained 2nd top score (Annex 2). However, it is addressed under the measure 10 since the main root causes of the ineffective coordination is legally and practically unclear responsibilities among stakeholders.</p> |
| Information and awareness | <p>7. Improve the information and awareness of the responsible organisations and communities at risk</p> | <p>√. This measure gained 2nd top score (Annex 2). It is also a determinant for effective EWS, including accurate forecast and warnings, while Laos has limited, inaccurate and not updated information and access. Some stakeholders have low awareness and/or neglect EWS, resulting effective EWS.</p> |
| Technical | <p>8. R&D of tools, basic infrastructure and facilities</p> <p>9. Implement measure 1, 5, 7 and 8</p> | <p>√. This measure had top score (Annex 2). It is also a determinant for effective EWS, including accurate forecast and warnings, while Laos has limited, inaccurate and not updated information and access. Some stakeholders have low awareness and/or neglect EWS, resulting effective EWS.</p> |
| Legal framework | <p>10. Improve legal framework and enforcement of policies or regulation on EWS, especially mainstreaming EWS in the</p> | <p>√. This measure gained high score (Annex 2). It is also a determinant for effective EWS, including accurate forecast and warnings, while Laos has limited, inaccurate and not updated information</p> |

| Category | Measures to overcome barriers | Measures selected as actions Description |
|--|---|---|
| | sectoral policies and enhancing effectiveness of the policies enforcement | and access. Some stakeholders have low awareness and/or neglect EWS, resulting effective EWS. |
| Others | 11. Enhance sustainable settlement including integrated land uses and resilient town planning | √. but incorporated in the measure 10. This measure gained high score (Annex 2). It is also a determinant for effective EWS, including accurate forecast and warnings, while Laos has limited, inaccurate and not updated information and access. Some stakeholders have low awareness and/or neglect EWS, resulting effective EWS. |
| <i>Notes: √ means measures were selected to include in the action plan. The measures noted X were not selected or merged into other measures</i> | | |

1.1.3.3 Identifying Activities for the Selected Actions

Identifying activities for the actions is necessary since actions are still broad and has implications on effectiveness and efficiency of the actions. The activities in Table 4 below were identified through a stakeholder consultation process, which the activities were initially listed by the TNA project team, and then consulted, elaborated and agreed with the stakeholders during focus group and consultation meetings organised in March and November 2017. Consequently, 29 activities were identified to implement five actions as follows.

TABLE 4 IDENTIFYING ACTIVITIES FOR THE ACTIONS

| No. | Action/Activity Description |
|--------------|--|
| Action 1 | Maintain or enhance the public investment, resources mobilisation from donors and private sector to improve EWS |
| Activity 1.1 | <i>Re-assess financial needs and funding sources</i> |
| Activity 1.2 | <i>Improve strategy on EWS</i> |
| Activity 1.3 | <i>Develop resource mobilisation plan</i> |
| Activity 1.4 | <i>Develop financial sources or donor directory</i> |
| Activity 1.5 | <i>Develop and submit financeable project proposals (to the government and donors)</i> |
| Activity 1.6 | <i>Improve effectiveness of public and foreign financing aids data management, M&E and inspection system</i> |
| Action 2 | Increase institutional, organisational capacity and human resources (HR) |
| Activity 2.1 | <i>Improve human resources development system including HR and capacity development plan, effective recruitment, staff knowledge management, enhancing learning culture and commitment</i> |
| Activity 2.2 | <i>Building capacity of national and local authorities including communities at risk of disasters on EWS through professional trainings, study visits and learning exchanges</i> |
| Activity 2.3 | <i>Increase staff to work at EWS centres and mobile technical team to facilitate warning communication, dissemination and response</i> |
| Activity 2.4 | <i>Promote EWS network, think-tank and civil organisations and information exchanges</i> |
| Activity 2.5 | <i>Improve EWS education and research</i> |

| No. | Action/Activity Description |
|---------------|---|
| Action 3 | Improve tools and develop infrastructure and facilities for EWS including response |
| Activity 3.1 | <i>Re-assess infrastructure needs for enhancing EWS and response capacity</i> |
| Activity 3.2 | <i>Re-survey, re-design and develop disaster resilient town plan and integrated land use plan for disaster risk areas and communities</i> |
| Activity 3.3 | <i>Develop tools/software for weather nowcasting</i> |
| Activity 3.4 | <i>Develop tools/software for weather numerical model (WNM)</i> |
| Activity 3.5 | <i>Install weather radar systems</i> |
| Activity 3.6 | <i>Develop automatic hydrological stations and gauge-to-gauge models for floods monitoring and forecast</i> |
| Activity 3.7 | <i>Develop automatic rain and river gauges including models for floods and landslide monitoring and forecast</i> |
| Activity 3.8 | <i>Develop telecommunication including IT systems for EWS</i> |
| Activity 3.9 | <i>Develop electricity and power back up systems in all areas at risk of hazards</i> |
| Activity 3.10 | <i>Develop access roads to and in all areas at risk of hazards</i> |
| Activity 3.11 | <i>Develop operation centres including tools/ software, equipment for EWS for EWS</i> |
| Activity 3.12 | <i>Develop and implement warning guidelines and SOPs for EWS including communications and response</i> |
| Activity 3.13 | <i>Re-locate the inevitable disaster risk communities</i> |
| Action 4 | Increase information and awareness |
| Activity 4.1 | <i>Research about hazards and update their profiles</i> |
| Activity 4.2 | <i>Study and identify best tools/technologies for (floods) monitoring and forecast, communication and response</i> |
| Activity 4.3 | <i>Disseminate information and organise awareness campaign</i> |
| Action 5 | Develop and enhance enforcement of policies or regulation on EWS |
| Activity 5.1 | <i>Develop policies or regulation on EWS</i> |
| Activity 5.2 | <i>Enhance mainstreaming disaster risk reduction and EWS in ESIA system including M&E and inspection</i> |

1.1.4 Identify Stakeholders and Determine Timelines

1.1.4.1 Identify Stakeholders for TAP Implementation

The EWS stakeholders could be identified based on the identified activities and mandates of relevant organisations. Apart from the Ministry of Natural Resources and Environment (MoNRE) including its departments; several stakeholders, especially the governmental organisations were already identified in the first two steps of TNA: technology prioritisation and BAEF. Furthermore, based on the review of the relevant organisations' mandates to the identified activities and the stakeholder consultation meeting in November 2017, a list of the primary and secondary stakeholders could be formulated as presented in Annex 4, and summarised in the Table 5 and Table 12.

TABLE 5 KEY STAKEHOLDERS ON EARLY WARNING SYSTEM

| No | Key Stakeholders | Overall mandates/Tasks | Relevant activities |
|----|------------------------|---|---------------------|
| 1 | Committee for Disaster | Responsible for overseeing overall disaster | All activities, |

| No | Key Stakeholders | Overall mandates/Tasks | Relevant activities |
|----|--|--|--|
| | Prevention and Control (CDPC) at National and Local Levels | prevention and control, especially policies, resources mobilisation and matters that involved with multi-sectors and at national level. | particularly activity 1.6, 3.13, 5.1 and 5.2 |
| 2 | Ministry of Natural Resources and Environment (MoNRE), particularly, Department of Meteorology and Hydrology (DMH), Department of Water Resources (DWR), Department of Climate Change (DCC) and Lao National Mekong River Commission-LNMRC (as a member of the CDPC) | MoNRE, the secretary to the CDPC, has the overall responsibility about natural resources and environmental hazards warnings. <ul style="list-style-type: none"> - DMH is responsible for weather, water and geo- hazards monitoring and warnings - DWR handles with water related hazards: floods and drought and coordinates with relevant sectors, e.g., DMH, DCC, LNMRC and MRC on water related hazards EWS - DCC coordinates with relevant sectors, e.g., DMH, DWR, NLMRC, MRC and MLSF on EWS and facilitates implementation of emergency response - LNMRC coordinates EWS in Mekong basin | All activities, but following activities are not directly implemented or just coordinated by MoNRE: activity 2.5, 3.2, 3.8, 3.9 and 3.10 |
| 3 | Ministry of Labour and Social Welfare (MOLSW) (a member of the CDPC) | Take lead in seeking resources and assisting disaster response and recovery. | Activity 1.3-1.6 and 3.2 |
| 4 | Ministry of National Defence (a member of the CDPC) | Take lead in assisting evacuation, rescue and disaster recovery | Activity 3.2 |
| 5 | Lao Red Cross | Assists disaster recovery | Activity 1.3-1.6 and 3.2 |
| 6 | Other ministries and public organisations including (MPT, MICT, MEM, MPWT, MAF- members of the CDPC) | Have a responsibility to inform and assist or response to warnings relevant to their sectors. | Activity 3.2, 3.8, 3.9, 3.10, 3.13 |
| 7 | Mekong River Commission (MRC) | Have the responsibility to develop and manage EWS in Mekong region. | All actions and activities but limits to Mekong river basin |
| 8 | National University of Laos, especially Faculty of Water Resources Engineering (FOWRE) and Faculty of Environment Science (FES) | Provides education and research on floods early warning system. | Activity 2.5 and 4.2 |
| 9 | Development partners and donors (WMO, AHA Centre, RIMES, WB, JICA, ADB, EU, AusAID, UNDP, SDC, FAO etc.) and international non-government organisations-INGOs (WFP, CARE, Oxfam, ADPC, IFRC, Caritas, SCA, | Provides technical and financial support for hazard and vulnerability assessment, response and disaster recovery. | All activity |

| No | Key Stakeholders | Overall mandates/Tasks | Relevant activities |
|----|--|--|-----------------------|
| | World Vision, Health Action) | | |
| 10 | Private sector e.g., hydropower developers | Assess, monitoring, provide information and warnings about hazards that may affect their businesses and stakeholders | Activity 3.13 and 4.2 |

1.1.4.2 Schedule Actions and Activities

The schedule of the actions and activities was defined by TNA project team in consultation with the key stakeholders in November 2017. Priority, nature and scale of the activities, readiness including time, technical and financial capacity of the responsible organisations to perform the activities were considered when scheduling. As a result, the schedule of the action on EWS was defined (see Annex 4) as well as the summarised TAP (Table 12).

The timeframe of the TAP implementation is five years, which is perceived to be suitable and sufficient time for technical and financial preparation including demonstration of EWS before full EWS operation. It was divided into two phases. The first phase, the preparation phase is 3 months, or between May to July 2018. This phase was expected to be commenced immediately following the TAP approval and during dissemination of TAP to stakeholders in May 2018. The full TAP implementation phase was expected to begin from July 2018, and for until December 2022.

1.1.5 Resources estimation

1.1.5.1 Capacity building requirement for implementation of the TAP

Effective TAP implementation necessitates strengthening the capacity of the key and other stakeholders. Capacity requirements or especially knowledge and skills gaps to be addressed were identified during BAEF. Those include enhancement of the EWS technical knowledge and skills, project management and others as outlined in the Table 6 below.

TABLE 6 CAPACITY BUILDING REQUIREMENTS FOR IMPLEMENTATION OF THE TAP

| Categories | Capacity building requirements |
|---------------------------------------|--|
| Technical knowledge and skills on EWS | <p>For defining hazards (drought, floods, landslide, and storms) patterns, mapping and vulnerability assessment:</p> <ul style="list-style-type: none"> - ArcGIS instrument, satellite weather and land use data, and the Hydrologic Modelling System (e.g., HEC-GeoHMS, HEC-GEORAS, HEC-RAS) including knowledge and skills - Tools and skills for downscaling the Global Climate Model (GCM) - Community-based disaster risk management (CBDRM) <p>For monitoring and forecast of floods, landslide, storms and extreme weather:</p> <ol style="list-style-type: none"> 1. Numerical weather model and news casting software, equipment and skills 2. Gauge-to-gauge correlation modelling knowledge and skills 3. Flash flood and landslide modelling/simulation software, equipment and skills |

| Categories | Capacity building requirements |
|--|---|
| | <ol style="list-style-type: none"> 4. Use radar and satellite image to combine NWM for news casting and interpretation of forecast results for regions for warnings in the country 5. Knowledge and skills for developing SOP and best practice guidelines for monitoring and forecast <p>For communication and dissemination of warning message:</p> <ol style="list-style-type: none"> 1. Research and develop effective and best practice on the warning communication and dissemination channel, methods, message and tools/materials for different hazards, risks and communities 2. Develop SOP and best practice guidelines for communication <p>For response capacity:</p> <ol style="list-style-type: none"> 1. Emergency, preparedness or response planning 2. Preparedness or response capacity assessment 3. Research skills to develop SOP and best practice guidelines for response. |
| Project and business management | <ol style="list-style-type: none"> 1. Project management including activity and its component planning, estimating-cost and human resource “time on task” for each activity and its components, procurement, risk management and M&E 2. Business planning including financial and economic analysis |
| Institutional and human resources development and management | <ol style="list-style-type: none"> 1. Institutional/organisational development including analysis 2. HR and capacity planning and development including capacity needs assessment 3. Staff knowledge mapping and management 4. DRR and EWS curriculum development |
| Financial and economic | <ol style="list-style-type: none"> 1. Feasibility study including financial and economic analysis such as cost and benefit or return on investment in EWS 2. Bankable proposal development-writing 3. Identification and analysis of financial or funding sources 4. Resources mobilisation planning 5. Effective and efficient public budgeting 6. Financial aids effectiveness/management including M&E |
| Legal | <ol style="list-style-type: none"> 1. R&D of disaster and climate change law and policy including its impacts 2. R&D and deployment of best practice on law enforcement |

1.1.5.2 Estimate Costs for Actions and Activities

The costs of the actions and activities were estimated by DCC including the TNA project team in consultation with DMH during DCC and DMH meeting in November 2017. The costs were calculated based on nature of activities and potential costs including service prices, costs of activities of previous similar projects and expert judgment.

The total cost for the TAP implementation could be about US\$ 47.23 million. It included three main costs: 1) the cost for dissemination and consultation in the preparation phase prior to the full TAP implementation, 2) the cost of each action and activity, and 3) the cost for contingency. The cost for

dissemination and consultation meetings; based on the 3 meetings and 2 days for each meeting, current government daily allowance, a consultant fee, and a meeting including administrative costs, is expected to be US\$ 18,000. The cost of implementation of each activity, considering allowance, a consultant fee, travel, meeting and other administrative costs is approximately US\$ 42.92 million (Table 12). The cost for contingency to address delay and variations, is estimated to be 10% of the total cost or US\$ 4,291,900. This assumed that there would likely be some risks on the estimated costs due to: 1) the cost of living including service fee and material prices change or increased, 2) capacity building may take longer and needs more budget since knowledge and skills of the DCC, DMH, local communities and other stakeholders are relatively limited and may need more international experts to support, and 3) other expenses associated with risks and accidents during fieldworks and other contingencies.

TABLE 7 ESTIMATED COSTS FOR IMPLEMENTATION OF THE ACTION PLAN

| No | Budget categories | Cost (US\$ Th.) |
|-----|---|-----------------|
| I | Budget for preparation of the action plan implementation | 18 |
| II | Budget for actions in the action plan | 42,919 |
| 1 | Increase public investment and resources mobilisation for EWS | 97 |
| 2 | Increase institutional capacity and human resources (HR) | 345 |
| 3 | Improve tools, infrastructure and facilities for EWS including response | 42,175 |
| 4 | Increase information and awareness | 265 |
| 5 | Develop and enhance enforcement of policies and regulation on EWS | 37 |
| III | Contingency budget (10% of the budget for actions) | 4,291.9 |
| | Total | 47,228.9 |

1.1.5.3 Identifying Sources of Funding

A common funding sources include budgets from the public, private and social organisations such as non-government and non-profit organisations. The public funding sources consist of the government and development partners. The government's fund for the Public Investment Project (PIP) including project identification and budget allocation is facilitated by Ministry of Planning and Investment (MPI) and Ministry of Finance (MOF), and project approved by the government committee and/or national assembly depending on the size of projects, budgets and impacts. The governmental originations such as Ministry of Natural Resources and Environment (MONRE) including DCC, DMH, DWR and EPF; Ministry of Labour and Social Welfare (MLSW), Ministry of National Defence (MOND) receive annual budget for the EWS as a PIP. In addition, the EWS can also be financed under the governmental reserves and emergency response fund, which is managed by MOF. As discussed in the BAEF report, the public or the government fund is however limited and has not been able to cover the financial needs for full development and operation of the EWS.

The key development partners and intergovernmental organisations that provided or have provided financial and technical supports to EWS and disaster risk reduction (DRR) in Laos are as listed in the Table 5. Furthermore, there are some funds that have provided or have possibility to provide financial

support for EWS and DRR are Global Environment Facility (GEF), the Global Facility for Disaster Reduction and Recovery (GFDRR) and other funds as follows.

TABLE 8 POTENTIAL FUNDING SOURCES AND DONORS

| No | Funding sources |
|----|--|
| 1 | Least Developed Countries' Fund (LDCF) |
| 2 | Green Climate Fund (GCF) |
| 3 | The Climate Risk and Early Warning Systems(CREWS) initiative-UNISDR |
| 4 | The ESCAP Trust Fund for Tsunami, Disasters and Climate Preparedness |
| 5 | The Integrated Disaster Risk Management Fund-ADB |

1.1.6 Management Planning

1.1.6.1 Risk and Contingency Planning

It is recognised that implementation of the planned activities may encounter some risks, especially cost, scheduling and performance risk (Table 9). In addition, there may be specific risks associated with each action. Measures to address the overall risks and specific risks of actions and activities were identified and outlined in Table 9, 10 and 12, respectively.

TABLE 9 OVERALL RISKS AND CONTINGENCY PLAN

| Risk items | Description | Contingency action |
|------------------|--|--|
| Cost risk | There may be a cost risk such as lower and higher costs which may result from unforeseen changes. | <ol style="list-style-type: none"> 1. Conduct regular M&E of the action plan implementation including budget use, and adjust as appropriate 2. Increase awareness about risks and contingency 3. Spare 10% of the action plan budget as contingency budget |
| Schedule risk | Schedule risk, or delay could happen as financial and human resources may not be secured right away following TAP approval. Furthermore, although the financial and resources are in place, the delay could happen due to other uncontrolled factors. | <ol style="list-style-type: none"> 1. Conduct regular M&E of the action plan implementation including budget use, and adjust as appropriate 2. Enhance organisational capacity, staff skills, policy and decision procedure to be ready and clear for contingency response |
| Performance risk | Implementation of the action plan may encounter performance risk, especially the goals of the actions are not attained, and benefits are not being delivered. These may result from uncontrolled factors, limited financial and technical capacity, lack of information, leadership and commitment and coordination or conflict of interest. | <ol style="list-style-type: none"> 1. Conduct regular M&E of the action plan implementation and identify measures to address the problems 2. Enhance organisational capacity, staff skills, and commitment to perform the TAP and contingency measures 3. Secure and utilise the contingency budget for improve performance and address performance risks |

TABLE 10 SPECIFIC RISK OF EACH ACTION AND CONTINGENCY PLAN

| No | Actions | Risks | Contingency measures/actions |
|----|---|---|--|
| 1 | Increase public investment and resources mobilisation for EWS | Public budget deficit, variable international financial pledge, small private sector and limited capacity-know how may pose a risk to organisations in charge to access to financial support and increase budget for EWS adequately | <ol style="list-style-type: none"> 1. Enhance capacity of the organisations in charge of EWS to mobilise and access to financial support effectively 2. Increase engagement and provide DRR and EWS information for decision makers, e.g., during DPCC, roundtable and the government meetings 3. Improve cooperation and coordination among stakeholder, with donors and private sector on the EWS financing 4. Promote R&D of cost effective EWS |
| 2 | Increase institutional capacity and human resources (HR) | Insufficient financial resources, ineffective coordination among stakeholders and between HR demand and supply side | <p>Implement the contingency actions for the action 1</p> <p>Improve coordination among stakeholders and between HR demand and supply side</p> |
| 3 | Improve tools, infrastructure and facilities for EWS including response | <ol style="list-style-type: none"> 1. As the risk of the action 1 2. Social and environmental impact resulted from infrastructure development | <ol style="list-style-type: none"> 1. Implement the contingency actions for the action 1 2. Conduct social and environmental impact assessment (SEIA) and implement social and environmental management plan (SEMP) |
| 4 | Increase information and awareness | <ol style="list-style-type: none"> 1. As the risk of the action 1 2. Lack of tools, best practices for raising awareness of the stakeholders at all levels: policy to communities 3. Difficult to access and conduct information dissemination and awareness raising for locals in the remote area 4. Local people (at risk of hazards) have limited knowledge and tools to access to EWS information | <ol style="list-style-type: none"> 1. Implement the contingency actions for the action 1 2. Improve synergy of development actions and coordination among stakeholders in all levels and in the remote area 3. Increase volunteers and other cost-effective methods for awareness raising |
| 5 | Develop and enhance enforcement of policies and regulation on EWS | As the risk of the action 1, 2 and 4 | <ol style="list-style-type: none"> 4. Implement the contingency actions for the action 1, 2 and 4 |

1.1.6.2 Success Criteria and Indicators for Monitoring of the TAP Implementation

Success criteria and indicator for monitoring of the TAP implementation was also identified by TNA project team in consultation with the key stakeholders in November 2017. The criteria and indicators (C&I) were divided into two levels: actions and activities as well as output-outcome and input level. Those C&I of the actions and activities were summarised in Table 11 and 12 below.

TABLE 11 KEY SUCCESS CRITERIA AND INDICATORS FOR MONITORING OF THE ACTION PLAN IMPLEMENTATION

| No | Action | Success criteria | Indicators for monitoring of implementation |
|----|---|--|---|
| 1 | Increase public investment and resources mobilisation for EWS | Sufficient financial resources for full development and operation of EWS, which reduce disaster loss and damage | Financial support and investment in EWS are increased |
| 2 | Increase institutional capacity and human resources (HR) | Sufficient institutional capacity and human resources for effective EWS development and operation, which reduce disaster loss and damage | Institutional capacity and human resources are improved |
| 3 | Improve tools, infrastructure and facilities for EWS including response | Sufficient tools, basic infrastructure and facilities for effective EWS development and operation | Tools, infrastructure and facilities for EWS are improved |
| 4 | Increase information and awareness | Sufficient information and EWS stakeholders have high awareness and preparedness to implement EWS | Information and awareness are improved |
| 5 | Develop and enhance enforcement of policies and regulation on EWS | Complete, clear and effective legal framework for effective or sustainable EWS development and operation | Policies and regulation on EWS are developed, and enforcement is more effective |

1.1.7 Summary Overview of the Action Plan for an End-to-End Early Warning System

Based on the previous sections, the summary of the TAP could be formulated. The summary TAP, the Table 12 below, consists of actions and activities, funding sources, responsible organisation, timeframe, budget for the implementation, risks and C&I of the TAP implementation. This TAP will be carried out for five years, by MoNRE, particularly the Department of Climate Change (DCC), Meteorology and Hydrology (DMH) and Water Resources (DWR). The total cost of the TAP implementation is about US\$ 47.23 million.

TABLE 12 SUMMARY ACTION PLAN FOR AN END-TO-END EARLY WARNING SYSTEM

| Actions/Activities | | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for monitoring of implementation | Cost (US\$ Th.) |
|--------------------|--|----------------------------|--|-------------------|--|--|---|-----------------|
| Action 1 | Increase public investment and resources mobilisation for EWS | | | | | | | 97 |
| Activity 1.1 | Re-assess the financial needs, funding sources and feasibility | Gov., JICA, WB, ADB, GFDRR | MONRE: DCC, DMH, EPF, WRD MLSF: SWD | May-Dec 2018 | Insufficient and inaccurate information about disaster loss and damage, and limited access to donors' information | Financial needs, funding sources and feasibility information made available and useful for financial planning and resources mobilisation | The re-assessment carried out and reported | 25 |
| Activity 1.2 | Improve strategy on EWS | Gov., JICA, WB, ADB | MONRE: DCC, DMH, EPF, WRD | Jul 2018-Mar 2019 | Insufficient information and/or financial and human resources including commitment | Comprehensive and practical strategy on EWS put in place and proved to be effective/useful | Strategy on EWS is improved, endorsed and implemented | 17 |
| Activity 1.3 | Develop resource mobilisation and (domestic and international) cooperation plan on technical-financial support including technology transfer | Gov., JICA, WB, ADB | MONRE: DCC, DMH, EPF, WRD, DOC MLSF: SWD MST | Jun 2018-Jun 2019 | Unclear or duplicated responsibilities among responsible organisations on resource mobilisation and cooperation on EWS and DRR | A comprehensive and practical resource mobilisation and cooperation plan put in place and early results are promising | Resource mobilisation and cooperation plan is developed and implemented | 12 |
| Activity 1.4 | Develop and update funding sources or donor directory | Gov. | MONRE: DCC, DMH, EPF, WRD | Oct 2018-Dec 2022 | Incomplete information due to inaccessible to donor information | Donors/funding sources directory including profiles put in place and used for financial planning and resources mobilisation including | Donors/funding sources directory is developed | 5 |

| Actions/Activities | | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for monitoring of implementation | Cost (US\$ Th.) |
|--------------------|--|--|---------------------------|-------------------|--|---|--|-----------------|
| | | | | | | cooperation | | |
| Activity 1.5 | Develop and submit financeable project proposals | Gov., WB, ADB, JICA, UNISDR, GEF, LDCF, GFDRR, WMO, AusAID | MONRE: DCC, DMH, EPF, WRD | Jun 2018-Dec 2022 | Limited information, financial and human resources to develop financeable project proposals | At least 2 project proposals accepted and funded between 2018 and 2022 | No. of proposal developed, submitted and funded | 30 |
| Activity 1.6 | Improve the public and donor financial aids data management system | Gov., WB, ADB, UNDP | MPI, MOF, MONRE | Sep-Dec 2018 | Not inclusive due to ineffective coordination and information sharing | Complete, and transparent-traceable financial aids data management system put in place and helpful for financial and cooperation M&E and improvements | Financial aids data and reporting improved | 8 |
| Action 2 | Increase institutional capacity and human resources (HR) | | | | | | | 345 |
| Activity 2.1 | Improve HRD system including HRD plan and M&E, staff knowledge management, recruitment | Gov., WB, ADB, JICA, WMO, UNISDR | MONRE: DCC, DMH, WRD | May-Dec 2018 | HRD and capacity building is not in line with the plan and system | Effective HRD system, sufficient human resources including staff knowledge, effective staff recruitment put in place and effective | HRD and management system developed and implemented | 20 |
| Activity 2.2 | Train national and local authorities including communities at risk of disasters on EWS (see table 6) | Gov., WB, ADB, JICA, ISDR, GEF, LDCF, GFDRR, WMO, AusAID | MONRE: DCC, DMH, WRD | Oct 2018-Dec 2022 | Ineffective and insufficient due to lack of resource persons, or financial resources, and the trainings are not to delivered to unqualified participants | Staff receive sufficient trainings, and have knowledge and skills to perform more effective EWS | Training plans developed, trainers contracted, no. of trainings organised, and participants attended | 120 |

| Actions/Activities | | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for monitoring of implementation | Cost (US\$ Th.) |
|--------------------|---|--------------------|--------------------------------------|--------------------|--|---|---|-----------------|
| Activity 2.3 | Increase technical mobile team to facilitate the EWS | Gov., WB, ADB | MONRE: DCC, DMH, WRD | Jan 2019- Dec 2022 | Insufficient mobile staff/team due to limited budget and skilful staff | The EWS mobile team receives sufficient trainings and capable of supporting the EWS, especially response | No. of mobile team established | 85 |
| Activity 2.4 | Promote EWS network, think-tank and civil organisations and information exchanges | Gov., WB, ADB | MONRE: DCC, DMH, WRD | Oct 2018- Dec 2022 | Could not mobilise resources for promotion and development of the think-tank, networking and exchange | Think-tank, networking and exchange platform are put in place and helpful supporting EWS development | Number of think-tank, networking and exchanges forum organised | 45 |
| Activity 2.5 | Improve EWS education and research | Gov., WB, ADB | MONRE: DCC, DMH, WRD, NERI, FWRE MST | Sep 2018- Oct 2022 | Insufficient resources including human, experiences and information to develop practical and comprehensive educational curriculum and research | A practical EWS curriculum including educational materials put in place and proved to be more effective | No. of teachers and researchers trained, and educational materials and curriculum developed | 75 |
| Action 3 | Improve tools, infrastructure and facilities for EWS including response | | | | | | | 42,175 |
| Activity 3.1 | Re-assess infrastructure needs for enhancing EWS and response capacity | Gov, WB, ADB | MoNRE: DCC/ DMH | Jun 2018- Dec 2020 | Financial resources are limited or not available in time for the assessment | Clear and comprehensive information about infrastructure including technical and financial needs, priority and feasibility made available and proved to be useful | Financial assessment conducted and reported | 65 |

| Actions/Activities | | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for monitoring of implementation | Cost (US\$ Th.) |
|--------------------|---|--|------------------|--------------------|---|--|---|-----------------|
| | | | | | | for EWS support infrastructure planning | | |
| Activity 3.2 | Survey and develop integrated land use and resilient town plans for flood prone areas | Gov, WB, ADB, GIZ | MoNRE: DCC/ DMH | Jun 2018- Dec 2020 | Limited financial and technical capacity, coordination and polices on land uses and disaster resilient town | Integrated land use, flood prone areas and resilient town development plans put in place and useful for enhancing EWS response | Survey conducted, and disaster resilient town plans developed, formulated as project proposal and submitted for funding | 100 |
| Activity 3.3 | Develop tools/ software for weather news casting | Gov. WB, ADB, SDC, JICA, AusAID, GFDRR, ISDR | MoNRE: DCC/ DMH | Oct 2018- Dec 2021 | Limited financial and human resources for development and maintenance | Tools/software put in place, and made weather news casting or real time forecast possible | News casting Tools/ software established and operated | 450 |
| Activity 3.4 | Improve weather numerical model (WNM) tools/ software | Gov. WB, ADB, SDC, JICA, AusAID, GFDRR, ISDR | MoNRE: DCC/ DMH | Oct 2018- Dec 2021 | As 3.3. above | Tools/software are put in place, and useful for more effective and timely hazards monitoring, forecast and warnings | WNM tools/ software improved and applied | 200 |
| Activity 3.5 | Install weather radar systems | Gov, WB, ADB, JICA | MoNRE: DCC/ DMH | Jan 2019- Dec 2021 | As 3.3. above | Weather radar systems established in the north and south, and useful for more effective and timely hazards monitoring, forecast and warnings | Weather radar systems established in the north and south | 12,000 |

| Actions/Activities | | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for monitoring of implementation | Cost (US\$ Th.) |
|--------------------|--|------------------------------------|---|--------------------|--|---|---|-----------------|
| Activity 3.6 | Develop automatic hydrological stations and gauge-to-gauge models for floods monitoring and forecast | Gov, WB, ADB Hydro-Power Companies | MoNRE: DCC/ DMH and Hydro-Power Companies | Oct 2018- Dec 2021 | As 3.3. above | Automatic hydrological stations and gauge-to-gauge models set up in place, and useful for more effective and timely hazards monitoring, forecast and warnings | Automatic hydrological stations and gauge-to-gauge models developed in all rivers and necessary areas | 500 |
| Activity 3.7 | Develop automatic rain gauges and models for flash flood and landslide monitoring and forecast | Gov, WB, ADB Hydro-Power Companies | MoNRE: DCC/ DMH and Hydro-Power Companies | Oct 2018- Dec 2021 | As 3.3. above | Automatic rain gauges including models are in place and helpful for effective and timely hazards monitoring, forecast and warnings of floods and landslide | Automatic rain gauges including models for floods and landslide monitoring and forecast developed | 500 |
| Activity 3.8 | Develop telecommunication network, siren and IT systems including EWS apps | Gov, WB, ADB Telecom. Companies | MoNRE: DCC/ DMH MPT | Oct 2018- Dec 2021 | Delayed or incomplete due to technical and financial constraints | Telecommunication including IT systems are put in place and helpful to EWS operation | Tele-communication systems for EWS developed | 3,600 |
| Activity 3.9 | Develop electricity and power back up systems in all areas at risk of hazards | Gov, EDL, WB, ADB | MoNRE: DCC/ DMH MEM | Oct 2018- Dec 2021 | As 3.8 above | Electricity and power back up systems are put in place and helpful to improve EWS | Power back-up systems installed | 2,700 |
| Activity 3.10 | Develop access roads to and in all areas at | Gov. WB, ADB, SDC, JICA, | MoNRE: DCC/ DMH | Oct 2018- | As 3.8 above | Access roads are in place and increase ease of | Access roads to and in all areas at risk of | 5,700 |

| Actions/Activities | | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for monitoring of implementation | Cost (US\$ Th.) |
|--------------------|---|--|---------------------------------|--------------------|---|--|--|-----------------|
| | risk of hazards | AusAID, GFDRR, ISDR | MPWT | Dec 2021 | | access to all areas at risk of hazards and evacuation | hazards completed | |
| Activity 3.11 | Develop operation centres including tools/software, equipment for EWS | Gov. WB, ADB, SDC, JICA, AusAID, GFDRR, ISDR | MoNRE: DCC/ DMH | Oct 2018- Dec 2020 | As 3.8 above | EWS centres are put in place and helpful to improve EWS | EWS centres established | 1,340 |
| Activity 3.12 | Develop warning guidelines and SOPs for EWS | Gov, WB, UNDP, ADB | MoNRE: DCC/ DMH | Nov 2018- Mar 2019 | 1) Financial resources may not be secured on time or insufficient, 2) Unclear responsibilities among stakeholders on DRR and EWS exist | Practical and effective SOPs for EWS put in place and proved to be effective | Developed SOPs for EWS | 20 |
| Activity 3.13 | Relocate communities at risk of disaster including development infrastructure | Gov, ADB | MoNRE: DCC/ DMH MPWT, MAF | Dev 2018- Dec 2020 | Financial resources may not be secured on time or insufficient, Other environmental and social impacts | Relocated communities equipped with effective EWS and disaster loss and damage avoided/reduced | No. of communities relocated, and disaster loss and damage avoided | 15,000 |
| Action 4 | Increase information and awareness | | | | | | | 265 |
| Activity 4.1 | Research, downscale and improve hazard maps and profiles | Gov. WB, ADB, SDC, JICA, AusAID, GFDRR | DCC/ DMH | Jun 2018- Oct 2019 | Organisations in charge may not secure financial sufficient support timely and limited capacity for R&D | Accurate and update downscaled hazard maps and profiles are available, and helpful for EWS operation | Research and downscaling hazard maps and profiles conducted | 120 |

| Actions/Activities | | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for monitoring of implementation | Cost (US\$ Th.) |
|--------------------|---|---------------------------------|------------------|-------------------|---|---|---|-----------------|
| Activity 4.2 | Study and identify best technologies and practices for EWS | Gov. WB, ADB, SDC, JICA, AusAID | DCC/ DMH | Jun 2018-Mar 2020 | Insufficient resources and capacity for R&D of best practices | Best technologies and practices for effective EWS development and operation are available and promising | No. of best tools/ technologies for EWS studied and identified | 85 |
| Activity 4.3 | Disseminate and organise awareness campaign | Gov. WB, ADB, SDC, JICA, AusAID | DCC/ DMH | Oct 2018-Mar 2022 | As 4.2 above | EWS stakeholders have more awareness, alert and safety behaviour in response to hazards warning | No. of workshop and meetings organised, and stakeholders attended | 60 |
| Action 5 | Develop and enhance enforcement of policies and regulation on EWS | | | | | | | 37 |
| Activity 5.1 | Develop policies or regulation on EWS | Gov, WB, UNDP | DCC/ DMH | Jun 2018-Mar 2019 | Delayed due to insufficient resources and experiences on DRR and EWS | Practical policies or regulation on EWS put in place and effective | A policy or regulation on EWS formulated and implemented | 17 |
| Activity 5.2 | Enhance mainstreaming DRR and EWS in developments and ESIA system | Gov. WB, ADB, SDC | DCC/ DMH | Nov 2018-Apr 2022 | ESIA operational risk or ineffective enforcement exists. Mainstreaming and enforcing EWS under the ESIA system may have same risk | Development projects incorporate and be responsible for disaster risk reduction and EWS in the developments and ESIA system | Disaster risk reduction and management including EWS mainstreamed in developments and ESIA system | 20 |
| Total | | | | | | | | 42,919 |

1.2 Action Plan for Developing and Sustaining a Disaster Impact Reduction Fund

1.2.1 Disaster Impact Reduction Fund

The disaster impact reduction fund (DIRF), in this context, means the financial mechanism to finance climate change adaptation, disaster risks and impacts reduction. This financial mechanism may include subsidies, funds, soft loans and insurance for reducing risks, losses, damage resulted from changing climate and disasters, and sustain people's livelihood, production and businesses.

Currently, the government pledges 100 billion LAK (US\$ 12 million) per year as the state reserve fund for emergency response, including disaster response and recovery actions. At local levels, some flood prone communities, for example, in Thathom district of Xiengkhouang and in Mok district of Xaysomboun province established the community funds to cope with disaster impacts, with support and contribution of households, originations and private sector in the districts. In 2016, these communities could raise fund of about US\$ 50,000 per year, and end year balance after spending on DRR activities was of about US\$ 5,000. However, compared to the financial needs, there is large financial gap. As mentioned, the estimated economic loss and damage resulting from climate-related disaster could be US\$ 278 million per year between now and 2029 (ISDR et al., 2012). In addition, the fund, sometimes, is not available in time of need, especially in the event of disasters. Importantly, there are barriers impeding development and management of the fund as described in the section 1.2.3.1 below.

1.2.2 Development goals

This TAP is to increase a specific fund to cover at least 50% of the forecasted economic loss and damage from disasters or about US\$139 million by 2022 and 65% (US\$ 181 million) by 2025.

1.2.3 Selection of Actions and Activities for the TAP

The actions to be included in the TAP were identified based on the Barriers Analysis and Enabling Framework (BAEF), including the barriers and measures to overcome barriers outlining in section 1.2.3.1. The actions were selected the measure throughout assessment and prioritisation. Details of the selection of action and activities were discussed in section 1.2.3.2 and 1.2.3.3, respectively.

1.2.3.1 Barriers and Measures to Overcome Barriers

Following the BAEF, eight barriers were identified as the main obstacles for development and operation of the disaster reduction fund in a sustainable manner. Three of them are financial and economic barriers, and four are non-financial and economic barriers. To overcome the barriers, eight overall measures were also identified accordingly (Table 13).

TABLE 13 BARRIERS ON THE DEVELOPMENT AND SUSTAINABILITY OF DISASTER IMPACT REDUCTION FUND

| Category | Barriers to develop and sustain a disaster impact reduction fund (DIRF) | Measures to overcome the barriers |
|---------------------------|---|---|
| Financial and economic | 1. Inadequate public budget for establishing the disaster reduction fund or increase the government emergency response fund for DRR | 1. Enhance the public budget investment in the government reserve fund for emergency response |
| | 2. Ineffective resources mobilisation for disaster reduction fund | 2. Enhance capacity and cooperation among stakeholders on resources mobilisation for the government reserve and the disaster reduction fund |
| | 3. Insufficient sustainable or effective financial mechanism and model for management of the disaster reduction fund | 3. Develop a sustainable or an effective financial mechanism and model for management of the disaster reduction fund |
| Legal framework | 4. Insufficient policy and regulation on disaster impact reduction fund | 4. Develop a policy or decree on disaster impact reduction fund |
| Organisational | 5. Unclear roles and responsibilities of stakeholder and unit in charge of development and management of disaster reduction fund | 5. Clarify roles and responsibilities of stakeholder and unit in charge of development and management of disaster reduction fund |
| Capacity/ Skills | 6. Limited knowledge and skills, especially on the disaster risk reduction or management financing | 6. Increase knowledge and skills on the disaster financing and fund development |
| Information and awareness | 7. Insufficient information, especially feasibility, an effective and successful disaster reduction fund and best practices | 7. Research and develop information especially feasibility studies, an effective and successful disaster reduction fund and best practices |
| Technical | 8. Insufficient reference projects | 8. Increase pilot and reference projects |

1.2.3.2 Selection of Actions

Selection of actions for the TAP was carried out by the TNA team and stakeholders including the climate change working group (Annex 1). The actions were derived from the measures, which were assessed and scored against five evaluation criteria: relevance, effectiveness, efficiency, impact and sustainability (Annex 2) prior to prioritise and select the measure as actions for the TAP. To ensure effectiveness and efficiency, it was planned that that top four measures which had top highest to 4th highest score would be selected for the TAP. The results, however, showed that most the measures were in the top four priorities, and they were all selected (Table 14). However, the measure 1 and 2 were grouped as they are related and share activities. The measure 3 was incorporate or implemented under the measure 7 and 8; and the measure 4 was combined with the measure 5. So, only 5 actions left to include in the TAP (Table 15).

TABLE 14 MEASURES SELECTED AS ACTIONS FOR INCLUSION IN THE TAP ON DISASTER IMPACT REDUCTION FUND

| Category | Measures to overcome the barriers | Measures selected as actions Description |
|--|---|--|
| Financial and economic | 1. Enhance the public budget investment in the government reserve emergency response | v. This measure gained 1 st top score or 1 st priority group (Annex 2). Although the government budget including the government reserves and emergency fund is small or limited, but it is sustainable and only the government existing funding source for disaster risk reduction and recovery (DRRR) |
| | 2. Enhance, mobilise and access to resources for disaster reduction fund | v This measure also received highest score or 1 st priority (Annex 2) as it is only option to increase financial support or fund for DRRR |
| | 3. Develop a sustainable or an effective financial mechanism and model for disaster reduction fund management | v. Selected, but incorporate in the measure 7 and 8 |
| Legal framework | 4. Develop a policy or decree on disaster impact reduction fund | v. This measure also obtained highest score or 1 st priority (Annex 2) as it is pre-requisite for establishment of the impact reduction fund |
| Institutional, organisational and human skills Organisation | 5. Improve roles and responsibilities of stakeholder and unit in charge of development and management of disaster reduction fund | v. Selected but addressed under the measure 4. This measure gained 2 nd top score (Annex 2). However, it is addressed under the measure 4. The main root causes of unclear responsibilities among stakeholders is due to the lack of legal framework to define clear |
| | 6. Increase knowledge and skills on the disaster financing and fund development | v The measure 6 had 1 st top score (Annex 2), due to it is a determinant of the effective and sustainable DIRF |
| Information and awareness | 7. Research and develop information especially feasibility and an effective and successful disaster reduction fund mechanism and best practices | v The measure 7 gained highest score or in the 1 st priority action as well (Annex 2). It is because the lack of information to justify the establishment and mobilise resources for DIRF is currently pragmatic |
| Technical | 8. Increase pilot and reference projects | v This measure also gained top score or in the 1 st priority action (Annex 2), since insufficient reference project also hinder expansion of DRRR financing and DIRF |
| <i>Notes: v means measures were selected to include in the action plan. X measures were not selected or merged into other measures</i> | | |

1.2.3.3 Selection of Activities to Implement the Actions

The activities for implementing actions were identified through a stakeholder consultation process. They were initially listed by the TNA project team and agreed through stakeholder and focus group consultation meeting in November 2017. The logics and effectiveness, efficiency, relevance and

impacts of the activities on the actions were considered during activities identification. As a result, list of activities for fulfilling four actions were formulated (Table 15).

TABLE 15 IDENTIFIED ACTIVITIES FOR ACTIONS ON DISASTER IMPACT REDUCTION FUND

| Actions | Activity | Description |
|--------------|---|---|
| Action 1 | Maintain the public budget and resources mobilisation for disaster emergency response | |
| Activity 1.1 | Conduct financial needs and resources assessment | This activity may not directly increase the financial resources and support for DIRF, but it would provide information about how much budget is actually needed for climate change adaptation and disaster resilience, feasibility and how to establish financial mechanisms or DIRF and mobilise resources for financing adaptation and disaster resilience, which are useful for financial planning and decision on investment |
| Activity 1.2 | Develop an effective or sustainable disaster risk management financing mechanism (based on activity 4.2) | This activity may not directly increase the financial resources and support for DIRF, but having information about how to sustainably or effectively finance climate change adaptation and disaster resilience would be useful for decision on investment and enhancing effectiveness and sustainability of disaster risk and impact management financing |
| Activity 1.3 | Develop and implement resource mobilisation plan | This activity is a pre-requisite for funding. Apart from clear financial needs (activity 1.2), having clear location, timeframe, and stakeholders involving in the technologies development and management would make decision on investment on the technologies easier |
| Activity 1.4 | Develop donors/funding sources directory | This activity may not directly increase the financial resources and support for DIRF, but it would provide information about where funding sources are and eligibility, how much and when it is available, how and when proposal should be developed and submitted. This information is needed for resource mobilisation and project planning, an effective and a sustainable access to financial support, while the directory including this information are not organised and updated systematically. |
| Activity 1.5 | Develop comprehensive and financeable project proposal including reliable financial and economic analysis | This activity is a determinant whether disaster risk and impact reduction including the DIRF would receive financial support and investment or not. So, it is a must. |
| Activity 1.6 | Improve effectiveness of public financing projects including M&E of the project impact, budget management system and reporting best practices | This activity is expected to increase trustworthiness or reliability among stakeholders, especially fund providers and recipient; leading to maintain or sustain disaster reduction funding |

| Actions | Activity | Description |
|--------------|---|--|
| Action 2 | Increase human resources (HR) | |
| Activity 2.1 | Building capacity of the national, local authorities and communities on disaster financing and fund management | This activity would have direct impact on the establishment, development and sustainability of disaster reduction fund |
| Activity 2.2 | Develop disaster financing education and research in high education | This activity would not have direct impact in short term, but it would help developing human resources for an effective and sustainable disaster reduction fund in future |
| Action 3 | Develop legal framework on disaster impact reduction fund | |
| Activity 3.1 | Develop decree on the disaster reduction fund | This activity is perceived to be determinant for establishing and sustaining the disaster reduction fund |
| Activity 3.2 | Develop regulation on the disaster reduction fund management | This activity would contribute to ensure effective and sustainable disaster reduction fund development and management |
| Action 4 | Increase information and awareness | |
| Activity 4.1 | R&D information about disasters loss and damage | This activity would provide information for disaster reduction fund planning and justification for financing |
| Activity 4.2 | Study and identify best practices about sustainable disaster financing and insurance of risks in all aspects (legal, organisation, management etc.) | This activity would help to convince establishing and increase fund for DRR. It would also contribute to ensure effective and sustainable disaster reduction fund development and management |
| Action 5 | Piloting establishing the fund for disaster risk and impact management | |
| Activity 5.1 | Pilot establishing a DIRF (soft loan and grant) for financing and insuring the floods and drought risk infrastructure and facilities, production and business and water supply system | Piloting and demonstrating good models should lead to stimulate and promising for expansion of the investment in disaster risk management financing including DIRF |

1.2.4 Identify Stakeholders and Determines Timelines

1.2.4.1 Identify Stakeholders for TAP Implementation

The stakeholders to in charge of and involve in the implementation of the DIRF were identified based on the identified activities and mandates of relevant organisations. Through the review and stakeholder consultation meeting in November 2017, list of the primary stakeholders was formulated as in Annex 2 and Table 16 below.

TABLE 16 KEY STAKEHOLDERS TO DISASTER REDUCTION FUND

| No | Key organisations | Mandates/Tasks | Relevant activities |
|----|-------------------|----------------|---------------------|
|----|-------------------|----------------|---------------------|

| | | | |
|---|---|--|---|
| 1 | Ministry of Natural Resources and Environment (MoNRE), particularly, Department of Climate Change (DCC) and Environment Protection Fund (EPF) | MoNRE, particularly DCC and EPF have a responsibility to seek for and manage financial resources for natural disasters prevention and control. | All activities |
| 2 | Ministry of Finance (MOF), particularly, Department of National Reserves (DNR) | MOF has a responsibility to allocate and manage the government reserve for emergency response including disaster response and recovery | Activity 1.1, 1.2, 2.1, 4.2 and 5.1 |
| 3 | Ministry of Labour and Social Welfare (MOLSW) | Responsible for seeking for financial resources for disaster response and recovery. | Activity 1.1-1.6, 2.1, 4.1, 4.2 and 5.1 |
| 4 | Committee for Disaster Prevention and Control (CDPC) at National and Local Levels | Responsible for seeking for financial resources for disaster prevention and control. | All activities |
| 5 | Development partners, donors and non-government organisations (NGOs) | Provides technical and financial support for disaster response and disaster recovery. | All activities |
| 6 | Development project developers and investors | Provides technical and financial support for disaster response and disaster recovery in their project areas | Activity 5.1 |

1.2.4.2 Schedule Actions and Activities

The schedule of the actions and activities was identified by the TNA project team in consultation with the key stakeholders in November 2017. Nature and scale of the activities, readiness including time, technical and financial capacity of the responsible organisations to perform the activities were considered when scheduling.

The schedule of the action plan implementation is expected to be within five years, starting from the approval and during the dissemination of TAP to stakeholders in May 2018. This is the preparation phase. A fully TAP implementation should start from August 2018 and complete in December 2022 (Annex 4 and Table 21).

1.2.5 Resources Estimation

1.2.5.1 Capacity Building

The capacity or Knowledge and skills needs were identified in the BAEF as well as the ones listed in the Table 17 below. To implement the TAP effectively, those knowledge and skills shall be addressed.

TABLE 17 CAPACITY BUILDING NEEDS FOR DEVELOPMENT AND MANAGEMENT OF DISASTER REDUCTION FUND

| No | Categories | Sub-categories or specific elements of skills |
|----|------------------------|--|
| 1 | Financial and economic | Knowledge and skills about mechanisms for financing climate and disaster risk reduction and management including (1) financial needs assessment, (2) feasibility |

| | | |
|---|--|--|
| | | including cost-benefit and return on investment, and (3) research and development of effective financing mechanism including insurance |
| 2 | Policy | Inadequate knowledge and skills to research and develop policy on climate and disaster financing, insurance and subsidy |
| 3 | Organisation | Inadequate skills to review, research and develop effective organisation structure and arrangement for effective management and operation of climate and disaster fund, insurance and subsidy |
| 4 | Resources mobilisation and access to finance | Inadequate skills to develop: <ul style="list-style-type: none"> - Bankable proposal including financial and economic as well as cost-benefit ratio (CBR) and internal rate of return (IRR) analysis - Identification and analysis of financial or funding sources and feasibility - Establish financial aid M&E system - Extension/promotion and marketing including to research and develop mechanism and methods for effective awareness raising on the important and advantage of disaster reduction fund - Access to finance e.g., contingent credit |

1.2.5.2 Estimation of Costs

The costs of the actions and activities were estimated by DCC including the TAN project team and the stakeholders (Annex 1) based on activities and risks. The costs were calculated and discussed in the focus group meeting in November 2017 and reviewed by DCC before finalisation.

The total cost of this TAP implementation is around US\$ 17.85 million. It included: 1) the cost for preparation including dissemination and revisit the TAP before implementation, 2) the cost of each action and activity, and 3) the cost for handling with risks. The cost for the preparation, based on the 3 meetings and 2 days for each meeting, current government daily allowance, a consultant fee, and a meeting including administrative costs, is expected to be US\$ 18,000. The total cost of all actions and activities implementation, considering allowance, a consultant fee, travel, meeting and other administrative costs could be about US\$ 16.21 million (Table 18 and 21). The cost for contingency to address delay and variations, is estimated to be 10% of the total cost or US\$ 1,621,000.

TABLE 18 TOTAL COST FOR IMPLEMENTATION OF THE TAP ON DISASTER REDUCTION FUND

| No | Actions | Cost (US\$ Th.) |
|-------|---|-----------------|
| I | Cost for preparation of the TAP implement | 18 |
| II | Cost for implementation of actions | 16,210 |
| 1 | Maintain the public budget and resources mobilisation for disaster emergency response | 165 |
| 2 | Increase human resources (HR) | 190 |
| 3 | Develop legal framework on disaster impact reduction fund | 30 |
| 4 | Increase information | 210 |
| 5 | Piloting disaster financing | 15,645 |
| III | Cost for contingency actions (10% of the actions cost) | 1,621 |
| Total | | 17,849 |

1.2.5.3 Identifying Sources of Funding

Broadly, the funding sources are from the public, private and social organisations or individual as mentioned in the TAP for the EWS. The public funding sources are the government and development partners' budget. Ministry of Natural Resources and Environment (MONRE) and Ministry of Labour and Social Welfare (MLSW), for instance, receive budget for DRR as a Public Invest Project (PIP). The Ministry of Finance (MOF) allocates and manages the governmental reserves and emergency response fund, which also finances DRR activities. The key development partners and intergovernmental organisations to support DRR including DIRF are as listed in the Table 5. Furthermore, there are potential funds such as Global Environment Facility (GEF), The Global Facility for Disaster Reduction and Recovery (GFDRR) and other funds (Table 8) mentioned earlier provide opportunities and eligible for Laos to get DRR financed.

1.3.1 Management Planning

1.3.1.1 Risk and Contingency Planning

The implementation of the TAP may encounter some risks namely costing, scheduling and performance risks, and such risks could be addressed as described in Table 9. In addition, the risks of each action and activities, and mitigation measures were also identified in the Table 19 and Table 21.

TABLE 19 SPECIFIC RISKS OF ACTIONS AND CONTINGENCY PLANNING

| No | Actions | Risks | Contingency actions |
|----|---|---|---|
| 1 | Increase the public budget and resources mobilisation | Responsible organisations may not be able to secure financial resources on time or adequately since: <ol style="list-style-type: none"> 1. Public budget deficit 2. Variable international financial pledge 3. Small private sector and limited financial capacity 4. Limited capacity-know how | <ol style="list-style-type: none"> 1. Enhance capacity and commitment of the responsible organisations to mobilise the funding 2. Increase engagement and information provision for decision makers 3. Improve cooperation and coordination among stakeholder and with development partners, donors and private sector |
| 2 | Improve human resources development (HRD) | <ol style="list-style-type: none"> 1. As the risks of the Action 1 2. Conflict interest and ineffective coordination among stakeholders and between organisation and personnel and technical departments of the stakeholders | <ol style="list-style-type: none"> 1. Implement contingency measures of the Action 1 2. Improve coordination among stakeholders and between organisation and personnel and technical departments of the stakeholders |

| No | Actions | Risks | Contingency actions |
|----|--|---|--|
| 3 | Develop legal framework on disaster impact reduction fund (DIRF) | 1. As the risks of the Action 1 2. Unclear mandates of the responsible organisation on the DIRF management | 1. Implement contingency measures of the Action 1 2. Organise meetings, clarify and agree on the responsibilities on DIRF |
| 4 | Increase information and awareness | As the risks of the Action 1 | Implement contingency measures of the Action 1 |
| 5 | Piloting disaster risk management financing models/mechanisms | As the risks of the Action 1 | Implement contingency measures of the Action 1 |

1.3.1.2 Success Criteria and Indicators for Monitoring of the Implementation

Based on planned activities and through the consultation meeting in November 2017, the success criteria and indicator (C&I) for monitoring of the TAP or actions implementation could be identified. The C&I of each action and activity were presented in Table 20 and 21, respectively.

TABLE 20 SUCCESS CRITERIA AND INDICATORS FOR MONITORING OF THE IMPLEMENTATION

| No | Actions | Success criteria | Indicators for M&E of Implementation |
|----|--|---|---|
| 1 | Increase the public budget and resources mobilisation | The government's and development partners' financial support increased to US\$139 million by 2020, US\$ 167 million by 2022. Of which, about 10% of the budget derived from the government. | (1) Financial assessments conducted, (2) Financial mechanisms, resources mobilisation or access plan, (3) project proposals developed and submitted, (4) and the financial aids data management system developed. |
| 2 | Increase human resources (HR) | Sufficient institutional capacity and human resources for effective and sustainable development and operation of the disaster reduction fund | Institutional capacity and human resources improved |
| 3 | Develop legal framework on disaster impact reduction fund (DIRF) | Complete, clear and effective legal framework for effective or sustainable DIRF development and operation | Policies and regulation on DIRF enacted |
| 4 | Increase information and awareness | Sufficient information, best practices and awareness for effective or sustainable DIRF development and operation | Information and awareness are improved |
| 5 | Piloting disaster risk management financing models/mechanisms | Responsible organisations can secure financial supports/fund for DIRF piloting | DIRF for financing or insuring DRR piloted |

1.3.2 Summary Overview of the Action Plan for Disaster Impact Reduction Fund

The summary of TAP (Table 22) was developed following the identification of development goals, actions and activities, stakeholder, timeframe, budget, risk and C&I of the TAP in previous sections. It needs about US\$ 17.85 million, which is for strengthening institutional and staff capacity of the relevant organisations to mobilise and access to financial resources for full development of DIRF.

TABLE 21 SUMMARY OVERVIEW OF THE ACTION PLAN ON DISASTER REDUCTION FUND

| Actions | Activities | Funding Sources | Responsible body | Time-frame | Risks | Success criteria | Indicators for M&E of Implementation | Cost US\$ Th. |
|--------------|---|---------------------------------|--|----------------|--|--|---|---------------|
| Action 1 | Increase the public budget and resources mobilisation | | | | | | | 165 |
| Activity 1.1 | Conduct assessments of financial needs, funding sources and feasibility | Gov. | MoNRE: DCC MOLSW: DODR | May-Dec 2018 | Financial and human resources may be insufficient or available on time of needs | A clear and comprehensive information about financial needs, funding sources and feasibility made available and useful for financial planning including resources mobilisation | The financial assessments are conducted and reported | 25 |
| Activity 1.2 | Develop an effective or sustainable disaster financing mechanism or model based on the result of the activity 4.2 | Gov, UNDP, WB, ADB, SDC, AusAID | MoNRE: DCC MOF: DOSR MOLSW: DODR | May - Dec 2018 | Insufficient information and capacity of MoNRE, MOLSW and MOF to develop an effective and/or sustainable financial mechanism | The effective or sustainable disaster financing mechanisms are put in place and helpful in fostering an effective and/or sustainable DIRF development and operation | Disaster financing best practices studied, and the effective or sustainable disaster financing mechanisms developed | 25 |
| Activity 1.3 | Develop and implement resource mobilisation plan | Gov, UNDP | MoNRE: DCC MOF: DOSR MOLSW: DODR | May - Dec 2018 | Insufficient information about funding sources | Comprehensive resource mobilisation or financial access plans put in place and early results are promising for increasing financial supports and cooperation on DRR | Resource mobilisation plans developed | 12 |
| Activity 1.4 | Develop funding sources and develop directory | Gov | MoNRE: DCC MOF: DOSR MOLSW: DODR | July -Dec 2018 | Incomprehensive due to inaccessible to | Donors/funding sources directory is put in place and useful for resources mobilisation and access | Donors/funding sources directory developed | 5 |

| Actions | Activities | Funding Sources | Responsible body | Time-frame | Risks | Success criteria | Indicators for M&E of Implementation | Cost US\$ Th. |
|--------------|---|---------------------------------------|--|--------------------|--|--|---|---------------|
| | | | | | funding sources or donor information | to technical and financial supports | | |
| Activity 1.5 | Develop and submit project proposals to the government and potential donors | Gov, WB, ADB | MOLSW: DODR | Oct 2018-Feb 2019 | Proposal is not accepted and funded due to unavailable resources or lack of business model | At least 1 or 2 project proposals accepted and funded projects within 5 years (2018-2022) | Number of proposal developed, submitted and funded | 85 |
| Activity 1.6 | Improve the public and donor's aids data management system, and M&E the partnership agreements implementation including round table meeting | Gov, UNDP, WB, ADB, SDC, AusAID, JICA | MPI: DoP, MoNRE: DCC MOF: DOSR MOLSW: DODR | July 2018-Jun 2022 | Ineffective coordination and information sharing | Complete, effective and transparent financial aids data management system is put in place and helpful for M&E of financial flow, increasing creditworthiness, technical and financial supports | 1) Financial aids data management system improved, 2) level of budget disbursement increased, 3) Trust, creditworthiness of donors, financiers and the government (national assembly, the government committee, MPI and MOF) improved | 13 |
| Action 2 | Increase human resources (HR) | | | | | | | 190 |
| Activity 2.1 | Building capacity of national, local authorities and | Gov, UNDP, WB, ADB, SDC, AusAID | MoNRE: DCC | Jun 2018-Dec 2021 | Insufficient due to financial and human resources | Staff receive sufficient trainings and have sufficient knowledge and skills for effective and | No. of trainings held, and staff participated. | 125 |

| Actions | Activities | Funding Sources | Responsible body | Time-frame | Risks | Success criteria | Indicators for M&E of Implementation | Cost US\$ Th. |
|--------------|--|-------------------------|---------------------------|---------------------|--|---|--|---------------|
| | communities on disaster financing and fund management | | | | including local capacity builders to facilitate capacity building | sustainable DIRF management | Staff knowledge and skills improved. | |
| Activity 2.2 | Develop disaster financing education curriculum and research in high education | Gov, WB, ADB | MoNRE: DCC | Aug 2018 - Dec 2019 | Insufficient resources, experiences, guidelines and best practices | Practical climate and disaster risk management financing curriculum is put in place and effective in development of HR and research in both short and long-term | No. of teachers, educational materials and curriculum and research improved | 65 |
| Action 3 | Develop legal framework on disaster impact reduction fund (DIRF) | | | | | | | 30 |
| Activity 3.1 | Develop policies or decree on the disaster reduction fund | Gov, UNDP, WB, ADB, SDC | MoNRE: DCC | Dec 2018-Feb 2019 | Insufficient knowledge, skills and financial resources for the development | Practical policies or decree on the disaster reduction fund are in place and more effectively enforced | Policies or decree on the disaster reduction fund developed and implemented | 15 |
| Activity 3.2 | Develop policies or regulation on the disaster loss and damage subsidies and risk management including insurance | Gov, UNDP, WB, ADB, SDC | MoNRE: DCC | May 2018-Jun 2021 | As 3.1 above | Practical policies or regulation on the disaster loss and damage subsidies and risk management including insurance are in place and more effectively enforced | Policies or regulation on the disaster loss and damage subsidies and risk management including insurance enacted | 15 |
| Action 4 | Increase information and awareness | | | | | | | 210 |
| Activity 4.1 | R&D information about disaster loss and damage | Gov, WB, ADB, UNISDR, | MoNRE: DCC MoLSW: DoDR | May 2018-Jun 2019 | Insufficient financial and human resources | Information about disaster loss and damage is sufficiently available and helpful for climate | Information about disaster loss and damage improved, | 100 |

| Actions | Activities | Funding Sources | Responsible body | Time-frame | Risks | Success criteria | Indicators for M&E of Implementation | Cost US\$ Th. |
|--------------|---|------------------------------------|---|--------------------|--|--|--|---------------|
| | | GFDRR, INGOs | | | for R&D | change adaptation and disaster resilience financial including DIRF planning and development | and more completed and accurate. | |
| Activity 4.2 | Study and identify best practices about sustainable disaster financing and insurance of risks in all aspects (legal, organisation, management etc.) | Gov, WB, ADB, UNISDR, GFDRR, INGOs | MoNRE: DCC MOF: BOL, DoSR, State Banks. MPI: DoP | May 2018- Dec 2021 | Insufficient financial and human resources for R&D and best practices | Information and guidelines about best practices are sufficiently available and helpful for climate change adaptation and disaster resilience financial including DIRF planning and development | Information about best practices on sustainable disaster financing and insurance of risks improved | 110 |
| Action 5 | Piloting disaster risk management financing models/ mechanisms | | | | | | | 15,645 |
| Activity 5.1 | Pilot establishing a DIRF for financing (soft loan and grant) and insuring the floods and drought risk reduction infrastructure and facilities for 1) agriculture production and business and 2) rural water supply | Gov, WB, ADB, GCF, LCDF, GFDRR | MoNRE: DCC MOF: BOL, DoSR, State Banks. MPI: DoP, DoM&E | Jan 2019- Jan 2022 | Insufficient financial and human resources for securing funds for piloting | Responsible organisations can secure financial supports and increase fund for piloting climate change adaptation and disaster resilience financial including DIRF improvement | A climate change adaptation and disaster resilience financial mechanism including DIRF and insuring is piloted | 15,645 |
| Total | | | | | | | | 16,240 |

1.3 Action Plan on River Basin Management for Climate Change Adaptation

1.3.3 River Basin Management

The river basin management employing integrated water resources management (IWRM) is crucial for enhancing climate change adaptation and disaster resilience in a river basin. In Laos, the IWRM is considerably important to promote the coordinated development and management of water, land and related resources, reduce water catastrophe, enhance climate change adaptation and disaster resilience so that maximise the economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems. The IWRM cycle, in general, includes development of river basin profiles and committee or stakeholder platform, shared vision, road map and then implementation, monitoring and evaluation (M&E) of the road map (Table 22). Importantly, to be resilient river basin, climate change adaptation and disaster resilient technologies and measures are mainstreamed and implemented under the road map.

Lao PDR has more than 10 important river basins, which are tributaries of Mekong and discharge to seas in neighbouring countries. However, to date, only few river basins have advanced planning and management including deployment of IWRM, such as Nam Ngum and Nam Theun-Kading River basins. However, mainstreaming climate change adaptation and disaster resilience in the planning were limited. In overall, RBM including IWRM is ineffective, and there are number of gaps in each element of IWRM and enabling environment as follows.

TABLE 22 IWRM CYCLE-ELEMENTS AND PERFORMANCE GAPS

| IWRM Cycle/ Elements | Status and Gaps |
|--|---|
| Defining goals/ Recognizing and identifying | Overall water resources goals and priority of water uses are defined in the law on water resources (2017) and strategy policy (2017), but the specific goals, targets and priority of each basin and sub-basin have not been clearly defined. |
| Water resources issues assessment/ Conceptualizing | <ul style="list-style-type: none"> Overall hydropower and irrigation potential have been assessed, but lack of assessment and identification of the potential of each basin. In addition, water demand or uses for other sectors such as livestock and fishery, industrial, domestic, tourism and navigation have not been estimated, Floods profiles and maps of 8 Mekong River's tributaries: Nam Ngum, Nam Ngiep, Nam Xan, Nam Ou, Xe Bangfai, Xe Banghieng, Xedon and Xekong, where floods usually take place, based on 10-years flood return period have been identified and mapped out in 2010, but lack of downscaling, Overall fish, aquatics and fishery and river basin where hydropower project exists have been assessed, but lack of specific information regarding status, production, diversity, food, movement and regular M&E, Hydro-met assessment conducted in 2012, but assessment of effectiveness of early warning system including facilitates and technologies are incomplete and have not been translated for early warning systems development at basin levels. |

| | |
|--|---|
| | <p>In addition, lack of assessment and identification of:</p> <ul style="list-style-type: none"> - Climate change impact and adaptive capacity of each river basin, - Assessment of hydrological cycle at river basin levels, - Water demand and supply status and capacity, - Integrated land uses including land suitability, - Other resources and development plans/activities in each basin, - Minimum and maximum of flows, water and wastewater, and sediments discharge, - Ecosystem services and values of each basin - Financial needs, feasibility including cost-benefit and return on investment, research and develop of effective financing and investing models for river basin management including IWRM - Best practices and effective IWRM for adaptation or sustainable development for replication or adoption. |
| Water resources strategy/plan/ Coordinating and planning | Only river basin development plans of Nam Ngum, Nam Thuen Hin Boun and Xebanghieng were developed, and others have not. In addition, existing plans lack of information and development targets and priority, practical measures and budgeting. |
| Implementation | The river basins that implemented sound IWRM are Nam Ngum, Nam Thuen Hin Boun, Nam Kading, Xebangfai and sub-basin such as Nam Ton, Nam Xong and Nam Po. However, development activities such as hydropower project, irrigation, water supply etc. have been progressing regarding their sectoral plan. |
| M&E | Review or M&E of the implementation of basin development plans are incomplete. Lesson learned and best practices for future sustainable RBM have not defined. |

1.3.4 Development goals

The overarching goals of the RBM is to ensure adequate quantity and quality of water supply for consumption and hygiene, socioeconomic development, environmental and ecosystems protection, climate change adaptation and minimization of water related conflicts and disastrous risks and impacts in all river basins, as mention at the beginning of the TAP for the water sector.

For this TAP, the goal is to deploy IWRM and climate change adaptation measures to improve for climate change adaptation and disaster resilience in eight river basins at risk of floods, storms and drought: Nam Ou, Nam Xeuang, Nam Ngum, Nam Nhiep, Nam Xan, Xebanfai, Xadon, Xekong.

1.3.5 Selection of Actions and Activities for the TAP

Overall, the actions to be included in the TAP were conducted through review and assessment of the barriers and measures identified in the Barriers Analysis and Enabling Framework (BAEF) report. The actions to include in the TAP were chosen from the measures through assessment and prioritisation of the measures against five criteria namely effectiveness, efficiency, impact, cost-benefit and sustainability. Following sections provided details about the barriers and the measures to overcome the barriers, actions and activities selection, respectively.

1.4.3.1 Barriers and Measures to Overcome Barriers

Seven critical barriers to RBM were identified as a result of the BAEF. Two of them are financial and economic barriers, and five are non-financial and economic barriers. Some measures are actionable, while others were breakdown sub-measure or actionable measures (Table 23).

TABLE 23 BARRIERS AND MEASURES TO OVERCOME BARRIERS ON RBM-IWRM

| Category | Barriers | Measures to overcome barriers |
|---|--|---|
| Financial and economic | 1. Inadequate budget and investment in RBM-IWRM, especially for climate change adaptation and disaster risk management | 1. Increase budget and investment in RBM-IWRM a. Maintain or increase the budget for the extension b. Enhance resources mobilisations, cooperation and access to external financial supports c. Promote investment of the private sector d. Improve the public budgeting including international aids effectiveness e. R&D and promote cost-effective technologies and practices |
| | 2. Unclear financial models to sustainably finance RBM | 2. Improve the clarity of the financial models to sustainably finance RBM |
| Legal framework | 3. Unclear legal framework on RBM and development including water allocation, right, ownership, tax | 3. Improve the clarity of the legal framework on RBM and development including water allocation, right, ownership, tax |
| | 4. Ineffective laws (water, forest, land, ESIA etc.) enforcement | 4. Improve laws (water, forest, land, ESIA etc.) enforcement effectiveness |
| Institutional, organisational capacity and human skills | 5. Limited knowledge and skills on RBM-IWRM, climate change adaptation and disaster risk management | 5. Increase knowledge and skills on RBM-IWRM |
| | 6. Polarisation and conflicts of interests on the uses of river basin resources | 6. Improve committee, cooperation and harmony of the river basin resources uses |
| Technical | 7. RBM is a timing and resources intensive | 7. R&D and deploy practical and cost-effective methods for RBM-IWRM including climate change adaptation and disaster resilience |
| Information and awareness | 8. Inadequate information about water resources including hydrology, water demand and supply, discharge and balance, hazards, hazards and disaster resilient technologies and best practices of all aspects of RMB | 8. Increase R&D of information about water resources including hydrology, water demand and supply, discharge and balance, hazards, hazards and disaster resilient technologies and best practices of all aspects of RMB (technical, legal, organisational and financing) ³ |
| | | 9. Develop and implement sustainable RBM |

³ Relate to the IWRM cycle steps

| | | |
|--|--|--------------------|
| | (technical, legal, organisational and financing) | reference projects |
|--|--|--------------------|

1.4.3.2 Selection of Actions

Selection of the actions for inclusion in the TAP based on the barrier and measures outlined BAEF as well as the Table 23 above. Actions were chosen from the measures through stakeholders' assessment of its relevance, effectiveness, efficiency, impact and sustainability and prioritisation (Annex 2). The assessment results however revealed that all the measures had about the same score or importance. Despite the measure 1,5 and 7 gained highest score or considered the most important, without implementing other measures, sustainable RBM could be hardly achieved. So, all measures were selected for the TAP (Table 24). However, sub-measure 1d is being addressed by MPI and MOF and not included, and the 1e is addressed under the measure 7 and 9. Finally, only six measures were selected as actions for the TAP (Table 25).

TABLE 24 SELECTED MEASURES TO INCLUDE IN RBM ACTION PLAN FOR CLIMATE CHANGE ADAPTATION

| Category | Measures to overcome barriers | Score | Measures selected as actions |
|---|---|-------|------------------------------|
| Financial and economic | 1. Increase budget and investment in RBM-IWRM a. Maintain or increase the budget for the extension b. Enhance resources mobilisations, cooperation and access to external financial supports c. Promote private sector investment in RBM d. Improve the public budgeting including international aids effectiveness e. R&D and promote cost-effective technologies and practices | 18 | √ |
| | 2. Improve the clarity of the financial models to sustainably finance RBM | 17 | √ |
| Legal framework | 3. Improve the clarity of the legal framework on RBM and development including water allocation, right, ownership, tax 4. Improve effectiveness of laws (water, forest, land, ESIA etc.) enforcement | 17 | √ |
| Institutional, organisational capacity and human skills | 5. Increase knowledge and skills on RBM-IWRM | 18 | √ |
| | 6. Improve committee, cooperation and harmony of the river basin resources uses | 17 | √ |
| Technical | 7. R&D and deploy cost-effective methods for RBM-IWRM including climate change adaptation and disaster resilience | 18 | √ |
| Information and awareness | 8. Increase R&D of information about water resources including hydrology, water demand and supply, balance, hazards, disaster resilient technologies and best practices of all aspects of RMB (technical, legal, organisational and financing) | 17 | √ |
| | 9. Develop and implement sustainable or effective RBM | | |

| | | | |
|--|--|--|--|
| | reference projects (based on best practices) | | |
| Notes: V means measures were selected to include in the action plan. X measures were not selected or merged into other measures. | | | |

1.4.3.3 Selection of Activities to Implement the Actions

Selection of activities for implementing actions was carried out through a stakeholder consultation process. The activities were firstly identified by the TNA project team, and then they were consulted, elaborated and agreed with the stakeholders during focus group and consultation meeting in March and November 2017, considering effectiveness efficiency, impact, sustainability and relevance of activities to the actions. Consequently, final list of activities could be summarised as presented in Table 25 below.

TABLE 25 IDENTIFIED ACTIVITIES FOR RBM ACTION PLAN FOR CLIMATE CHANGE ADAPTATION

| Actions/ Activities No. | Actions/Activities Description |
|----------------------------|--|
| Action 1 | Increase the public budget and resources mobilisation for RBM-IWRM |
| Activity 1.1 | Develop river basin development plan |
| Activity 1.2 | Conduct financial assessment (to identify funding sources and feasibilities) |
| Activity 1.3 | Develop financial sources or donor directory |
| Activity 1.4 | Develop resource mobilisation and engagement plan |
| Activity 1.5 | Develop and submit financeable project proposals |
| Activity 1.6 | Set up and implement M&E and financial management system |
| Action 2 | Develop financial models on W-RBM |
| Activity 2.1 | Conduct financial needs assessments for all river basins |
| Activity 2.2 | Conduct studies and define an effective or sustainable financial model financial model and mechanism for sustainable river basin or water resources management |
| Activity 2.3 | Pilot the financial model including M&E and redefining more effective or sustainable financial model |
| Action 3 | Improve policies and enforcement |
| Activity 3.1 | Review performance of the (financial) contributions of water users (businesses) to sustainable river basin management |
| Activity 3.2 | Develop the decree and reinforce legal measures on the water allocation, right, minimum and maximum water discharge, and tax or fee |
| Action 4 | Increase knowledge and skills on IWRM |
| Activity 4.1 | Improve human resource development system including capacity development plan, staff knowledge, building learning culture and commitment (e.g., MoNRE) |
| Activity 4.2 | Building national, local authorities and communities on IWRM and adaptation in water resources sector through professional trainings |
| Activity 4.3 | Increase extension staff to assist IWRM and adaptation at local levels |
| Activity 4.4 | Incorporate adaptation in IWRM education and research in high education |
| Activity 4.5 | Strengthen RBM steering committee and promote network, think-tank and civil organisation and information exchanges forum on climate change adaptation |
| Action 5 | Increase R&D of information on water resources, hazards, technologies and best practices |

| Actions/ Activities No. | Actions/Activities Description |
|----------------------------|---|
| Activity 5.1 | Survey and develop socioeconomic, environment and water resources profile including ecosystem services and water related hazards of all river basins and sub-basins |
| Activity 5.2 | R&D best practices on sustainable water resources management including financing, organisational arrangement and cooperation, law enforcement, water allocation and tax, disaster resilient infrastructure etc. |
| Activity 5.3 | Improve and disseminate information about water related hazards, quality and quantity, biodiversity and ecosystem |
| Action 6 | Pilot deployment of infrastructure and best technologies and practices for enhancing climate change adaptation and resilient development in river basins |
| Activity 6.1 | Survey and develop reservoirs and water storage facilities within or between the river basins and reservoirs for enhancing drought resilience |
| Activity 6.2 | Survey and develop reservoirs and water storage facilities within or between the river basins and reservoirs for floods mitigation and control |
| Activity 6.3 | Survey and develop infrastructure, sustainable land use plan, biological measures including forest restoration for prevention and control of landslide and erosions along the rivers and areas that are risk of landslide |
| Activity 6.4 | Identify and develop floods and drought early warning system including monitoring and forecast, communication system and emergency response plan |

1.3.6 Identify Stakeholders and Determines Timelines

1.3.6.1 Identify Stakeholders for TAP Implementation

The stakeholders to develop and management River Basins were identified based on a matching of the identified activities for TAP and mandates of the relevant organisations including the organisations. Some organisations were already known since they have involved in RBM and BAEF. In addition, the list of stakeholders was updated and validated during stakeholder consultation meeting in November 2017.

Table 26 below and Annex 4 give a summary of stakeholders including primary stakeholders who are mandated to manage and implement activities, and the secondary stakeholders who have a duty or task to support the implementation of activities, respectively.

TABLE 26 KEY STAKEHOLDERS IN RIVER BASIN MANAGEMENT

| No | Key organisations | Mandates/Tasks | Relevant activities |
|----|---|--|---------------------|
| 1 | Ministry of Natural Resources and Environment (MoNRE), particularly, Department of Water Resources (DWR), Meteorology and Hydrology | MoNRE has an overall responsibility about RBM. - DWR has a mandate to develop and implement or coordinate a river basin development plan - DMH has a mandate on weather, water and land warnings (article 34, law on meteorology and hydrology, 2017). | All activities |

| No | Key organisations | Mandates/Tasks | Relevant activities |
|----|---|---|---|
| | (DMH), Department of Climate Change (DCC) and Department of land (DOL) | <ul style="list-style-type: none"> - DCC promotes climate change mitigation and adaptation including early warning and emergency response. - DOL is overall land use planning and management | |
| 2 | Ministry of Agriculture and Forestry (MAF). In particular, Department of Irrigation (Dol), Department of Forestry (DOF) and Department of Livestock and Fishery (DLF) | MAF has responsibilities to inform and assist agricultural and forestry producers and business about hazards that may cause loss and damage to agricultural and forestry production including facilities such as irrigation and response. | Activity 1.2-1.6; 2.2-2.3; 4.2; 6.1-6.3 |
| 3 | Ministry of Public Health (MPH), in particular, Centre for Hygiene and Sanitation (CHS) or Namsaad | MPH has responsibilities assess and address disaster loss and damage on the rural water supply (Namsaad) and disease epidemics | Activity 1.2-1.6; 2.2-2.3; 4.2; 6.1-6.3 |
| 4 | Ministry of Energy and Mines (MEM) | MEM is responsible for assessing and addressing disaster loss and damage on energy projects, including coordinating EWS operation | Activity 6.2-6.4 |
| 5 | Ministry of Public Work and Transport (MPWT), particularly Department of Transport (DOT), Department of Road (DOR), Department of Urban Planning (DOUP) | MPWT is responsible for assessing and addressing disaster loss and damage on navigation, water transport, road-bridge and urban-rural infrastructure including coordinating EWS operation | Activity 6.3 |
| 6 | Ministry of Information, Culture and Tourism (MICT), particularly Department of Tourism Development (DTD) | MICT is responsible for assessing and addressing disaster loss and damage on tourism including tourists, tourism resources and infrastructure, and coordinating EWS operation | Activity 1.6 and 2.3 |
| 7 | Ministry of Planning and Investment (MPI), particularly Department of Planning (DOP) and Department of Investment Promotion (DIP) | MPI is responsible for facilitating public budget allocation and promote private investment in the river basins | Activity 1.6 and 2.3 |
| 8 | Ministry of Finance (MOF) | MOF is responsible for facilitating public budget allocation for the RBM | Activity 1.6 and 2.3 |
| 9 | Ministry of Industry and Commerce (MIC) | MIC is responsible for 1) plan and promote industry and trading that in line with RBM plan, and 2) assessing and addressing disaster loss and damage on industry and trading including infrastructure and facilities | Activity 1.6 and 2.3 |
| 10 | National University of Laos, especially Faculty of Water Resources Engineering | <ul style="list-style-type: none"> - FOWRE provides curriculum on water resources management including IWRM, floods prevention and control. | Activity 4.4 |

| No | Key organisations | Mandates/Tasks | Relevant activities |
|----|---|--|---------------------|
| | (FOWRE) and Faculty of Forestry (FOF) | - FOF provides education on RBM including IWRM | |
| 11 | Committee for RBM and Disaster Prevention and Control (CDPC) at National and Local Levels | Responsible for handling the problems and conflicts related water resources, disaster loss and damage involving with multi-sectors or stakeholders | All activities |
| 12 | Development partners, donors and NGOs | Provide technical and financial support for RBM including disaster prevention and control | All activities |

1.4.3.2 Schedule Actions and Activities

The schedule of the actions and activities was defined by TNA project team in consultation with the key stakeholders in November 2017. Logics and sequences, nature and scale of the activities, readiness including time, technical and financial capacity of the responsible organisations to perform the activities were considered when scheduling.

The timeframe of the action plan implementation is five years, which is perceived to be suitable and sufficient time for technical and financial preparation including demonstration of EWS before full EWS operation. The timeframe is divided into two phases. The preparation phase is 3 months, which shall be commenced following approval and during dissemination of TAP to stakeholders. This means the preparation phase would be between March to May 2018. The implementation phase would start from May 2018 and until December 2022.

1.3.7 Estimate Resources

1.3.7.1 Capacity Building

To implement the TAP effectively, capacity of the primary and secondary stakeholders is needed to be strengthened. The knowledge and skills to be addressed include technical, management including business and others as summarised in the Table 27 below.

TABLE 27 CAPACITY NEEDS FOR RBM FOR CLIMATE CHANGE ADAPTATION

| No | Categories | Elements of knowledge and skills |
|----|------------------------|--|
| 1 | Financial and economic | Knowledge and skills to assess (1) financial needs, (2) public budget planning, (3) feasibility including cost-benefit and return on investment of a project, and (4) research and develop of effective financing and investing models for watershed management including IWRM |
| 2 | Technical | Knowledge and skills on: <ul style="list-style-type: none"> - Adoption or localisation of IWRM to suit national context - R&D and application of best practices on IWRM for adaptation and sustainable development - Water resources valuation and financial and economic analysis of investment in |

| No | Categories | Elements of knowledge and skills |
|----|-----------------------------------|---|
| | | <p>water resources</p> <ul style="list-style-type: none"> - Monitoring environmental changes in river basins - Assessment of water demand and supply - Assessment and identification of minimum water attraction and discharge - Environmental and water tax - Study climate change impact on water sector including watershed and its adaptive capacity - Water related disasters (storms, floods and drought) risk management and reduction including forecast and early warnings - Water resources governance, leadership and effective organisation - Effective law enforcement including R&D of best practices - Integrated planning including integrated spatial, land use planning and strategic environment assessment |
| 3 | Policy | <p>Knowledge and skills to research and develop water resources policy, especially:</p> <ul style="list-style-type: none"> - Policy and agreement on integrated and participatory development planning policy (spatial integrated land use, resources, urban and rural town planning) - Policy and agreement on equitable resources use, benefit sharing, contribution and conflicts solving - Policy and agreement on minimum water discharge - Policy and agreement on water related disaster management - Policy on watershed based-socioeconomic development |
| 4 | Organisation | <p>Skills to carry out:</p> <ul style="list-style-type: none"> - Organisational analysis or review, - Research and develop effective organisation structure and arrangement for effective management |
| 5 | Strategic planning and management | <p>Skills on the application of strategic and spatial integration planning, sustainable land use, urban and rural town planning and resettlement</p> |
| 6 | Resources mobilisation | <p>Skills to develop:</p> <ul style="list-style-type: none"> - Bankable proposal - Identification and analysis of financial or funding sources and feasibility - Establish financial aid data management system |
| 7 | Extension/promotion | <p>Skills to research and develop mechanism and methods for effective awareness raising on the important and advantage of IWRM</p> |

1.4.4.2 Estimated Costs for Actions and Activities

The cost of the TAP implementation was made by DCC including the project team in consultation with DWR and DMH including the meeting in November 2017. The costs were calculated based on nature of activities, service and material prices, costs of activities of previous similar projects and expert judgment.

The total cost of the TAP implementation is approximately US\$ 29.18 million. It comprises: 1) the cost for dissemination and consultation before actual implementation, 2) the cost of each action and

activity, and 3) the cost for contingency. The cost for dissemination and consultation meetings, based on the 3 meetings and 2 days for each meeting, current government daily allowance, a consultant fee, and a meeting including administrative costs, could be US\$ 18,000. The cost of implementation of each action and activity, considering allowance, a consultant fee, travel, meeting and other administrative costs could possibly be US\$ 26.51 million (Table 28 and 31). The cost for contingency to address delay and variations, at the maximum, is estimated to be 10% of the total cost or US\$ 2,651,100. This derived from following assumptions: 1) the cost of living including service fee and material prices are slightly increased, 2) capacity building may take longer and needs more budget since knowledge and skills of the DCC, DWR, DMH, local communities and other stakeholders are still limited and may need more international experts to support, and 3) other expenses associated with risks and accidents during fieldworks and other contingency.

TABLE 28 ESTIMATED COST FOR THE TAP IMPLEMENTATION

| No | Actions | Cost (US\$ Th.) |
|-----|--|-----------------|
| I | Cost of preparation of the TAP implementation | 18 |
| II | Cost of the full implementation of actions in the TAP | 26,511 |
| 1 | Increase the public budget and resources mobilisation for RBM-IWRM | 3,169 |
| 2 | Develop financial models on W-RBM | 4,360 |
| 3 | Improve polices and enforcement | 160 |
| 4 | Increase knowledge and skills on IWRM | 1,340 |
| 5 | Increase R&D of information on water resources, hazards, technologies and best practices | 3,680 |
| 6 | Pilot deployment of best infrastructure technologies for climate change adaptation and disaster resilience in the river basins | 13,805 |
| III | Cost for contingency actions (10% of the cost for the actions) | 2,651.1 |
| | Total | 29,180.1 |

1.3.8 Management Planning

1.3.8.1 Risk and Contingency Planning

As described in Table 9, some risks such as costing, scheduling and performance risk may be faced by the organisations in charge of the TAP implementation. However, the risks could be addressed by implementing following overall contingency measures (Table 9) and specific measure for the risks of each action as follows.

TABLE 29 SPECIFIC RISK OF ACTIONS AND CONTINGENCY PLANNING

| No | Actions | Risks | Contingency actions |
|----|--|--|---|
| 1 | Increase the public budget, resources mobilisation and | Responsible organisations may not be able to secure financial resources on time or adequately due to: 1. Public budget deficit, | 1. Enhance capacity and commitment of the organisations in charge to mobilise and access to financial |

| No | Actions | Risks | Contingency actions |
|----|--|--|--|
| | access to financial supports from donors and private sector for RBM-IWRM | <ol style="list-style-type: none"> 2. Variable international financial pledge, 3. Small private sector and limited 4. Limited capacity-know how of the organisations in charge 5. Lack of mechanisms and ineffective law enforcement to create income and collect revenue and reinvest in RBM-IWRM | <p>support</p> <ol style="list-style-type: none"> 2. Increase engagement and provision of RBM-IWRM information for decision makers 3. Improve cooperation and coordination among stakeholder and with development partners, donors and private sector 4. Activate the RBM committee to facilitate and influence access to financial support and investment in RBM |
| 2 | Develop financial mechanisms and/or models for RBM-IWRM | The responsible organisations may not have human resources or obtain financial resources on time for taking the action | Implement contingency measures for action 1 above and action 4 below |
| 3 | Improve policies and enforcement | As action 2's risk above | Implement contingency measures for action 1 above and action 4 below |
| 4 | Increase knowledge and skills on RBM-IWRM including climate change adaptation, disaster prevention and control | <p>The responsible organisations may have neither sufficient financial resources nor resource persons to facilitate implementation of full capacity building programmes or according to capacity needs</p> <p>Trainings are not provided to the right people</p> | <ol style="list-style-type: none"> 1. Implement contingency measures for action 1 above 2. Improve internal or self- capacity building 3. Research and apply cost-effective capacity building methods 4. Increase commitment to secure financial resources 5. Improve coordination and synergy of capacity development activities among stakeholders, and between HR demand and supply side 6. Improve HRD and capacity development plan, staff knowledge management |
| 5 | Increase R&D of information on water resources, hazards, RBM technologies and best practices | Insufficient financial and human resources, tools, best practices and access to all communities at risk of hazards in the local levels and the remote area | <ol style="list-style-type: none"> 1. Implement contingency measures for action 1 above 2. Improve synergy of development actions and coordination among stakeholders in all levels and in the remote area 3. Increase volunteers and other cost-effective methods for awareness raising |
| 6 | Pilot deployment | 1. Responsible organisations may not | 1. Implement contingency |

| No | Actions | Risks | Contingency actions |
|----|---|--|---|
| | of best infrastructure and technologies for enhancing climate change adaptation and disaster resilience in the river basins | <ul style="list-style-type: none"> 2. Insufficient human resources, innovative approach and best practices to deploy climate change adaptation and disaster resilient technologies and infrastructure 3. Social and environmental impacts from infrastructure developments | <ul style="list-style-type: none"> measures for action 1 above 2. Insufficient human resources, innovative approach and best practices to deploy climate change adaptation and disaster resilient technologies and infrastructure 3. Implement EISA and SEMP |

1.3.8.2 Success Criteria and Indicators for Monitoring of the Implementation

The success criteria and indicators were identified by the TNA project team, in consultation with the key stakeholders, especially DWR and DMH in November 2017. The criteria and indicators (C&I) consist of C&I for monitoring of the actions and activities as summarised in Table 30 and 31, respectively.

TABLE 30 SUCCESS CRITERIA AND INDICATORS FOR MONITORING OF THE IMPLEMENTATION

| No | Actions | Success criteria | Indication for M&E |
|----|---|---|---|
| 1 | Increase the public budget and resources mobilisation for | Sufficient financial resources for RBM-IWRM adaptation planning and implementation in the key eight river basins: Nam Ou, Nam Xeuang, Nam Ngum, Nam Nhiep, Nam Xan, Xebanfai, Xadon, Xekong, leading to increase resilience and reduce disaster loss and damage | Financial support and investment in RBM-IWRM are increased |
| 2 | Develop financial mechanisms and/or models for RBM-IWRM | Complete, clear and effective financial models are in place, leading to convince or improve RBM-IWRM including climate change adaptation and disaster prevention and control financing | Financial mechanisms and/or models for RBM-IWRM are developed |
| 3 | Develop legal framework on water allocation, right, discharge, tax or fee | Complete, clear and effective legal framework are in place, leading to sustain financial resources for RBM-IWRM including climate change adaptation and disaster prevention and control | Policies and regulation on RBM-IWRM financing are enacted |
| 4 | Increase knowledge and skills on IWRM | Sufficient institutional capacity and human resources for effective IWRM for adaptation, leading to enhance resilience and reduce disaster loss and damage | Institutional capacity and human resources are improved |
| 5 | Increase R&D of information on water resources, hazards, | 1) Sufficient information and dissemination of water resources, hazards, technologies and best practices. | Information and awareness are improved |

| No | Actions | Success criteria | Indication for M&E |
|----|--|---|---|
| | technologies and best practices | 2) Stakeholders are aware of and increase cooperation and contribution to IWRM, adaptation, and disaster prevention and control | |
| 6 | Develop best technologies and infrastructure for adaptation in the river basins | Sufficient tools, basic infrastructure and facilities for effective climate change adaptation and disaster prevention and control in the river basins | Tools, infrastructure and facilities for climate change adaptation and disaster prevention and control are improved |
| 7 | Enhance cooperation among stakeholders and harmonise the uses of river basin resources | RBM-IWRM including climate change adaptation, disaster prevention and control and other developments in river basin are integrated, enhanced, and conflicts are minimised | Cooperation among stakeholders and harmonise the uses of river basin resources are improved |

1.3.9 Summary Overview of the River Basin Management Action Plan for Adaptation

Based on the previous sections, the action plan for the River Basin Management (RBM) for Climate Change Adaption could be summarised in Table 31. This summary TAP includes the actions and activities, funding sources, responsible organisations, timeframe, risks, success criteria and indicators for M&E and budget for the TAP implementation. This TAP calls for US\$ 19.18 million for strengthening institutional and staff capacity of MoNRE and relevant organisations to develop some models for resilient and sustainable RBM and best practices and mobilise and access to financial resources for expanding the resilient and sustainable RBM models to other river basin through the country.

TABLE 31 SUMMARY OVERVIEW OF RBM ACTION PLAN FOR CLIMATE CHANGE ADAPTATION AND DISASTER RESILIENCE

| Action | Activities | Funding Sources | Responsible body | Time-frame | Risks | Success criteria | Indication for M&E | Cost (US\$ Th.) |
|--------------|--|--|------------------|---------------|---|---|--|-----------------|
| Action 1 | Increase the public budget and resources mobilisation for RBM-IWRM | | | | | | | |
| Activity 1.1 | Develop river basin development plan including financial needs assessment for all river basins | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR | Jun 18-Dec 19 | Not inclusive due to insufficient resources, research and information | Comprehensive and practical strategy and action plan for each river basin put in place and proved effective | Strategy and action plan of each river basin developed and implemented | 3,000 |
| Activity 1.2 | Conduct financial assessment (to identify funding sources and feasibilities) | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR | Jun 18-Dec 18 | Incomplete information due to inaccessible to donor information | Inclusive information about funding sources and feasibilities made available and useful for financial planning and resources mobilisation | financial assessment conducted | 65 |
| Activity 1.3 | Develop financial sources or donor directory | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR | Oct 18-Dec 18 | Incomplete information due to inaccessible to donor information | Donors/funding sources directory including profiles put in place and useful for financial planning, resources mobilisation and | Donors/funding sources directory developed and updated | 6 |

| | | | | | | | | |
|--------------|--|--|-----|----------------|---|--|---|----|
| | | | | | | cooperation | | |
| Activity 1.4 | Develop resource mobilisation and engagement plan | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR | Jun 18- Dec 18 | Not inclusive and practical due to insufficient information about funding sources | A comprehensive and practical resource mobilisation and engagement plan put in place and early results are promising to increase technical and financial support | Resource mobilisation plans developed and implemented | 12 |
| Activity 1.5 | Develop and submit financeable project proposals | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR | Jul 18- Dec 22 | Insufficient information or resources to develop financeable proposal | At least 1 or 2 project proposals accepted and funded projects between 2018-22 | No. of proposal developed, submitted and financial supports received | 80 |
| Activity 1.6 | Improve public and foreign aids data management system, M&E implementation of partnership agreement including the roundtable meeting | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR | Sep 18- Dec 18 | Not inclusive due to ineffective coordination and information sharing | Complete, effective and transparent financial aids management system set up and helpful for M&E and improvement of cooperation and aids | Financial aids data management system improved, and data and information more completed, accurate and traceable | 6 |
| Action 2 | Develop financial models on W-RBM | | | | | | | |
| Activity | Conduct financial needs and | Gov. WB, ADB, | DWR | Jun 18- | Insufficient resources | Financial needs | Financial assessments | 90 |

| | | | | | | | | |
|--------------|---|--|----------|----------------|--|---|---|-------|
| 2.1 | mechanism assessments | GIZ, Hydro-power Developer | | Dec 18 | and information to develop impractical models or mechanism for financing RBD | and mechanism information made available and be useful for financial planning and support | are conducted | |
| Activity 2.2 | Develop a sound effective or sustainable financial model (based on activity 2.2, 3.1 and 3.2) | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR | Sep 18- Dec 19 | Insufficient capacity and research | An effective or sustainable financial model and mechanism put in place and proved to be promising for improving RBM financing | The effective or sustainable financial models studied and defined | 70 |
| Activity 2.3 | Pilot the financial model including M&E and redefining more effective or sustainable financial model | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR, DCC | Jan 19- Dec 20 | Insufficient or impractical models or mechanism for financing RBD | An effective or sustainable financial model put in place, promising and being model for financing RBD | Financial models or mechanism for financing RBD piloted | 4,200 |
| Action 3 | Improve polices and enforcement | | | | | | | |
| Activity 3.1 | Review law enforcement on the (financial) contributions of water users (businesses) to sustainable river basin management | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR | Jun 18- Dec 18 | Insufficient capacity and research | Gaps and best practices on law enforcement identified, clarified and useful for | Review law enforcement carried out | 60 |

| | | | | | | | | |
|--------------|--|--|----------|----------------|---|---|--|-----|
| | | | | | | improvement of law enforcement | | |
| Activity 3.2 | Develop policies or decree on the water allocation, right, minimum and maximum water discharge, and tax or fee | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR | Aug 18- Dec 20 | Insufficient capacity and research | Practical policies or decree put in place and proved to be effective | Policies or decree on the water allocation, right, minimum and maximum water discharge, and tax or fee enacted | 100 |
| Action 4 | Increase knowledge and skills on IWRM | | | | | | | |
| Activity 4.1 | Improve human resource development (HDR) system including capacity development plan, staff knowledge, building learning culture and commitment | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR, DCC | Jun 18- Dec 19 | HRD and capacity building is not in line with the plan and system | More effective HRD system put in place and effective for HRD | The HRD and management system including HRD plan, staff knowledge management, recruitment, self-learning and commitment, staff turn-over and change, HRD M&E system improved | 90 |
| Activity 4.2 | Building capacity of national, local authorities and communities on IWRM and adaptation in water resources sector through professional trainings | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR | Jun 18- Dec 22 | HRD and capacity building is not in line with the plan including capacity needs | Staff receive sufficient trainings and have sufficient technical knowledge and skills | Number of trainings provided, staff participated, and performance improved | 900 |
| Activity 4.3 | Increase field extension staff to assist IWRM and adaptation at local levels | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR | Oct 18- Dec 20 | Could not mobilise the resources and sustain volunteers and activities | Volunteers receive sufficient trainings and be able to support IWRM | Number of trained field extension staff increased, and adaptation capacity of communities improved | 200 |

| | | | | | | | | |
|--------------|--|--|----------|----------------|--|--|---|-------|
| Activity 4.4 | Improve climate change and adaptation and disaster education and research in higher education | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR, DCC | Sep 18- Dec 19 | Insufficient resources, experiences, information and guidelines | Practical IWRM curriculum including teaching materials and research put in place and proved effective | No. of teachers, materials, curriculum and research improved | 90 |
| Activity 4.5 | Promote network, think-tank and civil organisation and information exchanges on climate change adaptation | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR, DCC | Jun 18- Dec 22 | Insufficient resources, participation and promotion of civil organisation | IWRM Network, think-tank and civil organisation and information exchanges platform established and active | No. of network, think-tank and civil organisation and information exchanges organised | 60 |
| Action 5 | Increase R&D of information on water resources, hazards, technologies and best practices | | | | | | | |
| Activity 5.1 | Survey and develop profile on socioeconomic, water resources including ecosystem services and water related hazards of all river basins and sub-basins | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR | Oct 18- Dec 20 | Insufficient resources for survey and development | Comprehensive river basins and water resources profile made available for technical and financial planning | River basins and water resources profile improved or updated | 3,500 |
| Activity 5.2 | R&D best practices on sustainable water resources management including financing, organisational arrangement, cooperation, law enforcement, water | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR, DCC | Jun 18- Dec 22 | Unavailable or undefinable best practices. Insufficient resources for R&D | Best practices for sustainable water resources management made available and promising for | Best practices for sustainable water resources management studied and defined | 90 |

| | | | | | | | | |
|--------------|--|--|--------------------|----------------|---|---|--|-------|
| | allocation and tax, disaster resilient infrastructure etc. | | | | | stimulating application of IWRM for adaptation | | |
| Activity 5.3 | Improve and disseminate information about water related hazards, quality and quantity, biodiversity and ecosystem | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR, DCC | Jun 18- Dec 22 | Insufficient and budget, information, and best methods for awareness raising | Increased awareness and promotion of IWRM for adaptation | Information improved. No. of meetings, campaign, awareness raising activities held and stakeholders involved | 90 |
| Action 6 | Pilot deployment of infrastructure and best technologies for adaptation in the river basins | | | | | | | |
| Activity 6.1 | Develop reservoirs and water storage facilities within or between river basins and reservoirs for enhancing drought resilience | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR, DCC, DOI, DOA | Oct 18- Dec 21 | Delay or insufficient resources for survey and development | Effective reservoirs and water storage facilities put in place, and early results proved promising to increase drought resilience | Number of reservoirs and water storage facilities developed. Disaster resilience enhanced, and risks, loss and damage reduced. | 6,400 |
| Activity 6.2 | Develop drainage, water gate and facilities within or between river basins and reservoirs for floods mitigation and control | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR, DCC, DOI, DOA | Jun 18- Dec 21 | Delay and underdeveloped due to insufficient resources for survey and development | Effective drainage, water gate and facilities put in place, and early results proved promising to increase floods resilience | Number of reservoirs and water storage facilities for floods mitigation and control developed. | 225 |
| Activity 6.3 | Develop infrastructure and facilities for prevention and | Gov. WB, ADB, GIZ, Hydro-power | DWR, NERI | Jun 18- Dec 22 | Delay and underdeveloped due | Effective infrastructure and | Number of infrastructure and facilities for | 7,090 |

| | | | | | | | | |
|--------------|---|--|----------|---------------|---|--|--|--------|
| | control of landslide and erosions along the rivers and areas that are risk of landslide | Developer | | | to insufficient resources for survey and development | facilities for prevention and control of landslide and erosions put in place, and early results proved promising | prevention and control of landslide and erosions developed. Disaster resilience enhanced | |
| Activity 6.4 | Identify and develop floods and drought EWS including monitoring and forecast, communication system and emergency response plan | Gov. WB, ADB, GIZ, Hydro-power Developer | DWR, DMH | Jun 18-Dec 19 | Delay and underdeveloped due to insufficient resources for survey and development | Effective EWS put in place, and proved to be effective warnings and reduce loss and damage | Floods and drought EWS including monitoring and forecast, communication system and emergency response plan developed | 87 |
| | Total | | | | | | | 26,511 |

1.4 Action Plan for Climate Resilient Water Supply System

1.4.1 Climate Resilient Water Supply System

Water supply systems in Laos are divided into two main systems namely the urban water supply systems (Nam Papa) and the rural water supply system (Namsaad). Nam Papa are mostly electric pump and gravity-fed systems. Namsaad, apart from the electric pump and gravity-fed systems, includes deep boreholes, dug wells with concrete ring, rain water harvest systems, jars and elevated tanks. Currently, to water shortage in communities, especially in the event of floods and drought, a mobile water supply system including portable water purification and supply devices is deployed. The climate resilient water supply system refers to two water supply systems: 1) Nampapa or Namsaad that deploys climate and disaster resilient technologies and practices to enhance its resilience, and 2) the system that designs to supply water in the event of and post disaster to avoid water shortage. It includes the portable water purification system and concrete and plastic pools and tanks which established in safe place in or nearby communities at risk of disasters.

Currently, both Nampapa and Namsaad, especially resilient ones are not limited, resulting in low water supply and access to water. Despite the government and development partners have increased efforts to develop more and resilient water supply systems to ensure all people are accessible and affordable to water, as of 2015, only about 84% of the urban population⁴ access to clean water and 67% of them accessible to sanitation (MPI, 2015). In rural area, only 65% of the population are accessible to water supply, 55% are accessible to sanitation (WSP &WB, 2014). In addition, many of them are at risk of disasters due to climate change and disaster resilient technologies and practices have not full deployed in the developments of the water supply systems. In 2011, for example, Haima Typhoon caused a flood, loss and damage to the urban water supply system in a value of about USD 146,639 or at least US\$ 1.8 million is needed for recovery and reconstruction. Rural water supply systems including 2,684 gravity fed water supply systems were damaged in the value of US\$ 732,796 and requires US\$ 762,796 for recovery and reconstruction (Lao PDR, 2011). These problems have been recognised by the government, however, addressing them are challenged since there are number of barriers hindering this sub-sector development as specific in the Barriers Analysis and Enabling Framework (BAEF)⁵ and summarised in section 1.4.2.1.

1.4.2 Development goals

The overall goal of the water supply development is to ensure all people are accessible and affordable to clean water. In this regard, Lao PDR Government set specific development targets as follows:

- 1) Ensure 90% (100% of urban and 80% of rural) of the population have access to safe water (MPI, 2015);

⁴ Total population of Laos was about 6.5 million; urban population was 2.14 million (app. 32.9% of the total population) and rural population was about 4.36 million (67.1% of the total population) (Lao PDR, 2015).

⁵ the Barriers Analysis and Enabling Framework (BAEF) is prerequisite for the TAP but reported separately.

- 2) Ensure 77.5% (90% urban and 65% rural) of the population have access to basic water hygiene and sanitation system, and all population have access to clean water, basic hygiene and sanitation system by 2030 (MPI, 2015; WSP &WB, 2014);
- 3) 10 towns along the national road No. 13 deploys climate smart planning (MPI, 2016).

1.4.3 Selection of Actions and Activities for the TAP on Resilient Water Supply System

The actions to be included in the TAP were identified based on the barriers and measures to overcome barriers resulted from the Barriers Analysis and Enabling Framework (BAEF). The barriers and measures are summarised in the section 1.4.3.1, and the selection of action and activities are described in section 1.4.3.2 and 1.4.3.3, respectively.

1.4.3.1 Barriers and Measures to Overcome Barriers

Throughout the BAEF, nine barriers including three financial and economic and six non-financial and economic barriers are identified as the most important obstacles for development of resilient water supply systems (Table 23), which discussed in detail in subsection 1.4.3.2 and 1.4.3.3, respectively.

TABLE 32 BARRIERS ON THE DEVELOPMENT AND SUSTAINABILITY OF CLIMATE RESILIENT WATER SUPPLY SYSTEM

| Categories | Barriers | Measures to overcome barriers |
|--|---|--|
| Financial and economic | 1. Inadequate public budget and investment in CRWS | 1. Increase public budget and resource mobilisation from development partners and private sector for investment in CRWS |
| | 2. High investment cost of climate resilient technologies | 2. Reduce investment cost on climate resilient technologies |
| | 3. Low or economic unviable water supply systems | 3. Improve economic viability and subsidise climate resilient water supply systems |
| | 4. Limited access to finance | 4. Expand access to finance |
| Legal framework | 5. Insufficient policy and regulation on urban and integrated use land planning, and climate resilient technologies | 5. Develop policy and regulation on urban and integrated use land planning, and climate resilient technologies |
| | 6. Ineffective law enforcement | 6. Enhance law enforcement effectiveness |
| Organisational capacity and human skills | 7. Limited knowledge and skills on CRWS | 7. Increase knowledge and skills on CRWS |
| | 8. Ineffective quality assurance and control of the water supply system development | 8. Improve quality assurance and control of the water supply system developments |
| | 9. Insufficient streamlining disaster resilience technologies and practices in the water supply development strategy and projects | 9. Enhance streamlining disaster resilience technologies and practices in the water supply strategy, projects and developments |
| Information and awareness | 10. Inadequate information about hazards, risks, climate resilient | 10. Increase information about hazards, risks, cost-effective and best climate resilient |

| | | |
|--|--------------|--|
| | technologies | technologies and practices 11. Develop reference project or pilot CRWS deploying the cost-effective and best climate resilient technologies and practices |
|--|--------------|--|

1.4.3.2 Selection of Measures for Actions

As mentioned, the actions for the TAP was carried out following BAEF. The measures have been converted into actions. Then they were assessed by scoring and against five evaluation criteria: relevance, effectiveness, efficiency, impact and sustainability (Annex 2) by stakeholders including the climate change working group (See Annex 1). Top four measures or actions are selected to include in the TAP. As a result, 10 out of 13 measures have been selected for the TAP (Table 3).

TABLE 33 SELECTED MEASURES FOR CLIMATE RESILIENT WATER SUPPLY SYSTEM

| Categories | Measures to overcome barriers | Measures selected as actions and description |
|------------------------|---|--|
| Financial and economic | 1. Increase public budget and resource mobilisation from development partners and private sector for investment in CRWS | √ The measures received top score (Annex 2). The measures would impact CRWS development directly. Although the current budget is small or limited, but it is a sustainable financing source, which maintains CRWS |
| | 2. Reduce investment cost on climate resilient technologies (e.g., reduce tax for importing equipment for CRWS) | X The measures 2 received lower score (Annex 2) due to concerns trade-off or impact on the national or the government income. However, some aspects of this issue such as R&D of cost-effective technologies/ practices are addressed under the measure 10. |
| | 3. Improve economic viability and subsidise climate resilient water supply systems | X The measures 3 also received lower score (Annex 2) as it could be difficult to improve unless the measure 2 is conducted. However, some aspects of this issue are addressed under the measure 4 |
| | 4. Expand access to finance | √ The measures received high score (Annex 2) since it is an option apart from measure 1 and 2. In addition, if the CRWS is accessible to finance or economic viable, it would be more financially sustainable. |
| Legal framework | 5. Develop policy and regulation on urban and integrated use land planning, and climate resilient technologies | √ This measure also gained high score (Annex 2) and being priority as enforceable measures to develop integrated development and mainstream climate and disaster resilient technologies and practices in the development including water supply developments is insufficient. |
| | 6. Enhance law enforcement | √ |

| | | |
|---|---|--|
| | effectiveness | Selected, but combined with the measure 5 |
| Organisational capacity and human skills | 7. Increase knowledge and skills on CRWS | √ The measure 7 had 1 st top score, since knowledge and skills of the responsible organisations are determinant of CRWS development and operation. |
| | 8. Improve quality assurance and control of water supply system developments | √ Selected, but under the measure 5 and 6. |
| | 9. Enhance streamlining disaster resilience technologies and practices in the water supply strategy, projects and developments | √ Selected, but under the measure 5 and 6. |
| Information and awareness | 10. Increase information about hazards, risks, cost-effective and best climate resilient technologies and practices 11. Develop reference project or pilot CRWS deploying the cost-effective and best climate resilient technologies and practices | √ The measure 10 and 11 selected. The measure 10 gained 2 nd top score, while 11 was among the 1 st top score (Annex 2). Information is needed to effectively promote and develop CRWS. In addition, reference project is pre-requisite for convincing investments and expansion |
| <i>Notes: √ means measures were selected to include in the action plan. X measures were not selected or merged into other measures.</i> | | |

1.4.3.3 Selection of Activities to Implement the Actions

Selected activities to implement the actions (Table 34) were identified through a stakeholder consultation process. The activities were firstly identified by the TNA project team, before consulting and elaborating in agreement with the stakeholders during focus group and stakeholder meeting in March and November 2017. Effectiveness, efficacy, relevance and impacts of the activities to the actions were considered when the activities were being selected. Consequently, 21 activities were formulated for implementing the five actions plan (Table 34).

TABLE 34 SELECTED ACTIVITIES FOR CLIMATE RESILIENT WATER SUPPLY SYSTEM ACTION PLAN

| Actions | Activities |
|--------------|---|
| Action 1 | Increase the public budget and resources mobilisation |
| Activity 1.1 | <i>Develop strategy for the resilient water supply systems</i> |
| Activity 1.2 | <i>Conduct financial assessment to identify funding sources and feasibilities</i> |
| Activity 1.3 | <i>Develop financial sources or donor directory</i> |
| Activity 1.4 | <i>Develop resource mobilisation and engagement plan</i> |
| Activity 1.5 | <i>Develop and submit financeable project proposals</i> |
| Activity 1.6 | <i>Set up and implement M&E and financial management system</i> |
| Action 2 | Expand access to finance |

| Actions | Activities |
|--------------|--|
| Activity 2.1 | <i>Strengthen cooperation between domestic and regional banks and financial institutes to expand financial markets, lowering interest rate and simplify procedures for borrowing</i> |
| Activity 2.2 | <i>Increase financial capacity and readiness of enterprises</i> |
| Activity 2.3 | <i>Organise financial access dialogue on business risk management and financing</i> |
| Action 3 | Improve knowledge and skills on climate resilient technologies and practices |
| Activity 3.1 | <i>Conduct capacity needs assessment</i> |
| Activity 3.2 | <i>Provide technical and financial trainings on infrastructure standard system, climate and disaster resilient technologies and practices</i> |
| Activity 3.3 | <i>Improve organisation development system including human development plan, staff knowledge management, recruitment etc.</i> |
| Activity 3.4 | <i>Promote establishment of the network, think-tank and civil organisation and information exchanges on climate and disaster resilient technologies and practices</i> |
| Activity 3.5 | <i>Improve education and research on climate and disaster resilient technologies and practices in high education</i> |
| Action 4 | Develop and enhance enforcement of the policies on climate resilient technologies and infrastructure including CRWS |
| Activity 4.1 | <i>Develop policies on climate change and disaster resilient technologies including mainstreaming in the water supply developments</i> |
| Activity 4.2 | <i>Enhance enforcement of the policies on climate resilient technologies and infrastructure including construction quality control and ESIA</i> |
| Action 5 | Increase information and awareness about hazards, climate and disaster resilient technologies and practices |
| Activity 5.1 | <i>Develop hazard map and re-assess loss and damage, and disaster adaptive capacity or resilience of the water supply systems and financial needs</i> |
| Activity 5.2 | <i>Study and identify best climate and disaster resilient technologies and practices</i> |
| Activity 5.3 | <i>Pilot flood and drought resilient urban water supply systems</i> |
| Activity 5.4 | <i>Pilot flood and drought resilient rural water supply systems</i> |
| Activity 5.5 | <i>Disseminate information about hazards, climate and disaster resilient technologies and practices</i> |

1.4.4 Identify Stakeholders and Determines Timelines

1.4.4.1 Identify Stakeholders for TAP Implementation

The stakeholders of disaster resilient water supply systems were identified based on the identified actions and activities (Table 34), review of the relevant organisations' mandates. Some of the organisations were already identified since they have involved in the beginning of TNA including BAEF. However, final list of stakeholders (Table 35, 40 and Annex 4) was elaborated and validated during stakeholder consultation meeting in November 2017.

TABLE 35 KEY STAKEHOLDERS IN CLIMATE RESILIENT WATER SUPPLY

| No | Key organisations | Mandates/Tasks | Relevant activities |
|----|---|---|--|
| 1 | Ministry of Public Work and Transport, particularly Department of Water Supply (DOWS) or Nampapa, Department of Inspection (DOI) | Department of Nampapa is responsible for water supply in the urban area. DOI is responsible for inspection of the public invested Nampapa development project. | All activities except activity 3.5 and 5.4 |
| 2 | Ministry of Public Health, particularly Centre for Hygiene and Sanitation (CHS) or Namsaad | The centre for Namsaad is responsible for water supply in the rural area. | All activities except activity 3.5 and 5.3 |
| 3 | Nampapa State Enterprise (NSE) | As a developer, responsible development and operation of Nampapa (water supply in urban area) | Activity 5.3 |
| 4 | Ministry of Planning and Investment (MPI), particularly Department of Planning (DOP), Investment Promotion (DIP) | DOP is responsible for screening and allocation of the public budget for the public invested water supply (Nampapa and Namsaad) development project. DPI promotes and manages private invested water supply systems. | All activities |
| 5 | Ministry of Natural Resources and Environment (MoNRE), particularly, Department of Water Resources (DWR), Department of Environmental and Social Impact Assessment (DESIA) and Department of Climate Change (DCC) | DWR overseas water allocation, uses, discharge and treatment. DSIA overseas environmental and social impacts resulting from water supply development projects. DCC promotes climate change adaptation and disaster resilience in the water supply sector. | Activities 1.2-1.6; 3.1, 3.1, 3.4; 4.1, 4.2; 5.1-5.5 |
| 6 | National University of Laos, especially Faculty of Water Resources Engineering (FOWRE) and Faculty of Engineering and Construction (FEC) | FOWRE and DEC provides education on water supply systems. | Activity 3.5 and 5.5 |
| 7 | Committee for Rural Development and Poverty Reduction (CRDPR) | Responsible for development of water supply systems for the poor. | Activity 5.4 |
| 8 | Development partners, donors and NGOs | Provides technical and financial support for water supply developments. | All activities |

1.4.4.2 Schedule Actions and Activities

The schedules of the actions and activities (Annex 4 and Table 40) were defined by TNA project team in consultation with the key stakeholders in November 2017. Logics and sequences, nature and scale of the activities, readiness including time, technical and financial capacity of the responsible organisations to perform the activities were considered when scheduling.

This TAP implementation was scheduled for five years, dividing into two phases. The phase 1, the preparation will be in 3 months, commencing after approval and during dissemination of TAP to

stakeholders. This means the preparation phase will be between May and July 2018. The implementation phase shall be started in Aug 2018 and complete in December 2022.

1.4.5 Resource Estimation

1.5.4.1 Capacity Building

The capacity building requirements including knowledge and skills of the key stakeholders to be strengthened were identified in the BAEF. Those are technical and management skills related to CRWS as summarised in the following table.

TABLE 36 CAPACITY NEEDS FOR CLIMATE RESILIENT WATER SUPPLY SYSTEM

| No | Categories | Skills Needs |
|----|---|--|
| 1 | Risk knowledge | <ol style="list-style-type: none"> 1. Global Climate Model and downscaling techniques and models 2. ArcGIS skills for V&A of the water supply systems |
| 2 | Technology knowledge and skills for application | Analysis and apply disaster and climate resilient or proof equipment such as <ol style="list-style-type: none"> 1. Structural design to prevent vibration, erosion and landslide 2. Water leak detection and repair 3. Pressure system to increase or maintain water flow in pipe system, 4. Portable water filtering and purification devices 5. Man-made pond and water storage for drought adaptation 6. Rain water harvest system 7. Water proof deep boreholes |
| 3 | Financial and economic | Financial and economic analysis including CBR and IRR |
| 4 | Resources mobilisation | <ol style="list-style-type: none"> 1. Develop bankable project proposal including financial and economic analysis 2. Identify and analysis financial or funding sources and feasibility 3. Establish financial aids M&E system |
| 5 | Policy | Policy on the promotion of environmentally friendly climate resilient technologies including financing and subsidising, taxation and exception, incentives |
| 6 | Human resources development system | Organisational development including analysis and performance assessment, human resources and capacity building development planning, self-capacity needs assessments and staff knowledge management, HRD M&E |

1.5.4.2 Estimate Costs for Actions and Activities

The total costs of the actions and activities including 1) the cost for dissemination and consultation including adjustment of the TAP before actual implementation, 2) the cost of each action and activity, and 3) the cost for contingency is about US\$ 55.67 million. The cost for dissemination and consultation meetings; based on the 3 meetings and 2 days for each meeting, current government daily allowance, a consultant fee, and a meeting including administrative costs, is expected to be US\$ 18,000, which is comparative to similar activities of other projects. The cost of each activity implementation, considering allowance, a consultant fee, travel, meeting and other administrative

costs is approximately US\$ 50.96 million. The cost for contingency to address delay and variations, is estimated to be 10% of the total cost or US\$ 5, 095,600 (Table 37 and 40).

TABLE 37 ESTIMATE COSTS FOR ACTIONS AND ACTIVITIES

| No | Actions | Cost (US\$ Th.) |
|-----|---|-----------------|
| I | Cost for preparation of the TAP implementation | 18 |
| II | Cost of the full implementation of actions in the TAP | 50,956 |
| 1 | Increase the public budget and resources mobilisation to develop climate and disaster resilient water supply systems | 135 |
| 2 | Expand access to finance | 210 |
| 3 | Limited knowledge and skills on climate resilient technologies and practices | 322 |
| 4 | Develop and enforce policies on infrastructure standard, integrated development and environmentally friendly including climate resilient technologies | 264 |
| 5 | Increase information and awareness about hazards and risks, climate and disaster resilient technologies and practices and pilot project | 49,665 |
| III | Cost for contingency actions (10% of the actions in the TAP) | 5,095.6 |
| | Total | 55,673.6 |

1.4.6 Management Planning

1.4.6.1 Risk and Contingency Planning

There might be some risks that associated with the TAP implementation, especially costs estimating, scheduling and performance risks. However, as outlined in Table 8, the risks could be addressed by executing the overall contingency plan. In addition, the risks could be managed by implementing following specific measures for each action.

TABLE 38 SPECIFIC RISKS OF ACTIONS AND CONTINGENCY PLANNING

| No | Actions | Risk | Contingency actions |
|----|--|--|--|
| 1 | Increase the public budget and resources mobilisation to develop climate and disaster resilient water supply systems | Responsible organisations may not be able to secure financial resources on time or adequately due to: <ol style="list-style-type: none"> 1. Public budget deficit, 2. Variable international financial pledge, 3. Limited capacity-know how of the organisations in charge to secure finance resources for the climate and disaster resilient water supply systems | <ol style="list-style-type: none"> 1. Enhance capacity and commitment of the organisations in charge to mobilise and access to financial support 2. Improve cooperation and coordination among stakeholder and with development partners, donors and private sector 3. Promote private sector investment or PPP |

| No | Actions | Risk | Contingency actions |
|----|--|--|--|
| | | 4. Privatisation of urban water supply system | |
| 2 | Expand access to finance | 1. Limited access to finance due to high cost and/or financially and economically not viable 2. Water supply developers have limited financial capacity and human resources to develop financeable projects | Implement the contingency measures of the Action 1 and 3 |
| 3 | Enhance knowledge and skills on climate resilient technologies and practices in the water supply sector | As the risk of the Action 1 | Implement the contingency measures of the Action 1 |
| 4 | Develop policies on the streamlining climate resilient technologies and practices in the water supply sector and projects | Mainstreaming and update law on water supply may take time due to limited resources or inconsistent timeframe of the TAP | Accelerate the policies improvement or development process by implement the contingency measures of the Action 1 |
| 5 | Improve construction quality assurance and control of water supply development and maintenance including deployment of disaster resilient technologies and practices | It is difficult to improve the quality due to the risk of the Action 1 and 2. | Implement the contingency measures of the Action 1 and 2 |
| 6 | Increase information and awareness about the climate and disaster resilient water supply system | As the risk of the Action 1 | Implement the contingency measures of the Action 1 |
| 7 | Pilot climate and disaster resilient water supply systems | 1. As the risk of the action 1 2. Other social and environmental risks | 1. Implement the contingency measures of the Action 1 2. Strengthen EIA implementation |

1.4.6.2 Success Criteria and Indicators for Monitoring of the Implementation

Success criteria and indicator for monitoring of the TAP implementation was identified and include in the Table 39 below and the summary of the TAP (Table 40). The criteria and indicators were listed by the TNA project team, consulted and agreed with the key stakeholders in November 2017.

TABLE 39 SUCCESS CRITERIA AND INDICATORS FOR MONITORING OF THE IMPLEMENTATION

| No | Actions | Success criteria | Indicators for M&E |
|----|---|--|---|
| 1 | Increase the public budget and resources mobilisation | Sufficient financial resources for improving disaster resilience of at least 75% water | Financial support and investment in climate |

| No | Actions | Success criteria | Indicators for M&E |
|----|---|--|---|
| | to develop climate and disaster resilient water supply systems | supply systems on average, leading reduce disaster loss and damage on the water supply systems by 2022 | and disaster resilient water supply systems is increased |
| 2 | Expand access to finance | At least 80% of the financial and economic viable disaster resilient water supply projects/schemes are accessible to finance by 2022 | Access to finance of the water supply project and business increased |
| 3 | Improve knowledge and skills on climate resilient technologies and practices | Sufficient institutional capacity and human resources for effective climate and disaster resilient water supply systems development and operation | Institutional capacity and human resources are improved |
| 4 | Develop policies on climate resilient technologies and infrastructure | Practical policies on climate resilient technologies and infrastructure is enforced | Policies on climate resilient technologies and infrastructure enacted |
| 5 | Improve construction quality assurance and control including mainstreaming climate and disaster resilient technologies and practices in the water supply system development | The water supply developments compliance with engineering and environmental standards and requirements | Meetings and mainstreaming engineering and environmental standards and requirements in the water supply development |
| 6 | Increase information and awareness about hazards and risks, climate and disaster resilient technologies and practices | Sufficient information and stakeholders are aware of, increased cooperation and contribute to the development of disaster resilient water supply systems | Information and awareness are improved |
| 7 | Pilot climate and disaster resilient technologies and practices | At least 4 disaster resilient water supply systems are successfully piloted and being reference projects for expansion | Climate and disaster resilient technologies and practices are piloted |

1.4.7 Summary Overview of the Action Plan for Resilient Water Supply System

Following the identification of the actions and activities, funding sources, responsible organisations, timeframe, risks, success criteria and indicators for M&E and budget for the TAP, the summary TAP could be formulated as follows.

TABLE 40 SUMMARY OVERVIEW OF THE ACTION PLAN ON CLIMATE RESILIENT WATER SUPPLY SYSTEM

| Actions | Activities | Sources of funding | Responsible body and Focal Point | Time-frame (m/y) | Risk | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|--|--------------------|----------------------------------|-------------------|---|--|--|-----------------|
| Action 1 | Increase the public budget and resources mobilisation to develop climate and disaster resilient water supply systems | | | | | | | |
| Activity 1.1 | Develop strategy of the resilient water supply systems | Gov. | MPWT: DoWS MPH: CWSH | Jun 18- Mar 19 | Delayed, not inclusive or practical due to insufficient resources and information | Comprehensive and practical strategy and action plan put in place, and proved to be effective for CRWS | Strategy and action plan developed | 12.5 |
| Activity 1.2 | Conduct financial assessment to identify funding needs, sources and feasibilities | Gov, ADB | DoWS CWSH DCC | Jun 18- Dec 22 | 1) Under or overestimate financial needs due to limited information about costs on resilient technologies. 2) Not accessible to all information funding sources for feasibility study | 1) Accurate financial needs, 2) List of funding sources and access feasibility made available and useful for financial planning and resources mobilisation | Financial assessment and feasibility studies conducted | 10.5 |
| Activity 1.3 | Develop financial sources or donor directory | Gov. | DoWS CWSH DCC | Jun 18- Dec 22 | May not accessible to all information funding sources and may difficult to clearly define funding feasibility | Donors/funding sources directory including accessibility put in place, and proved to be useful for financial planning and resources mobilisation | Donors/funding sources directory developed and updated | 6 |
| Activity 1.4 | Develop resource mobilisation and | Gov, ADB | DoWS CWSH | Jun 18- Dec 18 | Insufficient information about funding sources | Comprehensive and practical resource | Resource mobilisation plans | 12 |

| Actions | Activities | Sources of funding | Responsible body and Focal Point | Time-frame (m/y) | Risk | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|-----------------|---|---|--|-------------------|--|--|--|-----------------|
| | engagement plan | | DCC | | | mobilisation plans put in place and early results are promising to increase technical and financial support | developed and implemented | |
| Activity 1.5 | Develop and submit financeable project proposals or business plans for government and donor's funding | Gov, ADB, Private: Napapa Companies | DoWS CWSH DCC | Jun 18- Dec 22 | Proposal is not accepted and funded due to unavailable resources, unqualified proposal | At least 1 or 2 project proposals accepted and funded projects within 2018-22 | Number of proposals and business plans developed, submitted and funded | 85 |
| Activity 1.6 | Improve public and foreign aids data management system, and M&E | Gov, UNDP, ADB | MPI: DoP, DoM&E DoWS CWSH | Jun 18- Dec 22 | Ineffective coordination and information sharing | Complete, effective and transparent financial aids management system put in place, and proved be effective for M&E and improvement of aids | Financial aids management system | 9 |
| Action 2 | Expand access to finance | | | | | | | |
| Activity 2.1 | Organise business meetings to enhance cooperation between domestic and regional banks and financial institutes (to expand financial access) | Gov, Financial institutes, Napapa Companies | MOF: BOL MPI: DOP Napapa Companies | Jun 18- Dec 22 | Delayed and unfulfilled due to low return on investment of water supply projects | Favourable loans made available and accessible for climate resilient water supply projects or businesses | Number of business trips and meetings held, and cooperation agreements reached | 80 |

| Actions | Activities | Sources of funding | Responsible body and Focal Point | Time-frame (m/y) | Risk | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|-----------------|---|---|---|-------------------|--|--|--|-----------------|
| Activity 2.2 | Organise trainings to increase financial capacity and readiness and of entrepreneurs | Gov, ADB, JICA, Napapa Companies | MOF: BOL MPI: DOP Napapa Companies | Jun 18- Dec 22 | Ineffective trainings due to insufficient resources and materials for the trainings | Entrepreneurs receives adequate trainings or strengthened, and proved to be effective to access to finance | Number of trainings organised, and stakeholders participated | 60 |
| Activity 2.3 | Organise forum on financial access and business models for climate resilient water supply systems | Gov, ADB, JICA, Napapa Companies | MOF: BOL MPI: DOP Napapa Companies | Jun 18- Dec 22 | Less effective due to limited experts, research and information for exchanges | Forum on water supply put in place, and proved to be effective in driving climate change and disaster resilient water supply systems | Number of forum held, and stakeholders participated | 70 |
| Action 3 | Limited knowledge and skills on climate resilient technologies and practices | | | | | | | |
| Activity 3.1 | Re-asses capacity needs | Gov, ADB, JICA, Private: Napapa Companies | MONRE: DCC MPWT: DoWS MPH: CWSH | Jun 18- Oct 18 | Less comprehensive and practical due to limited knowledge and skills on climate resilient technologies | Comprehensive capacity needs information made available for capacity development planning | Capacity needs assessments conducted | 12 |
| Activity 3.2 | Provide technical and financial trainings on infrastructure standard system, climate and disaster resilient | Gov, ADB, JICA, Private: Napapa Companies | MONRE: DCC MPWT: DoWS, DUH MPH: CWSH | Nov18- Dec 22 | Insufficient, ineffective or not practical trainings due to limited resource persons, budget, and trainings are not delivered to the right targets | Staff receive sufficient trainings and have sufficient technical and relevant knowledge | No. of trainings proved, and target organisations participated | 100 |

| Actions | Activities | Sources of funding | Responsible body and Focal Point | Time-frame (m/y) | Risk | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|---|------------------------|--|-------------------|--|---|--|-----------------|
| | technologies and practices | | | | | and skills to promote and manage CRWS | | |
| Activity 3.3 | Improve organisational human resources development (HRD) system including HRD plan, staff knowledge management, recruitment etc. | Gov. ADB, JICA, UNISDR | MONRE: DCC MPWT: DoWS MPH: CWSH | Jun 18- Dec 22 | Unable to secure enough resources for HRD improvement | HRD system put in place and proved to be effective | HRD system including HRD plan, staff knowledge management, recruitment etc. improved | 60 |
| Activity 3.4 | Promote establishment of the network, think-tank and civil organisations and information exchanges on climate and disaster resilient technologies and practices | Gov. ADB, JICA, UNISDR | MONRE: DCC, NRERI MPWT: DoWS MPH: CWSH | Jun 18- Dec 22 | Could not mobilise resources and development of the think-tank, networking and exchange | Think-tank, networking and exchange platform put in place and proved to be effective to enhance CRWS | Number of think-tank, networking and exchanges organised | 70 |
| Activity 3.5 | Improve education including curriculum and research on climate and disaster resilient water supply technologies and practices in high education | Gov. ADB, JICA, UNISDR | MONRE: DCC | Sep 18- Dec 19 | Less practical due to insufficient financial and human resources, information and network to develop practical and comprehensive curriculum and research | CRWS curriculum including educational materials are in place and proved to be practical and effective | Number of teachers, curriculum, educational and research materials and reports | 80 |
| Action 4 | Develop and strengthen enforcement of the policies on climate change and disaster resilient technologies including mainstreaming in the water supply developments | | | | | | | |
| Activity | Develop policies on | Gov. ADB, | MONRE: DCC | Jun 18- | Delayed due to insufficient | Practical policies on | Policies on climate | 64 |

| Actions | Activities | Sources of funding | Responsible body and Focal Point | Time-frame (m/y) | Risk | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|--|------------------------|----------------------------------|------------------|--|--|---|-----------------|
| 4.1 | climate change adaptation and disaster resilient technologies and mainstreaming in the water supply developments | JICA, UNISDR | | Mar 19 | financial and human resources, unclear responsibilities and lack of coordination among key responsible organisations | climate change adaptation and disaster resilient technologies put in place and effectively enforced | change adaptation and disaster resilient technologies enacted | |
| Activity 4.2 | Enhance enforcement of the policies on climate change adaptation and disaster resilient technologies including construction quality control and ESIA | Gov. ADB, JICA, UNISDR | MONRE: DCC | Jun 18- Dec 22 | Ineffective enforcement due to limited resources | The water supply developments compliance with engineering and environmental standards and requirements | Policies enforcement strengthened | 200 |
| Action 5 | Increase information and awareness about hazards and risks, climate and disaster resilient technologies and practices | | | | | | | |
| Activity 5.1 | Develop hazard map, re-assess loss and damage, and disaster resilience of the water supply systems and financial needs | Gov. ADB, JICA, UNISDR | MONRE: DCC | Jun 18- Dec 22 | Delayed or incomprehensive information and data due to insufficient resources for the assessment | Comprehensive information about disaster loss and damage including financial needs made available for effective CRWS planning and management | Hazard map and re-assessments conducted and reported | 385 |
| Activity 5.2 | Study and identify best climate and disaster resilient technologies and practices | Gov. ADB, JICA, | MPWT: DoWS MPH: CWSH | Jun 18- Dec 22 | Delayed or incomprehensive studies due to insufficient resources and information about best practices | The best technologies and practices made available for climate and disaster | Study on best technologies and practices for climate and disaster | 180 |

| Actions | Activities | Sources of funding | Responsible body and Focal Point | Time-frame (m/y) | Risk | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|--|---|----------------------------------|-------------------|---|---|--|-----------------|
| | | | | | | resilience promotion and management including decision on investment | resilience conducted | |
| Activity 5.3 | Disseminate information about hazards, climate and disaster resilient technologies and practices | Gov. ADB, JICA, | MPWT: DoWS MPH: CWSH | Jun 18- Dec 22 | Delayed due to financial and human resources constraints | Stakeholders have knowledge, information and awareness, and contribution to CRWS development | Number of dissemination workshops, and people participated or outreached | 50 |
| Activity 5.4 | Pilot floods and drought resilient rural water supply systems | Gov. ADB, JICA, INGOs | MONRE: DCC MPH: CWSH | Jun 18- Dec 22 | Delayed due to insufficient financial and human resources, information about hazards, resilient technologies and best practices | 1 to 2 models of each type of rural water supply system developed and replicated | Pilot projects developed and implemented | 25,450 |
| Activity 5.5 | Pilot floods and drought resilient urban water supply systems | Gov. ADB, JICA, Private: Nam Papa Companies | MONRE: DCC MPWT: DoWS | Jun 18- Dec 22 | As the risk of the action 5.4 | 2 to 3 urban resilient urban water supply reference projects or models developed and replicated | Pilot projects developed and implemented | 23,800 |
| Total | | | | | | | | 40,732 |

Chapter 2 Technology Action Plan for Climate Change Adaption in Agriculture Sector

2.1 Action Plan for Livestock Disease Prevention and Control-Surveillance

2.1.1 Livestock Disease Prevention and Control

Poor husbandry, feed and animal disease have been the major constraints for livestock production and commercialisation in Laos (FAO, 2005; Wilson, 2007; DLF, 2016). Disease outbreak causes animal death, and economic loss of about US\$ 40 million every year⁶. Foot-and-Mouth Disease (FMD) outbreak caused a loss of thousands of cattle and buffalo and in value of about USD 13.5 to US\$ 102 million affecting 414 villages in 14 out of 18 provinces of the country (Nampaya et al., 2015).

Climate change, especially climate variability and extreme climate have direct and indirect impact on livestock. The extreme weather, for example, hypothermia caused number of livestock dead, worth of US\$ 2.5 million in 2011 (Khounsy et al., 2012). In 2015, such weather hazard resulted in 7,162 cattle and 3,744 buffalo dead, affecting 1,384 smallholder livestock keepers in 46 districts in 6 provinces (Nampaya et al., 2015).

Some animal diseases are sensitive to climate change and changing climate can exacerbate disease outbreak in livestock. The top 13 climate sensitive diseases of importance to the Southeast Asia including Laos are 1) Salmonellosis, 2) Campylobacteriosis, 3) Cryptosporidiosis, 4) Leptospirosis, 5) Botulism, 6) Endoparasitosis, 7) Listeriosis, 8) Toxoplasmosis, 9) Escherichia coli infection, 10) Anthrax, 11) Liver fluke (fascioliasis), 12) Ectoparasites and 13) Under-nutrition (CIAT, 2014), which the majority is food-and-water borne zoonoses.

EWS describe in the section 1.1 is, in general, critical for hazards prevention. In addition, the livestock disease epidemics surveillance (LDES) including application of new tools such as environmental niche modelling, epidemiological modelling using R_0 map and teleconnection modelling are essential to predict diseases' occurrences in space and in time in relation to climate variability and change (Morand, 2015). The LDES includes knowledge and information system about disease, detection and monitoring of disease epidemics including inspection, taking samples and identification of the causes of a disease outbreak, declare of a disease outbreak and warning, and taking emergency prevention and control measures including vaccination.

The LDES system in Laos is however underdeveloped and underperformed, resulting in high livestock mortality due to disease outbreak induced changing climate, environment and other factors. The organisation in charge, particularly Department of Livestock and Fisher (DLF), Ministry of Agriculture and Forestry (MAP) is facing several performance gaps to effectively and sustainably implement and operate the LDES as summarised in the Table below.

⁶ It is an estimated number resulted from expert judgement by technical working group

TABLE 41 THE LIVESTOCK DISEASE EPIDEMICS SURVEILLANCE-LDES AND PERFORMANCE GAPS

| LDES components | Status of LDES and Key Development or Performance Gaps |
|--|---|
| Institutional and organizational arrangement | <ul style="list-style-type: none"> - The Livestock and Veterinary Management Authority established at all levels, but coordination amongst the authorities and other stakeholders are ineffective - Insufficient veterinary staff, budget and tools at local levels, especially district and village levels |
| Knowledge and information about animal diseases and prevention and control technologies and best practices | Important animal diseases are limited and updated, but limited research and information about the outbreak maps, patterns, trends, risks and best technologies and practices for detection and diagnose, prevention and control. |
| Detection, diagnosing and monitoring of animal disease outbreak | Regular veterinary service including inspection at the national border, slaughter house and evident-based disease outbreak reporting exist, however, there is no tools to predict and detect the outbreak in advance such as environmental niche modelling, epidemiological modelling using R_0 map and teleconnection modelling. In addition, disease testing, diagnosing and animal quarantine equipment are insufficient. |
| Declaration of a disease outbreak, dissemination and communication of warnings | <ul style="list-style-type: none"> - Overall announcement and warning of disease is conducted seasonally, however, the telecommunication, TV and radio programs to serve LDES have not been fully designed. Format, warning message and information are generic, and not standardised. - Monitoring and feedback mechanism and procedure to ensure whether the warning is reached and understood by relevant organizations and communities or not have not been standardised. |
| Implementation of prevention and control measures including vaccination | <ul style="list-style-type: none"> - Response or emergency plan for disease outbreak prevention and control are not in places |

2.1.2 Development goals

To develop more effective animal disease epidemic surveillance system (LDES) that provides more effective, accurate and timely disaster detection, warnings and response throughout the country.

2.1.3 Selection of Actions and Activities for the TAP

The actions to be included in the TAP were identified based on the Barriers Analysis and Enabling Framework (BAEF), especially barriers and measures to overcome barriers (section 2.1.3.1). The selection of action and activities are described in section 2.1.3.2 and 2.1.3.3, respectively.

2.1.3.1 Barriers and Measures to Overcome Barriers

Based on the BAEF, eight critical barriers including three financial and economic barriers and five non-financial and economic barriers have been considered as key barriers preventing livestock disease prevention and control as well as development and deployment of the surveillance system (Table 42).

TABLE 42 BARRIERS AND MEASURES FOR EFFECTIVELY PREVENTION AND CONTROL OF LIVESTOCK DISEASE

| Category | Barriers | Measures to overcome barriers |
|--|--|--|
| Financial and economic | 1. Inadequate budget and investment on livestock disease surveillance system (LDES) | 1. Increase budget and investment on LDES: |
| | 2. High cost of the LDES including technologies for disease epidemics surveillance vaccines detection, diagnose vaccination | 2. Reduce cost of the LDES including technologies for disease epidemics surveillance vaccines detection, diagnose vaccination |
| | 3. Limited access to finance for disease prevention and control | 3. Expand access to finance for disease prevention and control |
| Institutional, organisational and human skills | 4. Inadequate human resource | 4. Increase human resource |
| Technical | 5. Inadequate technologies including equipment, vaccine package, laboratory, surveillance and treatments facilities | 5. Increase technologies including equipment, vaccine package, laboratory, surveillance and treatments facilities |
| Information and awareness | 6. Inadequate information about livestock disease, cost-effective, best technologies and practices on LDES and clinical treatments | 6. Increase R&D of information about livestock disease, cost-effective, best technologies and practices on LDES and clinical treatments |
| | 7. Low awareness and neglect about livestock disease and LDES | 7. Increase awareness about livestock disease and LDES |
| Other | 8. Uncontrolled free-range and poor livestock farming facilities | 8. Promote standard and larger farming including animal feeds and implement measures to reduce the uncontrolled free-range livestock raising |

2.1.3.2 Selection of Actions

The actions for the TAP were formulated by converting the identified measures into actions. Then they were assessed by scoring and against five evaluation criteria: relevance, effectiveness, efficiency, impact and sustainability (Annex 5) by stakeholders including the climate change working group (See Annex 1). Top four measures or actions are selected to include in the TAP. As a result, seven out of eight measures have been selected for the TAP (Table 43).

TABLE 43 SELECTED MEASURES TO INCLUDE IN THE ACTION PLAN ON LIVESTOCK DISEASE PREVENTION AND CONTROL

| Category | Measures to overcome barriers | Score | Measures selected as actions for the TAP and description |
|---|--|-------|---|
| Financial and economic | 1. Increase budget and investment on LDES: a. Maintain or enhance the existing government budget on LDES b. Enhance effectiveness of resources mobilisation, cooperation and access to financial supports c. Improve effectiveness of the public investment project budgeting | 18 | v (1a, 1b) The measures 1a and 1b have direct impact on the LDES and highest score (Annex 3). The government budget for LDES may not be increased much since the national revenue or the government is limited and be in favour of investing in basic infrastructure. However, sustainable financing source, which maintains LDES. Implementing the measure 1b is likely to increase substantial LDES supports. The measure is also important as it may have co-benefit or impact various sectors' development. However, this measure is being implemented by MPI and MOF. |
| | 2. Reduce cost of vaccines, vaccination, and disease epidemics surveillance: a. Reduce LDES technologies importing and business tax b. Increase cooperation with domestic and international donors to access to low cost technology transfer. c. R&D of cost-effective LDES | 15 | X The measures 2a received lower score (Annex 3) as it is concerned about trade-off or impact on the national or the government income. The measure 2b is addressed in 1b and 2c will be implemented under the measure 6 and 7. |
| | 3. Expand access to finance for livestock business including disease prevention and control | 17 | v The measures received 2 nd top score (Annex 3) since it is an option for LDES to get financed, apart from the measure 1. In addition, it is also considered as a sustainable way. |
| Institutional, organisational capacity and human skills | 4. Enhance organisational capacity and human resource: a. Improve human resources development management system b. Increase knowledge and skills public and private sector c. Improve coordination between livestock sector and among stakeholders | 18 | v (4a, 4b, 4c) This measure is a 1 st top score, since knowledge and skills of the responsible organisations are determinant of the LDES development, effectiveness and sustainability. |
| Technical | 5. Increase technologies including equipment, vaccine package, laboratory, surveillance and | 17 | v This 2 nd top score measure (Annex 3) is also a determinant for effective LDES. |

| Category | Measures to overcome barriers | Score | Measures selected as actions for the TAP and description |
|---|--|-------|---|
| | treatments facilities | | Without these tools, it is hard to ensure effective and timely LDES and response. |
| Information and awareness | 6. Increase R&D of information about livestock disease, cost-effective, best technologies and practices on LDES and clinical treatments | 16 | √ This lower score measure (Annex 3) is needed since insufficient information would certainly affect the LDES. |
| | 7. Increase awareness and neglect about livestock disease prevention and control | 16 | √ Although lower score (Annex 3), but to be effective and sustainable, increased awareness, alert and contribution are prerequisite. |
| Other | 8. Promote standard and larger farming including animal feeds and implement measures to reduce the uncontrolled free-range livestock raising | 17 | √ This 2 nd top measure (Annex 3) is needed, otherwise, effectiveness of LDES could be hardly achieved. |
| <i>Notes: √ means measures were selected to include in the action plan. X measures were not selected or merged into other measures.</i> | | | |

2.1.3.3 Selection of Activities to Implement the Actions

Activities for implementing the actions were selected based on key stakeholder consultations. Firstly, list of activities was prepared by the TNA project team. Secondly, the list of the activities was presented and discussed with DoLF in November 2017, considering practicality, its relevance, effectiveness, efficiency, impacts on the actions and duplication with existing activities. As a result, activities of each action were finalised as presented in the Table 44 below.

TABLE 44 SELECTED ACTIVITIES FOR THE ACTION PLAN ON LIVESTOCK DISEASE PREVENTION AND CONTROL

| Actions | Activities |
|--------------|--|
| Action 1 | Increase budget and resources mobilisation for livestock disease surveillance |
| Activity 1.1 | <i>Develop strategy on livestock diseases surveillance including financial needs assessment</i> |
| Activity 1.2 | <i>Conduct financial assessment and identify the financial/funding sources or donors for livestock diseases surveillance development and management</i> |
| Activity 1.3 | <i>Develop the resource mobilisation plan</i> |
| Activity 1.4 | <i>Develop and submit financeable project proposals to the potential donors</i> |
| Activity 1.5 | <i>Develop and update the funding sources or donor directory</i> |
| Activity 1.6 | <i>Improve public budget and financial aids management system (effectiveness, accountability and transparency etc.)</i> |
| Action 2 | Expand access to finance for livestock business including disease prevention and control |
| Activity 2.1 | <i>Strengthen cooperation between domestic and regional banks and financial institutes (to expand domestic financial markets including lowering interest rate and simply procedures for borrowing)</i> |

| | |
|--------------|--|
| Activity 2.2 | <i>Increase financial capacity and readiness and of livestock entrepreneurs and farmers</i> |
| Activity 2.3 | <i>Organise financial access dialogue and M&E on the access to finance</i> |
| Action 3 | <i>Increase human resource</i> |
| Activity 3.1 | <i>Conduct capacity needs assessment</i> |
| Activity 3.2 | <i>Provide technical and financial trainings on livestock disease, epidemic detection, prevention and control</i> |
| Activity 3.3 | <i>Increase cooperation and partnership with development partners, international originations and INGOs on capacity building</i> |
| Activity 3.4 | <i>Improve organisation development system including human development planning, staff knowledge management, recruitment etc.</i> |
| Activity 3.5 | <i>Promote establishment of network, think-tank and civil organisation and information exchanges</i> |
| Activity 3.6 | <i>Improve on livestock disease, epidemic detection, prevention and control in education and research institutes</i> |
| Activity 3.7 | <i>Organise volunteer and technical mobile groups to support livestock disease, epidemic detection, warning, and control</i> |
| Action 4 | <i>Increase technologies including equipment, vaccine package, laboratory, surveillance and treatments facilities</i> |
| Activity 4.1 | <i>Improve livestock disease research, diagnose, treatment and control facilities, equipment and vaccines at DOLF, FOA of NUOL, Luang Prabang and Champasack college</i> |
| Activity 4.2 | <i>Improve livestock disease detection, diagnose and quarantine facilities at all international and major local check points</i> |
| Activity 4.3 | <i>Develop a centre for reporting and warning about livestock disease epidemics</i> |
| Action 6 | <i>Increase information and awareness on livestock disease, surveillance and treatment technology best practices and guidelines</i> |
| Activity 5.1 | <i>R&D livestock disease, disease epidemic surveillance and treatment technology best practices and guidelines or SOP</i> |
| Activity 5.2 | <i>Disseminate information about livestock disease, disease epidemic surveillance system, and treatment technology including best practices and guidelines</i> |
| Action 6 | <i>Reduce uncontrolled free range and scattered livestock raising and promote standard and larger farm system</i> |
| Activity 6.1 | <i>Develop a land use plan and strategy on forage and grassland for grazing animals</i> |
| Activity 6.2 | <i>R&D and promote animal feed development</i> |
| Activity 6.3 | <i>Enhance law enforcement on standard livestock farm system</i> |

2.1.4 Identify Stakeholders and Determines Timelines

2.1.4.1 Identify Stakeholders for TAP Implementation

The stakeholders could be identified based on reviewing the planned activities, and mandates, interest and actual projects related to livestock disease epidemic prevention and control that an organisation implements. Majority of the stakeholders, especially the governmental organisations which were identified before TNA project implementation. Some of the stakeholders engaged during consultation meetings and interview. In addition, at the consultation meeting on TAP in November 2017, the list of stakeholders was validated.

The Table 45 below provides a list of the primary or overall stakeholders who are mandated or implement the livestock disease epidemic prevention and control activities. In addition, some stakeholders were also identified for each activity as in Table 50.

TABLE 45 KEY STAKEHOLDERS IN LIVESTOCK DISEASE PREVENTION AND CONTROL

| No | Key organisations | Mandates/Tasks | Relevant activities |
|----|---|---|----------------------------------|
| 1 | Ministry of Agriculture and Forestry (MAF). In particular, Department of Livestock and Fishery (DLF), National Agriculture and Forestry Research Institute (NAFRI) | Research, promote healthy livestock production and business and enhancing livestock keepers and business to cope with livestock disease epidemics | All activities |
| 2 | National University of Laos, especially Faculty of Agriculture (FOA) and Agriculture Colleges | Provides education on livestock disease, clinical treatment and management | Activity 3.6 |
| 3 | Ministry of Industry and Commerce (MIC): Department of Small and Medium Enterprise Promotion (DSMEP) | Promote livestock enterprises including LDES, especially domestic enterprises | Activities 2.1-2.3, and 6.2 |
| 4 | Ministry of Planning and Investment (MPI): Department of Planning (DIP) and Department of Investment Promotion (DIP) | Facilitates public and private, especially large and external investment in livestock business including LDES | All activities |
| 5 | Livestock keepers and entrepreneurs, and Chamber of Commerce and Industry (CCI) | Invest, develop and co-operate LDES implementation | Activities 2.1-2.3, and 6.2, 6.3 |
| 6 | Development partners and INGOs: FAO, WB, ADB, AusAID | Provides technical and financial support on LDES | All activities |

2.1.4.2 Schedule Actions and Activities

The schedule of the actions and activities was defined by TNA project team in consultation with DOFL during mutual meeting in November 2017. Logics and sequences, nature and scale of the activities, readiness including time, technical and financial capacity of the responsible organisations to perform the activities were considered during the scheduling.

The timeframe of the action plan implementation is five years, which is perceived to be suitable and sufficient time for full technical and financial preparation. The timeframe is divided into two phases. The preparation phase is 3 months, which shall be commenced following the approval and during dissemination of TAP to stakeholders. This means this phase would be between May to July 2018. In overall, the implementation phase is expected to commence between May 2018 and December 2022.

2.1.5 Resources estimation

2.1.5.1 Capacity Building

Strengthening capacity to implement and manage the TAP is needed since the key stakeholders still have knowledge and skills gaps, and for reduce risks of the TAP implementation. The knowledge and skills needs can be divided into two main categories: technical knowledge and skills on a surveillance and project management. The technical knowledge and skills were identified during BAEF. The project management was listed and elaborated by TNA team and DOFL in November 2017. All knowledge and skills to be enhanced or trained could be summarised in the Table 46 below.

TABLE 46 CAPACITY NEEDS FOR LIVESTOCK DISEASE PREVENTION AND CONTROL

| Category | Knowledge and skills needs |
|--|--|
| Technical surveillance and EWS | |
| Risk knowledge | Knowledge and skills to identify disease, pattern and characteristics of epidemics, risks and impacts including economic and health impacts |
| Monitoring and detection of disease | Skills to develop and apply technologies for assessment of climate-sensitive disease hotspots mapping and outbreak. |
| Communication and dissemination of warning message | Research and develop effective and best practices on the communication and reporting |
| Response capacity | Knowledge and skills to: <ul style="list-style-type: none"> - Develop and implement preparedness or response plans - Assess preparedness or response capacity, - Develop SOP and best practice guidelines for response. |
| Institutional arrangements | Knowledge and skills to research and develop effective coordination mechanism among stakeholders |
| Business and economics | <ul style="list-style-type: none"> - Feasibility study including financial and economic analysis such as cost and benefit or return on investment in surveillance and EWS - Development of bankable proposal - Insurance and financial risk management related with loss due to disease outbreak and extreme weather - Identification and analysis of financial or funding sources - Resources mobilisation planning - Effective and efficient public budgeting - Financial aids management including M&E |
| Legal | <ul style="list-style-type: none"> - R&D of disaster and climate change law and policy including its impacts - R&D and deployment of best practice on law enforcement |
| Project management | |
| Project management | Project management including activity and its component planning, estimating-cost and human resource “time on task” for each activity and its components, procurement, risk management and M&E |

2.2.4.2 Estimate Costs for Actions and Activities

The total cost of the action plan implementation would be about US\$ 14.92 million. The costs of the actions and activities, in this context, include 1) the cost for dissemination and consultation including adjustment of the TAP before actual implementation, 2) the cost of each action and activity, and 3)

the cost for contingency. The cost for the dissemination and consultation meetings; based on the three meetings and two days for each meeting, current government daily allowance, a consultant fee, and a meeting including administrative costs, is expected to be US\$ 18,000, which is comparative to similar activities of other projects. The cost of each activity implementation, considering allowance, consultant fee, travel, meeting and other administrative costs is US\$ 13.546 million (Annex 5 and Table 50). The cost for contingency i.e. to address delay and variations, is estimated to be 10% of the total cost or US\$ 1,354,600.

TABLE 47 ESTIMATE COSTS FOR ACTIONS AND ACTIVITIES

| No | Actions | Cost (US\$ Th.) |
|-----|--|-----------------|
| I | Cost for preparation of TAP implementation | 18 |
| II | Cost of the full implementation of the actions in the TAP | 13,546 |
| 1 | Increase budget and resources mobilisation for LDES | 154 |
| 2 | Expand access to finance for livestock business including LDES | 235 |
| 3 | Increase human resource | 507 |
| 4 | Increase technologies including equipment, vaccine package, laboratory, surveillance and treatments facilities | 10,500 |
| 5 | Increase information and awareness on livestock disease, surveillance and treatment technology best practices and guidelines | 295 |
| 6 | Reduce uncontrolled free-range, promoting livestock feed and standard and larger farm system | 1,855 |
| III | Cost for contingency actions (10% of the action cost) | 1,354.6 |
| | Total | 14,918.6 |

2.1.6 Management Planning

2.1.6.1 Risk and Contingency Planning

As described in Table 9 in the section 1.1.6, in overall, costing, scheduling and performance risks and mitigation measures were taken into account during the TAP planning and implementation phase. In addition, specific risks and contingency actions of each action were also identified as outlined in the Table 48 below.

TABLE 48 SPECIFIC RISKS OF ACTIONS AND CONTINGENCY PLANNING

| No | Actions | Risks | Contingency actions |
|----|---|--|---|
| 1 | Increase budget and resources mobilisation for LDES | Responsible organisations may not be able to secure financial resources on time or adequately due to: <ol style="list-style-type: none"> 1. Public budget deficit, 2. Variable international financial pledge, 3. Limited capacity-know-how of the responsible organisations, | <ol style="list-style-type: none"> 1. Enhance capacity and commitment of the responsible organisations to mobilise and access to financial support 2. Increase engagement and provision of LDES information for decision makers 3. Improve cooperation and |

| No | Actions | Risks | Contingency actions |
|----|--|---|--|
| | | <p>entrepreneurs and farmers</p> <p>4. Lack of mechanisms and ineffective law enforcement to create fund for financing LDES</p> | <p>coordination among stakeholder and with development partners, donors and private sector</p> |
| 2 | Expand access to finance for livestock business including LDES | <p>1. Limited access to finance due to high cost and/or financially and economically not viable</p> <p>2. Livestock entrepreneurs have limited financial capacity and HR to develop financeable projects</p> | Implement the contingency measures of the Action 1 and 3 |
| 3 | Increase human resource (HR) | <p>1. The responsible organisations may not have capacity or sufficient financial resources to implementation of full capacity building programmes as needed</p> <p>2. Trainings are not provided to the right people</p> | <p>1. Implement contingency measures for action 1 above</p> <p>2. Research and implement cost-effective including internal or self- capacity building</p> <p>3. Increase organisational leadership and learning culture</p> <p>4. Improve coordination and synergy of capacity building activities among stakeholders, and between HR demand and supply side</p> <p>5. Improve HRD and capacity development plan, staff knowledge management</p> |
| 4 | Increase LDES technologies including equipment, vaccine package, laboratory, surveillance and treatments facilities | As the risk of the action 1 and 3 | Implement the contingency actions of the action 1 and 3 |
| 5 | Increase information and awareness on livestock disease, surveillance and treatment technology best practices and guidelines | As the risk of the action 1 and 3 | Implement the contingency actions of the action 1 and 3 |
| 6 | Reduce uncontrol free-range and promote livestock feed, standard and larger farm system | As the risk of the action 1 | Implement the contingency actions of the action 1 |

2.1.6.2 Success Criteria and Indicators for Monitoring of the Implementation

Success criteria and indicator for monitoring of the TAP implementation was identified and include in the summary of the TAP (Table 49 and 50). The criteria and indicators were listed by the TNA project team, consulted and agreed with the key stakeholders in November 2017.

TABLE 49 SUCCESS CRITERIA AND INDICATORS FOR MONITORING OF THE IMPLEMENTATION

| No | Actions | Success criteria | Indicators for M&E |
|----|--|---|--|
| 1 | Increase budget and resources mobilisation for LDES | Sufficient financial resources for full development and operation of LDES | Financial support and investment in LDES are increased |
| 2 | Expand access to finance for livestock business including LDS | Sufficient financial resources for livestock business including LDES | No. of livestock entrepreneurs are accessible to finance |
| 3 | Increase human resource | Sufficient institutional capacity and human resources for effective LDES development and operation | Institutional capacity and human resources are improved |
| 4 | Increase technologies including equipment, vaccine package, laboratory, surveillance and treatments facilities | Sufficient tools, basic infrastructure and facilities for effective LDES development and operation | Tools, infrastructure and facilities for LDES are improved |
| 5 | Increase information and awareness on livestock disease, surveillance and treatment technology best practices and guidelines | Sufficient information and LDES stakeholders have high awareness and preparedness to implement LDES | Information and awareness are improved |
| 6 | Reduce uncontrolled free-range and scattered livestock raising and promote standard and larger farm system | At least half of the uncontrolled free-range reduced, and standard and larger farm system increased by 2022 | No. of uncontrolled free-range reduced and proportion of standard and larger farm system increased |

2.1.7 Summary Overview of the Action Plan for Livestock Disease Prevention and Control

The summary TAP (Table 50) was derived from summary of the assessment and identification of actions and activities, funding sources, responsible organisation, timeframe, budget for the implementation, risks and C&I of the TAP implementation in previous sections. This TAP will be carried over five years, by DLF, the primary stakeholders, in coordination with DCC and DMH to implement the TAP. The total cost of the TAP implementation is about US\$ 14.92 million.

TABLE 50 SUMMARY OVERVIEW OF THE ACTION PLAN ON LIVESTOCK DISEASE PREVENTION AND CONTROL

| Actions | Activities | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$Th.) |
|--------------|---|--------------------------------|------------------|-----------------|---|---|---|----------------|
| Action 1 | Increase budget and resources mobilisation for climate and disaster early warning system (EWS) and livestock disease surveillance (LDS) | | | | | | | |
| Activity 1.1 | Develop the strategy on livestock diseases surveillance (LDS) including financial needs assessment | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | June 18-Dec 18- | Insufficient human resources and information about diseases, impacts and LDS technologies | A comprehensive and practical strategy on LDS put in place and proved to be helpful for increase technical and financial support, and effective LDS development | Strategy on livestock diseases surveillance (LDS) developed and implemented | 16 |
| Activity 1.2 | Conduct financial assessment and identify the funding sources and LDS feasibility | Gov, ADB, FAO, AusAID, SDC | MAF: DOLF | June 18-Dec 18- | Insufficient information about funding sources | Comprehensive and practical subsidy mechanism put in place and prove to be useful for increase technical and financial support on LDS | Comprehensive and practical subsidy mechanism developed or identified | 20 |
| Activity 1.3 | Develop the resource mobilisation plan | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18-Jan 19 | Insufficient resources for the development | Comprehensive resource mobilisation or financial access plan put in place and proved to be effective | Resource mobilisation plan developed and implemented | 10 |
| Activity 1.4 | Develop and submit financeable project proposals to the potential donors | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18-Dec 22 | Insufficient resources and skills for the proposals | At least 2 projects are funded within 5 years (2018-2022) | No. of project proposals developed, submitted and funded | 90 |

| Actions | Activities | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$Th.) |
|--------------|--|--------------------------------|------------------------------|---------------|---|---|---|----------------|
| | | | | | development | | | |
| Activity 1.5 | Develop and update the funding sources or donor directory | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Mar 19-Jun 22 | Not accessible and traceable all and updated information about funding sources, availability and access feasibility | A comprehensive and updated funding sources or donor directory put in place and prove to be useful for increase LDS technical and financial support including cooperation | Funding sources or donor directory developed and updated | 6 |
| Activity 1.6 | Improve public budget and financial aids management system (effectiveness, accountability and transparency etc.) | Gov, ADB, FAO, AusAID, SDC, EU | MPI: DOFAM, DOP MAF: DOLF | Jan 19-Jun 19 | Ineffective coordination and information sharing | Complete, effective and transparent financial aids data management system put in place and prove to be effective for M&E and improvement of aids | Financial aids data management and feedback or M&E system improved | 12 |
| Action 2 | Expand access to finance for livestock business including LDS | | | | | | | |
| Activity 2.1 | Strengthening cooperation between domestic and regional banks and financial institutes (to expand domestic financial markets and access including lowering interest rates and simplify procedures for borrowing) | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18-Jun 21 | Delayed and unfulfilled due to low return and risks on investment in livestock business | Favourable loans for livestock business including LDS are available and accessible by livestock entrepreneurs | Number of business trips and meetings organised, financial cooperation agreements formulated, and favourable loans for livestock business | 85 |

| Actions | Activities | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$Th.) |
|--------------|--|--------------------------------|------------------|---------------|---|--|---|----------------|
| | | | | | | | increased | |
| Activity 2.2 | Increase financial capacity and readiness and of livestock entrepreneurs and farmers | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18-Oct 21 | Insufficient financial and human resources for the trainings | Entrepreneurs strengthened and capable of increase access to finance | Number of trainings provided, and no. of livestock entrepreneurs and farmers participated | 90 |
| Activity 2.3 | Organise financial access dialogue and M&E on the access to finance | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18-Jun 22 | Less effective due to limited experts, research and information for exchanges | Forum on LDS put in place and proved effective facilitating problem solving | Number of forum organised and stakeholders participated | 60 |
| Action 3 | Increase human resource | | | | | | | |
| Activity 3.1 | Conduct capacity needs assessment | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18-Dec 18 | Delayed due to insufficient financial and human resources | Comprehensive information about capacity needs and helpful for HRD or capacity building planning and decision making | Capacity needs assessment conducted | 12 |
| Activity 3.2 | Provide technical and financial trainings on livestock disease, epidemic detection, prevention and control | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18-Sep 22 | As 4.1 above | Responsible organisations receive sufficient and practical trainings, and demonstrated capable of promoting and managing LDS | No. of trainings held, and target groups participated | 110 |
| Activity | Increase cooperation and | Gov, ADB, | MAF: DOLF | Jun 18- | As 4.1 above | Partners and | No. of t partnering and | 15 |

| Actions | Activities | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$Th.) |
|--------------|--|--------------------------------|------------------|----------------|---|--|--|----------------|
| 3.3 | partnership with development partners, international originations and INGOs on capacity building | FAO, AusAID, SDC, EU | | Dec 22 | | cooperation agreements increased | cooperating activities and mechanisms conducted | |
| Activity 3.4 | Improve organisation development system including human development planning, staff knowledge management, recruitment etc. | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18- Dec 22 | HRD and capacity building is not in line with the plan including capacity needs | Responsible organisations' staff receive sufficient trainings and have sufficient knowledge and skills to promote and manage LDS | HRD and management system including HRD plan, staff knowledge management, recruitment, M&E system improved | 45 |
| Activity 3.5 | Promote establishment of network, think-tank and civil organisation and information exchanges | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18- Dec 22 | Could not mobilise the resources and sustain volunteers and activities | Network, think-tank and civil organisations are in place, prove to be active and effective | No. of network, think-tank and civil organisation and information exchanges established | 50 |
| Activity 3.6 | Improve on LDS education and research in high educational institutes | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18- Jun 19 | Insufficient resources including human, experiences and best practices | Inclusive and practical LDS curriculum put in place and proved effective | Number of teachers, educational materials and curriculum and research developed | 90 |
| Activity 3.7 | Organise technical mobile/extension staff to support LDS | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18- Oct 21 | Insufficient resources to finance the mobile/ extension staff and activities | Field extension staff put in place sufficiently, and proved to be effective in promoting LDS | No. of technical mobile/extension staff to support LDS organised | 185 |

| Actions | Activities | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$Th.) |
|--------------|---|--------------------------------|------------------|----------------|---|---|---|----------------|
| Action 4 | Increase technologies including equipment, vaccine package, laboratory, surveillance and treatments facilities | | | | | | | |
| Activity 4.1 | Improve livestock disease research, diagnose, treatment and control facilities, equipment and vaccines at DOLF, FOA of NUOL, Luang Prabang and Champasack college | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18- Jun 22 | Delayed due to insufficient financial resources | Sufficient facilities, equipment and vaccines for effective animal disease prevention and control put in place and proved effective | No. of facilities, equipment provided or improved | 3,150 |
| Activity 4.2 | Improve livestock disease detection and diagnose facilities at all international and major local check points | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18- Jun 20 | As 5.1 above | Livestock disease detection and diagnose facilities put in place and proved effective | No. of livestock disease detection and diagnose facilities provided | 1,600 |
| Activity 4.3 | Develop a centre for reporting and warning about livestock disease epidemics | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18- Oct 20 | Delayed due to insufficient financial and human resources | Centre for reporting and warning about livestock disease epidemics put in place and proved to be effective | No. of centre for LDS including monitoring, reporting and warning established | 450 |
| Activity 4.4 | Formulate and implement vaccination and veterinarian service programme | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18- Oct 22 | As 5.3 above | Effective veterinarian service programme put in place and proved to be promising | No. of vaccination and veterinarian service programmes formulated and implemented | 5,300 |
| Action 5 | Increase information and awareness on livestock disease, surveillance and treatment technology best practices and guidelines | | | | | | | |
| Activity 5.1 | R&D livestock disease, disease epidemic surveillance, cost- | Gov, ADB, FAO, AusAID, | MAF: DOLF | Jun 18- Dec 22 | Delayed and incomprehensive due | Comprehensive and practical LDS and best | No. of R&D conducted | 180 |

| Actions | Activities | Sources of funding | Responsible body | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$Th.) |
|-----------------|---|--------------------------------|------------------|----------------|--|---|--|----------------|
| | effective treatments and best technology and practices including guidelines or SOP | SDC, EU | | | to insufficient resources and coordination | treatment technologies practices and SOP put in place and proved effective | | |
| Activity 5.2 | Disseminate information about livestock disease, disease epidemic surveillance system, and treatment technology including best practices and guidelines | Gov, ADB, FAO, AusAID, SDC, EU | MAF: DOLF | Jun 18- Dec 22 | As 6.1 above | Responsible organisations have sufficient knowledge, information and awareness, and contribution to resilient development | Number of dissemination workshops organised, and people participated or outreached | 115 |
| Action 6 | Reduce uncontrol free-range and scattered livestock raising and promote standard and larger farm system | | | | | | | |
| Activity 6.1 | Promote animal feed production and standard livestock farming (keep livestock in fence and stall) | Gov, ADB, EU, FAO, AusAID | MAF: DOLF | Jun 18- Dec 22 | Delayed since the poor farmers have limited budget for development of animal feed, fences and stalls | Animal feed improved and sufficient to kept animal in fence and stalls | Areas and amount of feed, proportion of livestock kept in fence and stalls increased and uncontrolled free-range livestock reduced | 1,775 |
| Activity 6.2 | Enforce rules of law for free-range animals which cause spreading of a disease | Gov, ADB, EU, FAO, AusAID | MAF: DOLF | Jun18- Dec 22 | Delayed or ineffective to enforce the rules of law due to poverty | No. or proportion of the uncontrolled free-range reduced | No. of measures enforced | 80 |
| | Total | | | | | | | 13,546 |

2.2 Action Plan for Agricultural Development Subsidy Mechanism

2.2.1 Agricultural Development Subsidies

Agricultural subsidy is a financial mechanism that the government provides specific financial support for farmers and entrepreneurs, in this context, to reduce risks and enhance resilience of production to hazards (storms, floods, landslide, drought etc.), climate and market variability.

Lao government has recognised the vulnerability of the agriculture sector and the needs to have mechanisms in place to assure agriculture production and industries. The law on agriculture, for example, calls for establishment of the agricultural promotion fund, but it has not been established. The government has set up the government emergency fund⁷ for coping with emergency issues including disasters. The fund, however, cannot expand much and allocate adequate budget for disaster loss and damage reduction.

2.2.2 Development goals

To secure financial resources to provide direct subsidy to technologies, price, loss and damage of agricultural production of around US\$ 30 million⁸ per year, by 2020. By 2025, it is expected that the annual subsidy would be US\$ 50 million⁹.

2.2.3 Selection of Actions and Activities for TAP on Agricultural Subsidy Mechanism

The actions to be included in the TAP were identified based on the Barriers Analysis and Enabling Framework (BAEF), especially barriers and measures to overcome barriers (section 2.3.2.1, Table 35). Details on the actions and activities selection process were elaborated in the section 2.3.2.2 and in section 2.3.2.3.

2.3.2.1 Barriers and Measures to Overcome Barriers

BAEF indicated that there are eight important barriers to develop and deploy agriculture subsidies. Of which, there are 5 critical barriers, which scored 3. Two of them are financial and economic and three are non-financial and economic barriers (Table 51). Details of the essential barriers were discussed in subsection 4.3.2.1 and 4.3.2.2.

⁷ The total government emergency fund is usually 100 million LAK (US\$ 12.5 million) per year, and it is used for all emergency issues, not only for disaster recovery.

⁸ About 3.33% of the total export value and 0.21% total public investment in agriculture sector (US\$23,375 million)

⁹ About 3.33% of the total export value and 0.21% total public investment in agriculture sector (US\$23,375 million)

TABLE 51 BARRIERS AND MEASURES TO DEPLOY AGRICULTURE SUBSIDY MECHANISM

| Categories | Barriers | Measures to overcome barriers |
|--|--|---|
| Financial and economic | 1. Inadequate budget for subsidy | Increase budget for subsidy |
| Legal framework | 2. Insufficient legal framework | Strengthen legal framework |
| Institutional, organisational and human skills | 3. Unclear responsibility for the development and management of the agriculture subsidy for adaptation and disaster resilience | Define clearly organisations' responsibilities to develop and manage the subsidy |
| | 4. Inadequate knowledge and skills about subsidies including financial, legal, organisational, methods and sustainability aspects of subsidies | Increase knowledge and skills of the key responsible bodies about subsidies including financial, legal, organisational, methods and sustainability aspects of subsidies |
| Information | 5. Insufficient information about the climate change and disaster subsidy mechanism | Increase information and reference project about design and implementation of a subsidy mechanism for climate change adaptation and disaster resilience |

2.3.2.2 Selection of Actions

Selection of actions for the TAP was carried out following BAEF. The actions were chosen from the measures (Table 51) by assessing and scoring the measures based on five evaluation criteria: relevance, effectiveness, efficiency, impact and sustainability (Annex 3). The preliminary assessment was carried by DCC, especially the TNA project team, and then validated through consultation with stakeholders, especially DOA and DOFL. Top three measures were expected from derived from assessment and consultation. Based on the results of the assessment and scoring, however, the measures were considerably equally important (Table 52 and Annex 5). Although the measure 1, 4 and 5 received the top score of priority, but without the measure 2 and 3, it would be difficult to ensure effectiveness and sustainability of the subsidies. As last, all five measures were selected as actions for the TAP (Table 53).

TABLE 52 SELECTED MEASURES FOR TAP ON AGRICULTURE SUBSIDY MECHANISM

| Categories | Measures to overcome barriers | Score | Measures selected as actions |
|-------------------------------|---|-------|------------------------------|
| Financial and economic | 1. Increase budget for subsidies: | 17 | √ |
| | a. Increase the public budget and state financial institutes for subsidies | | |
| | b. Mobilise resources and establish fund for subsidies | | |
| Legal framework | 2. Develop legal framework on agricultural and disaster recovery subsidies | 16 | √ |
| Institutional, organisational | 3. Define clearly organisations' responsibilities to develop and manage subsidies | 16 | √ |

| | | | |
|---|--|----|---|
| and human skills | 4. Increase knowledge and skills of the key responsible bodies about subsidies including financial, legal, organisational, methods and sustainability aspects of subsidies | 17 | √ |
| Information | 5. Increase information and reference project about design and implementation of a subsidy mechanism for climate change adaptation and disaster resilience | 17 | √ |
| <i>Notes: √ means measures were selected to include in the TAP. X measures were not selected or merged into other measures.</i> | | | |

2.3.2.3 Selection of Activities to Implement the Actions

Identifying activities for the actions is needed since they are still broad and has implications on effectiveness and efficiency of the implementation. The activities in Table 53 below were identified through a stakeholder consultation process. The activities were initially identified by the TNA project team, and then were discussed and reached consensus with the stakeholders, particularly DoA and DoFL in November 2017, considering practicality, logics, relevance and impacts and the existing activities or overlaps. As a result, the activities of each action were able to summarise in Table 53 as follows.

TABLE 53 SELECTED ACTIVITIES FOR THE ACTION PLAN ON AGRICULTURE SUBSIDY MECHANISM FOR CLIMATE AND DISASTER RESILIENCE

| | |
|--------------|--|
| Action 1 | Expand access to finance |
| Activity 1.1 | <i>Study and strengthen cooperation between domestic and regional banks and financial institutes to access to finance for climate and disaster risk management and subsidies</i> |
| Activity 1.2 | <i>Increase financial capacity and readiness of the state financial institutes and entrepreneurs</i> |
| Activity 1.3 | <i>Organise financial access dialogue on agriculture subsidies</i> |
| Action 2 | Maintain or enhance the effectiveness of the government fund for subsidise and financing climate and disaster risks and impacts management |
| Activity 2.1 | <i>Assessment of subsidy needs and capacity of the public sector</i> |
| Activity 2.2 | <i>Conduct feasibility, impact, trade-off and define appropriate subsidy mechanisms</i> |
| Activity 2.3 | <i>Develop and submit financeable project proposal, enhance effectiveness of the implementation and M&E of the government response fund</i> |
| Action 3 | Increase organisational capacity and human resources |
| Activity 3.1 | <i>Provide professional training and exchanges on subsidies on climate and disaster risk management</i> |
| Activity 3.2 | <i>Improve human resources development system of the public organisations responsible for the subsidies</i> |
| Activity 3.3 | <i>Improve education and research on climate and disaster financial risk management including subsidies and insurance</i> |
| Activity 3.4 | <i>Promote dialogue, network, think-tank and information exchanges on financial mechanism for disaster risk management</i> |
| Action 4 | Improve information about climate and disaster loss and damage, best practices and guidelines on the subsidies |
| Activity 4.1 | <i>Undertake research and disseminate information about climate and disaster loss and damage,</i> |

| | |
|--------------|--|
| | <i>best practices and guidelines on the subsidies</i> |
| Activity 4.2 | <i>Pilot a subsidy mechanism to address climate change and disaster risk management</i> |
| Action 5 | Develop policy or regulation on disaster risk management financing |
| Activity 5.1 | <i>Develop law on climate change</i> |
| Activity 5.2 | <i>Develop decree or policy on the establishment of a fund or financial mechanism for climate change and disaster prevention and control</i> |

2.3.3 Identify Stakeholders and Determines Timelines

2.3.3.1 Identify Stakeholders for TAP Implementation

Since such subsidies are governmental tasks, the key stakeholders, in general, are the governmental organisations or financial institutes. However, there are other stakeholders, especially foreign financial institutes or donors that may assist the government to implement agricultural subsidies for climate and disaster resilience. The Table 54 below listed the primary stakeholders on or for subsidies. In addition, there are other stakeholders related to each activity implementation which identified in accordance with each activity in the TAP (Table 59).

TABLE 54 KEY STAKEHOLDERS IN THE AGRICULTURE SUBSIDIES

| No | Key organisations | Mandates/Tasks | Relevant activities |
|----|--|--|------------------------------------|
| 1 | Ministry of Agriculture and Forestry (MAF). In particular, Department of Livestock and Fishery (DLF) | MAF has responsibilities to inform, increase awareness and assist livestock keepers and businesses about livestock disease epidemics control and prevention including disease epidemic surveillance. | All activities |
| 2 | Ministry of Natural Resources and Environment (MoNRE): Department of Climate Change (DCC), Environmental Protection Fund (EPF) | Provides curriculum on livestock disease, disease epidemics control and prevention including disease epidemic surveillance. | All activities |
| 3 | Ministry of Labour and Social Welfare (MOLSW): Department of Disaster Recovery (DCC) | Provides curriculum on livestock disease, disease epidemics control and prevention including disease epidemic surveillance. | Activity 2.1-2.3; 3.2, 3.4 and 4.2 |
| 4 | National University of Laos, especially Faculty of Agriculture (FOA) and agriculture colleges | Provides curriculum on livestock disease, disease epidemics control and prevention including disease epidemic surveillance. | Activity 3.3 |
| 5 | Livestock keepers and entrepreneurs, and group | Have responsibilities to prevent and control livestock disease epidemics including cooperation to implement disease epidemic surveillance programme | Activity 1.1, 3.1 and 4.2 |
| 6 | Development partners, donors and INGOs: ADB, WB, GRDRR, GEF, Green Climate Fund-GCF, Least Developed Countries' Fund (LDCF) | Provides technical and financial support on livestock disease epidemics control and prevention including disease epidemic surveillance. | All activities |

2.3.3.2 Schedule Actions and Activities

The schedule of the actions and activities in Annex 5 was defined by TNA project team in consultation with DoA and DOFL in November 2017. Nature and scale of the activities, readiness including time, technical and financial capacity of the responsible organisations to perform the activities were considered during scheduling.

This TAP will be implemented for five years. It includes, the preparation phase, which will be implemented within 3 months following the TAP approval or between May to July 2018. The full implementation phase would be after that until December 2022.

2.3.4 Resources estimation

2.3.4.1 Capacity Building

The capacity building, especially knowledge and skill needs are a prerequisite for TAP implementation. The knowledge and skills to be strengthened are technical and project management. The technical knowledge and skill needs were identified in the BAEF. The project management skills needs were defined by TNA project team in consultation with DoA and DOFL in November 2017. So, all the knowledge and skills to be built could be in Table 55 below.

TABLE 55 CAPACITY NEEDS FOR AGRICULTURE SUBSIDIES

| Main categories | Specific elements and aspects of subsidy skills |
|---|--|
| Technical | <ul style="list-style-type: none"> - Inadequate skills to study and identify agricultural products, crops and livestock suitable to be subsidised and how or what principle, procedure, criteria and guidelines are needed for subsidising - Inadequate skills to research and develop effective mechanism and methods for raising awareness about subsidy |
| Financial and economic/access to finance and resources mobilisation | <ul style="list-style-type: none"> - Inadequate knowledge and skills assess (1) financial needs for subsidy, (2) feasibility (financial, economic and policy) including cost-benefit, (3) research and develop of effective subsidizing models or mechanism, and (4) impact or trade-off of subsidies - Inadequate skills to mobilise resources, especially development of financeable proposals, identification and analysis of financial or funding sources and feasibility and establish subsidy M&E system |
| Policy | Inadequate knowledge and skills to research and develop policy on agriculture subsidy (e.g., principle, procedure, criteria and guidelines for subsidizing) |
| Organisational | Inadequate skills to review, research and develop effective organisation structure and arrangement for effective management and operation of the subsidy mechanism |
| Project management | Project management including activity and its component planning, estimating cost and human resource “time on task” for each activity and its components, procurement, risk management and M&E |

2.3.4.2 Estimation of Costs for Actions and Activities

The costs of the actions and activities such as 1) the cost for dissemination and consultation including adjustment of the TAP before actual implementation, 2) the cost of each action and activity, and 3) the cost for contingency are estimated by TNA team, DoA and DoFL. The cost for dissemination and consultation meetings; based on the 3 meetings and 2 days for each meeting, current government daily allowance, a consultant fee, and a meeting including administrative costs, is expected to be US\$ 18,000. The cost of each activity implementation, considering allowance, a consultant fee, travel, meeting and other administrative costs is US\$ 23.47 million (Annex 5 and Table 56 and 59). The cost for contingency to address delay and variations, is estimated to be 10% of the total cost or US\$ 233,070. So, the total cost of the action plan implementation is approximately US\$ 25.84 million.

TABLE 56 ESTIMATION OF COSTS FOR ACTIONS AND ACTIVITIES

| No | Activities | Cost (US\$ Th.) |
|-----|---|-----------------|
| I | Cost for preparation of the TAP implementation | 18 |
| II | Cost for full implementation of actions in the TAP | 23,472 |
| 1 | Expand access to finance | 220 |
| 2 | Maintain or enhance the effectiveness of government response fund for subsidise, climate and disaster risk management | 165 |
| 3 | Increase organisational capacity and human resources | 300 |
| 4 | Improve information about climate and disaster loss and damage, best practices and guidelines on the subsidies | 122 |
| 5 | Improve information about climate and disaster loss and damage, best practices and guidelines on the subsidies | 165 |
| 6 | Pilot a subsidy mechanism to address climate and disaster risk management | 22,500 |
| III | Cost for contingency actions (10% of the action cost) | 2,347.2 |
| | Total | 25,837.2 |

2.3.5 Management Planning

2.3.5.1 Risk and Contingency Planning

As described in Table 8, there might be some risks that are associated with the plan and implementation of the activities. The risks on the estimated costs, scheduling and performance risks were assessed during the TAP planning. However, these risks could be addressed by executing following contingency.

TABLE 57 SPECIFIC RISKS OF ACTIONS AND CONTINGENCY PLANNING

| No | Activities | Risks | Contingency actions |
|----|--------------------------|--|---|
| 1 | Expand access to finance | 1. Not fully access to finance due to high interest cost and/or financially and economically not viable projects or business | Implement contingency measures for action 3 |

| No | Activities | Risks | Contingency actions |
|----|---|---|---|
| | | 2. Entrepreneurs including farmers have limited financial capacity to develop bankable projects or business plans | |
| 2 | Maintain or enhance the effectiveness of government response fund for subsidise, climate and disaster risk management | Responsible organisations may not be able to secure financial resources on time or adequately due to: <ol style="list-style-type: none"> 1. Public budget deficit, 2. Variable international financial pledge, 3. Limited capacity-know how of the organisations in charge | <ol style="list-style-type: none"> 1. Enhance capacity and commitment of the organisations in charge to mobilise and access to financial support 2. Improve cooperation and coordination among stakeholder and with development partners, donors and private sector |
| 3 | Increase organisational capacity and human resources | <ol style="list-style-type: none"> 1. Insufficient financial resources for capacity 2. Trainings are not relevant with the targeted people and capacity needs | <ol style="list-style-type: none"> 1. Implement contingency measures for action 1 and 2 2. Research and implement cost-effective including internal or self- capacity building 3. Improve coordination and synergy of capacity development activities among stakeholders, and between HR demand and supply side |
| 4 | Improve information about climate and disaster loss and damage, best practices and guidelines on the subsidies | <ol style="list-style-type: none"> 1. The responsible organisations may have neither access to nor sufficient financial resources to implementation of full capacity building programmes regarding capacity needs 2. Trainings are not provided to the right people | <ol style="list-style-type: none"> 1. Implement contingency measures for action 3 2. Research and implement cost-effective including internal or self-capacity building 3. Increase commitment to secure financial resources 4. Improve coordination and synergy of capacity development activities among stakeholders, and between HR demand and supply side 5. Improve HRD and capacity development plan, staff knowledge management |
| 5 | Improve information about climate and disaster loss and damage, best practices and guidelines on the subsidies | As the risk of the action 1 and 3 | Implement contingency measures for action 1 and 3 |
| 6 | Pilot a subsidy mechanism to address climate and disaster risk management | As the risk of the action 1, 3 and 4 | Implement contingency measures for action 1, 3 and 4 |

2.3.5.2 Success Criteria and Indicators for Monitoring of the Implementation

Success criteria and indicator for monitoring of the TAP implementation was identified by the TNA team, DoA and DoFL and summarised in the TAP (Table 58 and 59).

TABLE 58 SUCCESS CRITERIA AND INDICATORS FOR MONITORING OF THE IMPLEMENTATION

| No | Activities | Success criteria | Indicators for M&E |
|----|---|---|--|
| 1 | Expand access to finance | Financial resources are available and ease of access | No. of producers and enterprises access to finance are increased |
| 2 | Maintain or enhance the effectiveness of government response fund for subsidise, climate and disaster risk management | Sufficient public budget for development and operation of the subsidies | Public budget and financial resources for subsidies increased |
| 3 | Increase organisational capacity and human resources | Sufficient organisational capacity and human resources for development and management of the subsidies | Organisational capacity and human resources (HR) are improved |
| 4 | Improve information about climate and disaster loss and damage, best practices and guidelines on the subsidies | Sufficient information and best practice guidelines for financing and subsidizing climate and disaster risk and impacts | Research, information and best practice guidelines improved/ developed |
| 5 | Pilot a subsidy mechanism to address climate and disaster risk management | At least 2 to 3 subsidy programmes piloted and become reference projects or models for expansion of the subsidy mechanism to address climate and disaster risk and impact reduction | No. of subsidy programme piloted |

2.3.6 Summary Overview of the Action Plan for Agricultural Subsidy Mechanism

The summary TAP (Table 59) provides a brief overview of the actions and activities, funding sources, responsible organisation, timeframe, budget for the implementation, risks and C&I of the TAP implementation identified above. This TAP will be carried out five years by DOA, the primary stakeholders, in coordination with DCC and MOF to implement the TAP. The total cost to implement this TAP is approximately US\$ 25.84 million.

TABLE 59 SUMMARY OVERVIEW OF THE ACTION PLAN ON AGRICULTURE SUBSIDIES FOR CLIMATE AND DISASTER RESILIENCE

| Actions | Activities | Sources of funding | Responsible body | Time frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th .) |
|--------------|---|----------------------|------------------|------------|--|--|--|------------------|
| Action 1 | Expand access to finance | | | | | | | |
| Activity 1.1 | Strengthen cooperation between domestic and regional banks and financial institutes to access to finance for financing and subsidizing climate and disaster risk management | The government(Gov.) | MOF: BOL, B&FIs | Dec 22 | Delay of the implementation due to low return on investment of water supply projects | Financial institute cooperation strengthened, and lead to put in place financial resources and mechanism including loans and subsidies for climate resilient agriculture development is available and accessible by stakeholders | Number of business meetings organised, and cooperation agreements reached | 85 |
| Activity 1.2 | Increase financial capacity and readiness of the state financial institutes and entrepreneurs | Gov. | MIC: DSMEP, CCI | Dec 22 | Ineffective due to unclear responsibilities of organisation in charge and limited budget | Agriculture entrepreneurs strengthened and capable of establishing or access to fund for adaptation. At least for two agriculture resilient financial subsidy programmes implemented | No. of trainings held, and targeted organisations participated | 70 |
| Activity 1.3 | Organise financial access dialogue on agriculture subsidies | Gov. | MIC: DSMEP, CCI | Dec 22 | Ineffective due to limited resources and information | Financial access dialogue put in place and proved to be effective for promoting agriculture resilient financing or subsidies | No. of financial access dialogue on agriculture subsidies organised, and stakeholders attended | 65 |

| Actions | Activities | Sources of funding | Responsible body | Time frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th .) |
|--------------|--|-------------------------|------------------------|------------|--|---|---|------------------|
| Action 2 | Maintain or enhance the effectiveness of the government fund for subsidise and financing climate and disaster risks and impacts management | | | | | | | |
| Activity 2.1 | Assess financial subsidy needs and capacity of the public sector | Gov, WB, ADB, UNDP, FAO | MAF: DoA | Dec 22 | Delayed or not inclusive due to limited resources and information | Inclusive and practical land suitability map and land use plan in disaster risk areas | Financial subsidy and capacity needs assessment conducted | 90 |
| Activity 2.2 | Conduct feasibility, impact, trade-off and define appropriate subsidy mechanisms | Gov, WB, ADB, UNDP, FAO | MAF: DoA | Dec 22 | Delayed or not inclusive due to limited resources and information | Practical climate change adaptation and disaster risk management financial mechanism including subsidies put in place and proved to be useful | Studies on feasibility, impact, trade-off and define appropriate subsidy mechanisms conducted | 75 |
| Action 3 | Increase organisational capacity and human resources | | | | | | | |
| Activity 3.1 | Provide professional trainings and exchanges on subsidies on climate and disaster risk management | Gov, WB, ADB, UNDP, FAO | MoNRE: DCC MAF: DoA | Dec 22 | Delayed, insufficient or ineffective due to limited financial and human resources including experts on subsidies | Staff receive sufficient trainings and have sufficient knowledge and skills to develop and deploy financial mechanism including subsidies for enhancing climate change adaptation and disaster resilience | No. of trainings organised, and targeted organisations participated | 100 |
| Activity 3.2 | Improve human resources development | Gov, WB, ADB, UNDP, FAO | MoNRE: DCC MAF: DoA | Dec 22 | As 3.1 above | Responsible organisations have sufficient human resources including staff, | HRD and management system improved | 60 |

| Actions | Activities | Sources of funding | Responsible body | Time frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th .) |
|-----------------|--|-------------------------|------------------|------------|---|--|---|------------------|
| | system of public organisations responsible for the subsidies | | | | | knowledge and skills to promote and manage agriculture resilient financing and subsidies | | |
| Activity 3.3 | Improve education and research on climate and disaster risk management subsidies | Gov, WB, ADB, UNDP, FAO | NUOL: FOA | Dec 22 | As 3.1 above | Curriculum and research on agriculture resilient financing and subsidy put in place and promising for HRD | No. of teachers, materials and curriculum and research improved | 70 |
| Activity 3.4 | Promote dialogue, network, think-tank and information exchanges on financial mechanism for disaster risk management | Gov, WB, ADB, UNDP, FAO | MAF: DoA | Dec 22 | Could not mobilise resources and development of the think-tank, networking and exchange | Think-tank, networking and exchange platform established and proved to be effective | Number of think-tank, networking and exchanges organised | 70 |
| Action 4 | Improve information about climate and disaster loss and damage, best practices and guidelines on the subsidies | | | | | | | |
| Activity 4.1 | Undertake R&D and disseminate information about climate and disaster loss and damage, best practices and guidelines on the subsidies | Gov, WB, ADB, UNDP, FAO | MAF: NAFRI | Dec 22 | Delayed or not inclusive due to the limited resources and information | Inclusive and practical land suitability map and land use plan in disaster risk areas are in place and useful for agriculture resilient financing and subsidy mechanism planning and development | No. of R&D and disseminate information conducted | 92 |

| Actions | Activities | Sources of funding | Responsible body | Time frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th .) |
|--------------|--|-------------------------------------|------------------|------------|--|---|---|------------------|
| Action 5 | Develop policy or regulation on disaster risk management financing | | | | | | | |
| Activity 5.1 | Develop policy and regulation for subsidizing for climate change and disaster loss and damage | Gov, WB, ADB, UNDP, FAO | MONRE: DCC, DEP | Dec 22 | Delayed, not inclusive or practical due to limited resources, knowledge and information including best practices about agriculture resilient financing and subsidies | Inclusive and practical policies on the subsidies put in place and proved to be effective | Policy and regulation for subsidizing for climate change and disaster loss and damage enacted | 30 |
| Action 6 | Improve information about climate and disaster loss and damage, best practices and guidelines on the subsidies | | | | | | | |
| Activity 6.1 | Pilot a subsidy mechanism to address climate and disaster risk management | Gov, WB, ADB, UNDP, FAO, WFP, GFDRR | MAF: DoA | Dec 22 | Insufficient resources and best practices | At least 2 to 3 agriculture resilient financing or subsidy programmes piloted, and demonstrated to be good models for expansion | No. of subsidy programme piloted | 22,500 |
| | Total | | | | | | | 23,307 |

2.3 Action Plan for Crop Diversification

2.3.1 Crop Diversification

Crop diversification refers to development and introduction of crops varieties and production systems in a farming system so that it enhances, apart from value-added agriculture system and conservation of plant diversity, resilience to climate variability, hazards including pest and disease outbreak.

The majority of crop diversification is in the form of integrated and rotation farming systems, agroforestry, home garden. Currently introduction of new crop varieties such as flood and drought resistant rice varieties are also practised. However, in overall, crop diversification is not effectively or fully developed and deployed for climate change adaptation.

2.3.2 Development goals

Crop diversification, especially introducing varieties of crops and integrated farming systems, is applied appropriately to increase net benefits of at least 20% as value-added to existing and newly developed farming systems.

2.3.3 Selection of Actions and Activities for Crop Diversification Development and Deployment

The actions to be included in the TAP were identified based on the Barriers Analysis and Enabling Framework (BAEF), especially barriers and measures to overcome barriers (section 2.3.3.1, Table 60). The selection of action and activities are described in section 2.3.3.2 and 2.3.3.3, respectively.

2.3.3.1 Barriers and Measures to Overcome Barriers

There are 6 critical barriers, which have been perceived to be the bottleneck point for development and deployment of crop diversification. Three of them are financial and economic, and three are non-financial barriers, and to overcome the barriers, six measures were identified accordingly (Table 60).

TABLE 60 BARRIERS AND MEASURES TO DEVELOP AND DEPLOY CROP DIVERSIFICATION

| Categories | Barriers | Measures to overcome barriers |
|------------------------|---|--|
| Financial and economic | 1. Limited financial resources for promotion and management of crop diversification affairs | 1. Improve financial resources for promotion and extension a. Maintain or increase the budget for the extension b. Enhance resources mobilisations, cooperation and access to external financial supports c. Promote investment of the private sector d. Improve the public budgeting including international aids effectiveness |

| Categories | Barriers | Measures to overcome barriers |
|---|--|--|
| | | e. R&D and promote cost-effective technologies and practices |
| | 2. Limited access to finance | 2. Expand access to finance |
| Institutional capacity and human skills | 3. Inadequate technical including climate change adaptation, financial and economic knowledge and skills on crop diversification (adaptive crop varieties and systems) | 3. Improve facilities for research and technical including adaptation, financial and economic knowledge and skills on crop diversification (adaptive crop varieties and systems) |
| Information and awareness | 4. Inadequate information on optimal, reference projects and best practices on crop diversification for climate change adaptation | 4. R&D information on optimal crop diversification for climate change adaptation and disaster resilience including cost-effective and best practices |
| | 5. Majority of the stakeholders have limited awareness about crop diversification and climate change adaptation | 5. Increase awareness of the stakeholders on crop diversification |
| Legal framework | 6. Insufficient policies to define clear definition, principles, guidelines, promotion and responsible organisations on crop diversification | 6. Improve policies, especially clarifying definition, principles, guidelines, promotion and responsible organisations on crop diversification |
| Technical | 7. Inadequate reference projects and best practices | 7. Develop reference projects and best practices |

2.3.3.2 Selection of Actions

As mentioned, the actions for the TAP was carried out following BAEF. Actions to include in the TAP derived from the measures, which were assessed and prioritised by scoring against five evaluation criteria: relevance, effectiveness, efficiency, impact and sustainability (Annex 3) by stakeholders (See Annex 1). To be focus, effective and efficient; the stakeholders expected to select top three measures to include in the TAP. The results of the assessment and scoring however showed that all the measure had about the same scores or equally important. Although the measure 1,2,3 and 7 were classified as the top priority, but without the measure 4 and other measures, CDS would be hardly developed in effective and sustainably ways. Hence, all the measures were chosen for the TAP (Table 60). However, sub-measure 1c is combined with the measure 2; the 1d is being addressed by MPI and MOF and not included, and the 1e is addressed under the measure 4. Finally, only six measures were selected as actions for the TAP (Table 61).

TABLE 61 SELECTED MEASURES FOR THE ACTION PLAN ON CROP DIVERSIFICATION

| Categories | Measures to overcomes barriers | Scores | Measures selected as actions for TAP |
|------------------------|---|--------|--------------------------------------|
| Financial and economic | 1. Improve financial resources for promotion and extension: | 18 | √ |
| | a. Maintain or increase the budget for the extension | | |

| | | | |
|---|---|----|---|
| | <ul style="list-style-type: none"> b. Enhance resources mobilisations, cooperation and access to external financial supports c. Promote investment of the private sector d. Improve the public budgeting effectiveness e. R&D and promote cost-effective technologies and practices | | |
| | 2. Expand access to finance | 18 | √ |
| Institutional capacity and human skills | 3. Improve research facilities and knowledge and skills of the responsible organisations or key stakeholders on crop diversification (technical, adaptation, business including financial-economic analysis, value chain, extension techniques, farmers organisation and leadership, see also Table 63) | 18 | √ |
| Information and awareness | 4. R&D information on optimal crop diversification for climate change adaptation and disaster resilience including cost-effective and best practices | 17 | √ |
| | 5. Increase awareness of the stakeholders on crop diversification | 16 | √ |
| Legal framework | 6. Improve policies, especially clarifying definition, principles, guidelines, promotion and responsible organisations on crop diversification | 16 | √ |
| Technical | 7. Develop reference projects and best practices | 18 | √ |
| <i>Notes: √ means measures were selected to include in the action plan. X measures were not selected or merged into other measures.</i> | | | |

2.4.2.2 Selection of Activities to Implement the Actions

Identifying activities for the actions is necessary since actions are still broad and has implications on effectiveness and efficiency of the actions. The activities in Table 62 below were identified through a stakeholder consultation process. They were firstly identified by the TNA project team, then were consulted and agreed with the stakeholders, particularly DoA in the focus group meeting in November 2017, considering effectiveness, efficiency, relevance and impacts of the activities to achieve the actions.

TABLE 62 SELECTED ACTIVITIES FOR THE ACTION PLAN ON CROP DIVERSIFICATION

| | |
|--------------|--|
| Action 1 | Increase public investment and enhance resource mobilisation to invest in crop diversification promotion and development |
| Activity 1.1 | <i>Develop strategy and action plan on crop diversification including financial needs assessment</i> |
| Activity 1.2 | <i>Conduct financial needs and funding sources assessment</i> |
| Activity 1.3 | <i>Develop resource mobilisation plan</i> |
| Activity 1.4 | <i>Develop and submit project proposals for funding the crop diversification</i> |
| Activity 1.5 | <i>Develop funding source/donor directory</i> |
| Activity 1.6 | <i>Improve public and foreign financial aids management system including M&E</i> |
| Action 2 | Expand access to finance |

| | |
|--------------|--|
| Activity 2.1 | <i>Study, identify and enhance cooperation between domestic and regional financial institutes (to expand financial markets including lowering interest rate and simply procedures for borrowing)</i> |
| Activity 2.2 | <i>Undertake R&D on the agriculture development fund</i> |
| Activity 2.3 | <i>Increase financial capacity and readiness of entrepreneurs to access/use funds</i> |
| Activity 2.4 | <i>Organise crop diversification forum including financial access dialogues</i> |
| Action 3 | <i>Increase organisational capacity and human resources</i> |
| Activity 3.1 | <i>Improve human resource development system including capacity development plan, staff knowledge, building learning culture and commitment of relevant organisations</i> |
| Activity 3.2 | <i>Build capacity of national, local authorities, entrepreneurs and communities on CDS</i> |
| Activity 3.3 | <i>Increase technical extension staff-mobile team</i> |
| Activity 3.4 | <i>Promote network, think-tank and civil organisation and information exchanges</i> |
| Activity 3.5 | <i>Improve crop diversification study in education and research institutes</i> |
| Action 4 | <i>Improve research facilities, information and best practice guidelines</i> |
| Activity 4.1 | <i>Improve crop diversification research facilities</i> |
| Activity 4.2 | <i>Re-assess the resilience of the capacity of existing crop production systems, develop land suitability map and land use plan in disaster risk and other areas, and identify an optimal adaptive crop varieties and systems for adaptation and commercial production including financial analysis of each system</i> |
| Activity 4.3 | <i>Develop and disseminate (technical and financial) best practice guidelines and fact sheets of the optimal crop diversification systems to enhance adaptation capacity, and address productivity reduction due to 1) erosion and landslide, 2) drought, 3) floods or inundation, 4) extreme climate, 5) soil degradation or nutrient deficiency and 6) pest and insect epidemics</i> |
| Action 5 | <i>Improve policies, especially clarifying definition, principles, guidelines, promotion and responsible organisations on crop diversification</i> |
| Activity 5.1 | <i>Develop an overall policy on environmentally friendly including climate change adaptation and disaster resilient technology</i> |
| Activity 5.2 | <i>Develop a specific policy or guidelines on the development, deployment and diffusion of the environmentally friendly and climate change adaptation technology in the agriculture sector</i> |
| Action 6 | <i>Pilot an optimal crop diversification system for adaptation and commercial production</i> |
| Activity 6.1 | <i>Pilot new or improved crop varieties and rotary or integrated in agriculture production systems to enhance adaptation capacity, and address productivity reduction due to the six problems</i> |

2.4.3 Identify Stakeholders and Determine Timelines

2.4.3.1 Identify Stakeholders for TAP Implementation

The stakeholders for development and management crop diversification could be identified based on mandates relevant organisations and the identified actions and activities on crop diversification. In addition, other stakeholders were also added based on the identified activities and through a stakeholder consultation meeting in November 2017.

Table 63 below provides list of the primary stakeholders with their mandates that match or relevant with the identified actions and activities on crop diversification. Furthermore, list of the primary stakeholders for each activity were also outlined in the TAP summary (Table 64).

TABLE 63 KEY STAKEHOLDERS IN THE CROP DIVERSIFICATION DEVELOPMENT AND MANAGEMENT

| No | Key organisations | Overall mandates/Tasks | Relevant activities |
|----|--|---|--|
| 1 | Ministry of Agriculture and Forestry (MAF). In particular, Department of Agriculture (DoA), Rural Development (DRD), National Agriculture and Forestry Research Institute (NAFRI) | MAF has the responsibilities on agriculture development and management through the country. DoA represents MAP to perform the responsibilities. DRD promotes livelihood including agriculture production, business and farmer organisations. NAFRI focuses on research and provision of information and new methods for better and sustainable production and agribusiness. | All activities |
| 2 | Ministry of Natural Resources and Environment (MoNRE): Department of Climate Change (DCC), Environmental Promotion (DOP), Environmental Protection Fund (EPF) and Natural Resources and Environment Research Institute (NRERI) | Promote climate change and disaster resilient technologies and practices in agriculture sector including crop diversification | Activity 1.2-1.6; 3.1-3.2; 4.2-4.3; 5.1-5.2; 6.1 |
| 3 | Ministry of Industry and Commerce (MIC), particularly, Department of Small-Medium Enterprise Promotion (DSMEP), Chamber of Commerce and Industry (CCI) | Promote business development including access to finance | Activity 1.6, 2.1, 2.3 |
| 4 | Ministry of Planning and Investment (MIP), particularly, Department of Investment Promotion (DIP) and Planning (DOP) | Promote large scale investment associated with land concession and facilitate the public investment including budget allocation for all sectors including the agriculture sector | Activity 1.6, 2.1, 2.3 |
| 5 | National University of Laos, especially Faculty of Agriculture (FoA) | Provides education/curriculum on crop production systems, techniques and agribusiness | Activity 3.5 and 4.3 |
| 6 | Agribusiness, entrepreneurs and farmers or farmer groups | Are directly implement agriculture production and agribusiness | Activity 2.1, 2.3; 3.1, 3.2; 6.1 |
| 7 | Development partners and NGOs | Provides technical and financial support on production and agribusiness | All activities |

2.4.3.2 Schedule Actions and Activities

The schedule of the actions and activities was defined by TNA project team in consultation with the key stakeholders in November 2017. Nature and scale of the activities, readiness including time, technical and financial capacity of the responsible organisations to perform the activities were considered when scheduling.

The timeframe of the action plan implementation is five years. The timeframe is divided into two phases. The preparation phase is 3 months, which shall be commenced following the approval and during dissemination of TAP to stakeholders. This means this phase would be between May to July 2018. The implementation phase would start from August 2018 until December 2022.

2.4.4 Resources estimation

2.4.4.1 Capacity Building

The key stakeholders still have knowledge and skills gaps which were identified in the BAEF. To implement the TAP effectively, capacity of both primary and secondary stakeholders as outlined in Table 64 below shall be strengthened.

TABLE 64 CAPACITY NEEDS FOR CROP DIVERSIFICATION

| Categories | Elements of knowledge and skills |
|------------------------------------|---|
| Financial and economic | Inadequate knowledge and skills to assess (1) feasibility including cost-benefit and return on investment, and (2) financial needs for adaptation or enhancing resilience of each crop diversification systems |
| Technical | Inadequate knowledge and skills to 1) assess vulnerability and adaptive capacity or resilience of existing crop diversification systems, 2) R&D of effective or best practices crop diversification systems for adaptation, 3) agro-ecological and hazard mapping, 4) develop curriculum or training module on crop diversification for adaptation, and 5) biotechnological skills for improvement of climate resilience crop variety |
| Policy | Inadequate knowledge and skills to research and develop policy on the promotion of environmentally friendly and climate change adaptation technology including crop diversification in agriculture sector and activities |
| Resources mobilisation | Inadequate skills to develop: <ul style="list-style-type: none"> - Bankable proposal - Identification and analysis of financial or funding sources and feasibility - Establish financial aid M&E system |
| Extension/ promotion and marketing | Inadequate skills to research and develop mechanism and methods for effective awareness raising on the importance and advantage of environmentally friendly and climate change adaptation technology including crop diversification |
| Project management | Project management including activity and its component planning, estimating-cost and human resource “time on task” for each activity and its components, procurement, risk management and M&E |

2.4.4.2 Estimate Costs for Actions and Activities

The costs of the actions and activities include 1) the cost for dissemination and consultation including adjustment of the TAP before actual implementation, 2) the cost of each action and activity, and 3) the cost for contingency were estimated by the TNA and DoA. The cost for dissemination and consultation meetings; based on the 3 meetings and 2 days for each meeting, current government

daily allowance, consultant fee, and a meeting including administrative costs, is expected to be US\$ 18,000. The cost of each activity implementation, considering allowance, a consultant fee, travel, meeting and other administrative costs is US\$ 10.43 million (Annex 5 and Table 65). The cost for contingency to address delay and variations, is estimated to be 10% of the total cost or US\$ 104,320. So, the total cost of the action plan implementation would be US\$ 11.49 million.

TABLE 65 ESTIMATE COSTS FOR ACTIONS AND ACTIVITIES

| No | Actions | Cost (US\$ Th.) |
|-----|---|-----------------|
| I | Cost for preparation of TAP implementation | 18 |
| II | Cost for full implementation of actions in the TAP | 10,432 |
| 1 | Increase public and enhance resource mobilisation to invest in the CDS | 162 |
| 2 | Expand access to finance | 230 |
| 3 | Increase organisational capacity and human resources (HR) | 475 |
| 4 | Research and develop information and best practice guidelines | 1,130 |
| 5 | Improve policies on crop diversification | 35 |
| 6 | Pilot an optimal crop diversification system for adaptation and commercialisation | 8,400 |
| III | Cost for contingency actions (10% of the full action cost) | 1,043.2 |
| | Total | 11,493.2 |

2.4.5 Management Planning

2.4.5.1 Risk and Contingency Planning

There might be some risks that associated with the planned and implementation of the activities as described in Table 9. Apart from the overall risks on the estimated costs, scheduling and performance risks, specific action may have specific risks. Apart from the measure to cope with the overall risks outlined in Table 9, specific measure for specific risks of each action could also formulated as presented in the following Table.

TABLE 66 SPECIFIC RISKS OF ACTIONS AND CONTINGENCY PLANNING

| No | Actions | Risks | Contingency actions |
|----|---|---|--|
| 1 | Increase public and enhance resource mobilisation to invest in the crop diversification | Responsible organisations may not be able to secure financial resources on time or adequately due to: <ol style="list-style-type: none"> 1. Public budget deficit, 2. Variable international financial pledge, 3. Limited capacity-know-how of the organisations in charge | <ol style="list-style-type: none"> 1. Enhance capacity and commitment of the organisations in charge to mobilise including develop financeable and submit the project proposals on time 2. Improve cooperation and coordination with stakeholders and with development partners and donors |
| 2 | Expand access to finance | <ol style="list-style-type: none"> 1. Limited access to finance due to high cost and/or financially and economically not viable projects or business 2. Entrepreneurs including | Implement the contingency measures of the Action 3 |

| No | Actions | Risks | Contingency actions |
|----|---|---|---|
| | | farmers have limited financial capacity to develop bankable projects or business plans | |
| 3 | Increase organisational capacity and human resources (HR) | <ol style="list-style-type: none"> 1. The responsible organisations may have neither access to nor sufficient financial resources to implementation of full capacity building programmes regarding capacity needs 2. Trainings are not provided to the right people | <ol style="list-style-type: none"> 1. Implement contingency measures for action 1 2. Research and implement cost-effective including internal or self-capacity building 3. Increase commitment to secure financial resources 4. Improve coordination and synergy of capacity development activities among stakeholders, and between HR demand and supply side 5. Improve HRD and capacity development plan, staff knowledge management |
| 4 | Research and develop information and best practice guidelines | As the risk of the action 1 and 3 | Implement contingency measures for action 1 and 3 |
| 5 | Improve policies on crop diversification | As the risk of the action 1, 3 and 4 | Implement contingency measures for action 1, 3 and 4 |
| 6 | Pilot an optimal crop diversification system for adaptation and commercial production | As the risk of the action 1, 3 and 4 | Implement contingency measures for action 1, 3 and 4 |

2.4.5.2 Success Criteria and Indicators for Monitoring of the Implementation

Success criteria and indicator for monitoring of the TAP implementation was identified and include in the summary of the TAP (Table 67). The criteria and indicators were listed by the TNA project team and DoA in November 2017.

TABLE 67 SUCCESS CRITERIA AND INDICATORS FOR MONITORING OF THE IMPLEMENTATION

| No | Actions | Success criteria | Indicators for M&E |
|----|---|---|--|
| 1 | Increase public and enhance resource mobilisation to invest in the crop diversification | Sufficient public budget for promotion and management of crop diversification | Public budget and financial supports on crop diversification increased |
| 2 | Expand access to finance | Financial resources are available and easier for access | No. of producers and enterprises access to finance are increased |
| 3 | Increase organisational capacity and human resources (HR) | Sufficient organisational capacity and human resources for crop diversification extension | Organisational capacity and human resources (HR) are improved |
| 4 | Research and develop information and best practice guidelines | Sufficient information and best practice guidelines for crop diversification extension | Research, information and best practice guidelines improved/ developed |
| 5 | Improve policies on crop | Practical policies on crop | Policies on crop diversification |

| No | Actions | Success criteria | Indicators for M&E |
|----|---|--|---------------------------------------|
| | diversification | diversification are in place and enforced | are improved |
| 6 | Pilot an optimal crop diversification system for adaptation and commercial production | Practical optimal crop diversification systems are in place as reference or models for enhancing disaster resilience and climate change adaptation in the agriculture sector | No. of crop diversity systems piloted |

2.4.3 Summary Overview of the Action Plan for Crop Diversification

The summary TAP (Table 68), following previous sections, sums up actions and activities, funding sources, responsible organisation, timeframe, budget for the implementation, risks and C&I to improve and deploy crop diversification in next five years as the first stage for climate change adaptation and disaster resilience. This TAP will be implemented by DOA, the primary stakeholders, in coordination with DCC, with the total cost of around US\$ 11.49 million.

TABLE 68 SUMMARY OVERVIEW OF THE ACTION PLAN ON CROP DIVERSIFICATION

| Action | Activities | Source of funding | Responsible body-Focal Point | Time frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|---|---|---------------------------------------|----------------|---|---|---|-----------------|
| Action 1 | Increase public investment and enhance resource mobilisation to invest in crop diversification promotion and development | | | | | | | |
| Activity 1.1 | Develop strategy and action/ business plan for each crop diversification system including financial and economic assessment | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD | MAF: DoA | Jun 18-Dec 18 | Insufficient information about hazards risks, vulnerability and resilience of crop production systems inclusions varieties, or insufficient financial and human resources to improve information and develop the strategy | A comprehensive and practical strategy and action plan for each crop diversification system is put in place and proved to be useful for increase effective and sustainable crop diversification development including technical and financial support | Strategy and action/business plan for each crop diversification system including financial needs assessment developed and implemented | 12 |
| Activity 1.2 | Conduct financial assessment and identify funding sources | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD | MAF: DoA, NAFRI MoNRE: DCC and EPF | Jun 18-Dec 18 | Responsible organisation's staff have neither sufficient skills, nor budget for research and information improvement | Clear and comprehensive information about financial needs, funding sources and feasibility are available and prove to be useful for planning on resources mobilisation and access to financial support | Financial assessment conducted, and funding sources identified | 10 |
| Activity 1.3 | Develop resource mobilisation plan | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD | MAF: DoA, NAFRI MoNRE: DCC and EPF | Sep 18- Jan 19 | Insufficient information about funding sources, and unclear responsibility on the resources mobilisation among organisations | Comprehensive resource mobilisation or financial access plans are put in place and proved to be useful for access to technical and financial support including cooperation | Resource mobilisation plan developed and implemented | 9 |
| Activity 1.4 | Develop and submit project proposals for | Gov, UNDP, ADB, WB, JICA, | MAF: DoA, NAFRI | Oct 18- Dec 22 | Insufficient human resources and | At least 2 project proposals accepted and funded | Number of proposal | 105 |

| Action | Activities | Source of funding | Responsible body-Focal Point | Time frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|-----------------|---|---|------------------------------|---------------|---|--|--|-----------------|
| | funding the crop diversification | AusAID, FAO, IFAD | | | information to develop good proposals | projects within 5 years (2018-2022) | developed, submitted and financial supports received | |
| Activity 1.5 | Develop funding source/donor directory | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD | MAF: DoA, NAFRI | Oct 18-Mar 19 | Inaccessible to detailed financial or donor aids information | A clear and comprehensive information about donors/funding sources including opportunities are available and useful for planning for cooperation and access to technical and financial support | Donors/funding sources directory developed and updated | 6 |
| Activity 1.6 | Improve public and foreign financial aids data management system including M&E and feedback mechanism | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD | MPI: DOP, DM&E | Oct 18-Mar 19 | 1). Ineffective one-door service including coordination and information sharing. 2) Difficult to define financial flow at the sector/subsector or technology level | Complete, effective and transparent financial aids data management system is put in place and prove to be useful for tracking financial flow, M&E and improvement of supports and budget disbursement rate | Financial aids data management system improved. External and internal financial aids M&E and feedback mechanism including roundtable meeting organised | 20 |
| Action 2 | Expand access to finance | | | | | | | |
| Activity 2.1 | Study, identify and enhance cooperation between domestic and regional financial | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD | MOF: BOL, B&FIs | Oct 18-Jun 19 | Delayed due to 1) Limited capacity-know how to facilitate to access to | Favourable loans are available and accessible for agribusiness including crop diversification and climate | No. of business trips and meetings held. No. of financial | 60 |

| Action | Activities | Source of funding | Responsible body-Focal Point | Time frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|--|---|------------------------------|---------------|---|---|--|-----------------|
| | institutes (to expand domestic financial markets and increase favourable loans and access of agribusiness) | | | | finance of the governmental organisations in charge and cooperation between public and private sector including financial institutes. 2) Low return on investment and high risk of agribusiness | change adaptation | cooperation agreements reached, and access to finance and loans received increased | |
| Activity 2.2 | Research and develop the agriculture development fund including decree on the agriculture fund | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD | MAF: DoA | Aug 18-Mar 19 | Ineffective due to unclear responsibilities of organisation in charge, and limited experiences and budget | Agriculture development fund, and available budget put in place and proved to be effective in promotion resilience of agriculture production and businesses | Agriculture development fund including decree on the agriculture fund developed and operated | 15 |
| Activity 2.3 | Increase financial capacity and readiness and of entrepreneurs through trainings and exchanges | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD | MIC: DSMEP, CCI | Jun 18-Dec 22 | Delayed due to limited resources and information | Entrepreneurs are strengthened and capable to access to finance. At least 2 crop diversification projects/business plans are financed | No. of trainings and exchanges held, and no. of participants attended | 90 |
| Activity 2.4 | Organise crop diversification forum including financial access dialogues | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD | MAF: DoA | Sep 18-Dec 22 | Limited resources for research and information, and limited participation of the important policy makers and private sector/financial | The forum on crop diversification is proved to be useful for fostering crop diversification research, development, deployment and diffusion | No. of forum organised, and organisations attended | 65 |

| Action | Activities | Source of funding | Responsible body-Focal Point | Time frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|-----------------|--|---|---------------------------------|---------------|--|---|--|-----------------|
| | | | | | institutes | | | |
| Action 3 | Increase organisational capacity and human resources (HR) | | | | | | | |
| Activity 3.1 | Improve HR development system including HR and capacity development plan, staff knowledge management, self-learning mechanism of relevant organisations (e.g., MAF, MIC/CCI) | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD | MAF: DoA, NAFRI MIC: CCI, DSMEP | Jun 18-Jun 19 | 1). Changes of organisational structure and staff movement. 2) Mismatched HR supply and demand side or ineffective coordination between educational institutes and MAF etc. 3) Limited organisational and staff self-learning and commitment. | Responsible organisations have capacity to promote and deploy crop diversification for increase agricultural production and business including resilience | The HRD and management system improved | 70 |
| Activity 3.2 | Building capacity of national, local authorities, entrepreneurs and communities on crop diversification through trainings and exchanges | Gov, UNDP, ADB, WB, JICA, SDC, AusAID, FAO, IFAD, INGOs: HELVETAS, SNV, Oxfam | MAF: DoA /NAFRI MIC: CCI, DSMEP | Jun 18-Dec 22 | 1). Limited financial and resource person to facilitate capacity building and following up. 2) HRD and capacity building plan is not yet improved or in place, leading to delay or mismatch between training and capacity needs. 3) Limited organisational and staff self-capacity building. | Staff receive sufficient trainings and have sufficient knowledge and skills to promote and deploy crop diversification for increase agricultural production and business including resilience to changing climate and hazards | No. of trainings and capacity building activities and staff participated | 135 |
| Activity 3.3 | Increase technical | Gov, UNDP, | MAF: DoA | Jan 19- | Insufficient resources | Field extension staff and | Number of | 120 |

| Action | Activities | Source of funding | Responsible body-Focal Point | Time frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|-----------------|--|--|---------------------------------|---------------|--|--|--|-----------------|
| | capacity of field staff and mobile team | ADB, WB, JICA, AusAID, FAO, IFAD | /NAFRI MIC: CCI, DSMEP | Dec 21 | and incentives to mobilise and sustain field staff, mobile team and activities | mobile team received sufficient trainings and be able to support entrepreneurs and farmers to deploy and expand crop diversification for climate change adaptation | technical capacity of field staff and mobile team established, and crop diversification practices expanded | |
| Activity 3.4 | Promote network, think-tank and civil organisation and information exchanges | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD | MAF: DoA, NAFRI MIC: CCI, DSMEP | Oct 18-Dec 22 | Insufficient resources and effective mechanism/model to promote development and sustain the think-tank, networking and exchanges | Think-tank, networking and exchange platform are put in place and proved to be useful for boosting crop diversification R&D, deployment and expansion | No. of think-tank, networking and exchanges organised and active | 60 |
| Activity 3.5 | Improve crop diversification study in education and research institutes | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD | MAF: DoA, NAFRI MIC: CCI, DSMEP | Nov 18-Dec 19 | Insufficient resources including human, and information to develop practical and comprehensive curriculum and research | More practical crop diversification curriculum including educational materials are put in place and promising for both short and long-term crop deployment and diffusion for climate change adaptation | No. of teachers, educational materials and curriculum developed, and research conducted | 90 |
| Action 4 | Research and develop information and best practice guidelines | | | | | | | |
| Activity 4.1 | Improve crop diversification research facilities | Gov, UNDP, ADB, WB, JICA, SDC, AusAID, FAO, IFAD | MAF: NAFRI | Oct 18-Dec 19 | Delayed or not inclusive due to limited resources and information | Crop diversification research facilities are put in place and useful for R&D of crop for climate change adaptation | Crop diversification research facilities improved | 520 |

| Action | Activities | Source of funding | Responsible body-Focal Point | Time frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|---|--|--|---------------|--|--|--|-----------------|
| Activity 4.2 | Re-assess the resilience of the capacity of existing crop production systems, develop land suitability map and land use plan in disaster risk areas, and identify an optimal adaptative crop varieties and systems for adaptation and commercial production including financial analysis of each system | Gov, UNDP, ADB, WB, SDC, AusAID, FAO, IFAD | MAF: DoA /NAFRI MoNRE: DCC, NRERI NUOL: FoA, FoF | Oct 18-Dec 19 | As 4.1 above | Optimal crop diversification systems are available for deployment to enhance crop production to be more resilient to changing climate | Assessments and feasibility studies carried out, land suitability map and land use plan in disaster risk areas plans developed, the optimal CDS for adaptation identified/ developed | 110 |
| Activity 4.3 | R&D best practices on the optimal crop diversification systems to address productivity reduction due to 1) erosion and landslide, 2) drought and water use deficiency, 3) floods, 4) extreme climate, 5) soil degradation or nutrient deficiency, 6) pest and insect epidemics | Gov, UNDP, ADB, WB, AusAID, FAO, IFAD | MAF: DoA /NAFRI | Sep 18-Dec 22 | As 4.1. above | Optimal and best practice guidelines on crop diversification systems are put in place and deployed for coping with the 6 problems | The optimal crop diversification systems and best practice guidelines are defined and demonstrated | 500 |
| Action 5 | Improve policies, especially clarifying definition, principles, guidelines, promotion and responsible organisations on crop diversification | | | | | | | |
| Activity 5.1 | Develop an overall policy on environmentally friendly including climate change adaptation and disaster resilient | Gov, UNDP, ADB, WB, AusAID, FAO | MoNRE: DEP MAF: DoA | Oct 18-Jun 19 | Limited resources, information and skills on the policies about environmentally friendly and climate change adaptation | Inclusive and practical policies on the environmentally friendly including technology for climate change adaptation are put in place and | Research, meetings, reports and polices developed | 20 |

| Action | Activities | Source of funding | Responsible body-Focal Point | Time frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|--|---------------------------------------|------------------------------|---------------|--|---|--|-----------------|
| | technology | | | | technology | proved to be useful for crop diversification development, promotion and management | | |
| Activity 5.2 | Develop a specific policy or guidelines on the development, deployment and diffusion of the environmentally friendly and adaptation technology in the agriculture sector | Gov, UNDP, ADB, WB, AusAID, FAO | MAF: DoA | Dec 18-Dec 19 | As 5.1 above | Inclusive and practical guidelines on the environmentally friendly including climate change adaptation technology are put in place and proved to be useful for crop diversification development, promotion and management | Research conducted, and guidelines developed | 15 |
| Action 6 | Pilot an optimal crop diversification system for adaptation and commercial production | | | | | | | |
| Activity 6.1 | Pilot crops varieties and rotary or integrated agriculture production systems to enhance adaptation capacity as well as coping with 6 problems mentioned in activity 4.3 | Gov, UNDP, ADB, WB, AusAID, FAO, IFAD | MAF: DoA, NAFRI | Oct 18-Dec 22 | Delayed due to insufficient resources and best practices | Piloted crop diversification systems proved to be good models promising and helpful to promote climate resilient agricultural production and businesses | No. of crop diversification systems piloted | 8,400 |
| | Total | | | | | | | 10,432 |

2.5 Action Plan for Climate Resilient Rural Infrastructure

2.5.1 Climate Resilient Rural Infrastructure

Climate resilient rural infrastructure (CRRI) to enhance climate adaptation and disaster resilience in the agricultural sector, in this context, means any rural infrastructure and facilities such as irrigations, reservoirs and ponds, erosion and landslide structure, multipurpose warehouse, greenhouses, logistics including roads and bridge, market places that are resilient to disaster themselves and enhance climate adaptation and disaster in the agricultural sector and related with agribusiness value chain. It means those infrastructures at least meet the engineering and construction standard, EIA requirements, mainstream and design for climate change adaptation and disaster resilient technologies and practices in the developments.

2.5.2 Development goals

The Development goals or development target of the climate resilient rural infrastructure vary from one another. Following are targets for developing climate resilient irrigation, warehouse and road. The resilient water supply systems are discussed in the Chapter 1.

Irrigations: By 2020, most of the existing and newly proposed irrigations, to extent it is possible, are re-assessed and adopted the climate resilient technologies and practices. Some of them will be relocated to avoid loss and damage from floods and landslide.

Multipurpose warehouse: Where (1) warehouse for storage of seeds, storage and drying crops for export; (2) disaster including pests, insects outbreak warning systems; (3) training and demonstration structure and facilities are adequately established in 9 provinces and 51 districts in the irrigable production areas by 2025, and other areas by 2030. Currently, none of such structure and facilities exists.

Rural roads: Climate and disaster resilient roads (quality paved road with adequate climate resilient technology support to prevent erosion and landslide) to facilitate timely agriculture commodity transport and trade, evacuation and access to assist in the event of disasters will be developed and connected for 50% of communities at risk of disasters by 2025 and 100% by 2030.

Erosion and landslide prevention infrastructure: 50% of communities or rural towns at risk of disasters have erosion and landslide prevention structures by 2025 and 100% by 2030.

2.5.3 Selection of Actions and Activities for TAP on Climate Resilient Rural Infrastructure

The actions to be included in the TAP were identified based on the Barriers Analysis and Enabling Framework (BAEF), especially barriers and measures to overcome barriers (section 2.5.3.1 and Table

69). How the actions and activities were selected are discussed in section 2.5.3.2 and 2.5.3.3. respectively.

2.5.3.1 Barriers and Measures to Overcome Barriers

As a result of the BAEF, eight barriers, which consists of three financial and economic and five are non-financial and economic barriers were identified as the main obstacle to develop and deploy climate and disaster resilience rural infrastructures. Eight overall measures were also identified to address the barriers accordingly (Table 69). To bring measure into action in effective and efficient manner, the measures were assessed and selected as discussed in section 2.5.3.2.

TABLE 69 BARRIERS TO FULLY, EFFECTIVELY AND SUSTAINABLY DEVELOP CLIMATE RESILIENT RURAL INFRASTRUCTURE

| Categories | Barriers | Measures to overcome barriers |
|----------------------------|---|---|
| Financial and economic | 1. High investment cost to deploy the climate resilient rural infrastructure (CRRRI) | 1. Reduce cost on the disaster resilient infrastructure: a) reduce tax or costs for importing equipment, materials and other disaster resilient technologies, b) enhance cooperation and access to international supports on technologies transfer or measure 2, and c) implement measure 4 and 5 |
| | 2. Inadequate the public and private budget to invest in the disaster resilient infrastructures | 2. Increase public and private investment on the disaster resilient infrastructures 3. Enhance resources mobilisation, cooperation and access to international supports |
| | 3. Insufficient financial and economic incentives e.g., tax reduction, exception and holiday for agribusiness that deploy CRRRI | 4. Improve financial and economic incentives e.g., tax reduction, exception and holiday for agribusiness that deploy CRRRI |
| Legal framework | 1. Insufficient legal framework on hazard prone area development, environmentally friendly including climate resilient technologies and mainstreaming in the (infrastructure) developments | 5. Improve policies on hazard prone area development, environmentally friendly including climate resilient technologies and mainstreaming in the (infrastructure) developments |
| | 2. Ineffective law enforcement on the infrastructure construction standards and ESIA inspection including projects screening, defining and implementing measures to avoid and mitigate disaster risks | 6. Increase effectiveness of law enforcement, especially the infrastructure construction standards inspection, EIA and CSR to avoid or mitigate risks and enhance disaster resilient technologies in the development |
| Institutional capacity and | 3. Limited intuitional capacity, staff knowledge and skills on | 7. Increase intuitional capacity, staff knowledge and skills on CRRRI |

| | | |
|---------------------------|---|--|
| human skills | the resilient infrastructures | |
| Information | 4. Inadequate information and awareness about hazards and the cost-effective climate resilient infrastructures including technologies | 8. Increase information and awareness about hazards and disaster resilient infrastructures including technologies and best practices |
| Technical/ Information | 5. Insufficient reference projects and models | 9. Pilot and increase reference projects and models on cost-effective climate resilient infrastructures |

2.5.3.2 Selection of Actions

The actions to include in the TAP were selected from the measures (Table 69) by stakeholders including the climate change working group (See Annex 1) who assessed and prioritised the measures by scoring and expert judgement considering relevance, effectiveness, efficiency, impact and sustainability of the measures (Annex 5) at the stakeholder consultation and focus group meeting in March and November 2017. To be focus, effective and efficient; top three measures (scored 16 to 18) were selected to include in the TAP. In addition, some actions that are related and may share activities were combined. Consequently, only seven measures were chosen for the TAP (Table 70).

TABLE 70 SELECTED MEASURES FOR ACTION PLAN ON CLIMATE RESILIENT RURAL INFRASTRUCTURE

| Categories | Measures to overcome barriers | Score | Selected measures for TAP |
|------------------------|---|-------|--|
| Financial and economic | 1. Reduce cost on the disaster resilient rural infrastructure (CRRI): a) reduce tax or costs for importing equipment, materials and other disaster resilient technologies, b) enhance cooperation and access to international supports on technologies transfer or measure 3, and c) implement measure 6, 8 and 9 | 15 | X Reduce tax or costs for importing equipment, materials and other disaster resilient technologies (measure 1a) is critical and may have trade-off since the tax is a main source of revenue and the government's budget is still shortage and needs to maintain tax income. The sub-measure 1b is implemented under the measure 2. |
| | 2. Increase the public and private investment, resources mobilisation and access to financial supports for the CRRI | 18 | √ The measures received top score (Annex 2). The measures would have direct impact CRRI financing and development. |
| | 3. Improve financial and economic incentives e.g., tax reduction, exception and holiday for agribusiness that deploy CRRI | 14 | X Reduction or exception of tax was excluded as discussed above. Other measures such as promoting private investment including PPP, EIA and CSR polices will be implemented under the measure 2 above. |
| | 4. Access to finance | 17 | √ |

| | | | |
|---|--|----|---|
| Legal framework | 5. Improve policies on hazard prone area development, environmentally friendly including climate resilient technologies and mainstreaming in the (infrastructure) developments | 16 | √ This measure gained lower score, but without this measure, the measure 6 would be fully and effectively implemented. |
| | 6. Increase effectiveness of law enforcement, especially the infrastructure construction standards and ESIA inspection including projects screening, defining and implementing measures to avoid and mitigate disaster risks | 17 | √ As a 2 nd top measure, and ineffective law has enforcement undermined quality infrastructure and resilient developments. |
| Institutional capacity and human skills | 7. Increase intuitional capacity, staff knowledge and skills on the resilient infrastructure | 18 | √ It is a 1 st top measure since insufficient intuitional capacity, staff knowledge and skills is critical barrier hindering CRRi. |
| Information | 8. Increase information and awareness about hazards and cost-effective disaster resilient infrastructure including technologies and best practices | 17 | √ This 2 nd top score measure is also a determinant for effective CRRi as climate change and disaster impacts is complex and the update and accurate information are needed |
| Technical/ Information | 9. Pilot and increase reference projects and models on the cost-effective climate resilient infrastructures | 18 | √ It is a 1 st top score measure, and reference projects are believed to be crucial to guide and stimulate the CRRi deployment and expansion |

Notes: √ means measures were selected to include in the action plan. X measures were not selected or merged into other measures.

2.5.3.3 Selection of Activities to Implement the Actions

Identifying activities for the actions was performed by the TNA project team, and key stakeholders including DoA, DoI, DUPH, and DoRB in November 2017, taking into account the matter of effectiveness, efficiency, relevance and impacts of the activities on actions. As a result, activities under each action are outlined as in Table 71 below.

TABLE 71 SELECTED ACTIVITIES FOR ACTION PLAN ON CLIMATE RESILIENT RURAL INFRASTRUCTURE

| | |
|--------------|--|
| Action 1 | Increase the public budget and resources mobilisation to develop climate and disaster resilient infrastructure |
| Activity 1.1 | <i>Develop strategy of the resilient rural infrastructure development</i> |
| Activity 1.2 | <i>Conduct financial assessment (to identify funding sources and feasibilities)</i> |
| Activity 1.3 | <i>Develop financial sources or donor directory</i> |
| Activity 1.4 | <i>Develop resource mobilisation and engagement plan</i> |

| | |
|--------------|---|
| Activity 1.5 | <i>Develop and submit financeable disaster resilient rural infrastructure project proposals</i> |
| Activity 1.6 | <i>Set up and implement M&E and financial investment data management system</i> |
| Action 2 | <i>Expand access to finance for private sector including agribusiness entrepreneurs</i> |
| Activity 2.1 | <i>Strengthening cooperation between domestic and regional banks and financial institutes (to expand domestic financial markets including lowering interest rate and simply procedures for borrowing)</i> |
| Activity 2.2 | <i>Increase financial capacity and readiness of the private sector and entrepreneurs</i> |
| Activity 2.3 | <i>Organise financial access dialogues on rural and disaster risk infrastructure financing and risk management</i> |
| Action 3 | <i>Improve knowledge and skills on climate resilient technologies and practices</i> |
| Activity 3.1 | <i>Conduct capacity needs assessment</i> |
| Activity 3.2 | <i>Provide technical and financial trainings on infrastructure standard system, climate and disaster resilient technologies and practices</i> |
| Activity 3.3 | <i>Improve organisation development system including human development plan, staff knowledge management, recruitment etc.</i> |
| Activity 3.4 | <i>Promote establishment of the network, think-tank and civil organisation and information exchanges on climate and disaster resilient technologies and practices</i> |
| Activity 3.5 | <i>Improve education and research on climate and disaster resilient technologies and practices in high education</i> |
| Action 4 | <i>Develop and re-enforce policies on climate resilient technologies and infrastructure</i> |
| Activity 4.1 | <i>Develop policies on climate resilient technologies, infrastructure and regulations on the development of infrastructure in the disaster-prone areas</i> |
| Activity 4.2 | <i>Enhance enforcement of the rural infrastructure construction standards and ESIA systems including screening, M&E and inspection</i> |
| Action 5 | <i>Increase information and awareness about hazards, climate and disaster resilient technologies and practices</i> |
| Activity 5.1 | <i>Research and develop detailed hazard maps and profiles, and integrated land use plans which included the hazard maps</i> |
| Activity 5.2 | <i>Re-assess loss and damage, and disaster adaptive capacity or resilience of the rural infrastructures and financial needs</i> |
| Activity 5.3 | <i>Study and identify best climate and disaster resilient technologies and practices</i> |
| Activity 5.4 | <i>Disseminate information about hazard maps and profiles, climate and disaster resilient technologies and practices</i> |
| Action 6 | <i>Pilot climate and disaster resilient technologies and practices</i> |
| Activity 6.1 | <i>Pilot landslide, erosion and floods resilient roads and bridges</i> |
| Activity 6.2 | <i>Pilot landslide, erosion and floods resilient irrigation</i> |
| Activity 6.3 | <i>Pilot development of water use efficient irrigation schemes for drought areas and dry season cultivation</i> |
| Activity 6.4 | <i>Pilot development of water tanks, reservoirs and ponds for drought resilience and dry season cultivation</i> |
| Activity 6.5 | <i>Pilot disaster (landslide and erosion, floods and drought) resilient rural water supply systems</i> |
| Activity 6.6 | <i>Pilot disaster resilient town including erosion and landslide protection planning and development</i> |

2.5.4 Identify Stakeholders and Determines Timelines

2.5.4.1 Identify Stakeholders for TAP Implementation

The stakeholders to each climate resilient rural infrastructure vary. However, the primary stakeholders could be listed in Table 72 as follow.

TABLE 72 KEY STAKEHOLDERS IN THE CLIMATE RESILIENT RURAL INFRASTRUCTURE

| No | Key organisations | Mandates/Tasks | Relevant activities |
|----|--|---|------------------------|
| 1 | Ministry of Natural Resources and Environment (MoNRE). In particular, Department of Climate Change, ESIA, Water Resources | is responsible for promoting and managing climate change adaptation, disaster prevention and control activities, environmental impacts caused by or natural hazards that may cause impacts on a development project. | All activities |
| 2 | Ministry of Public Work and Transport (MPWT). In particular, Department of Roads and Bridge (DoRB) and Urban Planning (DoU) | is responsible roads, bridges and urban development | Activity 6.1, 6.5, 6.6 |
| 3 | Ministry of Agriculture and Forestry (MAF). In particular, Department of Irrigation (DOI), Agriculture (DoA) | MAF has responsibilities to promote and assist development of agricultural infrastructure, facilities and equipment. <ul style="list-style-type: none"> - DOI is responsible for irrigation affairs. - DoA is responsible for promotion and management of production centre, warehouse etc invested by public sector. | Activity 6.2-6.4 |
| 4 | National University of Laos: FOWRE, FoEC | Provides educational research on irrigations, roads and constructions | Activity 3.5 |
| 5 | Private: <ul style="list-style-type: none"> - Agricultural entrepreneurs - Financial institutes e.g., - Hydropower, mining and others: | <ul style="list-style-type: none"> - Invest in rural infrastructure as a part of agribusiness or farmers' production what engage in an agribusiness - Issus loan for rural infrastructure projects as a part of agribusiness value chain - Develop irrigations and other risk mitigation structure for the project impacted people | Activity 6.1-6.5 |
| 6 | Development partners and INGOs: ADB, JICA, WB, IFAD etc. | Provides technical and financial support on rural infrastructure | All activities |

2.5.4.2 Schedule Actions and Activities

The schedule of the actions and activities was defined by TNA project team in consultation with the key stakeholders in November 2017. Nature and scale of the activities, readiness including time, technical and financial capacity of the responsible organisations to perform the activities were considered when scheduling.

The action plan will be implemented for five years. The implementation will be divided into two phases. The first phase: preparation phase will be in first 3 months, March to May 2018. The key activity in this phase is dissemination of TAP to stakeholders and planning for the implementation. The second phase: full implement phase is expected to begin in May 2018 and complete in December 2022.

2.5.5 Estimate Resources

2.5.5.1 Capacity Building

Capacity building is prerequisite in order to strengthen the stakeholders to implement the TAP effectively, efficiently. The capacity, especially technical knowledge and skills about climate resilient infrastructure to be strengthen were identified during BAEF as well as summary in Table 73. In addition, the stakeholders shall be enhanced their project management skills including activity planning, estimating cost, financial and economic analysis including CBR and IRR, human resource management, procurement, risk management and M&E.

TABLE 73 CAPACITY NEEDS FOR CLIMATE RESILIENT RURAL INFRASTRUCTURE

| Main Areas of Skills | Skills needs |
|------------------------------------|--|
| Technical | <ul style="list-style-type: none"> - Application of GIS and other V&A tools for assessing risks and impacts of the floods, landslide and drought on the rural infrastructure - Assessment and identification of climate and disaster resilient equipment/technologies and practises - Computer skills and software to design structures for erosion and landslide protection - Develop or apply proof equipment/techniques, resilient town planning, |
| Financial and economic | <ul style="list-style-type: none"> - Financial and economic analysis including CBR and IRR of technologies |
| Resources mobilisation | <ul style="list-style-type: none"> - Develop bankable project proposal including financial and economic analysis - Identify and analysis financial or funding sources and feasibility - Establish financial aids M&E system |
| Policy | Policy on the promotion of environmentally friendly climate resilient technologies including financing and subsidising, taxation and exception, incentives |
| Human resources development system | Organisational development including analysis and performance assessment, human resources and capacity building development planning, self-capacity needs assessments and staff knowledge management, HRD M&E |

2.5.4.2 Estimate Costs for Actions and Activities

The costs of the actions and activities, in this context, include 1) the cost for dissemination and consultation including adjustment of the TAP before actual implementation, 2) the cost of each action and activity, and 3) the cost for contingency. The cost for dissemination and consultation meetings; based on the 3 meetings and 2 days for each meeting, current government daily allowance, a consultant fee, and a meeting including administrative costs, is expected to be US\$ 18,000, which is

comparative to similar activities of other projects. The cost of each activity implementation, considering allowance, a consultant fee, travel, meeting and other administrative costs, can be summarised in the Table 74 and 77. The cost for contingency to address delay and variations, is estimated to be 10% of the total cost or US\$ 1,837,150. So, the total cost of the action plan implementation would be US\$ 2023 million.

TABLE 74 ESTIMATE COSTS FOR ACTIONS AND ACTIVITIES

| No | Actions | Cost (US\$ Th.) |
|-----|---|-----------------|
| I | Cost for preparation of TAP implementation | 18 |
| II | Cost for full implementation of actions in the TAP | 18,371.5 |
| 1 | Increase the public budget and resources mobilisation to develop and deploy CRRl | 138 |
| 2 | Promote private investment including providing incentives and facilitate to access to finance | 230 |
| 3 | Enhance institutional and staff capacity on climate resilient technologies and practices | 363.5 |
| 4 | Improve policies and enforcement | 65.00 |
| 5 | Increase information and awareness about hazards, cost-effective CRRl | 365 |
| 6 | Pilot climate and disaster resilient technologies and practices | 17,210 |
| III | Cost for contingency actions | 1,837.15 |
| | Total | 20,226.65 |

2.5.6 Management Planning

2.5.6.1 Risk and Contingency Planning

Number of risks have been identified during TAP preparation. Those risks consist of cost, scheduling and performance risks. As described in Table 9, the risks could be addressed by implement following contingency measures.

TABLE 75 SPECIFIC RISKS OF ACTIONS AND CONTINGENCY PLANNING

| No | Actions | Risks | Contingency actions |
|----|--|---|--|
| 1 | Increase the public budget and resources mobilisation to develop climate and disaster resilient infrastructure | Responsible organisations may not be able to secure financial resources on time or adequately due to: 1) Public budget deficit, 2) Variable international financial pledge, 3) Small private sector and limited 4) Limited capacity-know-how of the organisations in charge | 1) Enhance effectiveness of public budget planning and implementation 2) Enhance capacity and commitment of the organisations in charge to mobilise and access to financial support 3) Improve cooperation and coordination among stakeholder and with development partners, donors and private sector |

| No | Actions | Risks | Contingency actions |
|----|--|---|---|
| 2 | Promote private investment including providing incentives and facilitate access to finance | Agribusiness and entrepreneurs are relatively small and have limited resources or accessible to finance to invest in infrastructure to expand production and business and be resilient to hazards | Enhance capacity of the agribusiness and entrepreneurs to access to finance, cost-effective and incentives for development of the disaster resilient infrastructure |
| 3 | Enhance institutional and staff capacity on climate resilient technologies and practices | 1) Insufficient financial investment or support for institutional and staff capacity improvement. 2) Insufficient leadership, motivation and self-development | 1) Improve self- and cost effective, commitment and leadership on capacity building 2) Improve HRD system including HRD and capacity building plan, staff knowledge management and effective recruitment |
| 4 | Develop policies on climate resilient technologies and infrastructures, the development of infrastructure in hazards prone areas | Not inclusive due to ineffective coordination | Enhance environmental and disaster prevention and control committee to influence improvement of coordination among stakeholders and mainstreaming climate change adaptation and disaster resilience in the sector and project development |
| 5 | Increase information and awareness about hazards, climate and disaster resilient technologies and practices | As the risk of the action 1 and 3 | Implementation contingency measures of the action 1 and 3 |
| 6 | Pilot climate and disaster resilient technologies and practices | As the risk of the action 1, 3 and 5 | Implementation contingency measures of the action 1, 3 and 5 |

2.5.5.2 Success Criteria and Indicators for Monitoring of the Implementation

Success criteria and indicator (C&I) for monitoring of the TAP implementation formulated by the TNA project team and the key stakeholders in November 2017. The overall C&I were summarised in Table 76, and the C&I for each activity were identified and included in the TAP summary (Table 77).

TABLE 76 SUCCESS CRITERIA AND INDICATORS FOR MONITORING OF THE IMPLEMENTATION

| No | Actions | Success criteria | Indicators for M&E |
|----|--|--|---|
| 1 | Increase the public budget and resources mobilisation to develop climate and disaster resilient infrastructure | Sufficient financial resources to cover at least 50% of the disaster resilient rural infrastructures by 2025 and 90% by 2030 | Public financial investment on the rural and disaster risk infrastructure increased |
| 2 | Promote private investment including providing incentives | Private sector including agribusiness entrepreneurs have enough | Private sector including agribusiness entrepreneurs' |

| No | Actions | Success criteria | Indicators for M&E |
|----|---|---|--|
| | and facilitate access to finance | resources or accessible to finance and capable to invest in some infrastructures to expand production and business and be resilient to hazards including implementing PPP | investment in disaster resilient infrastructures increased/ improved or can cover costs of basic infrastructure including implementing PPP |
| 3 | Enhance institutional and staff capacity on climate resilient technologies and practices | MONRE, MPWT and MAF are capable of the development and management of disaster resilient rural infrastructures including access to financial supports and resources mobilisation for the development | Institutional capacity and human resources including HR and capacity development plan, staff knowledge management and recruitment improved |
| 4 | Develop policies on climate resilient technologies and infrastructures, the development of infrastructure in hazards prone areas | Practical policies | Policies on climate resilient technologies and infrastructure enacted |
| 5 | Improve quality assurance and control including mainstreaming climate and disaster resilient technologies and practices in rural infrastructure development | Disaster resilient technologies and practices are mainstreamed in developments and sufficient resources for the implementation | Construction/ engineering and ESIA standards enforced and complied |
| 6 | Increase information and awareness about hazards, climate and disaster resilient rural infrastructure including technologies and practices | Sufficient information and stakeholders are aware of, increased cooperation and contribute to the development of the disaster resilient rural infrastructure | Information and awareness on disaster resilient rural infrastructure are increased |
| 7 | Pilot climate and disaster resilient rural infrastructure including technologies and practices as reference projects | At least 4 disaster resilient rural infrastructure are successfully piloted and being reference projects for expansion | Climate and disaster resilient rural infrastructure are piloted |

2.5.7 Summary Overview of the Action Plan for Climate Resilient Rural Infrastructure

The Table 77 below summarised the actions and activities, funding sources, responsible organisation, timeframe, budget for the implementation, risks and C&I of the TAP implementation identified from previous sections. Overall, this TAP will be for five years focusing on strengthening preparedness and to learn from this TAP implementation to plan for full climate resilient rural infrastructure development. The TAP will be executed by DCC, the primary stakeholders, in coordination with DORB, DOI, DOA. The total cost to implement this TAP is US\$ 20.23 million.

TABLE 77 SUMMARY OVERVIEW OF THE ACTION PLAN ON CLIMATE RESILIENT RURAL INFRASTRUCTURE

| Action | Activities | Sources of funding | Responsible body-Focal Point | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|---|--------------------|--|-------------------|---|--|--|-----------------|
| Action 1 | Increase the public budget and resources mobilisation to develop climate and disaster resilient infrastructure | | | | | | | |
| Activity 1.1 | Revisit and validate action plans including field visits and validating financial needs for each type of rural resilient infrastructure | Gov, UNDP | MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH | Jun -Dec 2018 | Insufficient resources for field visits | Inclusive and practical actions for enhancing resilience of all types of rural infrastructures is put in place and proved to be useful for effective development climate and disaster resilient infrastructure including access to technical and financial support | Detailed action plans for climate resilient rural infrastructures (roads and logistics, irrigations, warehouses) developed | 14 |
| Activity 1.2 | Conduct financial assessment to identify the funding sources and feasibilities | Gov, UNDP, UNEP | MoNRE: DCC | Jun 2018-Jan 2019 | Inaccessible or lack of the detailed information on funding sources | Detail information on funding sources including funding eligibility and feasibility are available and useful for financial planning, cooperation and access | The assessment conducted | 12 |
| Activity 1.3 | Develop and update financial sources or donor directory | Gov | MoNRE: DCC | Jan 2019-Dec 2022 | As 1.2 above | Valid and informative donor directory is put in place and proved to be useful for cooperation, access to | A donor directory developed and updated | 6 |

| Action | Activities | Sources of funding | Responsible body-Focal Point | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|--|---|--|---------------------|---|---|---|-----------------|
| | | | | | | technical and financial support | | |
| Activity 1.4 | Develop resource mobilisation and engagement plan | Gov, UNDP, INGOs | MoNRE: DCC | Sep 2018-Jan 2019 | Not inclusive and practical due to insufficient financial or donor aids information | Practical resource mobilisation and engagement plan is put in place and proved to be promising for cooperation, access to technical and financial support | Resource mobilisation and engagement plan developed and implemented | 12 |
| Activity 1.5 | Develop and submit financeable project proposals | Gov, UNDP, ADB, WB, JICA, UNEP, AusAID, IFAD, GEF, LDCF, GCF, GFDRR, AF | MoNRE: DCC MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH | Nov 2018 - Dec 2021 | Proposal is rejected due to unavailable resources or unqualified proposal | At least 2 project proposals accepted and funded projects within 5 years (2018-2022) | Numbers of proposals developed, submitted and funded | 90 |
| Activity 1.6 | Improve public and foreign financial aids data management system | Gov, UNDP | MPI: DoP, DoM&E | Aug 2018- Jan 2019 | Ineffective coordination and information sharing | Complete, effective and transparent financial aids data management system is put in place and proved to be useful for tracking and M&E of financial support and improve cooperation | Foreign financial aids data management system improved | 10 |
| Action 2 | Promote private investment including providing incentives and facilitate access to finance | | | | | | | |

| Action | Activities | Sources of funding | Responsible body-Focal Point | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|---|----------------------------------|------------------------------|-------------------|---|--|---|-----------------|
| Activity 2.1 | Organise business trip and increase cooperation between domestic and regional banks and financial institutes (to expand financial resources including lending capacity) | Gov, UNDP, ADB, WB, JICA | MOF: BOL MPI: DOP | Jun 2018-Dec 2022 | Delayed and unfulfilled due to low or unclear return on investment in the climate resilient infrastructure projects | Favourable loans are made available and accessible for the development of the disaster resilient infrastructure | Number of business trips and meetings held; cooperation among public, private and farmers are improved | 85 |
| Activity 2.2 | Increase financial capacity and readiness of the private sector and agribusiness entrepreneurs | Gov, UNDP, ADB, WB, JICA | MOF: BOL MPI: DOP | Jun 2018-Dec 2022 | | Private sector is strengthened and at least 2 entrepreneurs or climate resilient infrastructure projects are accessible to finance/soft loans between 2018 and 2022 | Number of trainings and capacity building activities conducted | 65 |
| Activity 2.3 | Organise dialogues on how to establish financial models or mechanism (e.g., PPP) to finance disaster risk and resilient infrastructure | Gov, UNDP, ADB, WB, JICA, AusAID | MOF: BOL MPI: DOP | Jun 2018-Dec 2022 | Agreements or recommendation resulted from meetings are not effectively implemented due to lack of resources | Climate and disaster resilient infrastructure financial models or mechanism are put in place and proved to be promising for promoting climate and disaster resilient infrastructure investment | Number of dialogues, meetings organised, and financial mechanism or model for climate and disaster resilient infrastructure developed | 80 |

| Action | Activities | Sources of funding | Responsible body-Focal Point | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|--|----------------------------------|---|-------------------|---|--|---|-----------------|
| Action 3 | Enhance institutional and staff capacity on climate resilient technologies and practices | | | | | | | |
| Activity 3.1 | Re-assess capacity needs assessment for climate change adaptation and disaster resilience and develop the capacity development plan for the department of agriculture, irrigation, road, climate change and ESIA | Gov, UNDP, ADB, WB, JICA | MONRE: DCC DESIA MPWT: DoR MAF: DoA, DoI | Jun -Nov 2018 | HRD and capacity building is not in line with the plan and system | Information and plan on human resources including knowledge and skills development are clearly defined, put in place and useful for effective HRD including financial investment | Capacity needs assessment conducted, and capacity development plan developed | 13.50 |
| Activity 3.2 | Provide technical and financial trainings on infrastructure standard system, climate and disaster resilient infrastructure technologies and practices | Gov, UNDP, ADB, WB, JICA, AusAID | MONRE: DCC, DESIA MPWT: DoIM | Jun 2018-Dec 2022 | HRD and capacity building is not in line with the plan including capacity needs | Staff receive sufficient trainings and have sufficient technical knowledge and skills to develop and deploy technologies and practices for enhancing durability and resilience of infrastructure to changing climate and disasters | No. of trainings organised, and staff participated. Staff technical Knowledge and skills including performance improved | 120 |
| Activity 3.3 | Improve organisational capacity and human resource development (HRD) system including HRD plan, staff knowledge management, | Gov, UNDP, ADB, WB, JICA, AusAID | MONRE: DCC MAF: DoI, DoRPR MPWT: DoR, | Jun 2018-Dec 2022 | Could not mobilise the resources and sustain volunteers and activities | An effective organisational capacity building and HRD system are put in place and promising | Organisational capacity and human resource development (HRD) system including | 60 |

| Action | Activities | Sources of funding | Responsible body-Focal Point | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|-----------------|--|----------------------------------|------------------------------|-------------------|--|---|---|-----------------|
| | recruitment etc. | | DoWS, DUH MPH: CWSH | | | | HRD plan improved | |
| Activity 3.4 | Promote establishment of the network, think-tank and civil organisation, information exchanges and mainstream climate and disaster resilient technologies and practices in the rural infrastructure development plans and projects | Gov, UNDP | MONRE: DCC | Jun 2018-Dec 2022 | Insufficient resources for development of the think-tank, network and exchange | Think-tank, networks and exchange platform are set up and promising | No. of think-tank, network established, meetings and forums organised | 80 |
| Activity 3.5 | Improve education and research on the climate and disaster resilient technologies and practices in high education | Gov, UNDP, ADB, WB, JICA, AusAID | MONRE: DCC | Jun 2018-Dec 2022 | Insufficient resources including human, experiences and information to develop practical and comprehensive educational curriculum and research | A complete and practical curriculum on the climate and disaster resilient technologies are put in place and promising | Numbers and skills of teachers, educational materials, curriculum and research improved | 90 |
| Action 4 | Develop and re-enforce policies on climate resilient technologies and infrastructures, the development of infrastructure in hazards prone areas | | | | | | | |
| Activity 4.1 | Develop policies on climate resilient technologies and infrastructures, and the development of infrastructure in hazards prone areas | Gov, UNDP | MONRE: DCC | Jun 2018-Dec 2022 | Not inclusive and practical due to unclear national policies on science and technologies | Practical policies are put in place and promising | Policies on climate resilient technologies and infrastructure enacted | 15 |

| Action | Activities | Sources of funding | Responsible body-Focal Point | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|-----------------|--|--|---|-------------------|--|--|--|-----------------|
| Activity 4.2 | Enhance enforcement of regulations on infrastructure construction standard and ESIA screening, M&E and inspection | Gov, UNDP, ADB, WB, JICA | MONRE: DCC | Jun 2018-Dec 2022 | Incomplete or ineffective due to lack of resources and best practice guidelines | Disaster resilient technologies and practices are mainstreamed in developments and sufficient resources for the implementation | Construction/ engineering and ESIA standards enforced and complied | 50 |
| Action 5 | Increase information and awareness about hazards, climate and disaster resilient technologies and practices | | | | | | | |
| Activity 5.1 | Re-assess disaster risk, loss and damage, and resilience of the rural infrastructures and financial needs | Gov, UNDP, ADB, WB, JICA, GFDRR, WFP | MONRE: DCC MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH | Jun 2018-Dec 2022 | Delayed and incomprehensive due to insufficient resources and coordination | Sufficient information about disaster risk, loss and damage, resilience and financial needs made available and useful for climate resilient infrastructure planning and investment | No. of field survey and assessment conducted | 185 |
| Activity 5.2 | Study and identify best climate and disaster resilient rural infrastructures technologies and practices | Gov, UNDP, ADB, WB, JICA, AusAID, GFDRR, WFP | MONRE: DCC MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH | Jun 2018-Dec 2022 | Delayed and incomprehensive due to insufficient resources and information on disaster resilient technologies and practices | Information about best technologies and practices are available for effective climate resilient infrastructure planning and development | No. of studies conducted | 110 |
| Activity | Disseminate information | Gov, UNDP | MONRE: | Jun | Delayed and | Stakeholders received | Number of | 70 |

| Action | Activities | Sources of funding | Responsible body-Focal Point | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|-----------------|--|--|--|-------------------|---|--|---|-----------------|
| 5.3 | about hazards, climate and disaster resilient technologies and practices | | DCC MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH | 2018-Dec 2022 | ineffective due to insufficient resources and information | sufficient knowledge, information and awareness, and proved to be more active in contribution to resilient development | dissemination workshops held, and people participated or outreached | |
| Action 6 | Pilot climate and disaster resilient technologies and practices | | | | | | | |
| Activity 6.1 | Pilot landslide, erosion and floods resilient roads and bridges | Gov, UNDP, ADB, WB, AusAID, JICA, IFAD, GEF, LDCF, GCF, GFDRR, AF | MONRE: DCC, DMH, DOWR MPWT: DoR | Dec 18- Dec 20 | Delayed or incomplete due to insufficient resources, information and best practices | Disaster resilient roads and bridge put in place and proved to resilient and reduce disaster loss and damage, and being models for extension | No. of the resilient roads and bridges developed | 4,500 |
| Activity 6.2 | Pilot landslide, erosion and floods resilient irrigation | Gov, UNDP, ADB, WB, JICA, AusAID, FAO, IFAD, GEF, LDCF, GCF, GFDRR, AF | MONRE: DCC MAF: DoI, DoRPR | Oct 18- Dec 20 | As 6.1 above | Disaster resilient irrigation put in place and proved to resilient and reduce floods loss and damage, and being models for extension | No. of floods resilient irrigation developed | 2,100 |
| Activity 6.3 | Pilot development of water use efficient irrigation schemes for drought areas and dry season cultivation | Gov, UNDP, ADB, WB, FAO, IFAD, GEF, LDCF, GCF, GFDRR, AF | MONRE: DCC MAF: DoI, DoRPR | Oct 18- Dec 20 | As 6.1 above | Disaster resilient town plans put in place and proved to resilient and reduce drought loss and damage, and being models for extension | No. of water use efficient irrigation schemes developed | 1,050 |

| Action | Activities | Sources of funding | Responsible body-Focal Point | Time-frame | Risks | Success criteria | Indicators for M&E | Cost (US\$ Th.) |
|--------------|--|---|---------------------------------------|---------------|--------------|---|---|-----------------|
| Activity 6.4 | Pilot development of water tanks, reservoirs and ponds for drought resilience and dry season cultivation | Gov, UNDP, ADB, WB, AusAID, FAO, GEF, LDCF, GCF, GFDRR, AF | MONRE: DCC, DOWR | Jan 19-Dec 21 | As 6.1 above | Water tanks, reservoirs and ponds put in place and proved to resilient and reduce drought disaster loss and damage, and being models for extension | No. of water tanks, reservoirs and ponds developed and operated | 8,300 |
| Activity 6.5 | Pilot disaster (landslide and erosion, floods and drought) resilient rural water supply systems | Gov, UNDP, ADB, WB, AusAID, JICA, GEF, LDCF, GCF, GFDRR, AF | MONRE: DCC MPWT: DoWS MPH: CWSH | Oct 18-Dec 20 | As 6.1 above | Landslide and erosion, floods and drought resilient rural water supply systems put in place and proved to resilient and reduce disaster loss and damage, and being models for extension | No. of resilient rural water supply systems developed | 920 |
| Activity 6.6 | Pilot disaster resilient town planning and development including hazard mapping and integrated land use planning in 46 districts at risk of floods | Gov, ADB, WB, JICA, GEF, LDCF, GCF, GFDRR, AF | MONRE: DCC MPWT: DUH | Nov 18-Dec 21 | As 6.1 above | Disaster resilient town plans put in place and proved to be promising for reduced risks, loss and damage and being models for promotion | No. of disaster resilient town plans developed and implemented | 340 |
| Total | | | | | | | | 18,382 |

Chapter 3 Project Ideas

3.1 Project Ideas on Climate Change Adaptation Technologies and Practices in the Water Resources Sector

The TNA project, through consultation and consensus of the key stakeholders, identified two critical project ideas which are prioritised as the immediate action for the climate resilient technologies and practices in the water resources sector. Those project ideas are as follows, and details of the project ideas are in Table 78 and 79:

- 1) Piloting the end-to-end multi-hazards early warning system
- 2) Piloting water demand and supply including floods and drought mapping for climate resilient river basin development and management

TABLE 78 END-TO-END EARLY WARNING PROJECT IDEA

| Project 1 | Piloting the end-to-end multi-hazards early warning system |
|---------------------------------|--|
| Overall and specific objectives | The overall objective is to reduce loss and damage from disaster including floods, landslide drought and extreme weather, and enhance resilient and sustainable socioeconomic development. Specifically, this project is to strengthen MoNRE and other relevant stakeholders' capacity to develop and operate a full scale of end-to-end EWS. |
| Location | MoNRE and 14 provinces, 53 Districts and 160 communities at risk of the disasters |
| Key beneficiaries | MoNRE and 14 provinces, 53 Districts and 160 communities at risk of the disasters |
| Main components of the project | <p>Component 1: Improve hazard knowledge and information including research of technologies and best practices</p> <p>Component 2: Improve hazards monitoring and real-time forecast including development and deployment of weather numeric model, news casting and flash flood modelling and its standard operation procedures (SOP)</p> <p>Component 3: Improve warning communication systems including communication network, tools and equipment, warning categories and SOP</p> <p>Component 4: Develop disaster emergency plans including SOP and simulation drills</p> <p>Component 5: Institutional capacity building</p> |
| Expected results | <ul style="list-style-type: none"> - Disaster loss and damage to national and local economy as well as local lives and assets, production and business could be substantially avoided or reduced, - Key stakeholders such as the governmental authorities and local people at all levels are strengthened, capable to handle with hazards and maintain or enhance socioeconomic development effectively, - EWS is fully developed including sufficient operation centre, technologies for monitoring and forecast of hazards in lead-time, communication and response at national and local levels, and operated effectively. |
| Timeframe | 2018-2022 |
| Cost (US\$) | 13,500,000 |
| Executing Agency | Ministry of Natural Resources and Environment (MONRE), including Department of Climate Change (DCC) and Meteorology and Hydrology (DMH) |
| Project | Lao PDR, especially water resources sector is among the most vulnerable sectors to |

| Project 1 | Piloting the end-to-end multi-hazards early warning system |
|---|---|
| background and context | <p>changing climate. Floods occur almost every year, and drought once in every few years, and have caused significant economic loss and damage and exacerbated poverty. Floods, for example caused economic loss and damage of about US\$ 100 million per year, on an average (MLSW, 2012; GFDRR, 2014). Furthermore, ISDR et al., (2012) estimated that the economic loss and damage the disasters, would be, on average, US\$ 278 million per year between now and 2029.</p> <p>However, investing development of an effective or end-to-end EWS could possibly reduce the impacts substantially. For example, investing 18.32 million for a stand-alone EWS system could save US\$ 5.51 for each US dollar invested. Investment of US\$ 10.93 million for an integrated regional system could save US\$ 7 for each US dollar invested. These indicate that investing in EWS sounds economically viable, especially when compare to the cost-benefit ratio (CBR), 1:7 defined by WMO (ISDR et al., 2012).</p> |
| Project objectives and proposed activities and budget | <p>Component 1: Improve hazard knowledge and information including research of technologies and best practices</p> <ol style="list-style-type: none"> 1.1. Downscale and update hazard maps and information 1.2. Conduct vulnerability and response capacity assessment of all districts and communities at risk of hazards 1.3. Study best technologies and practices for hazard monitoring, forecast, warning, communication and response 1.4. Organise information exchanges and awareness raising activities <p>Component 2: Improve hazards monitoring and real-time forecast including development and deployment of weather numeric model, news casting and flash flood modelling and its standard operation procedures (SOP)</p> <ol style="list-style-type: none"> 2.1 Improve weather numeric model, software and equipment 2.2 Complete installation of automatic weather and water gauges in necessary areas and rivers and develop gauge-to-gauge modelling 2.3 Study and install flash flood and landslide models, software and equipment 2.4 Study and install drought monitoring software and equipment 2.5 Develop and set up news casting model, software and equipment 2.6 Set up weather observation radar in the north and south 2.7 Develop SOP for all monitoring and forecast models <p>Component 3: Improve warning communication systems including communication network, tools and equipment, warning categories and SOP</p> <ol style="list-style-type: none"> 3.1 Study and define best communication tools, channels and methods for communicating hazards warning and response 3.2 Develop SOP for warning and response communication including access to warning information and feedback 3.3 Develop, disseminate and install communication materials 3.4 Improve and standardise the warning message format and information for warnings 3.5 Improve basic infrastructure e.g., telecommunication network including internet, TV, radio, siren and speakers <p>Component 4: Develop disaster emergency plans including SOP and simulation drills</p> <ol style="list-style-type: none"> 3.1 Develop response or emergency and evacuation plan for all districts and communities at risk of hazards |

| | |
|--|---|
| Project 1 | Piloting the end-to-end multi-hazards early warning system |
| | <p>3.2 Organise simulation drills</p> <p>3.3 Organise workshops for improvement of the plans</p> <p>Component 5: Institutional capacity building</p> <p>5.1 Set up EWS centres or units including recruiting at least 2-3 staff for each centre in all provinces, districts and communities at risk of hazards</p> <p>5.2 Organise trainings and exchanges for stakeholders, especially staff in each centre and communities at risk of hazards</p> <p>5.3 Improve DRR including EWS committee structure, mandates and members at all levels</p> |
| Institutional arrangement and project implementation | <p>MoNRE will serve as the Executing Agency for the implementation of the project. Particularly, DCC will be in charge of the coordination of the project, by facilitating capacity building and implementation of the planned activities and making efficient and effective use of the resources allocated, in accordance with the Project Document, and ensuring effective collaboration and promoting information exchange with stakeholders. However, specific actions such as action 2 will be implemented by DMH. In addition, the activities related to development basic infrastructure will be carried by relevant ministries, and DCC performs coordination role.</p> <p>MoNRE including DCC and DMH and relevant organisations shall be ensured to appoint a qualified and competent person to be a Project Manager. Also, a qualified and competent person shall be identified and hired as an assistant, consultants, procurement, accountant and technical staff as the project team.</p> <p>The project detail design and implementation will base on the past experiences and base on best practices. In addition, the executive agency shall make ensure that the project implementation is in synergy with other existing and planned projects.</p> |
| Project monitoring and evaluation (M&E) and audit | <p>The project management team will be responsible for project implementation M&E. Monitoring will be conducted on regular basis, which include meeting and reporting of monthly and quarterly progress, mid-term and annual review. The evaluation will be conducted mid-term and final project completion, by internal and external evaluator. In addition, financial audit will also be performed by internal and external auditor</p> |

TABLE 79 CLIMATE RESILIENT RIVER BASIN DEVELOPMENT AND MANAGEMENT PROJECT IDEA

| | |
|------------------------------|---|
| Project 2 | Study and develop an integrated water resources development map for climate resilient and sustainable river basin development |
| Objective | To study and develop integrated maps including water resources, demand and supply or balance, land uses, hydropower and irrigation development for design and planning water management and development for floods and drought resilience in the main river basins |
| Location | All river basins including Mekong's tributary river basins, and Nam Ma, Nam Neun and Nam Sam |
| Key beneficiaries | All water users and communities at risk of floods, landslide and drought in all river basins |
| Main component of activities | <p>Component 1: Study and improve information about 1) hydrology, water resources, demand and supply or balance, 2) land use change, 3) hydropower, irrigations and other water development projects, 4) hazards and 5) water scenarios and RBM best practise in the main river basins</p> <p>Component 2: Organise dialogue and forum on the water demand and supply, floods and</p> |

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| | drought and integrated land use mapping for sustainable river basin management (RBM) including climate change adaption Component 3: Capacity building on the application tools for the integrated mapping and planning for climate change adaption and sustainable river basin development |
| Timeframe | 2018-2021 |
| Cost (US\$) | 16,511,000 |
| Executing Agency | Ministry of Natural Resources and Environment (MONRE), including Department of Climate Change (DCC) and Water Resources (DWR) |
| Project background and context | A combination of land use change, water developments projects including hydropower, water supply systems and irrigations in all main rivers and climate change could potentially cause unexpected impacts in all river basins and difficult for monitoring and forecast of disasters resulted from these three factors. Currently, information, development scenarios and capacity of MoNRE and other relevant organisations are much limited. Study and improve information about 1) hydrology, water resources, demand and supply or balance, 2) land use change, 3) hydropower, irrigations and other water development projects, 4) hazards and 5) water scenarios in the main river basins are expected to provide useful information and best practices for better and sustainable RBM. |
| Project activities | <p>Component 1: Study and improve information about 1) hydrology, water resources, demand and supply or balance, 2) land use change, 3) hydropower, irrigations and other water development projects, 4) hazards and 5) water scenarios and RBM best practise in the main river basins</p> <p>1.1 Improve the technical working group on water resources and form the study team</p> <p>1.2 Conduct studies about 1) hydrology, water resources, demand and supply or balance, 2) land use change, 3) hydropower, irrigations and other water development projects, 4) hazards and 5) water scenarios and RBM best practise in the main river basins</p> <p>Component 2: Organise dialogue and forum on the water demand and supply, floods and drought and integrated land use mapping for sustainable river basin management (RBM) including climate change adaption</p> <p>2.1 Organise dialogue and forum on water resources and climate change adaptation, water and energy, IWRM and sustainable development</p> <p>Component 3: Capacity building on the application tools for the integrated mapping and planning for climate change adaption and sustainable river basin development</p> <p>3.1 Organise trainings and workshops on the use of GIS for integrated river basin development including hazards mapping</p> <p>3.2 Organise trainings and workshops on climate change adaptation including vulnerability assessment and adaptation planning in the water resources sector</p> <p>3.3 Organise trainings and workshops on hydrological modelling and water demand and supply assessment including water evaluation and planning (WEAP) system</p> |
| Institutional arrangement and project implementation | <p>As the Executing Agency, MoNRE, particularly, DCC will make most efforts to work with DWR and Natural Resources and Environment Research Institute (NRERI), Ministry of Agriculture and Forestry (MAF), Energy and Mines (MEM), Ministry of Public Work and Transport (MPWT) in capacity building and implementation of the actions including ensuring efficiency, effectiveness and sustainability of the actions.</p> <p>MoNRE including DCC and DWR will assign qualified staff to be a Project Manager. Also, a qualified and competent person shall be identified and hired as an assistant, consultants, procurement, accountant and technical staff as the project team. The project</p> |

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| | implementation will base on best practices and ensure synergy with other existing and planned projects. |
| Project monitoring and evaluation (M&E) and audit | The project management team will be responsible for project implementation M&E. Monitoring will be conducted on regular basis, which include meeting and reporting of monthly and quarterly progress, mid-term and annual review. The evaluation will be conducted mid-term and final project completion, by internal and external evaluator. In addition, financial audit will also be performed by internal and external auditor |

3.2 Project Ideas on Climate Change Adaptation Technologies and Practices in the Agriculture Sector

Along with defining project idea for water resources sector, the TNA project, through consultation and consensus of the key stakeholders, also identified two important projects for the climate resilient technologies and practices in the agriculture sector. Those project ideas are as follows, and details of the project ideas are in Table 79:

- 1) Crop diversification
- 2) Promoting climate and disaster resilient rural infrastructure (irrigations, roads, warehouse and logistics, floods diversion, erosion and landslide structure)

TABLE 80 CLIMATE CHANGE ADAPTATION AND DISASTER RESILIENT INFRASTRUCTURE PROJECT IDEA

| | |
|-------------------------------|---|
| Project 1 | Enhance climate change adaptation and disaster resilience in the agriculture sector through resilient infrastructure |
| Objective | <ul style="list-style-type: none"> - To reduce loss and damage, and increase durability and resilience of the rural infrastructures - To secure or increase agriculture production and business, enhance food security |
| Location | Throughout the country |
| Key beneficiaries | <ul style="list-style-type: none"> - All producers and business at risk floods, landslide and drought - Infrastructure developers, users and management bodies |
| Main component of the project | <p>Component 1: Research and development information about risks and impacts and resilience of the rural infrastructure to climate change and disasters, and identify best technologies and methods for adaptation and financing mechanisms</p> <p>Component 2: Construct reservoirs and ponds including solar, gravity water pump and sprinkle irrigation for dry season cultivation</p> <p>Component 3: Enhance floods resilient infrastructure</p> <p>Component 4: Institutional and staff capacity building on climate resilient infrastructure</p> |
| Timeframe | 2018-2022 |
| Cost (US\$) | 28,518,000 |
| Executing Agency | MoNRE: DCC; MAF: DoA, DoI and DLF, MPWT: DORB, DOT |
| Project background | Rural infrastructure such as irrigations, warehouses, erosion protection facilities, |

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| and context | <p>greenhouse, production and demonstration centers and roads and logistics system are crucial for boosting production including climate adaptation and disaster resilience. These infrastructures are underdeveloped and low resilient to disasters, especially in rural areas. Laos has irrigable land of about 2.4 million ha, but less than 50% is irrigated (MAF, 2015). The proportion of villages that have road access was 84.51% (MPI, 2015). Erosion and landslide structure is far limited. Warehouse and logistics for keep seeds, agriculture products and inputs to avoid damage from extreme weather and disasters are almost none. Greenhouse is underdeveloped, especially poor farmers.</p> <p>Moreover, the existing infrastructure are low resilient to disasters. In 2011, for example, a damage and loss to irrigation including irrigation canals, weir, canal intake and gates in the value of US\$ 7.9 million (18% of total economic loss) as a result of the Typhoon Haima (Lao PDR, 2011). Road lengths of 67, 3232 and 867 km were damaged or destroyed by disaster in 2009, 2011 and 2013, respectively (MPI et al., 2014).</p> <p>So, this type of resilient infrastructure project is inevitably needed, and implementing this project will improve not only agriculture development, but broader socioeconomic development and disaster resilience.</p> |
| Project objectives and proposed activities and budget | <p>Component 1: Research and development information about risks and impacts and resilience of the rural infrastructure to climate change and disasters, and identify best technologies and methods for adaptation and financing mechanisms</p> <ol style="list-style-type: none"> 1.1 Conduct a survey and revisit all existing and planned infrastructures at risks or affected by climate change and disasters 1.2 Reassess and define best technologies and methods for adaptation and disaster resilience 1.3 Develop and implement the plan for enhancing climate change adaptation and disaster resilience of the infrastructure 1.4 Study and define disaster risk and infrastructure development financing mechanism and models <p>Component 2: Construct reservoirs and ponds including solar, gravity water pump and sprinkle irrigation for dry season cultivation</p> <ol style="list-style-type: none"> 2.2 Revisit, select and design reservoirs and ponds including solar, gravity water pump and sprinkle irrigation for dry season cultivation 2.3 Construct reservoirs and ponds including solar, gravity water pump and sprinkle irrigation for dry season cultivation based on best technologies and practices <p>Component 3: Enhance floods resilient infrastructure</p> <ol style="list-style-type: none"> 3.4 Re-survey, design and construct support structure equipment and erosion protection to the existing infrastructures 3.5 Re-survey, design and construct barriers, regulatory ponds and water diversion canals 3.6 Re-survey, design and construct multi-purposes warehouses in communities at risks of disasters 3.7 Re-survey, design and construct roads and bridge for evacuation and 3.8 Improve greenhouses for maintaining agriculture production 3.9 Promote and implement measures to improve livestock farm facilities 3.10 Improve meteorological station |

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| | <p>3.11 Improve production and demonstration centres</p> <p>Component 4: Institutional and staff capacity building on climate resilient infrastructure</p> <p>3.4 Conduct trainings and workshops on disaster risk and infrastructure development financing</p> <p>3.5 Study visit to climate and disaster resilient town and infrastructure planning and development in the regions</p> <p>3.6 Improve construction standards and EIA enforcement including inspection</p> |
| Institutional arrangement and implementation | <p>As the Executing Agency, MoNRE, particularly, DCC will make most efforts to work with DWR and Natural Resources and Environment Research Institute (NRERI), Ministry of Agriculture and Forestry (MAF), Energy and Mines (MEM), Ministry of Public Work and Transport (MPWT) in capacity building and implementation of the actions including ensuring efficiency, effectiveness and sustainability of the actions.</p> <p>MoNRE including DCC and DWR will assign qualified staff to be a Project Manager. Also, a qualified and competent person shall be identified and hired as an assistant, consultants, procurement, accountant and technical staff as the project team. The project implementation will base on best practices and ensure synergy with other existing and planned projects.</p> |
| Project monitoring and evaluation (M&E) and audit | <p>The project management team will be responsible for project implementation M&E. Monitoring will be conducted on regular basis, which include meeting and reporting of monthly and quarterly progress, mid-term and annual review. The evaluation will be conducted mid-term and final project completion, by internal and external evaluator. In addition, financial audit will also be performed by internal and external auditor</p> |

TABLE 81 PROJECT IDEA: ENHANCING RESILIENCE OF CROP PRODUCTION AND COMMERCIALISATION THROUGH CROP DIVERSIFICATION

| | |
|------------------------------|---|
| Project 2 | Enhancing resilience of crop production and commercialisation through crop diversification pilot project |
| Objective | <ul style="list-style-type: none"> - To reduce loss and damage, and increase resilience of crop production, agribusiness and biodiversity conservation - To enhance agriculture production and business, and food security |
| Location | Floods (14 provinces), drought (4 provinces) and pest-insect epidemics areas (Luang Prabang, Udomxay and Huaphan province) |
| Impacts/ beneficiary | All producers and business at risk floods, drought and pest-insect epidemics |
| Main component of activities | <p>Component 1: Research and development of crop diversification best practices</p> <p>Component 2: Enhance drought resilient production systems through crop diversification</p> <p>Component 3: Enhance floods resilient production systems through crop diversification</p> <p>Component 4: Capacity building on crop diversification for climate resilience</p> |

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| Timeframe | 2018-2022 |
| Cost (US\$) | 10,432,00 |
| Executing Agency | Ministry of Agriculture and Forestry (MAF): Department of Agriculture (DoA)-National Agriculture and Forestry Research Institute (NAFRI) |
| Project background and context | <p>Lao agriculture sector shares more than 25% of the GDP and more than 65% of the population of Laos are engaged in agriculture production. The national priorities and the policies of the government of Lao PDR is to graduate from LDC, elimination of poverty reduction, ensure food security, sustainable development, while agriculture and agribusiness are highly vulnerable to climate and market variability.</p> <p>Crop diversification is considered as a promising technology or practices for enhancing climate change adaptation and disaster resilience; however, information, best practices and references projects to deploy and diffuse this technology is far limited. This pilot project is expected to increase information on:1) vulnerability and resilience of existing crop varieties and production systems to changing climate and hydro-met disasters, 2) crop diversifications that suitable for different agro-ecology zones, including feasibility (financial and economic including cost and benefit, technical, farmers' choice), and 3) develop reference project including best practice guidelines for deployment and diffusion of crop diversification.</p> |
| Project objectives and proposed activities and budget | <p>Component 1: Research and development information about crop diversification best practices</p> <ol style="list-style-type: none"> 1.1 Review vulnerability of agriculture sector including agriculture production 1.2 Conduct studies and define crop diversification best practices including crop varieties and systems that resilient to climate change 1.3 Promote think-tank and disseminate information about crop diversification and climate change <p>Component 2: Enhance drought resilient production systems through crop diversification</p> <ol style="list-style-type: none"> 2.4 Develop pilot project or business plan including financial and economic feasibility study of crop diversification systems for resilience to drought 2.5 Pilot project or business plan on crop diversification systems including infrastructure and facilities for resilience to drought <p>Component 3: Enhance floods resilient production systems through crop diversification</p> <ol style="list-style-type: none"> 3.12 Develop pilot project or business plan including financial and economic feasibility study of crop diversification systems for resilience to flood or inundation 3.13 Implement pilot project or business plan on crop diversification systems including infrastructure and facilities for resilience to drought <p>Component 4: Capacity building on crop diversification for climate resilience</p> <ol style="list-style-type: none"> 4.1 Develop polices and master plan on crop diversification 4.2 Organise trainings and workshops on crop diversification and climate change including access to finance |

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| Institutional arrangement for project implementation | <p>MAF will serve as the Executing Agency for the implementation of the project. However, MAF, especially DoA and NAFRI shall closely work with MoNRE, especially DCC to ensure that the crop diversification is implemented in a way relevant to change adaptation and disaster resilience.</p> <p>Project committee will be established to oversee the project implementation and alignment with national policies. MAF shall appoint a qualified staff to be a Project Manager and form quality project team including consultants, assistant, procurement, accountant and technical staff.</p> |
| Project monitoring and evaluation (M&E) and audit | <p>The project management team will be responsible for project implementation M&E. Monitoring will be conducted on regular basis, which include meeting and reporting of monthly and quarterly progress, mid-term and annual review. The evaluation will be conducted mid-term and final project completion, by internal and external evaluator. In addition, financial audit will also be performed by internal and external auditor</p> |

Chapter 4: Conclusion

To enhance climate change adaptation capacity and disaster resilience in the water resources and the agriculture sector, the following eight climate change adaptation technologies or practices prioritised by MoNRE, particularly Department of Climate Change (DCC) including TNA project team and climate change technical working group (CC-TWG) and stakeholders necessitate more research, development and deployment.

- 1) Early warning system (EWS),
- 2) Disaster risk and impact reduction fund,
- 3) (Integrated) River basin management,
- 4) Climate resilient water supply systems,
- 5) Livestock disease prevention and control,
- 6) Agricultural development subsidy mechanism,
- 7) Climate resilient agricultural infrastructure, and
- 8) Crop diversification.

Based on the Barrier Analysis and Enabling Framework (BAEF), most of these technologies are underdeveloped and underperformed because they have been underfinanced. Investment cost in the technologies is high while their financial and economic return on the investments are either low or difficult to assess and justify for an investment and access to finance. Effective financial mechanisms for sustainably financing the technologies in the meantime are neither sufficient nor clear. Apart from the financial and economic obstacles, limited institutional capacity including staff technical knowledge and skills of MoNRE, MAF and stakeholders to promote and manage the technologies in an effective and sustainable manners is also a main barrier. In addition, insufficient and ineffective legal framework and enforcement, inadequate information, technologies, techniques, best practices and reference projects undermine the deployment of the technologies as well.

The TAP comprises actions and activities, funding sources, responsible organisations, timeframe, risks, success criteria and indicators for M&E and budget for overcoming the barriers as well as enhancing research and development for better use of the eight technologies and practices for strengthening climate change adaptation and disaster resilience in the water resources and the agriculture sector. In overall, among others, the most important actions are improvement of capacity building and access to financial supports and resources for research, development and piloting best technologies or practices to guide the technologies developments and deployments. The total costs for implementation of the TAPs is approximately US\$ 189.91 million, which included US\$ 115.43 million for adaptation in the water resources and 74.48 million in the agriculture sector, from mid of 2018 to an end of 2022. These costs included the cost for full development and deployment of EWS and the costs for preparation of full development and deployment of other technologies.

Annex 1 List of the Participants and Contributors to the Action Plan Development

| No | Name and Surname | Organization | Position |
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| 2 | Mr. Syamphone Sengchandala | DCC, MONRE | Deputy director general |
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| No | Name and Surname | Organization | Position |
|----|------------------------------|---|---|
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| 4 | Mr. Mone Nouansyvong | TNA project | Consultant |
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|----|-----------------------------------|------------------------|----------------------|
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| 43 | Mr. Somephan Vithaya | DMH | Technical |

Annex 2 Assessment of Measures to Include as Actions in the TAP in the Water Resources Sector

1. The assessment of measures to include in the TAP for EWS

| Measures | Total Score | Assessment criteria and scores Score: 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|---|
| Increase national/public revenue | 13 | <p>Effectiveness: 2. Although this measure is a national important measure; increase the national revenue may not always or significantly increase the public investment in EWS since competition for the public budget is still very competitive, the public budgeting is ineffective and imbalance or investment in the economic and infrastructure sector may still be of interest in next five years.</p> <p>Efficiency: 2. Considering the public investment and national revenue earning.</p> <p>Cost-benefit: 4. This measure would have high-eco benefit or impact on broader socioeconomic developments.</p> <p>Impact:2. Considering effectiveness and efficiency.</p> <p>Sustainability: 3. This measure could have more impact in longer term once the pubic budgeting is improved.</p> |
| Improve effectiveness of public budgeting and investment | 14 | <p>Effectiveness: 2. Improving the public/the government budgeting effectiveness is implementable. The public investment in EWS should be increased with the increase of effective budgeting since EWS is worth investing. The EWS's financial and economic return on investment is moderate to high, and it is critical for reducing social and environmental loss and damage as well as poverty reduction. However, the budget may not significantly increase or be moderate considering national revenues and MPI's current limited capacity and information about best practices on the national economic model, the public budgeting and screening project feasibility study including return on investment.</p> <p>Efficiency: 3. There may not be large investment in implementing this measure or action, except studies and develop best public budgeting models. In contrast, improving the effectiveness and efficient of the budgeting would increase the public investment projects and save more resources.</p> <p>Cost-benefit: 3. Improving the public/the government budgeting effectiveness would have great impact on national resources, the public budget allocation and investment in all sectors.</p> <p>Impact: 2. Moderate increase of budget would have moderate impact on EWS development.</p> <p>Sustainability: 3. Although it may not increase the government budget for EWS much, but it is very necessary since the majority of NPAs is limited. Importantly, it would have great and wider impact on the national socioeconomic development.</p> |
| Maintain or increase public and private investment in EWS development | 16 | <p>Effectiveness: 2. This activity is attainable considering national budget and capacity of the organisations in charge such as DCC, DMH and DOWR of MONRE. However, with limited national and pubic budget, the budget allocable for EWS might be moderate level or inadequate compare to its financial needs.</p> <p>Efficiency: 3. Although the public/the government budgeting can be increased but may not significantly increased considering national budget constraints and budget deficit. However, it may not require much budget for developing project proposals for the public investment. It means it can be efficient compare to allocable pubic budget to projects to be proposed.</p> <p>Cost-benefit: 5. Increase public and private investment in EWS development have large direct and indirect benefits to many sectors, especially air, land and water transportation, hydropower, irrigation and agriculture, communication system etc.</p> <p>Impact: 3. Moderate to high increase of budget would have moderate to high impact on EWS development.</p> |

| Measures | Total Score | Assessment criteria and scores Score: 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|--|
| | | Sustainability: 3. It is a sustainable funding sources and have long term impact on EWS development. |
| Reduce and alleviate investment cost on EWS: 1) Reduce import tax of EWS technologies, 2) Cooperate with partners for low cost EWS technologies | 13 | Effectiveness: 2. Although possible to implement but reducing cost on EWS is challenge, for example, reduce costs on import tax which is key national income. 2 nd sub-measure is crucial; however, it is also challenged to realise. Efficiency: 3. Reduce cost would increase efficiency or return on investment. Cost-benefit: 2. The 2 nd sub-measure has more co-benefits. Reversely, 1 st sub-measure or reducing tax may have a trade-off. Impact: 3. Although reducing cost would have great impact on EWS development promotion. Conserving feasibility of this measure, the impact could be moderate or high in case of the 2 nd sub-measures. Sustainability: 3. Considering effectiveness, co-benefits and impact of the 1 st and the 2 nd sub-measures. |
| Enhance effectiveness of resources mobilisation and access | 16 | Effectiveness: 4. Considering disaster and EWS funding trend and current capacity of the responsible organisations, particularly DCC, DMH, EPF to access to financial support. However, there may be some challenges or not fully access to international financial support which is still variable. Efficiency: 4. There may not be large investments, except studies on funding sources, development of financeable project proposals including good financial and economic analysis to convince an investment and financial support. The benefit would be very high compare to financial support to be obtained. Cost-benefit: 3. Considering the effectiveness and efficiency. Impact: 3. Considering the effectiveness Sustainability: 2. As external support could be variable and much relying on external support may not be sustainable. |
| Improve foreign aids effectiveness | 18 | Effectiveness: 4. Improving the foreign aids effectiveness it would maintain or enhance financial support which have great impact on EWS development as it is major funding sources. Laos is implementing Vientiane declaration on aids effectiveness and regularly M&E mechanism including organise roundtable meeting to address the issues. Efficiency: 3. There may not be large investment in implementing this measure or action, except studies on best models and practices. In contrast, improving the aids effectiveness would maintain or enhance EWS financial support which is more valuable compare to the cost of the implementation of the measures. Cost-benefit: 4. Improving the aids effectiveness would have great impact not only in EWS but also impacting other sectors. Impact: 3. Moderate increase of budget would have moderate impact on EWS development. Sustainability: 4. As EWS is largely financed by development partners |
| Improve institutional human resources (HR) development system | 17 | Effectiveness: 4. It is attainable considering capacity of the key stakeholders' capacity. HRD and management have direct impact on EWS development and operation, the better or more effective HRD, the better and more sustainable EWS could be expected. Efficiency: 3. Investing cost in HRD system should be efficient, especially in long term. Cost-benefit: 3. Considering the effectiveness and efficiency. Impact: 3. High, both shorth and long term. Sustainability: 4. Effective HRD and management would lead to more sustainable EWS. |

| Measures | Total Score | Assessment criteria and scores Score: 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|--|-------------|---|
| Increase staff's knowledge and skills in all aspects of EWS: technical, financing, legal and organisational | 18 | <p>Effectiveness: 4. It is attainable considering capacity of the key stakeholders' capacity. With adequate knowledge and skills, more effective EWS operation could be expected.</p> <p>Efficiency: 3. Investing cost in human resources could be high. However, it should be efficient, especially in long term, and when knowledge and skills are effectively provided to right originations/people to secure financial support and investment in EWS.</p> <p>Cost-benefit: 3. Considering the effectiveness and efficiency.</p> <p>Impact: 3. As effective or end-to-end EWS is people-centre EWS.</p> <p>Sustainability: 4. HRM would have long term impacts. Effective HRD and management would lead to more sustainable EWS.</p> |
| Improve coordination among stakeholders, e.g., implementing the EWS standard operation procedure (SOP) | 18 | <p>Efficiency: 3. Investing cost in human resources could be high. However, it should be efficient, especially in long term, and when knowledge and skills are effectively provided to right originations/people to secure financial support and investment in EPAM.</p> <p>Cost-benefit: 3. as well as effectiveness and efficiency.</p> <p>Impact: 3. As end-to-end EWS is a people centre EWS, and more effective coordination means more impact on EWS effectiveness.</p> <p>Sustainability: 4. As effective coordination is always needed.</p> |
| Increase information and awareness on EWS, especially technical, financing mechanism, legal and institutional framework and best practices | 17 | <p>Effectiveness: 4. Considering existing capacity and skills to be acquired in future, R&D of information and best practices are doable, although external technical support is needed. With sufficient information and best practices, EWS would be more effective.</p> <p>Efficiency: 2. Investing in information may be costly and may not be high efficient considering just production of information. However, once it is used for development, especially for financial and economic purpose, more benefit could overweight the cost.</p> <p>Cost-benefit: 3. Moderate to high considering the effectiveness and efficiency.</p> <p>Impact: 4. Available information may have not only impact on knowledge and awareness, but EWS operation. The more information, more effective EWS, and more loss and damage reduction could be expected.</p> <p>Sustainability: 4. As EWS requires an update information about hazards and technologies overtime.</p> |
| Increase tools and facilities | 18 | <p>Effectiveness: 4. EWS would be fully developed and effectively operated.</p> <p>Efficiency: 3. As EWS is worth investing as mention above.</p> <p>Cost-benefit: 3. Increase infrastructure and facilities including weather forecast, telecommunication, roads etc have large direct and indirect benefits to many sectors as well.</p> <p>Impact: 4. As it would help EWS fully and effectively operate.</p> <p>Sustainability: 4. It is highly and immediately needed as tools and guidelines are insufficient. Importantly, without the guidelines, although PAM could be continued, it could be out of track and undermine effectiveness, efficiency and impact.</p> |
| Develop legal framework and enhance law enforcement effectiveness | 16 | <p>Effectiveness: 3. In principle, having legal framework would have very impact on EWS, especially clear organisational mandates, investing or access to resources and mainstreaming in EWS in developments etc. however, considering capacity of relevant organisations and law enforce effectiveness which are variable, the impact would not be maximum.</p> <p>Efficiency: 2. Cost on investing in legal framework development and enforcement may be moderate. Considering the effectiveness, efficiency could at</p> |

| Measures | Total Score | Assessment criteria and scores Score: 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|---|
| | | <p>medium level.</p> <p>Cost-benefit: 3. Having legal framework in place is not only benefiting EWS, but also other related sectors.</p> <p>Impact: 4. Considering in line with the effectiveness.</p> <p>Sustainability: 4. Having legal framework in place would contribute to long term impact and high sustainability of EWS.</p> |
| Enhance sustainable settlement including integrated land uses and resilient town planning | 17 | <p>Effectiveness: 3. Considering current relevant organisations' capacity and skills or future skills to be built.</p> <p>Efficiency: 3. Some technical and financial resources are needed for R&D. However, with the best practice guidelines in place, it would lead to more effective EWS performance, leading to more efficient investing in EWS.</p> <p>Cost-benefit: 3. Integrated land uses, and resilient town planning would have wider impacts on EWS and other sectors/areas.</p> <p>Impact: 4. Once communities are not in the disaster risk areas, disaster loss and damage would be none or minimal. EWS may not need. Or if the communities settle in appropriate place or with sufficient infrastructure, the EWS could be more effective.</p> <p>Sustainability: 4. It is highly and immediately needed as tools and guidelines are insufficient. Importantly, without the guidelines, although PAM could be continued, it could be out of track and undermine effectiveness, efficiency and impact.</p> |

2. The assessment of measures to include in the TAP for Disaster Reduction Fund-DRF

| Measures to overcome the barriers | Total score | Assessment criteria, score and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|--|
| Maintain or increase the government emergency response fund | 16 | <p>Effectiveness: 4. Increase national or public revenue may not significantly increase public investment in DRF because budgeting, and budget allocation is likely ineffective, or imbalance and budget demand and investment may remain high in the economic and infrastructure sector in next five years.</p> <p>Efficiency: 3. Considering the public investment and national revenue earning.</p> <p>Cost-benefit: 2. Increase national/the public revenue would have great impact on broader socioeconomic developments.</p> <p>Impact:3. Considering effectiveness and efficiency.</p> <p>Sustainability: 4. Although it may not increase the government budget for DRF much, but it is a sustainable funding source.</p> |
| Strengthen capacity to mobilise resources for disaster reduction fund | 16 | <p>Effectiveness: 3. High effectiveness considering disaster funding trend and current capacity of the responsible organisations, particularly DCC, DMH, EPF to access to financial support. However, there may be some challenges or not fully access to international financial support to inject in this kind of fund.</p> <p>Efficiency: 3. There may not be large investments, except studying funding sources, developing financeable project proposals. However, the benefit would be outweighed the cost once financial support is obtained.</p> <p>Cost-benefit: 3. Considering the effectiveness and efficiency.</p> <p>Impact: 4. Considering the effectiveness</p> |

| Measures to overcome the barriers | Total score | Assessment criteria, score and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|---|
| | | Sustainability: 3. Although it works for some periods, relying on external support may not be sustainable. |
| Develop a sustainable or an effective financial mechanism and model on manage disaster reduction fund | 15 | <p>Effectiveness: 3. Because it is currently unclear how to develop and operate DRF in a sustainable or an effective manner, and with the mechanism in place, it should be helpful for convincing development and expansion of the DRF for climate resilience</p> <p>Efficiency: 3. Investing in developing a sustainable or an effective financial mechanism and model may involve with some cost, but it should be efficient when the mechanism is in place and drive DRF effectively and efficiently.</p> <p>Cost-benefit: 2. Moderate as the mechanism is for disaster specific.</p> <p>Impact: 3. Considering the effectiveness and efficiency</p> <p>Sustainability: 4. As sustainable or effective DRF requires a good mechanism.</p> |
| Develop a policy or decree on disaster impact reduction fund | 17 | <p>Effectiveness: 4. Having legal framework would have direct and significant impact on development of disaster reduction fund as legal frame do not exist. However, like other funds such as forest and environment protection fund, although there is legal frame in place, they are not fully operated due to HR constraints.</p> <p>Efficiency: 3. Cost on investing in legal framework development and enforcement may be moderate. Considering the effectiveness, efficiency could at medium level.</p> <p>Cost-benefit: 3. Having legal framework in place is not only benefiting EWS, but also other related sectors.</p> <p>Impact: 4. Considering the effectiveness.</p> <p>Sustainability: 3. Having legal framework in place would contribute to long term impact and high sustainability</p> |
| Improve roles and responsibilities of stakeholder and unit in charge of development and management of disaster reduction fund | 16 | <p>Effectiveness: 3. Because it is unclear whether DRF should be managed by DCC, EPF of MONRE or DOPR of MOF and DODR of MOLSW. Clear responsibility would lead to more funding and the DRF operation.</p> <p>Efficiency: 3. It is unlikely to cost much to improve the organisational mandates. It would be efficient considering more funding and more effective DRF operation to be derived as a result of the mandate clarification.</p> <p>Cost-benefit: 3. Once an organisation has clear mandates, broader impact on the organisational performance could be expected.</p> <p>Impact: 4. Considering the effectiveness.</p> <p>Sustainability: 3. As sustainability of DRF is much dependent on clear stakeholders' responsibility.</p> |
| Increase knowledge and skills on the disaster financing and fund development | 18 | <p>Effectiveness: 4. With adequate knowledge and skills, more effective development and management of the disaster reduction fund could be expected.</p> <p>Efficiency: 3. Investing cost in human resources could be high. However, it should be efficient, especially in long term, and when knowledge and skills are effectively provided to right originations/people.</p> <p>Cost-benefit: 3. Considering the effectiveness and efficiency.</p> <p>Impact: 4. As HR is critical issue at the moment, addressing HR would have great impact.</p> <p>Sustainability: 4. HRM would have long term impacts.</p> |

| Measures to overcome the barriers | Total score | Assessment criteria, score and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|--|
| Research and develop information especially feasibility, an effective and successful disaster reduction fund and best practices | 16 | <p>Effectiveness: 3. With sufficient information and best practices, disaster reduction fund would be somehow effectively developed. However, considering existing capacity of the relevant organisations such as DCC, EPF of MONRE or DOR of MOF; R&D of best practices or successful financial models to design efficient disaster reduction fund is challenge, and the external technical support is needed.</p> <p>Efficiency: 3. Some budget is required for R&D of the information. However, once the information is available, used for resources mobilisation and the DRF is increased; the financial benefit could overweight the cost.</p> <p>Cost-benefit: 3. Moderate to high considering the effectiveness and efficiency.</p> <p>Impact: 4. Available information may have great impact on DRF development, because Currently this is not enough information to justify and convince development of disaster reduction or increase the government emergency fund for disaster warning and response. The more information, the more fund, would be derived.</p> <p>Sustainability: 3. As DRF requires good and sufficient information overtime.</p> |

3. The assessment of measures to include in the TAP for River Basin Management-RBM

| Measures | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|---|
| Increase budget and investment in W-RBM | 17 | <p>Effectiveness: 4. Increase budget and investment, would lead to complete number of RBM activities such as water resources profile, planning and monitoring etc. However, it is challenges or not able increase and fully access to public budget and international financial support which is still variable.</p> <p>Efficiency: 4. There may not be large investments, except studies on funding sources, development of financeable project proposals including good financial and economic analysis to convince an investment and financial support. The benefit would be very high compare to financial support to be obtained.</p> <p>Cost-benefit: 3. Considering effectiveness and efficiency.</p> <p>Impact: 3. Considering effectiveness</p> <p>Sustainability: 3. the budget from the government is a sustainable source and should contribute to sustainability of RBM to some extent. External support is crucial for sustainability, but the funding could be variable.</p> |
| Develop financial models on W-RBM | 16 | <p>Effectiveness: 3. Because it is currently unclear how to mobilise resources and finance RBM sustainably. With a sustainable or an effective financial model in place, the relevant organisations should be able to convince and attract financial support for sustainable RBM</p> <p>Efficiency: 3. Investing in developing a sustainable or an effective financial mechanism and model may involve with some cost, but it should be efficient when the mechanism is in place and funding RBM increased and sustained.</p> <p>Cost-benefit: 3. Moderate to high as it would benefit number of river basins.</p> <p>Impact: 4. Considering the effectiveness and efficiency</p> |

| Measures | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|--|
| Develop legal framework on water allocation, right, ownership, tax | 17 | <p>Sustainability: 3. As sustainable or effective RBM requires a good model or mechanism.</p> <p>Effectiveness: 3. In principle, having legal framework would have high impact on RBM, as the polices on water allocation, right, ownership and tax do not exist or clear. However, RBM may not completely solved with the legal framework in place as there are other issues such as inadequate resources and information etc. to realise sustainable RBM.</p> <p>Efficiency: 2. Cost on legal framework development and enforcement may be moderate. Considering the effectiveness, efficiency could at medium level.</p> <p>Cost-benefit: 3. Having the legal framework in place would have high impact on other sectors and stakeholders involving river basins.</p> <p>Impact: 4. Considering and in line with the effectiveness.</p> <p>Sustainability: 4. Having legal framework in place would contribute to long term impact and sustainability of RBM.</p> |
| Increase knowledge and skills on RBM including IWRM for climate change adaptation and disaster resilience | 18 | <p>Effectiveness: 4. With adequate knowledge and skills, more effective RBM and IWRM could be realised.</p> <p>Efficiency: 3. Investing cost in human resources could be highly efficient, especially in long term, and when knowledge and skills are effectively provided to right originations/people.</p> <p>Cost-benefit: 3. Considering the effectiveness and efficiency.</p> <p>Impact: 4. As HR is critical issue, addressing the HR problems would have high impact on RBM-IWRM for adaptation.</p> <p>Sustainability: 4. HRM would have long term impacts. Effective HRD and management would lead to more sustainable RBM.</p> |
| Develop successful models and best practice on RBM including IWRM | 18 | <p>Effectiveness: 4. RBM is underdeveloped or not sustainable due to lack of development and deployment of successful models and best practice. So, with a sustainable or an effective model and best practices, the more sustainable or an effective RBM would be.</p> <p>Efficiency: 3. Investing in developing a sustainable or an effective financial mechanism and model may involve with some cost, but the benefits to be received as a result of sustainable or effective RBM would overweight the cost.</p> <p>Cost-benefit: 3. Moderate to high as it would benefit number of river basins.</p> <p>Impact: 4. As the effectiveness</p> <p>Sustainability: 4. As sustainable or effective RBM requires a good model or mechanism.</p> |
| Increase R&D of information on water resources, hazards, technologies and best practices | 16 | <p>Effectiveness: 3. As insufficient information and best practices are critical barriers for sustainable RBM, good info and best practices means the better RBM planning. However, although good information and plan, decision and actual implementation of RBM might be variable due to financial resources constraints.</p> <p>Efficiency: 3. Investing in R&D may cost moderately or high because of the information is far limited. However, once information is available for good planning and decision making, more funding could be expected.</p> <p>Cost-benefit: 3. Sufficient water resources, hazards, adaptation technologies and best practices could be useful for another sector planning and development as well.</p> <p>Impact: 3. Considering the effectiveness.</p> <p>Sustainability: 4. As sustainable RBM needs comprehensive information, so adequate information would have long term impact on RBM.</p> |
| Enhance cooperation and | 14 | <p>Effectiveness: 2. Despite effective coordination is promising for sustainable or effective RBM, it is hard to realise as there are large number of stakeholders and conflicts of interests exist.</p> |

| Measures | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|--|
| harmonise the uses of river basin water resources | | <p>Efficiency: 3. Cost for improvement coordination many not high, while the benefits to be received from the effective coordination would overweight the cost.</p> <p>Cost-benefit: 3. Moderate to high as it would benefit number of river basins.</p> <p>Impact: 3. As the effectiveness</p> <p>Sustainability: 3. Better coordination should increase sustainability of RBM. However, considering movements and influence of the existing RBM committee and management; apart from coordination, there are numbers factors that may drive sustainable RBM.</p> |

4. The assessment of measures to include in the TAP for Climate Resilient Water Supply Systems-CRWSS

| Measures to overcome barriers | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|---|
| Increase public budget and investment in CRWS | 16 | <p>Effectiveness: 3. Increase budget and investment, would lead to complete number of CRWSS schemes including improvement of construction standards, and resilience. However, it is challenges or not able increase and fully access to public budget and international financial support which is still variable.</p> <p>Efficiency: 3. There may not be large investments, except studies on funding sources, development of financeable project proposals including good financial and economic analysis to convince an investment and financial support. The benefit would be very high compare to financial support to be obtained.</p> <p>Cost-benefit: 3. As CRWSS benefits many sectors and areas.</p> <p>Impact: 4. Because the CRWSS remains far shortage of budget/investment.</p> <p>Sustainability: 3. As CRWSS remains highly relying on public budget/investment.</p> |
| Reduce investment cost on climate resilient technologies- CRT: 1) reduce or exempt tax on the import of the CRT, 2) enhance cooperation with partners for CRT support or access to lower cost CRT | 14 | <p>Effectiveness: 2. Although 1st sub-measure is critical and possible to implement but it is challenge as it is key national income. 2nd sub-measure is crucial; however, it is also hard to achieve.</p> <p>Efficiency: 3. Lower cost on CRT would increase efficiency of CRT. It may also have high impact or lead to increase expansion of CRWSS.</p> <p>Cost-benefit: 2. The 2nd sub-measure has more co-benefits. Reversely, 1st sub-measure or reducing tax may have a trade-off.</p> <p>Impact: 3. Although reducing cost would lead to increase CRWSS expansion; considering feasibility of the CRWSS which varies, the impact could be moderate or high.</p> <p>Sustainability: 3. The 1st may not be able to continue overtime and long run as it could impact on the national revenue. The 2nd sub-measure or international cooperation would continue in long term, however, relying on the international support have implications on the sustainability.</p> |
| Improve economic viability and subsidise climate resilient water supply systems | 15 | <p>Effectiveness: 3. As shortage of the budget is critical problem for CRWSS.</p> <p>Efficiency: 3. Subsidies would improve the financial feasibility of the CRWSS, however, it may not be sustainable or has a trade-off.</p> <p>Cost-benefit: 2. As the public budget shortage, increase subsidies for one sector may impact budget allocation in another sector.</p> <p>Impact: 4. With sufficient budget including subsidies, the CRWSS could rapidly developed.</p> |

| Measures to overcome barriers | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|---|
| | | Sustainability: 3. As sustainable or effective RBM requires a good model or mechanism. |
| Expand access to finance | 16 | <p>Effectiveness: 4. Considering disaster and EWS funding trend and current capacity of the responsible organisations, particularly DCC, DMH, EPF to access to financial support. However, there may be some challenges or not fully access to international financial support which is still variable.</p> <p>Efficiency: 4. There may not be large investments, except studies on funding sources, development of financeable project proposals including good financial and economic analysis to convince an investment and financial support. The benefit would be very high compare to financial support to be obtained.</p> <p>Cost-benefit: 3. Considering effectiveness and efficiency.</p> <p>Impact: 3. Considering effectiveness</p> <p>Sustainability: 2. As external support could be variable.</p> |
| Develop policy and regulation on climate resilient technologies | 17 | <p>Effectiveness: 3. In principle, having legal framework would have high impact on CRWSS, especially mainstreaming climate resilience technologies and practices in water supply systems developments. However, considering resources for water supply developments and enforcement of ESIA and construction regulation which are variable, the impact would be variable.</p> <p>Efficiency: 3. Cost on investing in legal framework development and enforcement may be moderate. Considering the effectiveness, efficiency could at medium level.</p> <p>Cost-benefit: 3. Having legal framework in place is not only benefiting CCWSS, but also other related sectors.</p> <p>Impact: 4. Considering in line with the effectiveness.</p> <p>Sustainability: 4. Having legal framework in place would contribute to long term impact and high sustainability of CRWSS.</p> |
| Enhance law enforcement effectiveness | 17 | <p>Effectiveness: 3. As low disaster resilience of water supply system is due to ineffective law enforcement such as ineffective construction standard and quality control, and lack of mainstreaming climate resilient technologies and practices in the ESIA system. So, the more effective enforcement of law, the more resilient the water supply systems would be. However, considering law enforcement business as usual, the effectiveness of law enforcement in near future may remain variable.</p> <p>Efficiency: 3. Investing in law enforcement would not cost much, while benefits derived from the effective law enforcement would be much more.</p> <p>Cost-benefit: 3. Quality water supply systems should other sector as well, for example, save cost and being model for other development.</p> <p>Impact: 4. As low construction standard and quality materials have great impact on the water supply development including resilience, coping with this issue would have high impact on CRWSS.</p> <p>Sustainability: 4. Sustainability of the CRWSS depends on effective law enforcement of construction standard and quality materials</p> |
| Increase knowledge and skills on CRWS | 18 | <p>Effectiveness: 4. The more knowledgeable and skilful staff, the more effective CRWS would be.</p> <p>Efficiency: 3. Investing cost in human resources could be efficient, especially in long term, and when knowledge and skills are effectively provided to right originations/people</p> <p>Cost-benefit: 3. Considering the effectiveness and efficiency.</p> <p>Impact: 4. Since HR is determinant for CRWS.</p> |

| Measures to overcome barriers | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|--|
| | | Sustainability: 4. HRD-M would have long term impacts and sustainability. |
| Improve water supply system development and management system including procurement, construction quality control | 18 | <p>Effectiveness: 4. As low disaster resilience of water supply system is due to low construction standard and ineffective quality control. Address this issue would scientifically improve resilience of water supply system.</p> <p>Efficiency: 3. Quality water supply systems should maintain efficiency.</p> <p>Cost-benefit: 3. Quality water supply systems should other sector as well, for example, save cost and being model for other development.</p> <p>Impact: 3. As CRWSS largely depends on construction standard and quality materials</p> <p>Sustainability: 4. High construction standard and quality materials</p> <p>Main high CRWSS.</p> |
| Develop the strategy on climate resilient water supply systems | 13 | <p>Effectiveness: 2. As the lack of strategy delays CRWS development including financing. With the strategy in place, CRWSS would be faster development. However, despite good strategy, decision and actual development of CRWSS might be variable due to financial resources constraints.</p> <p>Efficiency: 3. Investing in R&D of strategy may cost moderately but more funding could be expected following good strategy</p> <p>Cost-benefit: 2. As it is the CRWSS specific strategy</p> <p>Impact: 3. Considering the effectiveness.</p> <p>Sustainability: 3. As CRWS needs strategic guidance.</p> |
| Increase information about hazards, risks, climate resilient technologies | 15 | <p>Effectiveness: 3. As insufficient information is bottleneck point for CRWS, good and sufficient info would lead to better CRWS planning and development. However, although good information and plan, decision and actual implementation of RBM might be variable due to financial resources constraints.</p> <p>Efficiency: 3. Investing in R&D may cost moderately or high because of the information is quite limited. However, more funding could be expected following adequate information good planning and decision making.</p> <p>Cost-benefit: 3. Sufficient water resources, hazards, adaptation technologies and best practices could be useful for another sector planning and development as well.</p> <p>Impact: 3. Considering the effectiveness.</p> <p>Sustainability: 3. As effective CRWS needs detail and overtime update information about resilient technologies and practices, so adequate information has implications for sustainability of CRWS.</p> |

Annex 3 Assessment of Measures to Include as Actions in the TAP in the Agriculture Sector

1. The assessment of measures to include in the TAP for Livestock Disease Epidemics Surveillance-LDES

| Measures | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|--|-------------|---|
| Increase budget and investment on livestock disease surveillance | 18 | <p>Effectiveness: 3. Increase budget and investment, would lead to more effective LDES. However, it is challenges or not able increase and fully access to public budget due to limited revenue. Access to international financial support may be variable.</p> <p>Efficiency: 4. There may not be large investments, except studies on funding sources, development of financeable project proposals including good financial and economic analysis to convince an investment and financial support. The benefit would be very high compare to financial support to be obtained.</p> <p>Cost-benefit: 3. As LDES benefits many sectors and areas.</p> <p>Impact: 4. Because the LDES remains far shortage of budget/investment.</p> <p>Sustainability: 4. As LDES remains highly relying on public budget/investment.</p> |
| Reduce cost of vaccines, vaccination, and disease epidemics surveillance: 1) reduce import tax of the LDES including surveillance technologies, and 2) increase international cooperation so that increase access to the support or low cost LDES and surveillance technologies | 15 | <p>Effectiveness: 3. Although 1st sub-measure is critical and possible to implement but it is challenge as it is key national income. 2nd sub-measure is crucial; however, it is also hard to achieve.</p> <p>Efficiency: 4. Lower cost on LDES would increase efficiency of LDES. It may also have high impact or lead to increase expansion of LDES.</p> <p>Cost-benefit: 1. The 2nd sub-measure has more co-benefits. Reversely, 1st sub-measure or reducing tax may have a trade-off.</p> <p>Impact: 3. Reducing cost would lead to increase LDES expansion and effectiveness. However, it may have a trade-off.</p> <p>Sustainability: 3. The 1st may not be able to continue overtime and long run as it could impact on the national revenue. The 2nd sub-measure or international cooperation would continue in long term, however, relying on the international support have implications on the sustainability.</p> |
| Expand access to finance for disease prevention and control | 17 | <p>Effectiveness: 4. Considering disaster and EWS funding trend and current capacity of the responsible organisations, particularly DCC, DMH, EPF to access to financial support. However, there may be some challenges or not fully access to international financial support which is still variable.</p> <p>Efficiency: 4. There may not be large investments, except studies on funding sources, development of financeable project proposals including good financial and economic analysis to convince an investment and financial support. The benefit would be very high compare to financial support to be obtained.</p> <p>Cost-benefit: 3. Considering effectiveness and efficiency.</p> <p>Impact: 3. Considering effectiveness</p> <p>Sustainability: 2. As external support could be variable.</p> |
| Increase human | 18 | <p>Effectiveness:4. With sufficient HR, more effective livestock disease prevention and control could be expected.</p> |

| Measures | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|--|-------------|---|
| resource | | <p>Efficiency: 3. Investing cost in human resources could be efficient, especially in long term, and when knowledge and skills are effectively provided to right originations/people</p> <p>Cost-benefit: 3. Considering the effectiveness and efficiency.</p> <p>Impact: 4. As effectiveness</p> <p>Sustainability: 4. HRM would have long term impacts and sustainability of the livestock disease epidemic surveillance system</p> |
| Increase technologies including equipment, vaccine package, laboratory, surveillance and treatments facilities | 18 | <p>Effectiveness: 4. As lack of equipment, vaccine package, laboratory, surveillance and treatments facilities are the key barriers for LDES.</p> <p>Efficiency: 3. Investing in equipment, vaccine package, laboratory, surveillance and treatments facilities is costly. Investing in LDES is however is usually efficient.</p> <p>Cost-benefit: 3. As it is LDES specific.</p> <p>Impact:4. Considering the effectiveness and efficiency.</p> <p>Sustainability: 4. As livestock disease and technologies may evolve overtime, adequate equipment, vaccine package, laboratory, surveillance and treatments facilities would lead to continue LDES in long run.</p> |
| Increase information on livestock disease, surveillance and treatment technologies | 16 | <p>Effectiveness: 4. As insufficient information and best practices are scanty for better planning and decision on the investment in LDES, good info and best practices means the better LDES planning and development. However, despite good information and plan; decision and effective LDES relies on human and financial resources, which may be limited in near future.</p> <p>Efficiency: 3. Investing in R&D may involve with high cost because of quite high cost on R&D equipment, and large information gaps. However, good information for good planning and decision making, more funding and investment could be expected.</p> <p>Cost-benefit: 3. Moderate as information is mostly used for LDES.</p> <p>Impact: 3. Considering the effectiveness.</p> <p>Sustainability: 4. As livestock disease and technologies may evolve overtime, adequate information would have impact on the sustainability of LDES.</p> |
| Increase awareness and reduce ignorance about livestock disease control | 16 | <p>Effectiveness: 3. As low awareness about the surveillance system and best practices hinders investment in LDES, more knowledge and awareness of the surveillance system would increase public and private including farmers to invest and cooperate LDES implementation. However, high awareness, the LDES may not effective implement since human and financial resources may still be problematic in near future.</p> <p>Efficiency: 3. Investing in awareness raising may not involve with high cost. Investing in LDES is quite efficient.</p> <p>Cost-benefit: 3. As it is LDES specific.</p> <p>Impact: 3. Considering the effectiveness.</p> <p>Sustainability: 4. As livestock disease and technologies may evolve overtime, high awareness would lead to continue LDES in long run.</p> |
| Increase standard and larger farming and reduce uncontrolled free range and sparse | 17 | <p>Effectiveness: 3. Would avoid or could prevent disease outbreak to great extent. However, the LDES may not effective implement since financial resources of especially poor farmers may still be problematic in near future.</p> <p>Efficiency: 3. Investing in awareness raising may not involve with high cost. Investing in LDES is quite efficient.</p> <p>Cost-benefit: 4. As increase standard and larger farming and reduce free range could also reduce environment and social impact.</p> |

| Measures | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|-------------------|-------------|---|
| livestock raising | | Impact: 3. Considering the effectiveness. Sustainability: 4. As increase standard and larger farming are being promoted and free range will be reduced or no longer exist in long run. |

2. The assessment of measures to include in the TAP for Agriculture Subsidy Mechanism-ASM

| Measures | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|---|
| Increase the public budget and resources mobilisation for subsidising climate change adaptation and disaster resilience in the agriculture sector | 17 | Effectiveness: 4. Increase budget and investment, would lead to more subsidies. However, it is challenges or not able increase and fully access to public budget due to limited revenue. Access to international financial support may be uncertain. Efficiency: 3. There may not be large investments, except studies on funding sources, development of financeable project proposals including good financial and economic analysis to convince an investment and financial support. The benefit would be very high compare to financial support to be obtained. Cost-benefit: 3. As it benefits broader agriculture development and trade. Impact: 3. Because the shortage of budget/investment are the key barriers for subsidies. Sustainability: 4. Because the shortage of budget/investment are the key barriers for subsidies. However, the subsidy itself could be continue in long run or always exist. |
| Develop legal framework | 16 | Effectiveness: 3. In principle, having legal framework would have impact on ASM, especially clear organisational mandates, investing or access to resources etc.; however, considering capacity of relevant organisations and law enforce effectiveness which are variable, the impact would not be maximum. Efficiency: 3. Cost on investing in legal framework development and enforcement may be moderate. Considering the effectiveness, efficiency could at medium level. Cost-benefit: 3. Having legal framework in place is not only benefiting ASM for climate and disaster resilience, but also other agriculture development activities. Impact: 3. Considering in line with the effectiveness. Sustainability: 4. Having legal framework in place would contribute to long term impact and high sustainability of ASM. |
| Define clearly organisations' responsibilities s to develop and manage the subsidy | 16 | Effectiveness: 3. Once stakeholders have clear responsibilities, implement action development of ASM should be more effective. However, considering limited resources and low law enforce effectiveness, despite clear responsibility, ASM may not be effectively developed. Efficiency: 4. Cost on investing in improving organisational mandates may be moderate. Once the stakeholders perform well as a result of clear mandates, the benefit would overweight the cost. Cost-benefit: 3. Improving organisational mandates would also help better enforcement of other agriculture development activities. Impact: 3. Considering in line with the effectiveness. Sustainability: 4. Having legal framework in place would contribute to long term impact and high sustainability of ASM. |

| Measures | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|--|-------------|---|
| Enhance knowledge and skills on subsidies | 17 | Effectiveness: 3. With adequate knowledgeable and skilful staff would lead to more effective agriculture subsidies development and management. Efficiency: 3. Investing cost in HR could be efficient, especially in long term, and when knowledge and skills are effectively provided to right originations/people Cost-benefit: 3. Considering the effectiveness and efficiency. Impact: 3. As effective or end-to-end EWS is people-centre EWS. Sustainability: 4. HRM would have long term impacts. Effective HRD and management would lead to more sustainable EWS. |
| Increase information and reference project about subsidy mechanism for climate change adaptation and disaster resilience | 17 | Effectiveness: 3. As insufficient information and best practices prevent the ASM, the more information about the importance and benefit of ASM for decision making; ASM would be gained more supports and developed. However, despite ASM in place; the implementation could be variable due to variable limited resources. Efficiency: 3. Investing in R&D may involve with some costs. However, the more information about ASM; the more support on ASM would be, leading to more injection of fund for agriculture development subsidies. Cost-benefit: 3. High since that information are also useful for other agricultural development. Impact: 4. Considering the effectiveness. Sustainability: 4. Goof information should sustain deployment of ASM. However, subsidy itself is unlikely to be continue in long run. |

3. The assessment of measures to include in the TAP for Crop Diversification

| Measures | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|---|
| Increase budget for the extension | 17 | Effectiveness: 4. Considering disaster and EWS funding trend and current capacity of the responsible organisations, particularly DCC, DMH, EPF to access to financial support. However, there may be some challenges or not fully access to international financial support which is still variable. Efficiency: 3. There may not be large investments, except studies on funding sources, development of financeable project proposals including good financial and economic analysis to convince an investment and financial support. The benefit would be very high compare to financial support to be obtained. Cost-benefit: 3. Considering effectiveness and efficiency. Impact: 4. Considering effectiveness Sustainability: 3. As external support could be variable. |
| Increase knowledge and skills on crop diversification | 18 | Effectiveness: 4. Adequate HR would lead to more effective crop diversification Efficiency: 3. Investing cost in HR could be efficient, especially in long term, and when knowledge and skills are effectively provided to right originations/people Cost-benefit: 3. Considering the effectiveness and efficiency. Impact: 3. As effectiveness. Sustainability: 4. HRM would have long term impacts and more sustainable crop diversification development and management |
| Increase | 16 | Effectiveness: 3. As insufficient information and best practices are scanty for better planning and decision on the investment in CD, good info and best practices |

| Measures | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|--|
| information on optimal crop diversification for climate change adaptation and disaster resilience | | would lead to more effective CD development. However, despite good information and plan; CD development could be variable due to variable market, limited resources and access to finance would still be a problem for agriculture development in near future. Efficiency: 3. Investing in R&D may involve with high cost because there are large information gaps. However, good information and clear feasibility for decision making, more funding and investment could be expected. Cost-benefit: 3. High since that information are also useful for other agricultural development. Impact: 3. Considering the effectiveness. Sustainability: 4. As climate, CD technologies and practices may evolve overtime, adequate information would have impact on the sustainability of CD. |
| Increase awareness on crop diversification | 16 | Effectiveness: 3. As CD is not well-known, increase knowledge and awareness about advantages of the CD would push more farmers to deploy CD. Efficiency: 3. Investing in awareness programme may involve some costs. However, with high and spread awareness of CD, the CD would be deployed and reduce loss and damage to agriculture, leading to more efficient. Cost-benefit: 3. Since it is also useful for other agricultural development. Impact: 3. Considering the effectiveness. Sustainability: 4. The more farmers know and aware of CD, especially best practice, the longer CD would be deployed. |
| Develop reference projects and best practices | 18 | Effectiveness: 4. As CD lacks and requires reference projects and best practices to guide the development and deployment. Considering current future organisational capacity and skills to be built, defining and developing best practice guideline should be doable although it may need external technical support. Efficiency: 3. Some technical and financial resources are needed for R&D. However, the reference projects and best practices would lead to more efficient agriculture development. Cost-benefit: 3. Also beneficial to other agriculture development models. Impact: 4. The reference projects and best practices guidelines would lead to much improved and great impact on agriculture development. Sustainability: 4. The more variable climate, disease and pests, the more reference projects and best practices are needed for sustainable agriculture. |

4. The assessment of measures to include in the TAP for Climate Resilient Rural Infrastructure-CRRI

| Measures to overcome barriers | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|--|-------------|--|
| Reduce cost on the disaster resilient infrastructure: 1) reduce or exempt tax for importing CRRI | 15 | Effectiveness: 2. Although 1 st sub-measure is critical and possible to implement but it is challenge as it is key national income. 2 nd sub-measure is crucial; however, it is also hard to achieve. Efficiency: 3. Lower cost on CRRI technologies would increase efficiency of CRRI technologies. It may also have high impact or lead to increase expansion of CRRI. Cost-benefit: 3. The 2 nd sub-measure has more co-benefits. Reversely, 1 st sub-measure or reducing tax may have a trade-off. |

| Measures to overcome barriers | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|---|-------------|--|
| technologies, 2) increase cooperation with partners to access to support or lower cost CRRI | | Impact: 4. Although reducing cost would lead to increase CRRI expansion; considering feasibility of the CRI which varies, the impact could be moderate or high. Sustainability: 3. The 1 st may not be able to continue overtime and long run as it could impact on the national revenue. The 2 nd sub-measure or international cooperation would continue in long term, however, relying on the international support have implications on the sustainability. |
| Increase the public and private investment on the disaster resilient infrastructure | 18 | Effectiveness: 3. The public/the government budgeting can be increased but may not significantly increased considering national budget constraints and budget deficit. Considering international funding trend and current capacity of the responsible organisations, particularly DCC, DOI, DOR and DOUP, there may be some challenges to fully access to international financial support as it is still variable. Efficiency: 4. Implementing this activity would not be costly. There may be some costs associated with studies on funding sources, development of financeable project proposals including good financial and economic analysis to convince an investment and financial support. However, the benefit could be high or outweigh the cost, especially then the projects are funded, or financial supports are secured. Cost-benefit: 3. Considering effectiveness and efficiency. Impact: 4. Considering the effectiveness and efficiency Sustainability: 4. Although external support could be variable, the public budget is one of the sustainable financial sources. |
| Increase financial and economic incentives for the disaster resilient infrastructure | 14 | Effectiveness: 2. Considering financial capacity of the government including DCC, DOI, DOR and DOUP to provide financial and economic incentives. Despite it is a push factor for CRRI, it could be hard to implement in the situation where the public budget is limited or deficit. Efficiency: 4. Several CRRI could become efficient if the public could provide financial and economic incentives. Cost-benefit: 2. Considering effectiveness and efficiency. Impact: 4. Considering efficiency or if the private and entrepreneurs receive sufficient financial and economic incentives, CRRI related to their businesses and production could be substantially developed. Sustainability: 2. Financial and economic incentives to stimulate private and entrepreneurs including local communities to investment in CRRI is usually temporary intervention or taking place at the beginning and reduced once the private and entrepreneurs could invest in the infrastructure related to their businesses and production or the government has financial capacity to invest in all the public infrastructures. |
| Expand access to finance | 17 | Effectiveness: 3. Considering financial feasibility of rural infrastructure projects and capacity of the responsible organisations, particularly DCC, DOI, DOR, DOUP and private sector to access to financial support and resources. However, it is hard to tap all financial potentials or access to fully access the resources since international organisations' financial pledge to especially LDC and ASEAN countries including Laos are variable and some of the RRI may have low financial and economic return on investment. Efficiency: 3. Investing in CRRI could be high. However, several CRRI are perceived to have moderate to high financial and economic return on investment and benefits. So, investing in CRRI, in general, would be efficient, although some may, and some may not be efficient. Cost-benefit: 4. Developing or deploying CRRI will not only enhance climate resilience but it can also enhance multi-sectors developments such as trading and access to public services. |

| Measures to overcome barriers | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|--|-------------|--|
| | | Impact: 4. Considering effectiveness and cost-benefit Sustainability: 3. Increase access to finance and involve private sector and entrepreneurs to invest in CRRRI would enhancing sustainability of the RRI. |
| Develop policies on climate resilient technologies and infrastructure | 16 | Effectiveness: 3. With policies on climate resilient technologies and infrastructure in place, more effective CRRRI development and deployment could be expected. Efficiency: 2. Investing cost in developing policies on climate resilient technologies and infrastructure should be efficient, especially when it is effectively implemented, and funding or investment are increased. Cost-benefit: 4. Considering the effectiveness and efficiency. Impact: 3. Considering effectiveness and efficiency Sustainability: 4. Sustain CRRRI requires policies and effective enforcement |
| Increase effectiveness of law enforcement, especially the infrastructure and environmental standards inspection | 17 | Effectiveness: 3. With effectiveness of law enforcement, more effective CRRRI development and deployment. Efficiency: 3. Investing cost in law enforcement should be efficient, especially in long term as it could save cost or reduce environmental and disaster impacts Cost-benefit: 4. Considering the effectiveness and efficiency. Impact: 3. Considering effectiveness and efficiency Sustainability: 4. effectiveness of law enforcement would have long term impacts and sustain CRRRI |
| Increase intuitional capacity, staff knowledge and skills on the resilient infrastructure | 18 | Effectiveness: 4. With adequate knowledge and skills, more effective CRRRI development and deployment could be expected. Efficiency: 3. Investing cost in HR should be efficient, especially in long term, and when knowledge and skills are effectively provided to right originations/people Cost-benefit: 3. Considering the effectiveness and efficiency. Impact: 3. Considering effectiveness and efficiency Sustainability: 4. HRM would have long term impacts and more sustainable CRRRI |
| Increase information and awareness on climate change, disaster resilient infrastructure including best practices | 17 | Effectiveness: 3. As insufficient information is bottleneck point for CRRRI, good and sufficient info would lead to better CRRRI planning and development. However, although good information and plan, decision and actual implementation might be variable due to financial resources constraints. Efficiency: 3. Investing in R&D may cost moderately or high because of the information is quite limited. However, more funding could be expected following adequate information good planning and decision making. Cost-benefit: 2. Could be moderate as info is surveyed and collected for specifically CCRI planning and development. Impact: 3. Considering the effectiveness. Sustainability: 3. As effective CRRRI needs detail and overtime update information about hazards, resilient technologies and practices, so adequate information has implications for sustainability of CRRRI. |
| Develop reference projects/models | 18 | Effectiveness: 4. As CRRRI lacks and requires reference projects and best practices to guide the development and deployment. Considering current future organisational capacity and skills to be built, defining and developing best practice guideline should be doable although it may need external technical |

| Measures to overcome barriers | Total score | Assessment criteria, scores and description 1: Moderate, 2: Moderate to High, 3: High, 4 High to Very High, 5: Very High |
|-------------------------------|-------------|---|
| | | <p>support.</p> <p>Efficiency: 3. Some technical and financial resources are needed for R&D. However, the reference projects and best practices would lead to more efficient rural development.</p> <p>Cost-benefit: 3. Also beneficial broader social and economic developments.</p> <p>Impact: 4. The reference projects and best practices guidelines would lead to much improved and great impact on agriculture development.</p> <p>Sustainability: 4. The more variable climate and hazards, the more reference projects and best practices are needed for sustainable rural development.</p> |

Annex 4 Identifying timeframe and stakeholders for implementing TAPs in the Water Resources Sector

1. Scheduled the Action Plans for EWS

| Actions | Activities | Preparation (m/y) | | Implement-ation (m/y) | | Responsible body | |
|-----------------|---|-------------------|-----------|-----------------------|-----------|------------------|-----------|
| | | Start | Com-plete | Start | Com-plete | Primary | Secondary |
| Action 1 | Increase public investment and resources mobilisation for EWS | | | | | | |
| Activity 1.1 | <i>Conduct an assessment financial needs and funding sources</i> | May 18 | Jul 18 | Oct 18 | Mar 19 | DMH | DCC, WRD |
| Activity 1.2 | <i>Develop strategy and action plan on EWS</i> | May 18 | Jul 18 | Dec 18 | May 19 | DMH | DCC, WRD |
| Activity 1.3 | <i>Develop resource mobilisation plan</i> | May 18 | Jul 18 | Dec 18 | Jun 19 | DMH | DCC, WRD |
| Activity 1.4 | <i>Develop financial sources or donor directory</i> | May 18 | Jul 18 | Jan 19 | May 19 | DMH | DCC, WRD |
| Activity 1.5 | <i>Develop and submit financeable project proposals to donors</i> | May 18 | Jul 18 | Jan 19 | Dec 22 | DMH | DCC, WRD |
| Activity 1.6 | <i>Improve effectiveness of public investment including budget allocation and financing aids management system</i> | May 18 | Jul 18 | Mar 19 | Dec 22 | DMH | DCC, WRD |
| Action 2 | Increase institutional capacity and human resources (HR) | | | | | | |
| Activity 2.1 | <i>Improve human resources development system</i> | May 18 | Jul 18 | Oct 18 | Dec 22 | DMH | DCC, WRD |
| Activity 2.2 | <i>Building capacity of national and local authorities including communities at risk of disasters</i> | May 18 | Jul 18 | Dec 18 | Dec 22 | DMH | DCC, WRD |
| Activity 2.3 | <i>Increase mobile staff and volunteers to facilitate the EWS</i> | May 18 | Jul 18 | Jan 19 | Dec 22 | DMH | DCC, WRD |
| Activity 2.4 | <i>Promote EWS network, think-tank and civil organisations and information exchanges</i> | May 18 | Jul 18 | Jan 19 | Dec 22 | DMH | DCC, WRD |
| Activity 2.5 | <i>Improve EWS education and research</i> | May 18 | Jul 18 | Jan 19 | Dec 21 | DMH | DCC, WRD |
| Action 3 | Increase tools and develop infrastructure and facilities for EWS including response | | | | | | |
| Activity 3.1 | <i>Re-assess infrastructure needs for enhancing EWS and response capacity</i> | May 18 | Jul 18 | Oct 18 | Dec 20 | DMH | DCC, WRD |
| Activity 3.2 | <i>Re-survey, re-design and develop disaster resilient town plan and integrated land use in and for disaster risk areas and communities</i> | May 18 | Jul 18 | Dec 18 | Dec 21 | DMH | DCC, WRD |
| Activity 3.3 | <i>Develop tools/ software for weather nowcasting</i> | May 18 | Jul 18 | Jan 19 | Dec 21 | DMH | DCC, WRD |
| Activity 3.4 | <i>Develop tools/ software for weather numerical model (WNM)</i> | May 18 | Jul 18 | Jan 19 | Mar 20 | DMH | DCC, WRD |
| Activity 3.5 | <i>Install weather radar systems</i> | May 18 | Jul 18 | Jan 19 | Dec 21 | DMH | DCC, WRD |

| Actions | Activities | Preparation | | Implementation | | Responsible body | |
|-----------------|---|-------------|----------|----------------|----------|------------------|-----------|
| | | (m/y) | | (m/y) | | Primary | Secondary |
| | | Start | Complete | Start | Complete | | |
| Activity 3.6 | Develop automatic hydrological stations and gauge-to-gauge models for floods monitoring and forecast | May 18 | Jul 18 | Jan 19 | Dec 21 | DMH | DCC, WRD |
| Activity 3.7 | Develop automatic rain gauges including models for floods and landslide monitoring and forecast | May 18 | Jul 18 | Nov 18 | Dec 21 | DMH | DCC, WRD |
| Activity 3.8 | Develop telecommunication including IT systems for EWS | May 18 | Jul 18 | Oct 18 | Dec 21 | DMH | DCC, WRD |
| Activity 3.9 | Develop electricity and power back up systems in all areas at risk of hazards | May 18 | Jul 18 | Oct 18 | Dec 21 | DMH | DCC, WRD |
| Activity 3.10 | Develop access roads to and in all areas at risk of hazards | May 18 | Jul 18 | Oct 18 | Dec 22 | DMH | DCC, WRD |
| Activity 3.11 | Develop operation centres including tools/software, equipment for EWS for EWS | May 18 | Jul 18 | Oct 18 | Dec 21 | DMH | DCC, WRD |
| Activity 3.12 | Develop warning guidelines and SOPs for EWS | May 18 | Jul 18 | Sep 18 | Dec 19 | DMH | DCC, WRD |
| Activity 3.13 | Re-locate the inevitable disaster risk communities | May 18 | Jul 18 | Dec 18 | Dec 22 | DMH | DCC, WRD |
| Action 4 | Increase information and awareness | | | | | | |
| Activity 4.1 | Research about hazards and update hazards profiles | May 18 | Jul 18 | Oct 18 | Oct 20 | DMH | DCC, WRD |
| Activity 4.2 | Develop hazard maps of all flood prone areas | May 18 | Jul 18 | Oct 18 | Oct 20 | DMH | DCC, WRD |
| Activity 4.3 | Study and identify best tools/technologies for (floods) monitoring and forecast, communication and response | May 18 | Jul 18 | Aug 18 | Mar 21 | DMH | DCC, WRD |
| Action 5 | Develop and enforce policies and regulation on EWS | | | | | | |
| Activity 5.1 | Develop policies or regulation on EWS | May 18 | Jul 18 | Aug 18 | Mar 20 | DMH | DCC, WRD |
| Activity 5.2 | Re-locate inevitable disaster risk communities | May 18 | Jul 18 | Aug 18 | Mar 22 | DMH | DCC, WRD |

2. Scheduled Action Plan for Disaster Reduction Fund

| Actions | Activities | Preparation | | Implementation | | Responsible body | |
|-----------------|--|-------------|----------|----------------|----------|------------------|-----------------------------------|
| | | (m/y) | | (m/y) | | Primary | Secondary |
| | | Start | Complete | Start | Complete | | |
| Action 1 | Maintain the public budget and resources mobilisation for disaster emergency response | | | | | | |
| Activity 1.1 | Conduct financial needs and resources assessment | May 18 | Jul 18 | Apr 18 | Dec 18 | EPF, DCC | State Reserve Department-SRD, WRD |
| Activity 1.2 | Develop and implement resource mobilisation plan | May 18 | Jul 18 | Jul 18 | Jun 19 | EPF, DCC | SRD, WRD |
| Activity 1.3 | Develop financial sources/ donor directory | May 18 | Jul 18 | Dec 18 | Feb 19 | EPF, DCC | SRD, WRD |
| Activity | Develop and submit project proposals | May | Jul 18 | Sep 18 | Dec 22 | EPF, | SRD, WRD |

| Actions | Activities | Preparation | | Implementation | | Responsible body | |
|-------------------|--|-------------|----------|----------------|----------|------------------|-----------|
| | | Start | Complete | Start | Complete | Primary | Secondary |
| 1.4 | | 18 | | | | DCC | |
| Activity 1.5 | <i>Set up and implement M&E of resources mobilisation and financial management system</i> | May 18 | Jul 18 | Mar 19 | Dec 22 | EPF, DCC | SRD, WRD |
| Action 2 | Increase human resources (HR) | | | | | | |
| Activity 2.1 | <i>Building national, local authorities and communities on disaster financing and fund management</i> | May 18 | Jul 18 | Apr 18 | Dec 22 | EPF, DCC | SRD, WRD |
| Activity 2.2 | <i>Develop disaster financing education and research in high education</i> | May 18 | Jul 18 | Apr 19 | Dec 19 | EPF, DCC | SRD, WRD |
| Action 3 | Develop legal framework on disaster impact reduction fund | | | | | | |
| Activity 3.1 | <i>Develop decree on the disaster reduction fund</i> | May 18 | Jul 18 | Dec 18 | Dec 19 | EPF, DCC | SRD, WRD |
| Activity 3.2 | <i>Develop regulation on the disaster reduction fund management</i> | May 18 | Jul 18 | Oct 18 | Feb 19 | EPF, DCC | SRD, WRD |
| Activity 4 | Increase information and awareness | | | | | | |
| Activity 4.1 | <i>R&D information about disasters loss and damage</i> | May 18 | Jul 18 | Oct 18 | Dec 22 | EPF, DCC | SRD, WRD |
| Activity 4.2 | <i>Study and identify best practices about sustainable disaster financing and insurance of risks in all aspects (legal, organisation, management etc.)</i> | May 18 | Jul 18 | Dec 18 | Mar 19 | EPF, DCC | SRD, WRD |
| Activity 5 | Piloting disaster financing | | | | | | |
| Activity 5.1 | <i>Piloting financing risk management, loss and damage recovery of a production and business</i> | May 18 | Jul 18 | Apr 19 | Dec 22 | EPF, DCC | SRD, WRD |

3. Scheduled Action Plan for the River Basin Management

| Actions | Activities | Preparation | | Implementation | | Responsible body | |
|-----------------|---|-------------|----------|----------------|----------|------------------|--------------------|
| | | Start | Complete | Start | Complete | Primary | Secondary |
| Action 1 | Increase the public budget and resources mobilisation for RBM-IWRM | | | | | | |
| Activity 1.1 | <i>Develop river basin development plan including financial needs assessment for all river basins</i> | May 18 | Jul 18 | Oct 18 | Dec 20 | DWR | DCC, DHM, DEP, DOC |
| Activity 1.2 | <i>Conduct financial assessment (to identify funding sources and feasibilities)</i> | May 18 | Jul 18 | Oct 18 | Dec 19 | DWR | DCC, DHM, DEP, DOC |
| Activity 1.3 | <i>Develop financial sources or donor directory</i> | May 18 | Jul 18 | Jan 19 | Jun 19 | DWR | DCC, DHM, DEP, DOC |
| Activity 1.4 | <i>Develop resource mobilisation and engagement plan</i> | May 18 | Jul 18 | Oct 18 | Mar 19 | DWR | DCC, DHM, DEP, DOC |
| Activity 1.5 | <i>Develop and submit financeable project proposals</i> | May 18 | Jul 18 | Oct 18 | Dec 22 | DWR | DCC, DHM, DEP, DOC |
| Activity 1.6 | <i>Set up and implement M&E and financial management system</i> | May 18 | Jul 18 | Dec 18 | Dec 19 | DWR | DCC, DHM, DEP, DOC |
| Action 2 | Develop financial models on W-RBM | | | | | | |

| | | | | | | | |
|--------------|---|--------|--------|--------|--------|-----|--------------------|
| Activity 2.1 | Complete river basin planning (e.g., Mekong's tributary rivers, Nam Nuen, Nam Ma and Nam Sum which discharge to Vietnam's sea) | May 18 | Jul 18 | Dec 18 | Dec 21 | DWR | DCC, DHM, DEP, DOC |
| Activity 2.2 | Conduct financial needs and resources assessment | May 18 | Jul 18 | Dec 18 | Dec 19 | DWR | DCC, DHM, DEP, DOC |
| Activity 2.3 | Define a sound effective or sustainable financial model (based on activity 3.1 and 3.2) | May 18 | Jul 18 | Dec 18 | Dec 19 | DWR | DCC, DHM, DEP, DOC |
| Activity 2.3 | Pilot the financial model including M&E and redefining more effective or sustainable financial model | May 18 | Jul 18 | Apr 19 | Dec 22 | DWR | DCC, DHM, DEP, DOC |
| Action 3 | Develop legal framework on water allocation, right, discharge, tax or fee | | | | | | |
| Activity 3.1 | Review law enforcement on the (financial) contributions of water users (businesses) to sustainable river basin management | May 18 | Jul 18 | Oct 18 | Jun 19 | DWR | DCC, DHM, DEP, DOC |
| Activity 3.2 | Study and define best practices on the water allocation, right, minimum and maximum water discharge, and tax or fee | May 18 | Jul 18 | Jan 19 | Dec 21 | DWR | DCC, DHM, DEP, DOC |
| Activity 3.3 | Develop the decree on the water allocation, right, minimum and maximum water discharge, and tax or fee | May 18 | Jul 18 | Jan 19 | Dec 19 | DWR | DCC, DHM, DEP, DOC |
| Action 4 | Increase knowledge and skills on IWRM | | | | | | |
| Activity 4.1 | Improve human resource development system including capacity development plan, staff knowledge, building learning culture and commitment (e.g., MoNRE) | May 18 | Jul 18 | Oct 18 | Dec 22 | DWR | DCC, DHM, DEP, DOC |
| Activity 4.2 | Building national, local authorities and communities on IWRM and adaptation in water resources sector through professional trainings | May 18 | Jul 18 | Jan 19 | Dec 22 | DWR | DCC, DHM, DEP, DOC |
| Activity 4.3 | Increase extension staff to assist IWRM and adaptation at local levels | May 18 | Jul 18 | Jan 19 | Dec 22 | DWR | DCC, DHM, DEP, DOC |
| Activity 4.4 | Incorporate adaptation in IWRM education and research in high education | May 18 | Jul 18 | Jan 19 | Dec 21 | DWR | DCC, DHM, DEP, DOC |
| Activity 4.5 | Promote network, think-tank and civil organisation and information exchanges on climate change adaptation in water resources | May 18 | Jul 18 | Jan 19 | Dec 22 | DWR | DCC, DHM, DEP, DOC |
| Action 5 | Increase R&D of information on water resources, hazards, technologies and best practices | | | | | | |
| Activity 5.1 | Survey and develop profile on socioeconomic, water resources including ecosystem services and water related hazards of all river basins and sub-basins | May 18 | Jul 18 | Jan 19 | Jun 21 | DWR | DCC, DHM, DEP, DOC |
| Activity 5.2 | R&D best practices on sustainable water resources management including financing, organisational arrangement and cooperation, law enforcement, water allocation and tax, disaster resilient infrastructure etc. | May 18 | Jul 18 | Oct 18 | Dec 22 | DWR | DCC, DHM, DEP, DOC |
| Activity | Improve and disseminate information | May | Jul 18 | Jan 19 | Dec 22 | DWR | DCC, DHM, |

| | | | | | | | |
|-----------------|--|--------|--------|--------|--------|-----|--------------------|
| 5.3 | <i>about water related hazards, quality and quantity, biodiversity and ecosystem</i> | 18 | | | | | DEP, DOC |
| Action 6 | Develop best technologies and infrastructure for adaptation in the river basins | | | | | | |
| Activity 6.1 | <i>Survey and develop reservoirs and water storage facilities for enhancing drought resilience</i> | May 18 | Jul 18 | Oct 18 | Dec 21 | DWR | DCC, DHM, DEP, DOC |
| Activity 6.2 | <i>Survey and develop reservoirs and water storage facilities for floods mitigation and control</i> | May 18 | Jul 18 | Oct 18 | Dec 21 | DWR | DCC, DHM, DEP, DOC |
| Activity 6.3 | <i>Survey and develop infrastructure and facilities for prevention and control of landslide and erosions along the rivers and areas that are risk of landslide</i> | May 18 | Jul 18 | Oct 18 | Dec 22 | DWR | DCC, DHM, DEP, DOC |
| Activity 6.4 | <i>Identify and develop floods and drought early warning system including monitoring and forecast, communication system and emergency response plan</i> | May 18 | Jul 18 | Oct 18 | Dec 22 | DWR | DCC, DHM, DEP, DOC |
| Action 7 | Enhance cooperation and harmonise the uses of river basin resources | | | | | | |
| Activity 7.1 | <i>Establish river basin/watershed national and regional steering committees to coordinate and facilitate an integrated the river basin development</i> | May 18 | Jul 18 | Oct 18 | Jun 19 | DWR | DCC, DHM, DEP, DOC |
| Activity 7.2 | <i>Organise sustainable river basin development forum</i> | May 18 | Jul 18 | Dec 18 | Dec 22 | DWR | DCC, DHM, DEP, DOC |

4. Scheduled Action Plan for Climate Resilient Rural Infrastructure

| Actions | Activities | Preparation (month/year) | | Implementation (month/year) | | Responsible body | |
|-----------------|---|--------------------------|----------|-----------------------------|----------|------------------------------|------------|
| | | Start | Complete | Start | Complete | Primary | Secondary |
| Action 1 | Increase the public budget and resources mobilisation to develop climate and disaster resilient water supply systems | | | | | | |
| Activity 1.1 | <i>Develop strategy of the resilient water supply systems</i> | May 18 | Jul 18 | Aug 18 | Dec 19 | MPWT: DoWS, DUH MPH: CWSH | MONRE: DCC |
| Activity 1.2 | <i>Conduct financial assessment (to identify funding sources and feasibilities)</i> | May 18 | Jul 18 | Sep 18 | Dec 19 | MPWT: DoWS, DUH MPH: CWSH | MONRE: DCC |
| Activity 1.3 | <i>Develop financial sources or donor directory</i> | May 18 | Jul 18 | Dec 18 | Mar 19 | MPWT: DoWS, DUH MPH: CWSH | MONRE: DCC |
| Activity 1.4 | <i>Develop resource mobilisation and engagement plan</i> | May 18 | Jul 18 | Dec 18 | Jun 19 | MPWT: DoWS, DUH MPH: CWSH | MONRE: DCC |
| Activity 1.5 | <i>Develop and submit financeable project proposals</i> | May 18 | Jul 18 | Dec 18 | Dec 22 | MPWT: DoWS, DUH MPH: CWSH | MONRE: DCC |
| Activity 1.6 | <i>Set up and implement M&E and financial management system</i> | May 18 | Jul 18 | Jan 19 | Dec 19 | MPWT: DoWS, DUH MPH: CWSH | MONRE: DCC |

| | | | | | | | |
|--------------|---|--------|--------|--------|--------|---|---------------------------------|
| Action 2 | Expand access to finance | | | | | | |
| Activity 2.1 | <i>Strengthening cooperation between domestic and regional banks and financial institutes (to expand domestic financial markets including lowering interest rate and simplify procedures for borrowing)</i> | May 18 | Jul 18 | Jan 19 | Dec 22 | MOF: BOL MPI: DOP | MPWT: DoWS, DUH MPH: CWSH |
| Activity 2.2 | <i>Increase financial capacity and readiness and of entrepreneurs</i> | May 18 | Jul 18 | Jan 19 | Dec 22 | MOF: BOL MPI: DOP | MPWT: DoWS, DUH MPH: CWSH |
| Activity 2.3 | <i>Organise financial access dialogue on business risk management and financing</i> | May 18 | Jul 18 | Jan 18 | Dec 22 | MOF: BOL MPI: DOP | MPWT: DoWS, DUH MPH: CWSH |
| Action 3 | Limited knowledge and skills on climate resilient technologies and practices | | | | | | |
| Activity 3.1 | <i>Conduct capacity needs assessment</i> | May 18 | Jul 18 | Sep 18 | Feb 19 | MONRE: DCC | MPWT: DoWS, DUH MPH: CWSH |
| Activity 3.2 | <i>Provide technical and financial trainings on infrastructure standard system, climate and disaster resilient technologies and practices</i> | May 18 | Jul 18 | Jan 19 | Dec 22 | MONRE: DCC | MPWT: DoWS, DUH MPH: CWSH |
| Activity 3.3 | <i>Improve organisation development system including human development plan, staff knowledge management, recruitment etc.</i> | May 18 | Jul 18 | Dec 18 | Dec 22 | MONRE: DCC MPWT: DoWS, DUH MPH: CWSH | |
| Activity 3.4 | <i>Promote establishment of the network, think-tank and civil organisation and information exchanges on climate and disaster resilient technologies and practices</i> | May 18 | Jul 18 | Jan 19 | Dec 22 | MONRE: DCC | MPWT: DoWS, DUH MPH: CWSH |
| Activity 3.5 | <i>Improve education and research on climate and disaster resilient technologies and practices in high education</i> | May 18 | Jul 18 | Jan 19 | Dec 21 | MONRE: DCC | MPWT: DoWS, DUH MPH: CWSH |
| Action 4 | Develop and enforce policies on climate resilient technologies and infrastructure | | | | | | |
| Activity 4.1 | <i>Develop policies on climate resilient technologies and infrastructure</i> | May 18 | Jul 18 | Dec 18 | Dec 19 | MONRE: DCC | MPWT: DoWS, DUH MPH: CWSH |
| Activity 4.2 | <i>Enhance rural infrastructure engineering and ESIA screening, M&E and inspection</i> | May 18 | Jul 18 | Jan 18 | Dec 22 | MONRE: DCC | MPWT: DoWS, DUH MPH: CWSH |
| Action 5 | Increase information and awareness about hazards, climate and disaster resilient technologies and practices | | | | | | |
| Activity 5.1 | <i>Research and develop hazard maps and update hazards profiles</i> | May 18 | Jul 18 | Dec 18 | Dec 20 | MONRE: DCC | MPWT: DoWS, DUH MPH: CWSH |
| Activity 5.2 | <i>Re-assess loss and damage, and disaster adaptive capacity or resilience of the rural infrastructures and financial needs</i> | May 18 | Jul 18 | Jan 19 | Dec 20 | MPWT: DoWS, DUH MPH: CWSH | |
| Activity 5.3 | <i>Study and identify best climate and disaster resilient technologies and</i> | May 18 | Jul 18 | Dec 18 | Dec 22 | MPWT: DoWS, DUH | |

| | | | | | | | |
|---------------------|---|---------------|---------------|---------------|---------------|-----------------------|-----------------------|
| | <i>practices</i> | | | | | <i>MPH: CWSH</i> | |
| <i>Activity 5.4</i> | <i>Pilot floods and drought urban resilient water supply systems</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Jun 19</i> | <i>Dec 22</i> | <i>MONRE: DCC</i> | <i>DoWS, DUH CWSH</i> |
| <i>Activity 5.5</i> | <i>Pilot floods and drought urban resilient water supply systems</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Jun 19</i> | <i>Dec 22</i> | <i>MONRE: DCC</i> | <i>DoWS, DUH CWSH</i> |
| <i>Activity 5.6</i> | <i>Disseminate information about hazards, climate and disaster resilient technologies and practices</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Jun 19</i> | <i>Dec 22</i> | <i>DoWS, DUH CWSH</i> | <i>MONRE: DCC</i> |

Annex 5 Identifying timeframe and stakeholders for the implementing TAPs in the Agriculture Sector

1. Livestock Disease Prevention and Control

| Actions | Activities | Preparation (month/year) | | Implementation (month/year) | | Responsible body | |
|-----------------|---|--------------------------|----------|-----------------------------|----------|-----------------------|-------------------------------------|
| | | Start | Complete | Start | Complete | Primary | Secondary |
| Action 1 | Increase budget and resources mobilisation for livestock disease surveillance | | | | | | |
| Activity 1.1 | <i>Develop the strategy on livestock diseases surveillance including financial needs assessment</i> | May 18 | Jul 18 | Aug 18 | Mar 19 | MAF: DOLF | MAF: DOPC |
| Activity 1.2 | <i>Conduct financial assessment and identify the financial/funding sources or donors for livestock diseases surveillance development and management</i> | May 18 | Jul 18 | Aug 18 | Dec 18 | MAF: DOLF | MAF: DOPC, NAFRI |
| Activity 1.3 | <i>Develop the resource mobilisation plan</i> | May 18 | Jul 18 | Oct 18 | Apr 19 | MAF: DOLF | MAF: DOPC, NAFRI |
| Activity 1.4 | <i>Develop and submit financeable project proposals to the potential donors</i> | Dec 18 | Mar 19 | Mar 19 | Dec 22 | MAF: DOLF | MAF: DOPC, NAFRI |
| Activity 1.5 | <i>Develop and update the funding sources or donor directory</i> | Oct 18 | Dec 18 | Jan 19 | Mar 19 | MAF: DOLF | MAF: DOPC |
| Activity 1.6 | <i>Improve public budget and financial aids management system (effectiveness, accountability and transparency etc.)</i> | Jan 19 | Mar 19 | Mar 19 | Dec 22 | MPI: DOFAM, MAF: DOLF | MAF: DOPC |
| Action 2 | Reduce cost of vaccines, vaccination, and disease epidemics surveillance | | | | | | |
| Activity 2.1 | <i>Research and promote local knowledge best practices on livestock disease, epidemic detection, prevention and control</i> | May 18 | Jul 18 | Aug 18 | Aug 22 | MAF: DOLF | MAF: NAFRI NUOL: FOA |
| Activity 2.2 | <i>Increase cooperation and networks including assistance on vaccination, and disease epidemics surveillance</i> | May 18 | Jul 18 | Jan 19 | Dec 22 | MAF: DOLF | MAF: DOPC, NAFRI |
| Activity 2.3 | <i>Study and introduce appropriate import tax mechanism or reduce tax on importing vaccination, and disease epidemics surveillance technologies</i> | May 18 | Jul 18 | Jun 18 | Jun 19 | MAF: DOLF | MAF: NAFRI NUOL: FOA |
| Action 3 | Expand access to finance for livestock business including disease prevention and control | | | | | | |
| Activity 3.1 | <i>Strengthening cooperation between domestic and regional banks and financial institutes (to expand financial markets, lowering interest rate and simplify procedures for borrowing)</i> | May 18 | Jul 18 | Jul 18 | Jun 21 | MAF: DOLF | MAF: DOPC, NAFRI |
| Activity 3.2 | <i>Increase financial capacity and readiness and of livestock entrepreneurs and farmers</i> | May 18 | Jul 18 | Oct 18 | Oct 20 | MAF: DOLF | MAF: NAFRI MIC: DSMEP, CCI |
| Activity 3.3 | <i>Organise financial access dialogue and M&E on the access to finance</i> | May 18 | Jul 18 | Oct 18 | Jun 22 | MAF: DOLF | MAF: DOPC, NAFRI MIC: DSMEP, CCI |
| Action 4 | Increase human resource | | | | | | |
| Activity 4.1 | <i>Conduct capacity needs assessment</i> | May 18 | Jul 18 | Jul 18 | Dec 18 | MAF: DOLF | MAF: DOPO, NAFRI |
| Activity 4.2 | <i>Provide technical and financial trainings on livestock disease, epidemic detection, prevention and control</i> | May 18 | Jul 18 | Sep 18 | Sep 22 | MAF: DOLF | MAF: DOPO, NAFRI |
| Activity 4.3 | <i>Increase cooperation and partnership with development partners, international originations and INGOs on capacity building</i> | May 18 | Jul 18 | Oct 18 | Dec 22 | MAF: DOLF | MAF: DOPO, NAFRI |
| Activity | <i>Improve organisation development system including</i> | May | Jul | Jul | Dec | MAF: | MAF: DOPO, |

| Actions | Activities | Preparation (month/year) | | Implementation (month/year) | | Responsible body | |
|--------------|---|--------------------------|----------|-----------------------------|----------|------------------|-------------------------------------|
| | | Start | Complete | Start | Complete | Primary | Secondary |
| 4.4 | human development planning, staff knowledge management, recruitment etc. | 18 | 18 | 18 | 22 | DOLF | NAFRI |
| Activity 4.5 | Promote establishment of network, think-tank and civil organisations and information exchanges | May 18 | Jul 18 | Dec 18 | Dec 22 | MAF: DOLF | MAF: DOPO, NAFRI NUOL: FOA |
| Activity 4.6 | Improve on livestock disease, epidemic detection, prevention and control in education and research institutes | May 18 | Jul 18 | Sep 18 | Jun 19 | MAF: DOLF | MAF: DOPO, NAFRI NUOL: FOA |
| Activity 4.7 | Organise volunteer and technical mobile groups to support livestock disease, epidemic detection, warning, and control | May 18 | Jul 18 | Oct 18 | Oct 21 | MAF: DOLF | MAF: DOPO, NAFRI NUOL: FOA |
| Action 5 | Increase technologies including equipment, vaccine package, laboratory, surveillance and treatments facilities | | | | | | |
| Activity 5.1 | Improve livestock disease research, diagnose, treatment and control facilities, equipment and vaccines at DOLF, FOA of NUOL, Luang Prabang and Champasack college | May 18 | Jul 18 | Sep 18 | Jun 22 | MAF: DOLF | MAF: NAFRI NUOL: FOA Colleges |
| Activity 5.2 | Improve livestock disease detection and diagnose facilities at all international and major local check points | May 18 | Jul 18 | Jul 18 | Jun 20 | MAF: DOLF | MAF: NAFRI NUOL: FOA Colleges |
| Activity 5.3 | Develop a centre for reporting and warning about livestock disease epidemics | May 18 | Jul 18 | Oct 18 | Oct 20 | MAF: DOLF | MAF: NAFRI NUOL: FOA Colleges |
| Action 6 | Increase information and awareness on livestock disease, surveillance and treatment technology best practices and guidelines | | | | | | |
| Activity 6.1 | R&D livestock disease, disease epidemic surveillance and treatment technology best practices and guidelines or SOP | May 18 | Jul 18 | Aug 18 | Dec 22 | MAF: DOLF | MAF: NAFRI NUOL: FOA Colleges |
| Activity 6.2 | Disseminate information about livestock disease, disease epidemic surveillance system, and treatment technology including best practices and guidelines | May 18 | Jul 18 | Oct 18 | Dec 22 | MAF: DOLF | MAF: NAFRI NUOL: FOA Colleges |
| Action 7 | Reduce free range and scattered livestock raising and promote standard and larger farm system | | | | | | |
| Activity 7.1 | Develop a land use plan and strategy on forage and grassland for cattle | May 18 | Jul 18 | Jul 18 | Jun 19 | MAF: DOLF | MAF: NAFRI NUOL: FOA Colleges |
| Activity 7.2 | R&D and promote animal feed development | May 18 | Jul 18 | Jul 18 | Dec 22 | MAF: DOLF | MAF: NAFRI NUOL: FOA Colleges |
| Activity 7.3 | Enhance law enforcement on standard livestock farm system | May 18 | Jul 18 | Sep 18 | Dec 22 | MAF: DOLF | MAF: NAFRI NUOL: FOA Colleges |

2. Agriculture Subsidy Mechanism

| Actions | Activities | Preparation | | Implementation | | Responsible body | |
|---------|------------|-------------|----------|----------------|----------|------------------|-----------|
| | | Start | Complete | Start | Complete | Primary | Secondary |

| Actions | Activities | Preparation | | Implementation | | Responsible body | |
|-----------------|--|-------------|----------|----------------|----------|------------------|---|
| | | Start | Complete | Start | Complete | Primary | Secondary |
| Action 1 | Expand access to finance | | | | | | |
| Activity 1.1 | <i>Study and strengthening cooperation between domestic and regional banks and financial institutes (to access to finance to implement a climate and disaster risk management)</i> | May 18 | Jul 18 | Jul 18 | Dec 19 | MOF: BOL, B&FIs | MIC: CCI, DSMEP MPI: DIP MAF: DoA |
| Activity 1.2 | <i>Increase financial capacity and readiness and of entrepreneurs</i> | May 18 | Jul 18 | Oct 18 | Dec 22 | MIC: DSMEP, CCI | MAF: DoA MPI: DIP |
| Activity 1.3 | <i>Organise financial access dialogue on agriculture subsidies</i> | May 18 | Jul 18 | Dec 18 | Dec 22 | MIC: DSMEP, CCI | MAF: DoA MPI: DIP |
| Action 2 | Increase subsidise for climate and disaster risk management | | | | | | |
| Activity 2.1 | <i>Assessment of financial subsidy needs and capacity of the public sector</i> | May 18 | Jul 18 | Dec 18 | Dec 19 | MAF: DoA | MIC: DSMEP, CCI MPI: DIP |
| Activity 2.2 | <i>Conduct feasibility, impact, trade-off and define appropriate subsidy mechanisms</i> | May 18 | Jul 18 | Oct 18 | Dec 19 | MAF: DoA | MOF: BOL, B&FIs |
| Action 3 | Increase organisational capacity and human resources | | | | | | |
| Activity 3.1 | <i>Provide professional training and exchanges on subsidies on climate and disaster risk management</i> | May 18 | Jul 18 | Jan 19 | Dec 22 | MOF: BOL, B&FIs | MIC: DSMEP, CCI MPI: DIP MAF: DoA |
| Activity 3.2 | <i>Improve human resources development system of the public organisations responsible for the subsidies</i> | May 18 | Jul 18 | Oct 18 | Dec 22 | MAF: DoA | MONRE: DCC |
| Activity 3.3 | <i>Improve education and research on climate and disaster risk management subsidies</i> | May 18 | Jul 18 | Jan 19 | Dec 22 | NUOL: FOA | MAF: DoA |
| Activity 3.4 | <i>Promote dialogue, network, think-tank and information exchanges on financial mechanism for disaster risk management</i> | May 18 | Jul 18 | Jan 19 | Dec 22 | MAF: DoA | MAF: NAFRI MIC: CCI, DSMEP |
| Action 4 | Improve information about climate and disaster loss and damage, best practices and guidelines on the subsidies | | | | | | |
| Activity 4.1 | <i>R&D and disseminate information about climate and disaster loss and damage, best practices and guidelines on the subsidies</i> | May 18 | Jul 18 | Oct 18 | Dec 22 | MAF: NAFRI | MAF: DoA MONRE: DCC |
| Activity 4.2 | <i>Pilot a subsidy mechanism to address climate and disaster risk management</i> | May 18 | Jul 18 | Jun 19 | Dec 22 | MAF: DoA | MONRE: DCC |
| Action 5 | Develop policy or regulation on disaster risk management financing | | | | | | |
| Activity 5.1 | <i>Develop law on climate change</i> | May 18 | Jul 18 | Oct 18 | Dec 22 | MONRE: DCC | |
| Activity 5.2 | <i>Develop decree or policy on the establishment of a fund or financial mechanism for climate change and disaster prevention and control</i> | May 18 | Jul 18 | Jan 19 | Dec 22 | MONRE: DCC, DEP | MAF: DoA |

3. Crop Diversification

| Actions | Activities | Preparation (month/year) | | Implementation (month/year) | | Responsible body | |
|-----------------|--|-----------------------------|--|--------------------------------|--------------|--------------------------------------|--|
| | | Start | Compl ete | Start | Compl ete | Primary | Secondary |
| | | Action 1 | Increase public and enhance resource mobilisation to invest in the crop diversification | | | | |
| Activity 1.1 | Develop strategy and action plan on crop diversification including financial needs assessment | May 18 | Jul 18 | Dec 18 | Dec 19 | MAF: DoA | MAF: NAFRI |
| Activity 1.2 | Conduct financial needs and funding sources assessment | May 18 | Jul 18 | Oct 18 | Mar 19 | MAF: DoA, NAFRI | MONRE: DCC, EPF |
| Activity 1.3 | Develop resource mobilisation plan | May 18 | Jul 18 | Sep 18 | Mar 19 | MAF: DoA, NAFRI | MONRE: DCC, EPF |
| Activity 1.4 | Develop and submit project proposals for funding the crop diversification | May 18 | Jul 18 | Nov 18 | Dec 22 | MAF: DoA, NAFRI | MONRE: DCC, EPF |
| Activity 1.5 | Develop funding source/donor directory | May 18 | Jul 18 | Jan 19 | Mar 19 | MAF: DoA, NAFRI | MONRE: DCC, EPF |
| Activity 1.6 | Improve public and foreign financial aids management system including recording, reporting, M&E | May 18 | Jul 18 | Oct 18 | Dec 20 | MPI: DOP, DM&E | MAF: DoA MONRE: DCC, EPF |
| Action 2 | Expand access to finance | | | | | | |
| Activity 2.1 | Study, identify and enhance cooperation between domestic and regional financial institutes (to expand domestic financial markets including lowering interest rate and simplify procedures for borrowing) | May 18 | Jul 18 | Oct 18 | Jun 19 | MOF: BOL, B&FIs | MIC: DSMEP, CCI MPI: DIP MAF:DoA |
| Activity 2.2 | R&D the agriculture development fund | May 18 | Jul 18 | Sep 18 | Mar 19 | MAF: DoA | |
| Activity 2.3 | Increase financial capacity and readiness and of entrepreneurs | May 18 | Jul 18 | Oct 18 | Dec 22 | MIC: DSMEP, CCI | MAF:DoA MPI: DIP |
| Activity 2.4 | Organise crop diversification forum including financial access dialogues | May 18 | Jul 18 | Dec 18 | Dec 22 | MAF:DoA | MAF: NAFRI MIC: CCI, DSMEP |
| Action 3 | Increase organisational capacity and human resources | | | | | | |
| Activity 3.1 | Improve human resource development system including capacity development plan, staff knowledge, building learning culture and commitment of relevant organisations (e.g., MAF, MIC including CCI) | May 18 | Jul 18 | Oct 18 | Jun 22 | MAF:DoA/N AFRI MIC: CCI, DSMEP | MPI: DIP MONRE: DCC |
| Activity 3.2 | Building capacity of national, local authorities, entrepreneurs and communities on crop diversification | May 18 | Jul 18 | Jan 19 | Dec 22 | MAF:DoA/N AFRI MIC: CCI, DSMEP | MPI: DIP MONRE: DCC |
| Activity 3.3 | Increase technical extension staff-mobile team | May 18 | Jul 18 | Dec 18 | Dec 21 | MAF:DoA/N AFRI MIC: CCI, DSMEP | MPI: DIP MONRE: DCC |
| Activity 3.4 | Promote y network, think-tank and civil organisation and information exchanges | May 18 | Jul 18 | Oct 18 | Dec 22 | MAF:DoA/N AFRI MIC: CCI, DSMEP | MPI: DIP MONRE: DCC |
| Activity 3.5 | Improve crop diversification study in education and research institutes | May 18 | Jul 18 | Jan 19 | Dec 20 | MAF:DoA/N AFRI MIC: CCI, DSMEP | MPI: DIP MONRE: DCC |

| Actions | Activities | Preparation (month/year) | | Implementation (month/year) | | Responsible body | |
|-----------------|--|-----------------------------|----------|--------------------------------|----------|-------------------|-------------------------------------|
| | | Start | Complete | Start | Complete | Primary | Secondary |
| Action 4 | Research and develop information and best practice guidelines | | | | | | |
| Activity 4.1 | Develop land suitability map and land use plan in disaster risk areas | May 18 | Jul 18 | Jan 19 | Dec 20 | MAF: NAFRI | MAF:DoA |
| Activity 4.2 | Re-assess resilient capacity of the existing crop production systems and identify an optimal crop diversification system for adaptation and commercial production including financial analysis of each system | May 18 | Jul 18 | Oct 18 | Dec 19 | MAF:DoA/N AFRI | MONRE: DCC |
| Activity 4.3 | Develop and disseminate (technical and financial) best practice guidelines and fact sheets of the optimal crop diversification systems to enhance adaptation capacity, and address productivity reduction due to 1) erosion and landslide, 2) drought and water use efficiency, 3) floods or inundation, 4) extreme climate, 5) soil degradation or nutrient deficiency and precise farming 6) pest and insect epidemics | May 18 | Jul 18 | Jan 19 | Dec 22 | MAF:DoA/N AFRI | MONRE: DCC MIC: CCI, DSMEP |
| Action 5 | Pilot an optimal crop diversification system for adaptation and commercial production | | | | | | |
| Activity 5.1 | Develop the policies or decree on environmentally friendly and climate change adaptation technology in agriculture sector | May 18 | Jul 18 | Oct 18 | Jun 19 | MAF:DoA | MAF: NAFRI MONRE: DCC, DEP |
| Activity 5.2 | Develop the policy or guidelines on the development, deployment and diffusion of the environmentally friendly and climate change adaptation technology in agriculture sector | May 18 | Jul 18 | Mar 19 | Dec 19 | MAF:DoA | MAF: NAFRI MONRE: DCC, DEP |
| Action 6 | Pilot an optimal crop diversification system for adaptation and commercial production | | | | | | |
| Activity 6.1 | Pilot crops varieties and rotary or integrated in agriculture production systems to enhance adaptation capacity, and address productivity reduction due to the six problems | May 18 | Jul 18 | Oct 18 | Dec 22 | MAF:DoA | MAF: NAFRI MONRE: DCC, DEP |

4. Climate Resilient Rural Infrastructure

| Actions | Activities | Preparation (month/year) | | Implementation (month/year) | | Responsible body | |
|--|--|---|----------|--------------------------------|----------|--|--|
| | | Start | Complete | Start | Complete | Primary | Secondary |
| | | Action 1 Increase the public budget and resources mobilisation to develop climate and disaster resilient infrastructure at disaster risk areas | | | | | |
| Activity 1.1 | Develop strategy of the resilient rural development | May 18 | Jul 18 | Oct 18 | Oct 20 | MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH | MONRE: DCC |
| Activity 1.2 | Conduct financial assessment (to identify funding sources and feasibilities) | May 18 | Jul 18 | Oct 18 | Dec 19 | MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH | MONRE: DCC |
| Activity 1.3 | Develop financial sources or donor directory | May 18 | Jul 18 | Aug 18 | Mar 19 | MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH | MONRE: DCC |
| Activity 1.4 | Develop resource mobilisation and engagement plan | May 18 | Jul 18 | Oct 18 | Oct 20 | MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH | MONRE: DCC |
| Activity 1.5 | Develop and submit financeable project proposals | May 18 | Jul 18 | Oct 18 | Dec 22 | MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH | MONRE: DCC |
| Activity 1.6 | Set up and implement M&E and financial management system | May 18 | Jul 18 | Dec 18 | Dec 22 | MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH | MONRE: DCC |
| Action 2 Expand access to finance | | | | | | | |
| Activity 2.1 | Strengthening cooperation between domestic and regional banks and financial institutes (to expand domestic financial markets including lowering interest rate and simplify procedures for borrowing) | May 18 | Jul 18 | Oct 18 | Oct 22 | MOF: BOL MPI: DOP | MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH MONRE: DCC |
| Activity 2.2 | Increase financial capacity and readiness and of entrepreneurs | May 18 | Jul 18 | Jan 19 | Dec 22 | MOF: BOL MPI: DOP | MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH MONRE: DCC |
| Activity 2.3 | Organise financial access dialogue on business risk management and | May 18 | Jul 18 | Jan 19 | Dec 22 | MOF: BOL MPI: DOP | MAF: DoI, DoRPR MPWT: DoR, |

| Actions | Activities | Preparation (month/year) | | Implementation (month/year) | | Responsible body | |
|---------------------|---|-----------------------------|------------------|--------------------------------|---------------|--|---|
| | | Start | Complete | Start | Complete | Primary | Secondary |
| | | | <i>financing</i> | | | | |
| Action 3 | Limited knowledge and skills on climate resilient technologies and practices | | | | | | |
| <i>Activity 3.1</i> | <i>Conduct capacity needs assessment</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Oct 18</i> | <i>Dec 19</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |
| <i>Activity 3.2</i> | <i>Provide technical and financial trainings on infrastructure standard system, climate and disaster resilient technologies and practices</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Oct 18</i> | <i>Dec 22</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |
| <i>Activity 3.3</i> | <i>Improve organisation development system including human development plan, staff knowledge management, recruitment etc.</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Oct 18</i> | <i>Dec 22</i> | <i>MONRE: DCC MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> | <i>MSWF</i> |
| <i>Activity 3.4</i> | <i>Promote establishment of the network, think-tank and civil organisation and information exchanges on climate and disaster resilient technologies and practices</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Jan 19</i> | <i>Dec 22</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |
| <i>Activity 3.5</i> | <i>Improve education and research on climate and disaster resilient technologies and practices in high education</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Jan 19</i> | <i>Dec 20</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |
| Action 4 | Develop policies on climate resilient technologies and infrastructure | | | | | | |
| <i>Activity 4.1</i> | <i>Develop policies on climate resilient technologies and infrastructure</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Jan 19</i> | <i>Dec 20</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |
| Action 5 | Improve quality assurance and control including mainstreaming climate and disaster resilient technologies and practices in rural infrastructure development | | | | | | |
| <i>Activity 5.1</i> | <i>Enhance rural infrastructure engineering and ESIA screening, M&E and inspection</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Jan 19</i> | <i>Dec 22</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |
| Action 6 | Increase information and awareness about hazards, climate and disaster resilient technologies and practices | | | | | | |
| <i>Activity 6.1</i> | <i>Research and develop hazard maps and update hazards profiles</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Oct 18</i> | <i>Dec 21</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |
| <i>Activity 6.2</i> | <i>Re-assess loss and damage, and disaster adaptive capacity or</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Oct 18</i> | <i>Dec 20</i> | <i>MONRE: DCC MAF: DoI,</i> | <i>MSWF</i> |

| Actions | Activities | Preparation (month/year) | | Implementation (month/year) | | Responsible body | |
|-----------------|---|-----------------------------|---------------|--------------------------------|---------------|--|---|
| | | Start | Complete | Start | Complete | Primary | Secondary |
| | <i>resilience of the rural infrastructures and financial needs</i> | | | | | <i>DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> | |
| Activity 6.3 | <i>Study and identify best climate and disaster resilient technologies and practices</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Oct 18</i> | <i>Dec 20</i> | <i>MONRE: DCC MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> | <i>MSWF</i> |
| Activity 6.4 | <i>Disseminate information about hazards, climate and disaster resilient technologies and practices</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Dec 18</i> | <i>Dec 22</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> | <i>MONRE: DCC</i> |
| Action 7 | Pilot climate and disaster resilient technologies and practices | | | | | | |
| Activity 7.1 | <i>Pilot landslide, erosion and floods resilient roads and bridges</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Dec 18</i> | <i>Dec 22</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |
| Activity 7.2 | <i>Pilot landslide, erosion and floods resilient irrigation</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Dec 18</i> | <i>Dec 22</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |
| Activity 7.3 | <i>Pilot development of water use efficient irrigation schemes for drought areas and dry season cultivation</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Jan 19</i> | <i>Dec 22</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |
| Activity 7.4 | <i>Pilot development of water tanks, reservoirs and ponds for drought resilience and dry season cultivation</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Jan 19</i> | <i>Dec 22</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |
| Activity 7.5 | <i>Pilot disaster (landslide and erosion, floods and drought) resilient rural water supply systems</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Jan 19</i> | <i>Dec 22</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |
| Activity 7.5 | <i>Pilot disaster resilient town planning and development including hazard mapping and integrated land use planning</i> | <i>May 18</i> | <i>Jul 18</i> | <i>Jan 19</i> | <i>Dec 22</i> | <i>MONRE: DCC</i> | <i>MAF: DoI, DoRPR MPWT: DoR, DoWS, DUH MPH: CWSH</i> |

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