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IDA/R2017-0234/1

June 16, 2017

Closing Date: Thursday, July 6, 2017 at 6 p.m.

FROM: Vice President and Corporate Secretary

Lao People's Democratic Republic

Lao PDR Southeast Asia Disaster Risk Management Project

Project Appraisal Document

Attached is the Project Appraisal Document regarding a proposed credit to Lao People's Democratic Republic for a Lao PDR Southeast Asia Disaster Risk Management Project (IDA/R2017-0234), which is being processed on an absence-of-objection basis.

Distribution:
Executive Directors and Alternates
President
Bank Group Senior Management
Vice Presidents, Bank, IFC and MIGA
Directors and Department Heads, Bank, IFC and MIGA

Document of

The World Bank

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Report No: PAD2196

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

CREDIT

IN THE AMOUNT OF SDR 21.90 MILLION

(US$30 MILLION EQUIVALENT)

AND A GRANT FROM THE SOUTHEAST ASIA DISASTER RISK INSURANCE FACILITY PROGRAM MULTI-DONOR TRUST FUND

IN THE AMOUNT OF US$1.00 MILLION

TO THE

LAO PEOPLE'S DEMOCRATIC REPUBLIC

FOR THE

LAO PDR SOUTHEAST ASIA DISASTER RISK MANAGEMENT PROJECT

June 14, 2017

Social, Urban, Rural and Resilience Global Practice
East Asia and Pacific Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective April 30, 2017)

Currency Unit =	Special Drawing Rights (SDR)
US$1.3710 =	1 SDR

FISCAL YEAR
January 1 - December 31

Regional Vice President:	Victoria Kwakwa
Country Director:	Ulrich Zachau
Senior Global Practice Director:	Ede Jorge Ijjasz-Vasquez
Practice Manager:	Abhas Kumar Jha
Task Team Leader(s):	Henrike Brecht, Olivier Mahul, Zuzana Stanton-Geddes

ABBREVIATIONS AND ACRONYMS

AADMER	Association of Southeast Asian Nations Agreement on Disaster Management and Emergency Response
ADB	Asian Development Bank
ARAP	Abbreviated Resettlement Action Plan
ASEAN	Association of Southeast Asian Nations
CCRIF	Caribbean Catastrophe Risk Insurance Facility
DDMCC	Department of Disaster Management and Climate Change
DMH	Department of Hydrology and Meteorology
DOF	Department of Finance
DONRE	Department of Natural Resources and Environment
DOP	Department of Planning
DOW	Department of Waterways
DPWT	Department of Public Works and Transport
DRFI	Disaster Risk Financing and Insurance
DRM	Disaster Risk Management
DSS	Decision Support System
DUPH	Department of Urban Planning and Housing
ECoP	Environmental Code of Practice
EGEF	Ethnic Groups Engagement Framework
EGDP	Ethnic Groups Development Plan
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
ERM	Emergency Response Manual
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
FM	Financial Management
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GNI	Gross National Income
GoL	Government of Lao People's Democratic Republic
ICB	International Competitive Bidding
ICT	Information and Communication Technology
IFR	Interim Financial Report
IWRMP	Integrated Water Resource Management Project
JICA	Japan International Cooperation Agency
JMA	Japan Meteorological Agency
LRSP	Lao Road Sector Project
KOICA	Korea International Cooperation Agency
M&E	Monitoring and Evaluation
MOF	Ministry of Finance
MONRE	Ministry of Natural Resources and Environment
MPI	Ministry of Planning and Investment
MPWT	Ministry of Public Works and Transport
MRC- HYCOS	Mekong River Commission Hydrological Cycle Observation System
NCB	National Competitive Bidding

NPV	Net Present Value
NSEDP	National Socio-Economic Development Plan
O&M	Operation and Maintenance
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
PDO	Project Development Objective
POM	Project Operation Manual
QMS	Quality Management System
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SDG	Sustainable Development Goal
SEA	Southeast Asia
SEADRIF	Southeast Asia Disaster Risk Insurance Facility
SOPs	Standard Operating Procedures
SRD	State Reserve Department
STEP	Systematic Tracking of Exchanges in Procurement
TOR	Terms of Reference
TTL	Task Team Leader
WMO	World Meteorological Organization

BASIC INFORMATION

Is this a regionally tagged project?	Country(ies)	Financing Instrument
Yes	Cambodia, Lao People's Democratic Republic, Myanmar	Investment Project Financing

[ ] Situations of Urgent Need of Assistance or Capacity Constraints

[ ] Financial Intermediaries

[✔] Series of Projects

Approval Date	Closing Date	Environmental Assessment Category
06-Jul-2017	31-Oct-2022	B - Partial Assessment

Bank/IFC Collaboration
No

Proposed Development Objective(s)

The Project Development Objective (PDO) is to reduce the impacts of flooding in Muang Xay and enhance the Government's capacity to provide hydro-meteorological services and disaster response.

Components

Component Name	Cost (US$, millions)
Integrated Urban Flood Risk Management	13.50
Hydromet Modernization and Early Warning Systems	10.00
Financial Planning for Disaster Resilience	6.00
Knowledge and Coordination	1.50
Contingent Emergency Response	0.00

Organizations

Borrower :	Lao People's Democratic Republic (Lao PDR)
Implementing Agency :	Ministry of Public Works and Transport Ministry of Natural Resources and Environment Ministry of Finance Ministry of Planning and Investment

PROJECT FINANCING DATA (US$, Millions)

[ ] Counterpart Funding	[ ] IBRD	[✔] IDA Credit [ ] Crisis Response Window [✔] Regional Projects Window	[ ] IDA Grant [ ] Crisis Response Window [ ] Regional Projects Window	[✔] Trust Funds	[ ] Parallel Financing

Total Project Cost:	Total Financing:	Financing Gap:
31.00	31.00	0.00
	Of Which Bank Financing (IBRD/IDA): 30.00	

Financing (in US$, millions)

Financing Source	Amount
International Development Association (IDA)	30.00
Southeast Asia Disaster Risk Insurance Facility (SEADRIF) Pr	1.00
Total	**31.00**

Expected Disbursements (in US$, millions)

Fiscal Year	2018	2019	2020	2021	2022	2023

Annual	1.38	2.53	4.41	7.51	10.74	3.43
Cumulative	1.38	3.91	8.32	15.84	26.57	30.00

INSTITUTIONAL DATA

Practice Area (Lead)

Social, Urban, Rural and Resilience Global Practice

Contributing Practice Areas

Transport & ICT
Water

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

Gender Tag

Does the project plan to undertake any of the following?

a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF

Yes

b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment

Yes

c. Include Indicators in results framework to monitor outcomes from actions identified in (b)

Yes

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	Substantial
2. Macroeconomic	Substantial
3. Sector Strategies and Policies	Moderate
4. Technical Design of Project or Program	Substantial

5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	High
7. Environment and Social	Moderate
8. Stakeholders	Moderate
9. Other	
10. Overall	Substantial

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

[ ] Yes [✔] No

Does the project require any waivers of Bank policies?

[ ] Yes [✔] No

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	✔	
Natural Habitats OP/BP 4.04	✔	
Forests OP/BP 4.36		✔
Pest Management OP 4.09		✔
Physical Cultural Resources OP/BP 4.11	✔	
Indigenous Peoples OP/BP 4.10	✔	
Involuntary Resettlement OP/BP 4.12	✔	
Safety of Dams OP/BP 4.37		✔
Projects on International Waterways OP/BP 7.50	✔	
Projects in Disputed Areas OP/BP 7.60		✔

Legal Covenants

Sections and Description

Institutional Arrangements

Financing Agreement: Schedule 2, Section I.A

Recurrent, Continuous
Recipient to maintain, throughout the Project implementation period: (a) project implementation structures within MPI, MPWT, MONRE, and MOF; and (b) a national disaster risk financing and insurance working group; all with functions, staffing and resources satisfactory to the Association.

Sections and Description
Project Operation Manual
Financing Agreement: Schedule 2, Section I.B
Recurrent, Continuous
Recipient to ensure that the Project is carried out in accordance with the Project Operation Manual; and not amend, waive or abrogate any provisions of the manual unless the Association agrees otherwise in writing.

Sections and Description
Memoranda of Understanding
Financing Agreement: Schedule 2, Section I.C
Due Date: 3 months after Effectiveness
Recipient, through MPWT, to: (a) enter into a memorandum of understanding with Oudomxay, under terms and conditions satisfactory to the Association; (b) exercise its rights under the memorandum of understanding in such manner as to protect the interests of the Recipient and the Association and to accomplish the purposes of the Credit; and (c) not assign, amend, abrogate or waive the memorandum of understanding or any of its provisions unless the Association agrees otherwise in writing.

Sections and Description
Annual Work Plans and Budgets
Financing Agreement: Schedule 2, Section I.D
Annual, Continuous
Recipient to ensure that: (a) the Association is furnished, not later than October 31 of each fiscal year of the Recipient during the implementation of the Project (or such later date as the Association may agree) for the Association's no-objection, a consolidated Annual Work Plan and Budget; (b) the Project is implemented in accordance with the Annual Work Plan and Budget, and provide, promptly as needed, its share of the Project financing as specified in the plan; and (c) not make or allow to be made any change to the Annual Work Plan and Budget without prior no-objection in writing by the Association.

Sections and Description
Environmental and Social Safeguards
Financing Agreement: Schedule 2, Section I.E
Recipient to ensure that the Project is carried out in accordance with the Environmental and Social Management Framework, the Resettlement Policy Framework, the Ethnic Group Engagement Framework, and any Safeguard Assessment and Plan; not amend, abrogate, or waive any of the safeguard instruments unless the Association

agrees otherwise, and report on their status of implementation as part of the semiannual progress reports.

Sections and Description
Contingent Emergency Response
Financing Agreement: Schedule 2, Section I.G
Recurrent, Continuous
Recipient to adopt a satisfactory Emergency Response Manual for Component 5 of the Project and, in the event of an eligible crisis or emergency, ensure that the activities under said component are carried out in accordance with such manual and all relevant safeguard requirements.

Sections and Description
Mid-term Review
Financing Agreement: Schedule 2, Section II.A.2
Due date: 30 months after Effectiveness
Recipient to prepare and furnish to the Association a mid-term report, documenting progress achieved in the carrying out of the Project during the period preceding the date of such report; review with the Association such mid-term report; and thereafter take all measures required to ensure the continued efficient implementation of the Project and the achievement of its objectives, based on the conclusions and recommendations of the mid-term report and the Association's views on the matter.

Conditions

Type	Description
Effectiveness	Signing of Grant Agreement Financing Agreement, Article IV, Section 4.01 The Grant Agreement has been executed and delivered and all conditions precedent to its effectiveness or to the right of the Recipient to make withdrawals under it (other than the effectiveness of the Financing Agreement) have been fulfilled.
Disbursement	Financing of Premia Financing Agreement: Schedule 2, Section IV.B.1 (b) The Recipient may not withdraw the proceeds of the Credit allocated to the financing of premia until it has requested the withdrawal of the Credit for the payment of Premia to the Southeast Asia Disaster Resilience Insurance Facility or the Association (or both), in each case in accordance with the relevant paragraph of Section V of Schedule 2 to the Financing Agreement.
Disbursement	Contingent Emergency Response

	Financing Agreement: Schedule 2, Section IV.B.1 (c) The Recipient may not withdraw the proceeds of the Credit as may be allocated to Component 5 unless an Eligible Crisis or Emergency has occurred, all related safeguards instruments and requirements have been completed, the emergency response implementing entities have adequate staff and resources, and the Recipient has adopted the Emergency Response Manual, acceptable to the Association.

PROJECT TEAM

Bank Staff

Name	Role	Specialization	Unit
Henrike Brecht	Team Leader(ADM Responsible)	Disaster Risk Management/Infrastructure	GSU08
Olivier Mahul	Team Leader	Disaster Risk Finance	GFM3A
Zuzana Stanton-Geddes	Team Leader	Disaster Risk Management	GSU08
Khamphet Chanvongnaraz	Procurement Specialist(ADM Responsible)	Procurement	GGO08
Siriphone Vanitsaveth	Financial Management Specialist	Financial Management	GGO20
Aristeidis I. Panou	Counsel	Legal	LEGES
Benedikt Lukas Signer	Team Member	Disaster Risk Finance	GFM3A
Brendan Ming Hui Chia	Team Member	Operations	GSU08
Carmenchu D. Austriaco	Team Member	Finance	WFALN
Chanin Manopiniwes	Team Member	Economist	GTI02
Dzung Huy Nguyen	Team Member	Disaster Risk Management	GSU08
Frederick Yankey	Team Member	Financial Management	GGO20
Hideaki Hamada	Team Member	Disaster Risk Finance	GFM3A
Inneke Herawati Ross	Team Member		GSU08
Louise F. Scura	Team Member	Disaster Risk Management	EACTF
Makoto Suwa	Team Member	Disaster Risk Management	GFDRR
Manush A. Hristov	Counsel	Legal	LEGES

Martin Fodor	Team Member	Environmental Safeguards	GEN2B
Martin Henry Lenihan	Safeguards Specialist	Social Safeguards	GSU02
Peter William Crawford	Safeguards Specialist	Environental Safeguards	GEN2B
Robert Curle Jesse Reid	Team Member	Disaster Risk Management	GSU19
Simon B. Chenjerani Chirwa	Team Member	Procurement	GGO08
Sombath Southivong	Team Member	Infrastructure	GTI02
Sybounheung Phandanouvong	Safeguards Specialist	Social Safeguards	GSU02
Thu Hang Vu	Team Member	Disaster Risk Finance	GFM02
Vatthana Singharaj	Team Member	Operations	EACLF

Extended Team

Name	Title	Organization	Location
Adri Verwey	Director / Strategic Advisor	FloodConsult	Amsterdam,Netherlands
Chusit Apirumanekul	Hydromet Specialist		Bangkok,Thailand
Veronica Mendizabal Joffre	Governance and Capacity Development Consultant		Nairobi,Kenya

LAO PEOPLE'S DEMOCRATIC REPUBLIC
LAO PDR SOUTHEAST ASIA DISASTER RISK MANAGEMENT PROJECT

TABLE OF CONTENTS

I. STRATEGIC CONTEXT

A. Country Context

1. **This project is part of a regional Southeast Asia (SEA) Series of Projects on Disaster Risk Management (DRM), involving Cambodia, the Lao People's Democratic Republic, and Myanmar**. SEA is highly exposed to natural disasters and the recurrent extreme events are seen as directly linked to the persistent poverty in the region. Among SEA countries, Cambodia, Lao PDR, and Myanmar face particularly high annual average losses, in excess of 0.7 percent of their gross domestic product (GDP). This Series of Projects, comprising the Cambodia, Lao PDR, and Myanmar SEA DRM projects, seeks to strengthen the region's capacity and cooperation in the field of DRM. The projects incorporate three main common themes. First, disaster risk pooling will be promoted by seeking to establish the Southeast Asia Disaster Risk Insurance Facility (SEADRIF) which would be the first regional catastrophe risk pool in SEA, to provide participating countries with immediate liquidity for rapid disaster response. Second, the projects will strengthen the respective Ministries of Finance and Planning as well as the line ministries to mainstream DRM into policies and support systematic allocations for resilience. Third, integrated packages of structural and nonstructural investments to increase climate and disaster resilience will be implemented. The approach combines investments at the country and regional levels (see annex 6).

2. **After rapid economic growth in the past decades, Lao PDR has reached lower-middle-income status with a gross national income (GNI) of US$1,740 in 2015.**[1] With an average annual growth rate of 8 percent between 2005 and 2015, the increase in GDP is projected to remain around 7 percent over the next three years, driven by electricity generation and exports as well as services, construction, and manufacturing.[2] While growth has traditionally been reliant on natural endowments, more recently, services expanded, including retail, tourism, and transport. Public debt increased to 68 percent of GDP in 2016, a high level for a country at Lao PDR's level of development.

3. **Poverty in Lao PDR has declined in recent years, but it remains relatively high with development benefits not equitably shared among the population.** Absolute poverty declined from 33.5 percent in 2002–03 to 23.2 percent in 2012–13, lifting half a million people out of poverty. However, inequality widened with the Gini coefficient increasing from 32 in 2002–03 to 36 in 2012–13, and the pace of poverty reduction and growth in consumption is modest by international standards.[3] Moreover, many people remain close to the poverty line—data from 2013 show that about 80 percent of the population still live on less than US$2.5 per day and face a 10 percent chance of falling back into poverty, particularly in the event of a shock.[4]

4. **Disasters in Lao PDR disproportionately affect the poor.** Lao PDR is exposed to high climate and disaster risks and the economic development puts more people and assets at risk. Floods, storms, and

[1] World Bank. 2016. *Economic Update. East Asia and the Pacific. Growing Challenges.*
[2] World Bank. Forthcoming. Lao PDR Systematic Country Diagnostic. GNI of US$1,805 indicated in World Bank. 2016. *Economic Update. East Asia and the Pacific. Growing Challenges.*
[3] World Bank. Forthcoming. Lao PDR Systematic Country Diagnostic.
[4] World Bank. 2015. *Drivers of Poverty Reduction in Lao PDR. Lao PDR Poverty Policy Notes*.

droughts are the most prevalent hazards, which are expected to become more severe under the influence of climate change (see annex 5). Three of the five costliest natural disasters have taken place since 2009, including two floods in 2013 (CRED 2016)[5]. The 2015–16 El Niño has been one of the strongest on record and has affected Lao PDR through lower yields, reduced hydropower production, and damages from storms. A preliminary financial risk assessment estimated high annual economic losses for Lao PDR due to natural disasters, equivalent to 0.7 percent of GDP.[6] Related to floods, Lao PDR could face yearly average costs for emergency response of US$10 million and these costs could exceed US$36 million once every 10 years (10 percent annual probability).[7] The poor have been suffering the brunt of the consequences in the aftermath of disasters, due to their overexposure, higher vulnerability, and reduced ability to recover. Disasters impoverish the poor and entrap them in the poverty cycle.[8] In the last few years, poverty could have declined more rapidly had a large number of vulnerable households not fallen back into poverty, after shocks.[9]

5. **To reduce disaster impacts, a comprehensive approach with pre- and post-disaster measures is needed.** In particular, resilient urban risk management, early warning, and post-disaster financing are needed to sustain economic progress. While Lao PDR is still mostly a rural country, the country is urbanizing rapidly. The urban population increased by 40 percent between 2005 and 2015, and between 2000 and 2010, it recorded the fastest rates of urban spatial expansion in East Asia, reaching 7.3 percent.[10] If not managed, urbanization will lead to an accumulation of people and assets in hazardous areas and unsafe structures. At the same time, investments in early warning systems, which have been proven to have a high return rate,[11] are needed to protect the livelihoods of communities and mitigate agricultural and other shocks in the event of a disaster. Finally, appropriate risk financing instruments, which help the Government of Lao PDR (GoL) quickly respond to a disaster, are lacking. These instruments are needed to, for example, finance social protection for the most vulnerable in post-disaster situations.

B. Sectoral and Institutional Context

6. **Recognizing the links between development, sustainability, and resilience, Lao PDR has incorporated disaster and climate resilience into its policies; however, there are still challenges in the**

[5] Centre for Research on the Epidemiology of Disasters International Disaster Database. www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium. Data accessed 2016.
[6] World Bank and Global Facility for Disaster Reduction and Recovery (GFDRR). 2012. *ASEAN. Advancing Disaster Risk Financing and Insurance in ASEAN Member States: Framework and Options for Implementation*. Among ASEAN countries, Lao PDR faces the highest estimated 100-year loss measures as loss of 11.7 percent GDP, rising to 13.9 percent GDP in simulation of a 200-year Probable Maximum Loss.
[7] This assessment of emergency response cost is based on a preliminary actuarial analysis using historical data on the total number of people affected by floods since 1974 as reported in the international EM-DAT database. It assumes that (a) all affected people receive emergency relief and (b) the total emergency response cost is US$80 per person.
[8] Hallegatte, S., Vogt-Schilb, A., Bangalore, M., Rozenberg, J., 2017. *Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters. Climate Change and Development*; Washington, DC: World Bank.
[9] World Bank. 2015. *Drivers of Poverty Reduction in Lao PDR. Lao PDR Poverty Policy Notes*.
[10] World Bank. 2015. *East Asia's Changing Urban Landscape: Measuring a Decade of Spatial Growth*. Urban Development Series. Washington, DC: World Bank.
[11] Jha, A., Stanton-Geddes, Z, eds. 2013. *Strong, Safe, and Resilient: A Strategic Policy Guide for Disaster Risk Management in East Asia and the Pacific. Directions in Development*. Washington, DC: World Bank; p. 78.

implementation. The World Bank has been supporting DRM mainstreaming in Lao PDR with a technical assistance program since 2010, focusing on integrating climate resilience into strategic plans and investment planning of critical ministries. The Government integrated climate risks and measures in the 7th National Socio-Economic Development Plan (NSEDP) 2011–15 and has scaled up its focus on DRM in the 8th NSEDP for 2016–20. Key sectoral policies and strategies in the environment, transport, education, and agriculture sector have integrated climate and disaster considerations. For example, the Ministry of Natural Resources and Environment (MONRE) has introduced a chapter on DRM and climate change in its Vision 2030, Strategy 2025, and Action Plan 2020. The Ministry of Planning and Investment (MPI) has issued a ministerial decision in 2017 to establish a public investment review process that considers climate and disaster risk.

7. **Gaps to ensure a comprehensive approach to DRM remain.** Implementation of the strategies is challenging due to limited financial and human resources. Mainstreaming of DRM principles into development across sectors is not systematized, and, in practice, the focus in the Government remains on disaster response. The role of MPI and the Ministry of Finance (MOF in DRM is limited although the leadership of both ministries is critical in prioritizing and supporting strategic risk reduction investments. In 2013, the Department of Disaster Management and Climate Change (DDMCC) under MONRE has become the Secretariat of the National Disaster Prevention and Control Committee, previously anchored with the Ministry of Labor and Social Welfare. These changes resulted in coordination and implementation challenges.

8. **Increasing the resilience of cities is an important part of strengthening comprehensive DRM in Lao PDR.** The Department of Waterways (DOW) of the Ministry of Public Works and Transport (MPWT) is responsible for urban flood control, navigation, and river bank protection. DOW is struggling to protect growing Lao cities from floods, and flood mitigation activities focus mainly on emergency works. Flooding is exacerbated by the fact that land use planning is not informed by disaster risk assessments and land zoning is not enforced. Due to the highly interdependent nature of systems in cities, disasters result in cascading impacts, in which the availability of basic services is easily disrupted. In its five-year investment plan (2016–21), DOW included the flood risk protection of Muang Xay, the capital of Oudomxay Province, as one of its highest priorities. The city, a critical transport hub located in the mountainous areas of Nam Ou River Basin, is subject to large-scale flash floods every four to five years. The lack of strategic planning, insufficient flood control measures, rudimentary early warning and public alert systems, and delayed recovery emergency budget have led to high costs of these events. An upcoming Law on Urban Development, prepared by the Department of Urban Planning and Housing (DUPH) within MPWT, will require all cities in Lao PDR to prepare an urban development plan which is an opportunity to address some of the growing disaster and climate risks facing the emerging urban communities.

9. **Upgrading observing networks, capacity building, real-time collection of data, and dissemination of reliable forecasts and weather information to different users need to be improved for effective DRM.** Early warning and hydrological and meteorological (hydromet) services are provided by the Department of Hydrology and Meteorology (DMH) of MONRE, with an annual budget of US$300,000, personnel of 245, and a limited observation network given the size of the country. While DMH provides a basic level of services, it lags behind SEA countries in its core capacities and forecasting technology. It cannot meet its quality, upgrading and maintenance needs, or the demand for improved services and products. For example, DMH has only limited capacity to forecast flash floods which

constrains its ability to provide timely warning to the communities affected, and it has no capacity to receive user feedback. With previous World Bank support, DMH prepared strategic, legal, and operational documents for hydromet services and early warning systems to clarify the roles and responsibilities of DMH and strengthen the institutional setup and collaboration.

10. **Linked to the shortfalls in disaster risk reduction, the emergency response cost for disasters, particularly floods, can lead to a significant short-term funding gap which results in a diversion of public funds.** The GoL has established a State Reserve Fund under the State Reserve Department (SRD) at MOF and has allocated a contingency budget, but it remains exposed to catastrophic events, relying heavily on international donor assistance for response, relief, and recovery. A comprehensive Disaster Risk Financing and Insurance (DRFI) strategy or policy would help the GoL systematically manage the financial impact of disasters and improve its rapid response financing capacity. Given the limited ability of the GoL to access domestic and international credit sources, access insurance markets, or raise tax revenue after disasters, recovery and reconstruction costs of previous disasters have been partially met through budget reallocation by line agencies and donor assistance. These mechanisms are unpredictable, cause delays in Government response, and take money away from other development priorities. Significant costs from disasters remain unaddressed and have to be absorbed by affected populations, often resulting in the most vulnerable being the worst affected. Regional cooperation on the DRFI, envisioned also under the Agreement on Disaster Management and Emergency Response (AADMER) of the Association of Southeast Asian Nations (ASEAN), remains nascent: a regional program that would enable participating countries to access sovereign disaster risk response financing does not exist.

11. **The proposed project will address key identified needs through an integrated approach to DRM with engineered and non-engineered risk reduction investments.** To strengthen risk assessments and risk reduction, it will help pilot the concept of integrated urban flood risk management in Muang Xay and strengthen the institutional capacity of the implementing agencies for resilient planning. To support preparedness and help avoid unnecessary damage and losses, the project will support the modernization of hydromet and early warning systems on national level, with physical installations including in the Nam Ou River Basin, where Muang Xay is located. Both types of investments will serve as examples for other cities and river basins in the country. Besides facilitating early warnings, the nonstructural investments will provide data to support long-term planning. To strengthen financial protection, the project will help devise a comprehensive approach to the DRFI, to develop a national DRFI strategy and enable access to sovereign disaster risk insurance.

C. Higher Level Objectives to which the Project Contributes

12. **This project will directly contribute to the implementation of Lao PDR's 8th NSEDP and help the country fulfill regional and global commitments.** The project and its three Project Development Objective (PDO)-level indicators contribute directly to the NSEDP Output 2 on "Preparedness for natural disasters and risk mitigation" under Outcome 3 "Natural Resources and the environment protected and sustainably managed, green growth promoted, disaster preparedness enhanced, and climate resilience developed." The second PDO-level indicator of the project on hydromet user satisfaction also supports the NSEDP Output 2 of its 'cross-cutting' area on "Improved information and communication technologies." Finally, the third PDO-level indicator on disaster risk insurance contributes to the NSEDP Output 1 on "Fiscal and monetary policy stability" under the outcome on "Continued growth and

reduced economic vulnerability." At the regional and global levels, the project results will support Lao PDR to contribute to its international obligations on DRM within the AADMER and Sendai Framework and support the achievement of the global Sustainable Development Goal (SDG) 13, which is to take urgent action to combat climate change and its impacts, and more broadly, SDGs 1 and 10, to reduce the incidences of poverty and inequality, respectively.

13. **The World Bank Group Country Partnership Framework for Lao PDR for the period FY17–21,[12] highlights the need to invest in disaster and climate resilience**. The Lao PDR Systematic Country Diagnostic of 2016[13] identifies as one of the 11 priority areas "Putting in place strengthened disaster risk management to reduce risks and better deal with climate change." The proposed project will strengthen DRM and directly contribute to the achievement of this priority action. The project complements planned resilient investments in the transport sector under the IDA-financed Lao Road Sector Project (LRSP) II, and institutional and policy reforms envisioned under the proposed Green Resilient Growth Development Policy Credit. The project is fully aligned with the World Bank Group's East Asia Pacific Regional Strategy,[14] presented to the Board in February 2016. The proposed project particularly links to the strategic pillars: (a) Infrastructure and urbanization through investments in urban flood risk management and (b) Climate change and DRM through physical and capacity investments in flood risk reduction, early warning, and the DRFI.

14. **The project aims to contribute to the World Bank Group's twin goals of ending extreme poverty and boosting shared prosperity in a number of ways.** Natural disasters have socioeconomic consequences that go beyond their most obvious impacts. When disasters strike, the population with the highest poverty rates are disproportionally affected, facing food insecurity and malnutrition.[15] Lao households are poorly equipped to deal with frequent shocks and largely rely on informal social networks, often leading to behaviors that reinforce the cycle of poverty. Job losses after disasters have significant impacts on people's well-being and long-term prospects, especially those who live close to subsistence levels.[16] Poverty in Lao PDR could have declined more rapidly in the last years had a large number of vulnerable households not fallen back into poverty. About half of the poor in 2012–13 were non-poor in 2007–08. Many people escaping poverty remain close to the poverty line where vulnerability to shocks, like disasters, is high.[17] Poverty rates in the three project provinces range between 21 and 30 percent.[18] Integrated flood risk management investments will lead to better protection and preparedness of people and assets in Muang Xay, the most flood-affected district in Lao PDR in terms of number of events reported (DesInvetar). Investments in hydromet and early warning systems will help prevent or lessen unnecessary loss of lives and damages through better risk

[12] World Bank. 2017. *Lao PDR: Lasting Accessible Opportunities - Country Partnership Framework for Lao PDR 2017–2021*. Washington DC: World Bank Group. Report number 110813-LA.
[13] World Bank 2017. *Lao PDR - Systematic Country Diagnostic: Priorities for Ending Poverty and Boosting Shared Prosperity: World Bank Group*. Report number 112241.
[14] World Bank. 2016. East Asia and the Pacific. Overview - strategy. Website accessed September 2016.
[15] Lao PDR. 2009. *The Ketsana Typhoon in the Lao People's Democratic Republic. Damage, Loss and Needs Assessment*.
[16] In 10 countries surveyed globally, poor households were between 20 and 50 percent more likely to be hit by hydromet disasters such as floods, because of where they live and their housing conditions, see Hallegatte et al. 2017. *Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters*. Washington, DC: World Bank.
[17] World Bank. 2015. *Drivers of Poverty Reduction in Lao PDR. Lao PDR Poverty Policy Notes*.
[18] Various. 2016. *Where are the Poor? Lao PDR 2015 Census-Based Poverty Map: Province and District Level Results*. p.14

information and improved end-user communication.[19] Financial protection will help shield the Government's budget and mitigate long-term fiscal impacts. Enabling the GoL to provide immediate post-disaster response for the most vulnerable population reduces the need for households to fall back on negative coping strategies, such as cutting expenditures in health or education, which can have long-term development impacts.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

15. The PDO is to reduce the impacts of flooding in Muang Xay and enhance the Government's capacity to provide hydro-meteorological services and disaster response.

B. Project Beneficiaries

16. Direct project beneficiaries include communities in the urban area of Muang Xay, which has a population of 98,000, with 50 percent estimated to be female. End users of improved hydromet and weather information, particularly the population of the Nam Ou River Basin, comprising the Oudomxay (307,622), Luang Prabang (431,889), and Phongsali Provinces (177,989),[20] also benefit from the project. National- and local-level project stakeholders will benefit from capacity and institution-building activities. Indirect project beneficiaries include (a) travelers passing through Muang Xay, as the most important traffic junction in northern Lao PDR; (b) the country's population benefitting from more reliable, actionable, and better communicated weather, climate, hydrological, and early warning information; and (c) the wider population of Lao PDR benefitting from improved institutional capacities for disaster risk finance and integration of DRM into sector strategies.

C. PDO-Level Results Indicators

17. The achievement of the PDO will be measured through the following key indicators:

(a) Percentage of urban population in Muang Xay protected from floods, of which are female (percentage).

(b) Satisfaction of weather information end-users increased (Yes/No).

(c) Lao PDR has information and capacity to access sovereign disaster risk insurance (Yes/No).

[19] Jha, A., Stanton-Geddes, Z, eds. 2013. *Strong, Safe, and Resilient: A Strategic Policy Guide for Disaster Risk Management in East Asia and the Pacific. Directions in Development*. Washington, DC: World Bank; p. 78:
[20] GoL: Population numbers per 2015 census

III. PROJECT DESCRIPTION

A. Project Components

Component 1: Integrated Urban Flood Risk Management (US$13.5 million IDA Credit)

18. Implemented by DOW of MPWT, this component will strengthen flood protection and resilient urban planning in Muang Xay. The component activities will be coordinated with DUPH of MPWT.

19. **Subcomponent 1.1: Structural Investments (US$11.5 million).** Supporting (a) flood protection infrastructure, including investments in riverbank protection, embankments, canal improvements, sluice gates, pumping stations, a river-side park, and tree planting and (b) resettlement activities through assistance in financing for compensation and assistance to displaced person(s).

20. **Subcomponent 1.2: Non-structural Investments (US$1 million).** Providing technical and analytical support for capacity building on integrated urban flood risk management, including (a) enhancing resilient planning, (b) developing eco-friendly urban design solutions, and (c) strengthening the operation and maintenance (O&M) of flood protection systems.

21. **Subcomponent 1.3: Project Management (US$1 million).** Provision of assistance to strengthen the institutional, organizational, and technical capacity of MPWT to support implementation of Component 1 of the project, including coordination, technical matters, procurement, financial management (FM), social and environmental safeguards, monitoring and evaluation (M&E), and reporting.

Component 2: Hydromet Modernization and Early Warning Systems (US$10 million IDA Credit)

22. Implemented by DMH of MONRE, this component will improve the delivery of weather, climate, and hydrological services and end-to-end early warning systems throughout the country. Physical investments will include three provinces of the Nam Ou River Basin, namely Luang Prabang, Oudomxay, and Phongsali.

23. **Subcomponent 2.1: Strengthening Early Warning Systems and Service Delivery Systems (US$5 million).** Provision of technical support for early warning dissemination and service delivery systems, through among others, (a) developing and implementing a service delivery strategy; (b) strengthening early warning services by developing localized and impact-based warning products, and enhancing the timely dissemination of warnings; (c) enhancing accessibility of hydromet information; (d) introducing a quality management system (QMS) for service production and delivery; and (e) capacity building on service delivery, hydromet monitoring and forecasting, database management, and communications systems.

24. **Subcomponent 2.2: Modernizing the Observing, Forecasting, and Communications Systems (US$4 million).** Supporting the expansion of the hydromet network, and the forecasting and communications system in the country, including in the Luang Prabang, Oudomxay, and Phongsali Provinces, through among others, (a) installing new and upgrading existing hydromet stations; (b)

renovating selected office facilities; and (c) enhancing forecasting, dissemination, communication, and information technology systems.

25. **Subcomponent 2.3: Project Management (US$1 million).** Provision of assistance to strengthen the institutional, organizational, and technical capacity of MONRE to support implementation of Component 2 of the project, including coordination, technical matters, procurement, FM, social and environmental safeguards, M&E, and reporting.

Component 3: Financial Planning for Disaster Resilience (US$5 million IDA Credit, of which US$2 million national IDA Credit and US$3 million regional IDA Credit, and US$1 million Trust Fund Grant)

26. Implemented by SRD in MOF, this component will help increase the financial resilience of Lao PDR against natural disasters and the Government's capacity to meet post-disaster funding needs.

27. **Subcomponent 3.1: Support for Strengthening National Financial Resilience (US$1 million Trust Fund Grant).** Provision of technical assistance to strengthen MOF's capacity for financial planning for disaster resilience, including (a) preparing and implementing a national disaster and climate risk finance strategy, (b) facilitating the recipient's engagement in the preparation and establishment of a regional disaster risk pooling mechanism, and (c) supporting day-to-day implementation of Component 3.

28. **Subcomponent 3.2: Payment of Disaster Risk Insurance Premium (US$5 million IDA Credit, of which US$2.00 million national IDA Credit and US$3 million regional IDA Credit).** Facilitating access to sovereign risk insurance through the financing of premia.

Component 4: Knowledge and Coordination (US$1.50 million IDA Credit)

29. Implemented by the Department of Planning (DOP) of MPI, this component supports (a) overall project coordination and management, including M&E, and financial audits; (b) studies for mainstreaming DRM in planning and investment; and (c) supporting day-to-day implementation of Component 4 of the project.

Component 5: Contingent Emergency Response Component (US$0)

30. This component will allow for a reallocation of credit proceeds from other components to provide emergency recovery and reconstruction support following an eligible crisis or emergency. An Emergency Response Manual (ERM) will be developed with fiduciary, safeguards, monitoring and reporting, and any other necessary implementation arrangements.

B. Project Cost and Financing

31. The lending instrument will be Investment Project Financing with a five-year implementation period. In addition to the IDA Credit of US$30 million equivalent, comprising US$27 million national IDA and US$3 million regional IDA Credit, a US$1 million trust-funded recipient-executed Grant will be provided by SEADRIF Program to support capacity building and technical assistance for Subcomponent 3.1.

32. **Rationale for regional IDA.** The project meets the regional funding eligibility criteria as follows: (a) the series includes three countries Myanmar, Cambodia, and Lao PDR; (b) the series is expected to generate significant cross-boundary benefits by seeking to establish SEADRIF, which would be the first regional catastrophe risk pool in SEA, to provide participating countries with immediate liquidity for rapid disaster response; and (c) the series will also provide a platform for transferring knowledge and building common approaches for the DRM and climate resilient policies and institutional set-up.

Table 1. Project Cost and Financing

Project Components	Project Cost (US$, millions)	IDA Financing, National (US$, millions)	IDA Financing, Regional (US$, millions)	Trust Fund (US$, millions)
1. Integrated Urban Flood Risk Management	**13.5**	**13.5**	**—**	**—**
1.1. Structural Investments	11.5	11.5	—	—
1.2. Non-structural Investments	1.0	**1.0**	—	—
1.3. Project Management	1.0	**1.0**	—	—
2. **Hydromet Modernization and Early Warning Systems**	**10.0**	**10.0**	—	—
2.1. Strengthening Early Warning Systems and Service Delivery Systems	5.0	5.0	—	—
2.2. Modernizing the Observing, Forecasting, and Communications Systems	4.0	4.0	—	—
2.3. Project Management	1.0	1.0	—	—
3. Financial Planning for Disaster Resilience	**6.0**	**2.0**	**3.0**	**1.0**
3.1. Support for Strengthening National Financial Resilience	1.0	—	—	1.0
3.2. Payment of Disaster Risk Insurance Premium	5.0	2.0	3.0	—
4. Knowledge and Coordination	**1.5**	**1.5**	**—**	**—**
5. Contingent Emergency Response	**0.0**	**0.0**	**—**	**—**
Total costs	**31.0**	**27.0**	**3.0**	**1.0**

C. Lessons Learned and Reflected in the Project Design

33. Lessons learned from previous projects in Lao PDR and from similar national and regional World Bank-financed activities have been applied in the project design.

34. **Given the interconnectedness of urban systems, building urban resilience requires an integrated, multisectoral approach.** Separated sectoral approaches to disaster risk reduction and urban

planning leave communities exposed to, and ill-prepared for, the social and economic threats posed by natural hazards. An integrated approach, in which land-use planning decisions are informed by the need for adaptation strategies, can improve cities' resilience both by placing critical infrastructure and high-density uses out of hazardous zones, and by identifying opportunities for resilient infrastructure to be adequately built into the urban fabric. Along with physical investments, the project will support the development of a risk-based urban planning approach to close the gap between engineers, emergency managers, and city planners. This approach was successfully implemented, for example, in New York City, where, in response to Hurricane Sandy (2012), a comprehensive flood protection plan was developed, which includes infrastructure investments; natural area restorations; and urban planning, design, citizen engagement, and governance improvements. Updated data, including LiDAR, relevant to disaster risk and climate change was used to inform the planning of these initiatives, policy decisions, and related land-use implications. The implementation of the New York City plan is based on close coordination among government agencies, as well as the involvement of the private sector to tap alternative sources of financing.[21] Under this project, infrastructural investments in Muang Xay will be sustained by establishing a system supported by Subcomponent 1.2, which strengthens the cross-sector coordination of DOW and DUPH to integrate flood risk considerations into policy making and investments.

35. **To ensure sustainability of hydromet services, a comprehensive approach with investments in institutions and infrastructure is required.**[22] The design of Component 2 reflects lessons learned from World Bank experience in hydromet modernization projects in recent years where balanced and integrated investments on strengthening of service delivery, improving institutional capacity, and modernizing infrastructure have been identified as essential for developing effective hydromet services. Technical assistance and gradual knowledge transfer are an integral part of the hydromet modernization package under Component 2. The project will support sustainable O&M of the modernized system by (a) creating greater demand for hydromet information services by systematically engaging sectoral users and developing sector-specific information services, (b) introducing QMSs to services to build user's confidence in utilizing various DMH products, and (c) developing a business model to inform the long-term financial strategy for DMH including the possibility of introduction of fee-based services in the future to broaden and diversify income base. A lesson learned from Japan[23] is that user-oriented, risk-based, and seamless early warning services should be established and advanced in close cooperation with the relevant authorities and the public. In this regard, the project will help DMH to shift from hazard warning to impact-based warning for more effective disaster preparedness through stronger collaboration with disaster management authorities.

36. **A comprehensive financial protection strategy allows for timely and cost-efficient mobilization of funds for rapid response and recovery needs post disaster**. Ex ante financial planning builds on an optimal combination of domestic reserves, contingent credit, and risk transfer solutions like disaster risk insurance. Projects such as the Caribbean Catastrophe Risk Insurance Facility (CCRIF), participation of

[21] The City of New York. 2016. *One New York – The Plan for a Strong and Just City.* http://www.nyc.gov/html/onenyc/downloads/pdf/publications/OneNYC.pdf.
[22] David Rogers and Vladimir Tsirkunov. 2013. *Weather and Climate Resilience: Effective Preparedness through National Hydrological and Meteorological Services*. Washington, DC: World Bank.
[23] World Bank. 2017. *Modernization of Japan's Hydromet Services. A Report on Lessons Learned for Disaster Risk Management*. Washington, DC: World Bank.

Honduras and Nicaragua in the CCRIF, the Pacific Resilience Program, the Turkish Catastrophe Risk Insurance Project, and the Southeast Europe Catastrophe Risk Insurance Project show that insurance can enhance the financial protection of governments by transferring catastrophe risks to the reinsurance and capital markets. In addition, regional catastrophe risk pools allow for a better risk diversification and higher risk retention, both contributing to lower insurance premiums. These lessons learned have been integrated into the design of Component 3 by including the proposed regional catastrophe risk pooling mechanism as part of the national financial protection strategy to be developed and designing regional catastrophe risk pool to leverage regional risk diversification, build up regional reserves, and access international catastrophe risk insurance market on competitive terms. It should also be noted that such regional vehicles require strong political commitment and significant donor support (for example, preparation and capitalization of a regional pool).

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

37. **Implementation.** The project will be implemented through existing GoL structures of the line ministries. Component 1 will be implemented by DOW within MPWT, Component 2 by DMH within MONRE, Component 3 by SRD within MOF, and Component 4 will be overseen by DOP in MPI. The main implementing ministries, MPI, MPWT, MONRE, and MOF, will assign a team of staff responsible for management, procurement, FM, and safeguards of aspects. Consultants will be hired, as needed, to strengthen the capacity of the respective GoL agencies. These key staff and consultants will be appointed and trained to carry out their respective functions. For Component 3, a National DRFI Working Group was established, chaired by MOF, which will guide the implementation of Component 3. The implementing departments will monitor progress against the agreed performance indicators and produce periodic progress reports. Detailed institutional and implementation arrangements are described in the Project Operation Manual (POM), which has been finalized. The POM includes an FM Manual detailing the division of responsibilities for the fiduciary function between central- and provincial-level agencies. For Component 5, an ERM will be developed, which will detail the implementation of emergency activities, including aspects related to procurement, FM, reporting, M&E, and safeguards.

38. **Coordination.** MPI will be responsible for the overall coordination and management of the project. Component-specific works and consultants will be procured by DOW, DMH, and SRD. To ensure clear assignment of roles, responsibilities, and accountability for project results between the central and local levels of the GoL, the Minister of MPWT and the Governor of Oudomxay Province will sign a Memorandum of Understanding for the implementation of Component 1. The Oudomxay Provincial Department of Public Works and Transport (DPWT) and the three relevant provincial Department of Natural Resources and Environment (DONRE) will be responsible for day-to-day contract management on sites as well as reporting. To foster regional collaboration related to disaster finance, a Regional DRFI Working Group was set up with representatives from the relevant finance ministries of Cambodia, Lao PDR, and Myanmar. Links to ASEAN will be explored to maintain higher-level political coordination between the countries.

B. Results Monitoring and Evaluation

39. The Results Framework will be the main tool for M&E of the outcome and intermediate indicators for the project. An M&E system on the overall project implementation status will be developed and maintained by MPI, which will be responsible for collecting the required data, setting up the monitoring system, and reporting the results as part of the project progress reports.

C. Sustainability

40. To promote sustainability of urban flood risk management investments beyond the project, support will be provided to institutionalize resilient practice through capacity and institution building, improved development planning, and sustainable maintenance. The project will engage both central- and local-level agencies in the implementation and O&M of Muang Xay City infrastructure and services and strengthen their capacity to manage the system. Where possible, community engagement in construction and O&M will also be promoted.

41. Sustainability of the hydromet and early warning systems investments will be strengthened by creating greater demand for hydromet services, prioritizing institutional capacity (such as QMSs and training), cost-effective budgeting for the O&M, expansion of hydromet services, selecting technological solutions for monitoring and forecasting that are appropriate to the context of the institutions and of Lao PDR, introducing QMSs to various DMH services to build user's confidence, and developing a business model to inform the long-term financial strategy for DMH. At the same time, the detailed design of the system will be developed to ensure that O&M requirements will be kept manageable. In the past, the implementing agencies have experienced how highly advanced equipment has failed due to theft and damage and inability to quickly acquire and install replacements. Such risks will be considered an extra criterion in the detailed design phase of the project investments.

42. The development of a national financial protection strategy is key to ensure the sustainability of the regional catastrophe risk pooling vehicle. Integration of the regional vehicle in a comprehensive financial protection strategy at the national level ensures that the GoL has additional resources available to meet the financial needs caused by disasters of any severity or impact, not relying on a single financial solution. This project will help advance the DRFI agenda in the region, contributing to the establishment and sustainability of a regional catastrophe risk pooling mechanism such as SEADRIF.

D. Role of Partners

43. Ongoing urban flood risk management activities implemented by DOW focus on Vientiane City, benefitting from support from the Asian Development Bank (ADB) and the Japan International Cooperation Agency (JICA). The GoL has established an Infrastructure Sector Working Group, led by the Minister of MPWT, as a mechanism to facilitate overall coordination among development partners, including on issues of flood risk management, and this project will contribute to strengthen this mechanism for dialogue and coordination. Regarding Component 2, the ADB, JICA, the Japan Meteorological Agency (JMA), Korea, and China are supporting hydromet and early warning systems in Lao PDR. Related to Component 3, partnerships with development partners will be explored to leverage additional development financing to help prepare the regional catastrophe risk pool and finance it

through (a) technical assistance, (b) capitalization of a regional catastrophe risk pool, and (c) financing of the start-up costs. This will include participation in regional consultations on the structure of regional catastrophe risk pool with other Asian countries, regional organizations such as ASEAN, and the private (re)insurance industry. Donor partners have already expressed strong interest to support such a regional catastrophe risk pooling mechanism. This is, for example, fully aligned with the G7 Climate Risk Insurance Initiative InsuResilience led by Germany and with the ASEAN+3 DRFI agenda promoted by Japan.

IV. KEY RISKS

A. Overall Risk Rating and Explanation of Key Risks

44. **The overall risk rating for the project is Substantial,** reflecting risks related to stakeholder coordination, institutional capacity to implement the project, fiduciary, and technical design.

45. **Stakeholder engagement and coordination** between central and local levels as well as between DOW, DUPH, and DMH will be needed under Component 1 to ensure effective implementation. Project preparation and implementation arrangements help support the working dialogue among the stakeholders. Engagement and coordination between the participating countries of the regional catastrophe risk pooling initiative (Lao PDR, Cambodia, and Myanmar) is critical to ensure the establishment of such a regional vehicle. All three countries have agreed to include a technical assistance component in their respective projects to support the preparation and implementation of the regional vehicle. A regional DRFI working group has been established with representatives of the three countries. Political momentum is being built through ASEAN+3 with the support of the Government of Japan. Should one of the countries decide not to join, other countries could still access sovereign disaster risk insurance through the World Bank Treasury.

46. **Institutional capacity to implement project.** The project links institution and capacity-building to all physical investments. Implementation support and quality assurance will be provided to the implementing agencies. Under Component 3, to promote longer-term financial protection against disasters, technical assistance will be provided to develop mainstreaming regulations as well as a financial protection strategy and action plan to promote fiscal resilience. The establishment of a regional catastrophe risk pool minimizes capacity risks as key financial risk management functions would be outsourced to a dedicated facility manager while at the same time providing a significant learning opportunity for MOF. An Operational Manual of the proposed regional catastrophe risk pool will be prepared together with MOF.

47. **Technical design.** Related to Component 1, estimating rainfall intensities, durations, and runoff; river and tide levels; and the impacts of climate change are inherently risky. This is particularly the case in Muang Xay where historical data are scarce. Technical designs will have to interpolate data from other regional sources. Related risks will be mitigated by using proven international methodologies. Regarding Component 2, the technical design will take into consideration international standards while ensuring that equipment and systems fit the local context and needs. Substantial technical risk prevails for Component 3 due to challenges linked to developing a regional catastrophe risk pooling mechanism and designing innovative parametric disaster risk insurance products against floods (see annex 7). The

proposed regional risk pooling mechanism will be devised in consultation with the participating countries and donors interested in providing financial support to the regional pool. The design of innovative parametric insurance products, especially against flood risks, will rely on state-of-the-art catastrophe risk modeling and remote sensing technology. The design and indicative pricing of tailor-made disaster risk insurance products and their placement through the proposed regional catastrophe risk pool SEADRIF or the World Bank Treasury will allow the GoL to access to sovereign disaster risk insurance.

48. **Fiduciary.** The main fiduciary risks relate to the capacity of the implementing agencies to ensure that FM and procurement guidelines are followed. Mitigating measures are provided in the FM and procurement sections of annex 2. The World Bank's fiduciary policies do not apply to potential insurance payouts enabled through the project since the project scope ends with providing access to sovereign disaster risk insurance.

49. **Disaster and climate risk.** Lao PDR is highly vulnerable to natural disasters. Current climate change projections suggest that the wet season is expected to become wetter and the dry season drier, indicating increased frequency and intensity of floods and drought. Disaster and climate risk considerations are fully integrated into the project design through resilient practice and investments introduced under Component 1 and 2 and strengthening of financial resilience to disasters (see annex 5).

V. APPRAISAL SUMMARY

A. Economic Analysis

50. **A cost-benefit analysis was conducted to calculate the economic internal rate of return (EIRR) and net present value (NPV) by comparing costs and benefits under 'without-project' and 'with-project' scenarios.** For Component 1, the economic analysis covers a period of 20 years (2018–37) where the stream of benefits is expected to come in after three years of implementation. Component 2 covers a period of 15 years (2018–32) to reflect the lifespan of the equipment, where the stream of benefits is expected to come in after one year. A 12 percent discount rate is used for this project.

51. The analysis for Component 1 is based on avoided direct losses to assets in the flooded area. The major economic benefits of Component 1 are expected to come mainly from avoided losses of assets from flash flooding. Assuming the project enables the city to avoid flash flood damages of 3 percent to city's asset, once every four years (that is, with an Annual Exceedance Probability of 25 percent), the benefits of avoiding such loss will yield the EIRR of 21 percent with an NPV of US$7.16 million. Detailed assumptions and sensitivity analysis of Component 1 are given in annex 4. Additional benefits can also come from improvement of land value due to less flooding, but the measurement of such impact is complex and detailed data are not available.

52. For Component 2, a separate analysis was conducted based on hydromet and early warning systems effectiveness to reduce asset losses from natural disasters nationwide and to enhance productivity in weather-sensitive sectors. Major economic benefits are expected to come from avoided annual asset losses from seasonal natural events and improvement of weather-sensitive production

sectors due to a better hydromet system. The EIRR is estimated to be 82 percent and NPV US$95.2 million. Detailed assumptions and sensitivity analysis on the costs and benefits of Component 2 are given in annex 4.

53. For Component 3, the preliminary actuarial analysis of the portfolio of flood risk including Cambodia, Lao PDR, and Myanmar shows that indicative premium savings are estimated in excess of 27 percent due to catastrophe risk pooling, risk retention of first losses through joint reserves, and economies of scale in operational costs, compared to the insurance premium if countries were to access the international reinsurance markets individually. The analysis covers the period of the project (5 years), where a three-year disaster insurance coverage is available from the third year of project implementation. When disaster risk insurance is provided through the proposed regional pool SEADRIF, the EIRR is estimated at 30 percent on average, varying from −29 percent if no severe disaster occurs during the three-year period (with a probability of 73 percent over three years) to 262 percent or more if at least one severe disaster (with a probability of 10 percent over 3 years) occurs during the three-year period. With a 12 percent discount rate and a US$5 million premium contribution, this is equivalent to NPV of US$0.5 million on average, ranging from −US$2.1 million to US$8.0 million. Should disaster risk insurance be intermediated by the World Bank Treasury, the average EIRR is estimated at 23 percent.

B. Technical

54. **Flood risk management.** Prioritizing the protection of the Muang Xay urban area is an appropriate approach as the urban core is the socioeconomic heart of the city. Construction of riverside natural areas will not only help the city prevent river erosion but also promote eco-friendly urban design that would make the city more livable and attractive for development. At the institutional level, improved protocols in integrated urban resilience planning and implementation will be established. O&M for the city flood control and drainage systems will be developed in the close implementation and operation of the early warning system to be established under Component 2.

55. **Hydromet and early warning systems.** Component 2 investments are part of a systematic and comprehensive approach to enhance Lao PDR's hydromet and early warning systems' delivery in a sustainable and long-term manner. This project focuses on high-priority, high impact investments, complementing ongoing and planned investment supported by the World Bank and other donors, guided by needs of priority sectoral users including agriculture, transport, energy, and DRM. Establishment of a National Framework for Climate Services will provide a platform to systematically and continuously interact with sectoral users to provide DMH with opportunities to understand evolving user needs. This component will strengthen the entire hydromet service value chain through physical investments and technical assistance.

56. **Disaster risk finance.** For Component 3, the technical design builds on the extensive experience of the World Bank in supporting the establishment of such pools, for example, in the Caribbean and in the Pacific, and an internal Quality Enhancement Review will be held on the proposed technical design of the regional disaster risk pool. In parallel to defining the policy priorities with the countries, consultations are under way with key counterparts including private sector partners and potential host jurisdictions such as Singapore. Insurance products will be designed and priced to ensure (a) increased financial protection of the participating countries (for example, perils insured, coverage); (b) financial sustainability of the pool, that is, they are adequately priced; and (c) attractiveness to the reinsurance

market so that excess catastrophe risks can be transferred to the reinsurers on competitive terms. Insurance products offered by the regional pool will first cover floods and excess rainfall, which are a major peril in all participating countries (Lao PDR, Myanmar, and Cambodia). They will be then extended to other perils such as tropical cyclones and earthquakes (see annex 7).

57. **Innovation.** The project includes several innovative aspects, including (a) closing the gap between hydraulic engineers and city planners by demonstrating a risk-based approach to urban planning. As part of this, the use of Open Data will be explored during project implementation to strengthen data collection and dissemination to enhance the operations of decision-support systems for flood risk management; (b) promoting a paradigm shift from hazard to impact-based forecasting that will convey the expected impacts as a result of the expected weather in key sectors; and (c) preparation of the first regional catastrophe risk pool in Asia, including new financial product design that combines a parametric trigger and a soft trigger (for small disaster events and potential basis risk), informed by state-of-the-art earth observation technology for financial flood risk assessment.

C. Financial Management

58. **For Component 1, the Department of Finance (DOF) in MPWT is responsible for FM; for Component 2, DOF in MONRE; for Component 3, SRD in MOF; and for Component 4, DOP in MPI.** MPI, as the coordinating agency under the project, will consolidate financial reports and arrange for annual audits under all components. There are varying degrees of FM capacities among the implementing agencies. In the event that Component 5 finances goods, works, and/or consultant services required for an eligible crisis or emergency, the applicable FM arrangements will be detailed in the ERM.

59. **The main FM risk** identified is weak capacity and lack of experience. Unfamiliarity of assigned project staff with FM policies is likely to increase risks of noncompliance, delays in submitting consolidated financial and audit reports, unsatisfactory accounting records, and misuse of funds. Risk mitigation measures include the following:

(a) Assigning Government staff with adequate qualification and experience in each implementing agency to support project FM and to build capacity. Staff has been identified to facilitate implementation.

(b) Recruiting a national consultant for Component 2 and part-time international consultant under Component 4 to provide additional support and capacity building to implementing agencies as needed. The terms of reference (TOR) for these consultants have been agreed and the recruitment of these positions should be completed within three months of project effectiveness.

(c) An FM Manual has been developed.

(d) Providing training on disbursement and FM requirements to finance/accounting staff involved in the project implementation after project effectiveness.

(e) Engaging qualified auditors with TOR acceptable to the World Bank to audit project expenditure on an annual basis until the project closes. The auditors should be engaged

within six months of project effectiveness. The project's FM performance will be reviewed at each implementation support mission, scheduled twice a year. The project will be subject to an annual audit to ensure expenditures have been incurred for its intended purposes.

D. Procurement

60. **DOW under MPWT will be responsible for procurement activities under Component 1, DMH under MONRE will be responsible for Component 2, SRD in MOF for Component 3, and DOP in MPI for Component 4.** Arrangements for Component 5 will be detailed in the ERM to be prepared and agreed with the World Bank. MPWT has adequate capacity to manage procurement activities under the project. Within MPWT, DOW will be responsible for the preparation of the technical designs, specification of goods, and TOR, as well as contract management under this project. DOF in MPWT will support DOW with the preparation of procurement documents and coordination and monitoring of procurement activities. DMH and SRD have technical staff who can provide technical input and prepare TOR for procurement activities, but they lack experience in management of procurement activities even under Government-financed activities. MPI will provide overall coordination for the project. Key risks identified include (a) limited experience of staff in DOW, DMH, SRD, and DOP with World Bank procurement guidelines; (b) delays in the procurement process; and (c) governance risks. These risks will be mitigated through an agreed action plan, which is included in annex 2.

61. Procurement under the project will be governed by the 'World Bank Procurement Guidelines: Procurement of Goods, Works, Non-consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers' and 'Consultant Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers', dated January 2011, revised in July 2014.[24] The World Bank Anti-Corruption Guidelines, dated October 2006 and revised January 2011, will also apply. World Bank Standard Bidding Documents and Standard Requests for Proposals will be used for all procurement of goods, works, and non-consulting services involving International Competitive Bidding (ICB) and selection of consultancy services involving international competition. Implementing agencies will use the Internet-based system of Systematic Tracking of Exchanges in Procurement (STEP) for World Bank approvals for procurement plans, prior review requests, and records of procurement transactions. Transparency will also be increased through the development of information and communication technology (ICT) systems for accounting, e-procurement, and budget monitoring. National Competitive Bidding (NCB) will be carried out in accordance with the national regulations, including the Procurement Decree #03, dated January 9, 2004, and Implementation Rule and Regulations #0063 issued by MOF on March 12, 2004. These procedures have been reviewed by the World Bank and found acceptable, subject to some exceptions which will be specified in the Financing Agreement. National harmonized bidding documents will be used for procurement of goods, works, and non-consulting services under NCB. Before implementation of procurement activities under Component 5, the GoL will prepare an Emergency Response Manual acceptable to the World Bank.

[24] The Project Concept Note was approved in 2015 before the effectiveness of the new Procurement Policy. Use of Borrower Regulations under the new Procurement Policy was considered. However, since scope of procurement will involve relatively low- to medium-value packages using traditional approaches, there would be little benefit in switching to the new policy framework. In addition, project preparation was at an advanced level at the time of new policy effectiveness.

62. **Readiness for implementation.** An initial Procurement Plan (May 25, 2017) for the first 18-month implementation period, which has been finalized and deemed acceptable to the World Bank.

E. Social (including Safeguards)

63. **Overview.** The project's safeguards approach is designed to ensure compliance and sustainability of category B and C subprojects. In the unlikely case that a subproject of category A would be proposed, it would be considered ineligible for the project's support. The safeguards considerations relate to Component 1 and Component 2. Components 3 and 4 finance disaster insurance premiums and technical assistance for which safeguards are not applicable. For Component 5, safeguards instruments will be developed during implementation according to arrangements agreed in the ERM. The project triggers the following World Bank social safeguard policies:

- **Involuntary Resettlement (OP/BP 4.12).** There may be minor land acquisitions and the relocation and resettlement of project-affected people and their households due to the construction of riverbank protection and embankments, flood gates, weirs, river-side parks, drainage canals, and hydromet stations. Therefore, the World Bank's policy on Involuntary Resettlement is triggered. Because the exact location of these investments is unknown at preparation and the designs will not be prepared until implementation, it is not possible to identify site-specific resettlement impacts. Therefore, a Resettlement Policy Framework (RPF), acceptable to the World Bank, has been prepared by the client and will apply to all subprojects to address potential adverse social impacts due to involuntary acquisition of assets and changes in land use. The RPF includes provisions for compensation and rehabilitation assistance and, if land donation is involved, procedures for land contributions. At the request of the GoL, approved by the Regional Vice President in accordance with policy on April 27, 2017, the costs of resettlement will be financed from the credit up to a maximum of US$900,000. A description of the anticipated costs and the associated risks are provided in annex 2. The RPF will apply to all investments in Component 1, including nonstructural investments in improved land-use planning, or the design of green and socially attractive solutions (Subcomponent 1.2). Even though these activities involve technical assistance, if implemented, they may result in the relocation of households located in no-build zones or occupying spaces intended for green solutions. In such cases, the requirements of the RPF apply, and the Government will need to prepare Resettlement Action Plans (RAPs), acceptable to the World Bank, for any households or assets likely to be relocated as a result of the implementation of any studies.

- **Indigenous Peoples (OP/BP 4.10).** The Nam Ou River Basin and Muang Xay are home to multiple ethnic groups.[25] The subprojects of Components 1 and 2 may directly or indirectly affect communities which are home to members of some of these ethnic groups. Therefore, the World Bank's policy on Indigenous Peoples is triggered. An Ethnic Groups Engagement Framework (EGEF), acceptable to the World Bank, has been prepared to

[25] With a population of approximately 307,600 people, the province has more than 20 different clans belonging to 12 different ethnic groups. GoL. 2015. Lao Population and Housing Census 2015, Provisional Report. *https://www.citypopulation.de/Laos.html.*

address potential adverse social impacts to the ethnic minorities that may occur due to the implementation of the project (including nonstructural investments planned under Subcomponent 1.2) and to ensure members of these ethnic groups benefit from the project in a culturally appropriate way. The EGEF requires that special measures be established to ensure that the interest of ethnic minorities are protected. Once subproject sites are known, the identification of potential impacts and mitigation measures will be based on a social assessment and a process of free, prior, and informed consultation, in accordance with the requirements of OP/BP 4.10, and will be detailed in an Ethnic Groups Development Plan (EGDP).

64. **Citizen engagement.** Local communities and stakeholders were consulted during project preparation and consultations will continue throughout the design and implementation of the project to ensure that communities are adequately informed and that the needs of beneficiaries, including women, youth, and the elderly, particularly related to DRM, are addressed. The project design for Component 1 foresees participatory approaches which will facilitate engagement of local communities in the management of flood risks, including the development of community disaster preparedness plans, and engagement in construction and O&M. Component 2 designs envision engagement of the public; improvements in last-mile early warning and communications efforts will provide further opportunities for community consultations and engagement. Two intermediate indicators will monitor percentage of addressed grievances and proportion of population satisfied with urban flood risk management investments.

65. **Gender considerations.** Men and women have often different perceptions of risks, take on different roles in emergencies and disaster preparedness, and face different impacts. Specific to early warning systems, women can have more limited access to information impeding action. The project design and implementation takes into account gender differences.

- **Analysis.** During the preparation of the project, a gender profile and a summary of gender entry points were prepared, based on consultations and a survey that identified specific concerns of women. The outcomes are considered in the project design, POM, and safeguards instruments.

- **Action.** In line with the GoL's legal framework, which strongly promotes gender equality among women and men in economic, social, and political life, and the Country Gender Action Plan for Lao PDR,[26] the project will seek to (a) strengthen women's participation and capacity in DRM to make informed decisions about preparing and protecting themselves and their families from hazards through tailored information outreach and training; this will be achieved through engagement of women's organizations including the Lao Women's Union; (b) promote gender inclusive employment with equal pay and gender-responsive physical design in standard contract bidding documents; and (c) raise awareness of contractors on gender-sensitive employment practices, the prevention of gender-based violence among their workforce, and hiring of women; and (d) the active

[26] World Bank Group. Forthcoming (draft September 2016). Country Gender Action Plan. Reducing Vulnerability And Increasing Opportunity. Lao PDR. For the Period FY17-FY21.

participation of women will be sought in the identification and management of nonstructural investments to protect against floods in high and low density areas. Safeguards compliance will mitigate potential negative impacts related to women's and children's health and well-being.

- **Monitoring.** The project will monitor percentage of female beneficiaries benefitting from the project investments, and the proportion of female population satisfied with improved hydromet investments.

66. **Grievance Redress Mechanism.** Most project grievances relate to safeguards. In addition to the World Bank grievance redress (see the section on grievance redress), the project will implement a project-level grievance redressal mechanism through an online grievance reporting system and other practical means. The online system publishes the IDA citizen engagement indicators through a website. Citizen engagement indicators are included as project intermediate outcome indicators in the Results Framework.

F. Environment (including Safeguards)

67. The project will generate positive benefits to the disaster-affected people in Muang Xay and the Nam Ou River Basin by introducing green infrastructure for resilience, which will complement the hard engineering solutions to address urban flooding, for instance, through the creation of a riverside part and planting of trees. The project triggers the following environmental safeguard policies:

- **Environmental Assessment (OP/BP 4.01).** Significant negative environmental impacts are not anticipated and impacts will be limited mainly to dust, noise, household business disturbance, and waste during construction. These issues are moderate and site specific. They can be managed by applying good construction practices. The use of materials for the construction will be monitored.

- **Natural Habitats OP/BP 4.04.** Since natural habitats along river banks will potentially be affected by the proposed civil works, this policy is triggered. Compliance will be ensured through the application of the Environmental and Social Management Framework (ESMF).

- **Physical Cultural Resources (OP/BP 4.11).** There is a possibility that physical cultural resources could be found during construction of infrastructure, especially in the indigenous peoples' areas. To address such a case, a chance finds procedure was included in the ESMF.

- **Projects on International Waterways (OP/BP 7.50).** A number of structural investments aimed to bolster flood protection in Muang Xay City, Oudomxay Province, will take the form of investments in riverbank protection and embankments, flood gates, weirs, river-side parks, and drainage canals along the Nam Ko River, which is a tributary of the Nam Beng and Nam Tha Rivers. Nam Beng and Nam Tha Rivers are tributaries of the Mekong River, which is an international waterway. Accordingly, as the project may have an impact on tributaries of an international waterway, OP/BP 7.50 is triggered. The World Bank, on behalf of the GoL, notified all the riparian countries of the Mekong River (Cambodia, China, Myanmar, Thailand, and Vietnam) and also informed the Mekong River Commission.

68. **Instruments.** Given that specific subprojects and locations are not known at the time of appraisal, the GoL prepared an ESMF, based on the results of a Preliminary Environmental and Social Assessment that provides guidelines to ensure that the project is implemented in an environmentally and socially sustainable manner in line with the Government and World Bank safeguards policies. Environmental and Social Impact Assessments will be prepared under the project as required. The ESMF provides a generic Environmental Management Plan (EMP), EGEF, and RPF to guide impact screening and identify measures and instruments to mitigate potential impacts. Expected safeguard instruments to be developed under the project include Environmental and Social Management Plans (ESMPs), an Environmental Code of Practice (ECoP), Abbreviated Resettlement Action Plans (ARAPs), and an EGDP. References to these instruments will be incorporated into the bidding documents to inform the contractors of their obligations to comply with the national and World Bank safeguard policy requirements.

69. **Consultations.** A series of public consultations with stakeholders, including women and ethnic minorities, were held in Vientiane on June 20, 2016, and on September 22, 2016, and in Oudomxay from June 21 to June 24, 2016, to discuss the prepared safeguard instruments, namely the ESMF, RPF, EGEF, and generic EMP. Results from this free, prior, and informed consultation process suggest that stakeholders and potential project-affected people largely support the project development and implementation.

70. **Disclosure.** Draft safeguard instruments were disclosed on September 14, 2016. The final ESMF and RPF were disclosed in English on April 9, 2017. The final EGEF was disclosed in English and Lao on April 10, 2017. The final Lao ESMF and Lao RPF were also published on April 10, 2017.

G. Other Safeguard Policies (if applicable)

71. No other safeguard policies are triggered under the project.

H. World Bank Grievance Redress

72. Communities and individuals who believe that they are adversely affected by a World Bank supported project may submit complaints to existing project-level grievance redress mechanisms or the World Bank's Grievance Redress Service. The Grievance Redress Service ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the World Bank's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of World Bank non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and World Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service, please visit *http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service*. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

VII. RESULTS FRAMEWORK AND MONITORING

Results Framework

COUNTRY : Lao People's Democratic Republic

Lao PDR Southeast Asia Disaster Risk Management Project

Project Development Objectives

The Project Development Objective (PDO) is to reduce the impacts of flooding in Muang Xay and enhance the Government's capacity to provide hydro-meteorological services and disaster response.

Project Development Objective Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Percentage of urban population in Muang Xay protected from floods		Percentage	30.00	70.00	Annual	Monitoring reports	DOW
of which are female		Percentage	50.00	50.00	At the end of the project	Monitoring reports	DOW
Description: Percentage of the population of Muang Xay, capital of Oudomxay, that is protected, i.e. not flooded.							
Name: Satisfaction of weather information end-users increased		Yes/No	N	Y	At the beginning and end of the project	Monitoring reports	DMH

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Description: Satisfaction rate towards improved services for civilians and government officials from different sectors, including DRM, civil aviation, media, and agriculture (gender-disaggregated) calculated as a percentage of users surveyed. This will be assessed through a beneficiary survey which will also assess gender specific aspects (e.g. access to hydromet information; behavioral impact; etc.).							
Name: Lao PDR has information and capacity to access sovereign disaster risk insurance		Yes/No	N	Y	At the end of project	Monitoring reports	SRD
Description: Country-specific sovereign disaster risk insurance product has been designed and quoted competitively.							

Intermediate Results Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Length of embankment rehabilitated		Kilometers	0.00	8.00	Annual	Construction reports	DOW
Description: Length of embankment constructed in Muang Xay.							
Name: Risk informed spatial and urban plans for a city in		Yes/No	N	Y	At the end of the project	Monitoring reports	DOW & DUPH

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
the Nam Ou Basin developed							
Description: Development plan for Muang Xay developed with innovative urban design that addresses flood risk and risk-based land use planning.							
Name: Accuracy of weather forecast improved		Yes/No	N	Y	Annual	Monitoring reports	DMH
Description: Establishment of a national verification system for tracking the accuracy of weather forecasts. Improvement in accuracy of forecasts registered in the tracking system.							
Name: Validated hydormet data is accessible on a centralized online data management platform		Yes/No	N	Y	At the end of the project	Monitoring reports	DMH
Description: Development of data sharing tools. Platform operational and accessible.							
Name: National disaster risk finance strategy developed		Yes/No	N	Y	At the end of the project.	Monitoring reports	MOF
Description: A financial strategy detailing how funds are mobilized and executed for post disaster response will be developed.							
Name: Participants in consultation activities during		Number	0.00	500.00			

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
project implementation							
of which women		Percentage	0.00	40.00			
Description: Project beneficiaries who participate in consultations on the project activities. Relates to all project components. This is a measure of citizen engagement.							

Name: Grievances registered related to delivery of project benefits addressed (%)		Percentage	0.00	80.00	Annual	Monitoring and construction reports	MPI
Grievances related to delivery of project benefits that are addressed-(number)		Number	0.00	100.00	Annual	Monitoring and construction reports	MPI
Description: This indicator measures the transparency and accountability mechanisms established by the project so the target beneficiaries have trust in the process and are willing to participate, and feel that their grievances are attended to promptly. It is understood that local sensitivities and tensions will not allow grievance or redress mechanisms to be established in all projects.							

Target Values

Project Development Objective Indicators

Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	End Target
Percentage of urban population in Muang Xay protected from floods	30.00	30.00	35.00	50.00	60.00	70.00	70.00
of which are female	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Satisfaction of weather information end-users increased	N	N	N	N	N	Y	Y
Lao PDR has information and capacity to access sovereign disaster risk insurance	N	N	N	N	N	Y	Y

Intermediate Results Indicators

Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	End Target
Length of embankment rehabilitated	0.00	0.00	0.00	2.00	4.00	8.00	8.00
Risk informed spatial and urban plans for a city in the Nam Ou Basin developed	N	N	N	N	Y	Y	Y
Accuracy of weather forecast improved	N	N	N	N	Y	Y	Y
Validated hydormet data is accessible on a centralized online data management platform	N						Y

Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	End Target
National disaster risk finance strategy developed	N	N	N	N	Y	Y	Y
Participants in consultation activities during project implementation	0.00	100.00	200.00	300.00	400.00	500.00	500.00
of which women	0.00	35.00	35.00	35.00	35.00	35.00	40.00
Grievances registered related to delivery of project benefits addressed (%)	0.00	20.00	40.00	50.00	70.00	80.00	80.00
Grievances related to delivery of project benefits that are addressed-(number)	0.00	20.00	40.00	60.00	80.00	100.00	100.00

ANNEX 1: DETAILED PROJECT DESCRIPTION

COUNTRY: Lao People's Democratic Republic
Lao PDR Southeast Asia Disaster Risk Management Project

1. The Lao PDR Southeast Asia Disaster Risk Management Project promotes an integrated approach to DRM, adopting a comprehensive approach to DRM and climate change adaptation and integrating soft and hard measures. The project will strengthen urban flood risk management, including hydromet forecasting and early warning systems. Financial resilience will also be enhanced through the development of a regional financial protection mechanism. A coordinated approach to reduce flood risk will be adopted linking multiple ministries and departments that are responsible for different aspects of DRM.

Hazard Profile of Lao PDR

2. Lao PDR is characterized by rugged, mountainous terrain in the northern provinces and valleys and floodplains in the remaining areas. The main natural hazards are annual riverine and flash floods, landslides, forest fires, acute water shortages during specific months of the year, and the occasional wind storm or typhoon. With regard to disaster impact, floods, such as those from the Mekong River, are most substantive, having affected over 4 million people according to a 2014 EM-DAT study. The country is prone to regular flooding due to the location of major rivers such as the Mekong and Se Kong. Apart from the Mekong, there are several other rivers such as the Nam Ou, Se Bang Fai, Se Bang Heng, Se Kong, Nam Jha, Nam Beng, Nam San, Nam Ngiep, Nam Ngum, Nam Lik and Sedone, which are responsible for floods in the country.

3. Floods in the country are caused by insufficient and inadequate protective dykes along the critical points, poor functioning of water control gates, lack of pumping stations or mobile pumps when inundation occurs, small and shallow natural channels to drain flood water, deforestation, land degradation, river straightening works, and 'hardened' catchments which result in increasing and rapid concentration of runoff, reclamation of wetlands, low lying areas, and poor land-use planning. Climate change and rapid deforestation in the country has also led to severe and frequent floods, while some of the flooding is triggered by storms, as was the case when severe tropical storm ‘Xangsane’ in 2006 caused flooding in the central and southern parts of the country.[27]

Disaster Risk Management in Lao PDR

4. The Government mainstreamed climate risks and measures in the 7th NSEDP 2011–15 and has reflected them even more clearly in the 8th NSEDP for 2016–20. Key sectoral policies and strategies in the environment, transport, education, and agriculture sectors have also integrated climate and disaster considerations. For example, MONRE has introduced a chapter on Disaster Risk Management and Climate Change in its Vision 2030, Strategy 2025, and Action Plan 2020. A Climate Change and Disaster Management Law is currently being developed with expected approval in 2017. The National Strategy on Climate Change from 2010 specifically highlights the risk of cities to floods and the need for structural

[27] MPI and APDC (2015). *National and provincial level Risk Assessment Report of Lao PDR.*

and nonstructural adaptation options, as well as the need to develop reliable national early warning system. The National Disaster Prevention and Control Committee was established in 2012. In 2013, DDMCC under MONRE has become the Secretariat of the National Disaster Prevention and Control Committee, replacing the National Disaster Management Office anchored with the Ministry of Labor and Social Welfare. DDMCC is in the process of developing a National Disaster Reduction Strategy and the Decree on Climate Change and Disaster Management. The Handbook for Post Disaster Needs Assessment was developed by the GoL in 2012. New disaster risk financing mechanisms have been developed by the GoL including the establishment of the State Reserve Fund in 2013 under MOF, where 3 percent of the annual expenditure budget is contributed to the fund as well as a Social Welfare Fund in 2015 under the Ministry of Labor and Social Welfare, for disaster emergency relief to complement the National Contingency Fund. In 2017, MPI has issued a ministerial decision to establish a public investment project review process that takes into account climate resilience and disaster risk considerations.

5. Since 2010, Lao PDR has benefited from a grant program in DRM, amounting to US$6 million, including recipient and World Bank-executed projects such as Mainstreaming Disaster and Climate Risk Management into Investment Decisions, financed by the Japan Policy and Human Resources Development, and Building Resilience to Natural Disaster, financed by the GFDRR. The program has supported capacity development, mainstreaming of DRM principles into national and provincial planning documents in the transport, agriculture, environment, and urban planning sectors and improvements in the early warning systems. For example, the Mainstreaming Disaster and Climate Risk Management into Investment Decisions Project, under the overall supervision of MPI, has supported MPWT to prepare a disaster risk assessment and hazard mapping for the road sector and to develop technical guidelines on climate resilient roads in Lao PDR. Technical demonstrations were conducted on three sections of National Road 1B. Building on the results of the IDA-financed LRSP I, the LRSP II will increase the climate resilience of transport sector through improvement in maintenance and asset management, and piloting of climate resilient approaches in select provinces. The ongoing World Bank-financed Lao PDR Integrated Water Resources Management Project (IWRMP) focuses on improving water resource and fisheries management in the Lower Mekong Basin and includes strengthening hydromet systems, water quality monitoring, and water resource modelling, among others. In addition, an IDA-financed Green Growth Development Policy Operation is being prepared with the goal of supporting the Government in strengthening its capacity to (a) consolidate green and resilient growth principles across the national development strategy and (b) promote the first stage transformation for green growth in selected sectors.

Resilient Urban Development

6. A recent ADB report[28] notes that urbanization in Lao PDR is taking place with little coordination, inadequate investment in infrastructure and community services, and minimum regard for the environment. Masterplans, developed at a central level, are ineffective tools for controlling development. It identifies a number of challenges and priorities which will be considered under Component 1. These include the need for (a) strategic spatial planning to be incorporated into national

[28] Asian Development Bank. 2012. *Lao People's Democratic Republic Sector Assessment, Strategy, and Road Map*. http://www.adb.org/sites/default/files/institutional-document/33722/files/lao-pdr-urban-sector-assessment.pdf.

and provincial socioeconomic plans; (b) urban plans to be more responsive and flexible to changing conditions; (c) planning for climate change—potential impacts need to be considered as key criteria in the planning process and prioritization of infrastructure investments; (d) stakeholder participation in plan making; (e) transparent, consistent prioritization of plans and infrastructure investments; (e) stronger planning enforcement; and (f) promoting the role of private sector participation through improving the legal framework.

7. To reduce flood risks, cities cannot rely solely on hard-engineered measures but rather take an integrated and flexible approach with the right balance between structural (engineered) and nonstructural (non-engineered) measures. The project will work with DUPH and DOW in MPWT to promote the incorporation of resilience strategies into land-use planning which will help create more resilient urban environments in Lao PDR, in particular, in the example of Muang Xay. Integrated land-use and infrastructure plans, for example, can make use of risk assessments to understand disaster vulnerability in different parts of the city, avoiding the placement of critical infrastructure or high-density uses in these areas. A more integrated approach to DRM also creates opportunities in terms of introducing green infrastructure for resilience. Instead of hard engineering solutions to address urban flooding, for instance, infrastructure such as bioswales, permeable pavements, and parks can be planned and designed, addressing not only disaster risk concerns but also creating more liveable, people-centric urban environments.[29] The integration of land-use and resilience strategies and the implementation of green infrastructure solutions will require strong coordination among agencies, as well as supportive legal and regulatory frameworks.

Hydromet and Early Warning Systems

8. Weather, hydromet, and early warning services in Lao PDR require systematic and substantial improvement to fulfil its role for the country and its citizens. The scope of DMH services is limited to the provision of basic information products: DMH provides basic metrological information products including daily weather forecast, three-day city forecast, weekly weather forecast, one- and three-month forecast and warning services for typhoon, heavy rainfall, flood, and flash flood. Provision of sector-specific information products is limited to the civil aviation sector and warning services require more location specificity and a shift to impact-based warning. DMH has limited human resources with a strong need in upgrading the skillset of its personnel. The total number of DMH staff is 245, with 70 stationed at the headquarters and 175 deployed in the provinces.[30] There are 18 meteorologists, 10 hydrologists, 71 meteorology technicians, 11 hydrology technicians, 1 electronic engineer, 4 electronic technicians, 130 observers and support staff, and 1 IT specialist. The Weather Forecast and Aeronautical Division, which is responsible for issuing weather forecasts and other information, has 14 staff.[31]

9. DMH infrastructure to deliver scope of services comparable to other countries in the region and international standards is not sufficient. DMH operates 17 main synoptic stations and 32 secondary synoptic stations, and out of the 49 synoptic stations, 10 are located at airports and are utilized for

[29] World Bank and GFDRR. 2016. *The Role of Green Infrastructure Solutions in Urban Flood Risk Management.*
[30] UNISDR et al. 2012. *Country Assessment Report for Lao PDR.* Strengthening of Hydrometeorological Services in Southeast Asia.
[31] UNISDR et al. 2012. *Country Assessment Report for Lao PDR.*

providing aviation services. DMH has 128 manual rainfall stations but only 93 are currently operational. DMH also operates 109 staff gauges, 49 discharge stations, and 3 seismic stations located in Luang Prabang, Lak Sao, and Vientiane. All synoptic stations are manned. DMH is operating 28 climatological stations, however in 2012, only 20 climate stations are operational. There are no agrometeorological observations or quality observations. The Mekong River Commission Hydrological Cycle Observation System (MRC-HYCOS) has also established three stations along the Mekong River and nine stations along the Mekong tributaries which are fully automatic. MRC-HYCOS is equipped with an automated data acquisition and telemetry communication system. [32] DMH has only limited capacity to forecast flash floods which constrains ability to provide timely warning to the communities affected. Even in case of warning delivered, there is no feedback mechanism from users to evaluate the quality of information provided. Lao PDR participates in several regional initiatives and programs, through which DMH can access and use regional and global products and services, including the Severe Weather Forecasting Demonstration Project, led by the World Meteorological Organization (WMO), MRC-HYCOS, Regional Flood Flash Guidance, and WMO-United Nations Economic and Social Commission for Asia and the Pacific Typhoon Committee.

10. To address some of the gaps in the institutional aspect, DMH prepared a draft Early Warning Strategy and Standard Operating Procedures (SOPs) and a draft Decree on Hydromet Services and Early Warning Systems with the support of the World Bank. It is expected that these strategic, legal, and operational documents will help clarify the roles and responsibilities of DMH, strengthen the institutional arrangements, and streamline operational collaboration in the provision of hydromet and early warning services. The current investments in DMH include the IDA-financed IWRMP, which has financed the establishment of the building for the National Early Warning Center. The ADB financed the Flood and Drought Risk Management and Mitigation Project supporting the expansion of hydromet observation network, strengthening flood forecasting capability, and providing equipment to National Early Warning Center. In addition, JICA is considering assisting DMH in expanding the radar network.

11. The IWRMP Additional Financing, which is expected to be approved by the IDA Board of Executive Directors in July 2017, will support the National Economic Research Institute in MONRE to develop a Decision Support System in priority basins for water resources planning. A Decision Support System (DSS) (modelling packages, database, and interface for information services) will be developed for the basins of Xe Bang Fai, Xe Bang Hieng, Nam Ngum, and Nam. A modelling package, consisting of rainfall-runoff (hydrological) model, basin simulation (water balance), and flood (hydraulic) model will be developed in Nam Ou under the IWRMP. The Lao PDR SEA DRM Project will expand the DSS developed by the IWRMP for the Nam Ou by integrating a weather forecast module into the DSS for forecasting and warning dissemination. Workshops to promote collaboration between the National Economic Research Institute and DMH will be carried out. The IRWMP Additional Financing will also support DMH with the upgrading of the observation network by installing 35 hydromet stations in the northern parts of Lao PDR. The IWRMP and the Lao PDR SEA DRM Project will closely collaborate in the location selection, procurement, installation, and training to be procured under each project. The IRWMP will not finance capacity building or improvement of service delivery of DMH since these activities are taken up by the Lao PDR SEA DRM Project.

[32] UNISDR et al. 2012. *Country Assessment Report for Lao PDR*.

12. The Lao PDR SEA DRM Project will pursue a harmonized investment approach in hydromet systems by working with other development partners. It is envisioned that DMH, with support from the World Bank, will facilitate dialogue with all the development partners involved to ensure all the investments will contribute to the consolidated hydromet modernization plan without duplication. A list of other donor-supported projects in the hydromet sector in Lao PDR is included in table 1.1.

Table 1.1. Donor-Funded Hydromet Projects in Lao PDR

Donor/ Technical Field	ADB (Flood and Drought Risk Management and Mitigation Project; US$3 million)	Food and Agricultural Organization (Agro-Climatic Monitoring and Information Systems Project; US$5 million)	Korea (Flash Flood Alert and Automated Rainfall Warning System Project; US$3 million)	World Bank IWRMP Additional Financing (Hydromet Services, US$3 million)	Lao PDR SEA DRM (Early Warning Systems, Service Delivery Systems; US$10 million component)
Observation					
Hydrology	Provision of 16 hydrological stations (telemetry system with GPRS) in Sebangfai and Sebanghien River Basins				Expansion of hydromet objective forecasting and observing systems, calibration facility
Meteo-rology	Provision of 5 weather stations (telemetry system with GPRS) in Sebangfai and Sebanghien River Basins	Improvement of agro-met monitoring station networks with both conventional and automatic weather stations to increase coverage in the major agricultural production areas			
Data Management					
Hydrology	Data capturing, processing, and forecasting to support early warning systems				Data integration of different donor systems, upgrading of communications systems, and National Data Center
Meteo-rology		Strengthening agro-met services and information management system (Land			

Donor/ Technical Field	ADB (Flood and Drought Risk Management and Mitigation Project; US$3 million)	Food and Agricultural Organization (Agro-Climatic Monitoring and Information Systems Project; US$5 million)	Korea (Flash Flood Alert and Automated Rainfall Warning System Project; US$3 million)	World Bank IWRMP Additional Financing (Hydromet Services, US$3 million)	Lao PDR SEA DRM (Early Warning Systems, Service Delivery Systems; US$10 million component)
		Resources Information Management System)			
Forecasting					
Hydrology	Software for flood forecasting and capacity building				Use of global and regional products for forecasting; delivery of localized and impact-based warning products
Meteo-rology					
Development of Specialized Services					
Hydrology			Installation of Flash Flood Alert System and Automated Rainfall Warning System in Vang Vieng		Development of service delivery strategy, sector-specific climate service products, impact-based forecasting; national and provincial monsoon forums
Meteo-rology					
Dissemination and Communication					
Hydrology	Equipment for National Early Warning Center				Enhancement of early warning communication at all levels, dissemination through social media, mobile services, media studio, and media training
Meteo-rology					
User Decision Making					
Hydrology					Introduction of a

Donor/ Technical Field	ADB (Flood and Drought Risk Management and Mitigation Project; US$3 million)	Food and Agricultural Organization (Agro-Climatic Monitoring and Information Systems Project; US$5 million)	Korea (Flash Flood Alert and Automated Rainfall Warning System Project; US$3 million)	World Bank IWRMP Additional Financing (Hydromet Services, US$3 million)	Lao PDR SEA DRM (Early Warning Systems, Service Delivery Systems; US$10 million component)
					QMS to provide consistency and coherency in service production and delivery
Meteo-rology					
Capacity Building					
Hydrology	Forecasting of floods, droughts, extreme weather events, and seasonal climate prediction		Conduct training on systems		Strengthen institutional capacity of DMH through QMS, staff training programs, development of business plan
Meteo-rology					

Disaster Risk Finance

13. In 2016, the World Bank assisted MOF in developing draft standard operating procedures (SOPs) to operationalize the State Reserve Fund (established by Decree 291 in 2013) under SRD at MOF. The SOPs are designed to enable timely access and efficient disbursement of funds following a disaster, to facilitate implementation of recovery efforts by line ministries. Apart from the development of the SOPs for the State Reserve Fund, the World Bank has drafted a DRFI Country Diagnostic Note for Lao PDR, which provides a review of the current disaster risk financing instruments available to the Government, and gives options for consideration for further development of a DRFI Program.

14. Table 1.2 gives a summary estimate of total resources available to the GoL for disaster risk financing, by source of funds/type of instrument. With the current focus of the DRFI tools on reserve funds and contingency budgets, the GoL remains financially exposed to less frequent but high impact catastrophic events.

Table 1.2. Estimated Amount of Funds Available for Disaster Response in Lao PDR

Estimated Amount of Funds Available for Disaster Response		
Disaster Risks	**Financing Source Available**	**Amount of Funds Available**
High-risk layer (for example, major floods, major typhoons)	Donor assistance	Unpredictable and unreliable for example, 2010 total commitment of US$10 million (often in kind)
	Tax policy	Not currently used
	Sovereign risk transfer solutions	Not currently used
	External debt	Unclear
Medium-risk layer (for example, regional floods)	Contingent credit	Not currently available
Low-risk layer (for example, localized floods, landslides)	Budget reallocation	Unclear
	Contingency budget	National Contingency Fund: LAK 100 billion (US$12 million) (reserved for disasters)
	Reserve funds	State Reserve Fund: LAK 300 billion (US$37 million) actual allocation in State Budget for FY2014–15. LAK 130 billion (US$16 million) actual transfer to the fund account; Social Welfare Fund: LAK 500 million (US$62,000) in FY2014–15; Road Maintenance Fund: Approximately, LAK 40 billion (US$5 million) available for disaster recovery for roads

Source: GoL 2016.

15. Regional cooperation on the DRFI, envisioned also under the AADMER, remains nascent. Drawing on the World Bank analysis in 2012,[33] the ASEAN Committee on Disaster Management, the ASEAN Finance and Central Bank Deputies Meeting, and the ASEAN Insurance Regulators Meeting adopted the ASEAN DRFI Roadmap, which serves as a regional framework and guideline toward regional risk financing. It comes with the establishment of the ASEAN Cross-Sectoral Coordination Committee on the DRFI and embodied in the ASEAN Disaster Risk Insurance Program.[34]

Project Description

Component 1: Integrated Urban Flood Risk Management (US$13.5 million IDA Credit)

16. This component will strengthen flood resilience and resilient urban planning in Muang Xay, the capital of Oudomxay Province. It will be implemented by DOW of MPWT, in coordination with DUPH. The growing city of Muang Xay in the Nam Ou River Basin is one of the cities in Lao PDR which is most often affected by floods. The planned investments are in line with DOW's five-year investment plan (2016–21), which includes flood risk management investments in Muang Xay as a high priority.

[33] World Bank and GFDRR. 2012. *ASEAN. Advancing Disaster Risk Financing and Insurance in ASEAN Member States: Framework and Options for Implementation.*
[34] Association of Southeast Asian Nations. 2016. *AADMER Work Program 2016–2020.*

17. **Subcomponent 1.1: Structural Investments (US$11.50 million)** will finance flood protection infrastructure in Muang Xay, including (a) investments in riverbank protection, embankments, canal improvements, sluice gates, pumping stations, a river-side park, and tree planting and (b) resettlement activities through assistance in financing for compensation and assistance to displaced person(s). It will be implemented by DOW of MPWT, in coordination with DUPH.

18. The reduction of flood hazard in Muang Xay will be achieved by increasing the discharge capacity of the rivers passing through the city to reduce the peak flood water levels, upgrading of embankment schemes, various additional river channel improvements, and the construction of sluice gates preventing backflow of river water to the city. The planned interventions can be considered non-regret interventions, as a large part the city is frequently inundated, most recently in the years 2008 and 2013. It has been noted that the frequency of flooding is increasing over the past decades due to rapid urban expansion, deforestation of the upstream catchments, and possibly the impact of climate change. The proposed works have the potential to lower flood depths in the city by 1 to 2 meters, reducing significantly the damages caused by frequent floods. The embankments will protect the most highly populated parts of the city from frequent flooding, including the important National Road 13.

19. The most urgent intervention will be the canalization of River Nam Ko passing through the center of Muang Xay. This is still a natural river passing through an expanding city. Lessons learned from all over the world show that this situation is not sustainable. Natural rivers have the natural behavior of overtopping river banks during flood season. For this reason, all rivers in the developed world show artificial river banks covered with smooth revetments which bring the flood levels down to arrive at very low frequencies of overtopping the river banks. The design dimensions of the channel will have to be determined by numerical model simulations, as part of the project. The redesign of the channel will lead to a loss of the current natural values of this river section as its banks will have to be lined, preferably with natural stones, to maximize the flood discharge capacity. The study will investigate possibilities to minimize environmental losses, while increasing significantly the discharge capacity of the channel, by bringing in a team of national and international urban architects. Apart from proposing green solutions, this team will also design all-season access to the river to achieve social benefits. As further compensation for the loss of natural values, a river-side park will be created near the city center, which will be extended by the creation of some hiking trails further downstream along the river.

20. The detailed designs for the infrastructure investments will be based on a detailed risk assessment, which is being conducted during project preparation. The design will comprise the compilation of a digital elevation model for the project area and, subsequently, the development of an integrated hydrological and hydrodynamic models to be used for a precise dimensioning of channels, embankment elevation heights, other channel improvements, and the need for sluice gates. The study will take into account the current and future situation, including the impacts of urban expansion and climate change.

21. **Subcomponent 1.2: Non-structural Investments (US$1 million)** will complement infrastructure investments, including developing resilient urban design solutions and enhancing institutional capacity building on integrated urban flood risk management. It has the following objectives:

(a) Reinforcing planning capabilities of DOW, DUPH, and other agencies. This will be achieved by, among others, reinforcing the complete flood management infrastructural design line

of data collection, data processing, numerical model development, flood hazard mapping, scenario analysis, and costing of proposed solutions. This covers the collection of data and their use, such as meteorological data, primarily rainfall, terrain elevation maps, aerial photographs of urban areas, terrain characteristics, detailed information on rivers, drainage systems, river and seawater levels, and discharges. These activities will be coordinated with the planned extension of data collection under Component 2, which also will facilitate the planning needs of municipalities and line agencies.

(b) Developing resilient eco-friendly urban design solutions by focusing on socially attractive and green solutions. The subcomponent will finance studies and a training program on key principles of flood risk management, including safe location, safe construction, and safe activities, that promote the practice of 'living with water' through the integration of blue-green ecosystem-based infrastructure with 'grey' hard-engineered infrastructure. Approaches to allow room for the river in low-density areas, while protecting against flooding in high-density areas, will be explored.

(c) Strengthening O&M through the development of an Operations Manual and associated training to sustain the investments under the project. This subcomponent envisages on-the-job-training, gradual knowledge transfer, and participatory workshops for larger groups of stakeholders and joint workshops with Component 2 related agencies.

22. **Subcomponent 1.3: Project Management (US$1 million)** will provide assistance to strengthen the institutional, organizational, and technical capacity of MPWT to support project implementation, including coordination, technical matters, procurement, FM, social and environmental safeguards, M&E, and reporting.

Component 2: Hydromet Modernization and Early Warning Systems (US$10 million IDA Credit)

23. Implemented by DMH, this component will improve the delivery of weather, climate, and hydrological services and end-to-end early warning system at a national level by upgrading the entire hydromet value chain in Lao PDR with emphasis on timeliness, improved quality and quantity, and user friendliness of services. Physical investments financed include three provinces of the Nam Ou River Basin, namely Luang Prabang, Oudomxay, and Phongsali.

24. **Subcomponent 2.1: Strengthening Early Warning Systems and Service Delivery Systems (US$5 million)** Provision of technical and analytical support for early warning dissemination and service delivery systems, including the following:

(a) Development and implementation of a service delivery strategy and associated institutional capacity building. The service delivery strategy will inform the development of detailed investment plans across short-, medium-, and long-term planning horizons (for example, two, four, and ten years) to ensure that the improvement of service delivery and infrastructure will be carried out in tandem.

(b) Strengthening of early warning services by developing localized and impact-based warning products, enhancing timely dissemination of warnings through diversified channels, and

ensuring last mile connectivity. The timely dissemination of information will be ensured through media outlets including TV, radio, social media, newspapers, and mobile services. Collaboration with stakeholders, including DDMCC and the media will be enhanced, for example, through media training which will be conducted in collaboration with partners such as Lao National Radio and Lao National TV.

(c) Enhanced dissemination of hydromet information through an online platform.

(d) Introduction of a QMS for service production and delivery. A QMS is required by the International Civil Aviation Organization for the provision of aeronautical meteorological services. The project will help extend the QMS to critical aspects of DMH to show that the organization is operating to an identified standard giving users more confidence in the services it provides.

(e) Capacity development of DMH and relevant agencies for service delivery, early warning, hydromet monitoring and forecasting, database management, and communication systems. An evaluation framework for DMH service delivery systems will be established. The National Framework for Climate Services will provide a platform to systematically engage users from different sectors. Through sectoral working groups under this National Framework, priority services will be identified for weather sensitive sectors such as agriculture, water resources management, health, DRM, energy, and transport. Dissemination of weather and climate information will be enhanced through diversifying communication channels. A business plan will be developed to strategize cost recovery from value added services for, but not limited to, aviation and the power sector.

25. Staff planning and capacity development programs will be developed based on identified gaps in the skills to operationalize the new systems and training needs. Technical training will be conducted to strengthen staff capacity at national, provincial, and district offices in instrumentation, calibration, ICT, data management, general meteorology, hydrology and climatology, forecasting, models, and service delivery, among others. Leadership development and management training will also be provided to senior management to enhance their managerial skills, planning, budget, and human resources management and business and partnership development. As it is expected that the National University's newly started Bachelor's in Science meteorology course will be crucial in developing national capacity of the hydromet sector in Lao PDR, the project will also finance activities aiming at strengthening the program by developing curriculum and teaching materials. The project will ensure the integration of systems through system integrator service contract, which will be supplemented by international advisor(s) who assist DMH in developing the Concept of Operations, and provide advice to the senior management in strategic and technical issues, as well as assist DMH in managing different contracts and coordinating development partners. DMH would also seek a twinning arrangement with more advanced national hydromet services in the region to garner support for day-to-day operations and mentoring. Project management, monitoring, reporting, and evaluation will be carried out by DMH.

26. **Subcomponent 2.2: Modernizing the Observing, Forecasting, and Communication Systems (US$4 million).** Supporting the upgrade of the hydromet network and forecasting and communication systems, in coordination with efforts from other development partners including the ADB, the Food and Agricultural Organization, and JICA. This component will finance the following:

(a) Installation of new hydromet stations and upgrading of existing hydromet stations to automatic systems. Stations to be installed will be integrated in the existing systems and aligned with the DMH Station Master Plan. The investment plan and implementation is closely coordinated with investments under the Mekong IWRMP by, for example, conducting the joint procurement of stations under both projects.

(b) Renovation of the provincial offices, including Internet facilities and communication systems.

(c) Upgrading of forecasting and dissemination systems of DMH by enhancing forecasting systems through the integration of global and regional numerical weather prediction products to ensure the effective use of global and regional products provided by, for example, the European Centre for Medium-Range Weather Forecasts, JMA, China Meteorological Administration, and Korea Meteorological Administration, as well as regional severe weather guidance products through Hanoi Regional Center under the Severe Weather Forecasting Demonstration Project. It will promote transboundary dialogue and cooperative management in the Mekong region, particularly with Thailand and Vietnam. Verification of forecasts will be systematized, recorded, and publicized on a regular basis.

(d) Enhancing IT and data systems at the national and provincial levels to enhance communication between DMH and other stakeholders.

27. **Subcomponent 2.3: Project Management (US$1 million).** Provision of assistance to strengthen the institutional, organizational, and technical capacity of MONRE to support project implementation, including coordination, technical matters, procurement, FM, social and environmental safeguards, M&E, and reporting.

Component 3: Financial Planning for Disaster Resilience (US$5 million IDA Credit, of which US$2 million national IDA Credit and US$3 million regional IDA Credit, and US$1 million Trust Fund Grant)

28. The objective of this component is to strengthen the financial planning capacity of Lao PDR for disaster resilience by enhancing MOF's capacity to integrate disaster and climate resilience into development and enhance the Government's financial capacity to meet post-disaster funding needs for rapid response. This component will be implemented by MOF.

29. **Subcomponent 3.1: Support for Strengthening National Financial Resilience (US$1 million Trust Fund Grant).** This subcomponent will provide technical assistance to strengthen MOF's capacity for financial planning for disaster resilience, including (a) preparing and implementing a national disaster risk finance strategy; (b) facilitating the country engagement in the preparation of a regional disaster risk pooling mechanism, such as SEADRIF, designed to provide participating countries with effective and affordable post-disaster rapid response financing; and (b) supporting day-to-day implementation of this part of the project. At the national level, this will include identification of (explicit and implicit) contingent liabilities related to climate and disaster risks, assessment of the impact of disasters into fiscal risk management and debt management framework, review of existing portfolio of disaster risk financing policies and instruments, identification of fiscal gaps, cost benefits analysis of financial

instruments, development of financial policies and instruments, review of domestic disaster risk insurance markets, review the post-disaster loss reporting systems, review of framework governing resource mobilization and execution post-disaster, and development of pre-agreed and pre-defined disaster response plans and their associated financial plan for at least two sectors. At the regional level, this will enable country engagement and country coordination in the preparation and implementation of a regional catastrophe risk pooling mechanism such as SEADRIF, including the preparation of studies for governance, operational, legal, and financial structure of the regional catastrophe risk pooling vehicle; drafting of an Operations Manual; establishing the necessary risk data infrastructure; and support to product design.

30. **Subcomponent 3.2: Payment of Disaster Risk Insurance Premium (US$5 million IDA Credit, of which US$2 million national IDA Credit, and US$3 million regional IDA Credit).** This subcomponent will assist the Government in accessing sovereign disaster risk insurance by financing the disaster risk insurance premium for three years from a catastrophe risk pooling mechanism such as the proposed SEADRIF. As another option, should the establishment of SEADRIF be delayed for any reason, the Government could purchase catastrophe insurance coverage directly from the World Bank Treasury, who would aggregate the risk from the participating countries and then pass it on as one single portfolio to international reinsurance markets. This option has worked successfully in the Pacific and would provide the Government with diversification benefits from working together while simplifying the institutional arrangements.

Component 4: Knowledge and Coordination (US$1.5 million IDA Credit)

31. Implemented by MPI through DOP, this component will support (a) overall project coordination and management, including M&E and financial audits and (b) studies for DRM mainstreaming in planning and investment.

Component 5: Contingent Emergency Response (US$0)

32. This component will allow for rapid reallocation of project proceeds in the event of a natural or man-made disaster or crisis. To trigger this component, the Government needs to declare an emergency or provide a statement of fact justifying the request for the activation of emergency funding. The Government may request the World Bank to reallocate project funds to support response and reconstruction. If the World Bank agrees with the determination of the disaster and associated response needs, this component will draw resources from the unallocated expenditure category and/or allow the Government to request the World Bank to re-categorize and reallocate financing from other project components to cover emergency response and recovery costs. Disbursements will be made against a positive list of critical goods or the procurement of works, and consultant services required to support the immediate response and recovery needs.

33. An Emergency Response Operations Manual will apply to this component, detailing FM, procurement, safeguards, and any other necessary implementation arrangements. This will be developed in cooperation with MOF and the line ministries to ensure effective horizontal coordination at the national level for disaster preparedness and response. In addition, vertical coordination of disaster management committees between the national, provincial, district, commune, and village levels will be promoted.

ANNEX 2: IMPLEMENTATION ARRANGEMENTS

COUNTRY: Lao People's Democratic Republic
Lao PDR Southeast Asia Disaster Risk Management Project

Project Institutional and Implementation Arrangements

1. Component 1 will be implemented by DOW within MPWT. Component 2 will be implemented by DMH within MONRE. Components 3 and 5 will be overseen by MOF. A National DRFI Working Group has been established, chaired by MOF. To foster regional collaboration, a Regional DRFI Working Group was set up with representatives from the relevant finance ministries of Cambodia, Lao PDR, and Myanmar. Links to ASEAN will be explored to maintain higher-level political coordination between the countries. Component 4 will be jointly overseen by MPI. For Component 5, an ERM will be developed which will detail the implementation of emergency activities, including all aspects related to procurement, FM, reporting, audit, M&E, and safeguard compliance. The designated implementing agencies have systems and operational procedures in place.

2. **Project coordination.** MPI will be responsible for overall coordination of the project. MPI will procure specialists to provide expertise and support related to procurement, FM, safeguards compliance, and project management (M&E) related to the overall project. Component-specific works and consultants will be procured by DOW, DMH, and MOF respectively. DOP has the specific following roles and responsibilities:

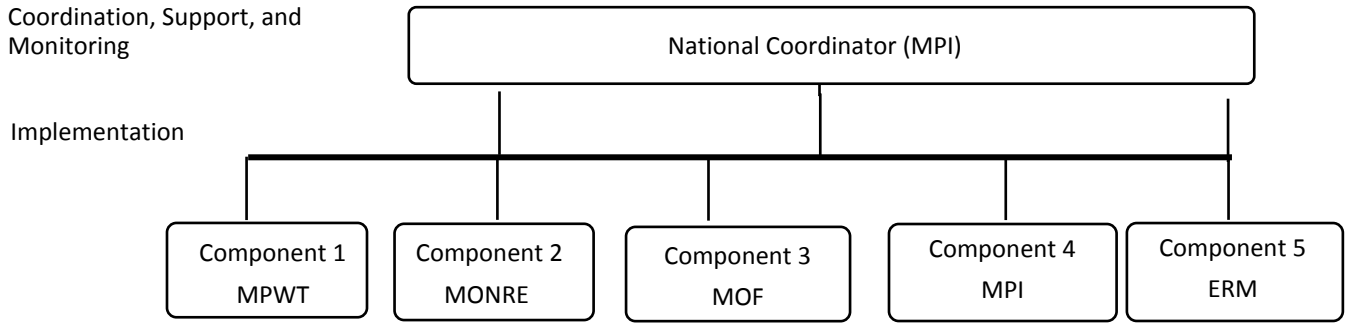
- Ensure the POM is followed.
- Review the implementation schedule and disbursement plan for project activities.
- Consolidate quarterly and yearly progress reports from all implementing agencies and report on project progress to MPI and the World Bank.
- Ensure that audits (technical and financial) are carried out.
- Ensure safeguard policies are followed.
- Review training plans.
- Identify and resolve issues related to implementation constraints or delays.

3. **Central- and provincial-level coordination.** The Minister of MPWT and the Governor of Oudomxay Province will sign a Memorandum of Understanding to ensure a clear assignment of roles, responsibilities, and accountability for Component 1. For Components 1 and 2, the Oudomxay DPWT and the relevant DONRE will be responsible for day-to-day contract management on sites and reporting.

4. **Implementation.** The project will work through existing Government structures of the line ministries. The implementing ministries, MPI, MPWT, MONRE, and MOF, will assign a team of staff responsible for management, procurement, FM, and safeguards of project activities. Consultants will be hired where needed to strengthen the capacity of the respective GoL agencies. The implementing

departments will monitor progress against the agreed performance indicators and produce periodic progress reports. Detailed institutional and implementation arrangements are described in the POM.

Figure 2.1. Overall Institutional and Implementation Structure



Financial Management

5. **Summary of FM assessment.** An FM assessment was carried out in accordance with OP/BP 10.0. The main FM risks identified are weak capacity and lack of experience. There are varying degrees of FM capacities among the implementing agencies. The implementing agencies lack qualified staff, systems, procedures, and experience in implementing a donor-financed project. This is likely to increase the risk of noncompliance, delays in submitting consolidated financial reports and audit reports, and it could lead to the misuse of funds. The overall FM risk, before and after the implementation of the proposed mitigation measures, is considered Substantial. The proposed mitigation measures are included in table 2.1.

Table 2.1. Financial Management Action Plan

	Actions	Responsible Party	Target
1	For all components, assign Government staff with adequate qualification and experience to support FM work for the project and for capacity-building purposes	DOF, DMH, SRD, DOP	Was confirmed at negotiations
2	Recruit a national consultant for Component 2 and part-time international consultant under Component 4 to provide support to all implementing agencies as needed	DMH, DOP	Within three months of project effectiveness
3	TOR for two FM consultants	DMH, DOP	Before effectiveness
4	Complete revision of FM Manual for Components 2–4	DMH, DOP, SRD	Was completed by negotiations
6	Training on disbursement and FM requirements provided to finance/ accounting staff involved in project implementation	All implementing agencies and World Bank	After project effectiveness
7	Project audit TOR	DOP	Before effectiveness
8	Engagement of project auditors	DOP	Within 6 months of project effectiveness
9	IFR format	DOF, DMH, SRD,	Was confirmed at negotiations

		DOP	

Organization and Staffing

6. **Component 1.** DOF of MPWT will have overall responsibility for FM of Component 1. DOF has extensive experience managing donor-funded projects such as World Bank-supported LRSP I and LRSP II, ADB, and other financiers (for example, the Swedish International Development Coordination Agency). DOF is responsible for accounting and disbursement of project funds, with support from consultants for review and on-job coaching. Capacity of DOF staff and existing arrangements in place are considered acceptable. In Oudomxay Province, the division of planning, budget, and statistics of DPWT will be responsible for FM at that level. Staff have limited experience working on donor-funded projects involving small amount of funds under the LRSP I. Overall, the experience of Oudomxay provincial staff is limited. Training and periodic support will be required to strengthen their capacity. The FM Manual used under the LRSP II is acceptable to the World Bank and will be also used under this component.

7. **Component 2.** DOF of MONRE has limited experience in managing funds of donor-funded projects. The number of staff at DOF is relatively small and their English language skills are basic. Given the limited number, capacity, and experience of DOF, technical support from a qualified national FM consultant will be required. The consultant will be recruited with TOR acceptable to the World Bank with prior review. For capacity-building purposes, DMH will assign a staff member from the Finance Division to assist and be trained by the consultant. The staff member will be assisting with disbursements and accounting of the project. DOF will also assign a focal point to work closely with the consultant. At the provincial DONRE level, staff will also be assigned to be responsible for managing and summarizing funds advanced to them. Acceptable FM guidelines used in the IDA-financed IWRMP will be adapted for use under this component.

8. **Component 3.** The financial accounting division of SRD of MOF will be responsible for FM of this component. As the activities under this component are not complex and for capacity-building purposes, staff of the accounting division will be assigned to work on FM for this component. The assigned staff will be supported on a day-to-day basis by a national coordinator/administration to be recruited for this component and by the international consultant to be recruited under Component 4, as required.

9. **Component 4.** DOP of MPI will manage part of Component 4. Although DOP has experience implementing small projects financed by trust funds administered by the World Bank, previous FM tasks were carried out by a consultant. Given the lack of qualified and experienced finance and accounting staff within DOP, a consultant's help will be required. It is recommended that DOP recruits a project coordinator cum administration and finance officer to provide FM and admin support to this component. For capacity-building purposes, DOP should consider assigning a staff with finance and accounting experience from DOP finance division to work full time and be trained by the consultant. DOP will also carry out the task of consolidating annual financial reports and arranging the project audit given their overall project coordination role. Given the importance of FM task, MPI's coordinating role and limited capacity of staff, it is also recommended that DOP recruits a part-time international consultant to provide FM support to DOP and capacity building to other implementing agencies as needed. The consultants will be recruited with TOR acceptable to the World Bank. The part-time international consultant will also assist the implementing agencies to set up FM procedures. A part-time arrangement of 120 days over a two-year period for the initial two years would suffice. An assessment

of needs should be carried out after the first two years of project implementation.

10. All finance and accounting staff involved in the project will be trained in World Bank disbursement and FM requirements once the project becomes effective.

11. **Budgeting and planning.** A budget will be prepared by each component's implementing agencies and consolidated by the finance unit located at DOP of MPI. Budget should be prepared annually and cover the period of the GoL fiscal year (January to December), and in accordance with the approved annual work plan. The quality of budgeting and forecasting will be strengthened as part of support provided by the FM consultants. This will facilitate the use of variable ceiling of the designated account based on six-month cash forecast. The POM elaborates the process and timing for the preparation and approval of the annual budget.

12. **Funds flow.** A Designated Account will be opened for each implementing agency. IDA funds will flow to four designated accounts, maintained at the Bank of Lao, managed by the National Treasury. As necessary, operating accounts can be opened at the provincial level to receive funds for implementation of activities at that level. The amount transferred to the provincial operating account will be considered as advance payment.

13. **Accounting policies and procedures.** Cash basis of accounting will be used by the project to prepare financial statements. Existing accounting software used by DOF of MPWT will be used to record transactions and produce financial reports for Component 1. DMH currently does not use any accounting software. Records are made manually. Given that a large project amount is planned for Component 2, the project will support DMH to use an accounting software to record and report on receipts and the use of funds. Given that transactions under Components 3 and 4 will be minimal, an accounting software may not be needed. For Component 1, FM policies and procedures to be used under this project will follow that of the LRSP II FM Manual. The FM Manual has been found acceptable to the World Bank. For Component 2, the FM Manual used in the IWRMP can be reviewed and adapted for use. As for Components 3 and 4, the FM Manual previously used by DOP can be reviewed and adapted for use. Original supporting documents will be retained at each implementing agency's office during the life of the project or until at least the later of (a) one year after IDA has received the audited financial statements covering the period during which the last withdrawal from the Credit was made or (b) two years after the closing date.

14. **Financial reporting.** The project will follow the GoL fiscal year (January to December). Unaudited interim financial reports (IFRs) will be prepared by each implementing agency on a biannual basis (that is, every six months). Each IFR will cover a period of six months. The IFR will be submitted to the World Bank by each implementing agency no later than 45 days after the end of each six months, with a copy to DOP. The IFR will report at minimum receipts, expenditure, and fund balances, and uses of funds by project components/activities. Variance analysis between actual and budgeted expenditure will be performed and reported as part of the IFR. Format of the IFR has been agreed upon. At the end of each fiscal year, DOP will consolidate the IFR and produce an annual financial report for the audit.

15. **Audit arrangements.** The project will be subject to an annual audit by qualified auditors to be recruited under Component 4, with TOR acceptable to the World Bank. All component expenditure will be audited and opinion provided on the whole project. The TOR was confirmed and agreed at

negotiation. The audit report together with a Management Letter will be submitted to the World Bank no later than six months of each fiscal year end. Audited financial statement and audit opinion will also be subject to disclosure in accordance with World Bank Policy on Access to Information.

Disbursement

16. **Disbursement arrangements.** To facilitate smooth and efficient cash flow, four designated accounts will be opened for the four implementing agencies. The designated account will be opened at the Bank of Lao and managed by the National Treasury. The designated accounts will have variable ceilings based on six-month cash forecast. Applicable disbursement methods will include (a) advance, (b) reimbursement, (c) direct payment, and (d) special commitment. Minimum application value for direct payment and reimbursement will be US$300,000. Disbursements will be made against the following expenditure categories. Reporting of expenditure paid from designated account will be based on submission of Statement of Expenditure. Frequency of reporting of expenditure will be a period not greater than three months.

Table 2.2. Expenditure Categories

Expenditure Category	Amount (SDR, millions)	Amount (US$, millions)	Percentage of Expenditure to be Financed (inclusive of taxes)
(1) Goods, works, non-consulting services, and consultants' services, training and workshops, and operating costs under Part 1 of the project [and resettlement compensation required for Part 1.1 of the project]	9.85	13.50	100
(2) Goods, works, non-consulting services, and consultants' services, training and workshops, and operating costs under Part 2 of the project	7.30	10.00	100
(3) Goods, works, non-consulting services, and consultants' services, training and workshops, and operating costs under Part 4 of the project	1.10	1.50	100
(4) Premia under Part 3.2 of the project	3.65	5.00	100
(5) Emergency expenditures under Part 5 of the project	0.00	0.00	100
Total	**21.90**	**30.00**	**—**

17. **Component 3.2.** Payments of the disaster risk insurance premium can be either to SEADRIF or World Bank Treasury. Either way, it is expected that the payment will be through direct payment on request of SRD of MOF. No other expenditure is eligible under this component other than insurance premiums. Payments to the risk pooling carrier (SEADRIF or World Bank Treasury) will be made in one installment once requested by the Government and all conditions have been fulfilled. To request disbursement of the funds from the World Bank to the catastrophe risk pooling carrier, Lao PDR's MOF

will submit a withdrawal application following the instructions provided in the Disbursement Letter (Additional Instructions) for the value of the insurance premium.

18. **Disbursement for Component 5—Contingent Emergency Response.** No withdrawal will be made under Component 5 until the GoL has (a) declared that a crisis or emergency has occurred, and the World Bank has agreed with the determination; (b) prepared and disclosed all safeguards instruments required for activities under Component 5 of the project, if any, and the Government has implemented any actions which are required to be taken under said instruments; (c) established adequate implementation arrangements, including a positive list of goods and/or specific works and services required for emergency recovery, satisfactory to the IDA, including staff and resources for the purposes of said activities; and (d) has prepared and adopted an ERM acceptable to IDA so as to be appropriate for the inclusion and implementation of activities under Component 5.

19. Disbursements would be made either against a positive list of critical goods and/or against the procurement of works and consultant services required to support the immediate response and recovery needs of the GoL. All expenditures under this component, should it be triggered, will be in accordance with OP/BP 10.00 and will be appraised, reviewed, and found to be acceptable to the World Bank before any disbursement is made. All supporting documents for reimbursement of such expenditures will be verified by respective implementation agency, certifying that the expenditures were incurred for the intended purpose and to enable a fast recovery following the crisis or emergency, before the withdrawal application is submitted to the World Bank. This verification would be sent to the World Bank together with the application. Expenditure under this component will also be subject to external audit.

20. The project will have a disbursement deadline date (final date on which IDA will accept applications for withdrawal from the Recipient or documentation on the use of Credit proceeds already advanced by the IDA) of four months after the closing date of the project. This 'Grace Period' is granted to permit the orderly project completion and closure of the Credit account through the submission of applications and supporting documentation for expenditures incurred on or before the closing date. Expenditures incurred between the closing date and the disbursement deadline date are not eligible for disbursement. All documentation for expenditure forwarded to IDA for disbursements will be retained and be made available to the external auditors for their annual audit, and to IDA and its representatives if requested. In the event that auditors or IDA implementation support missions find that disbursements made were not justified by the supporting documentation or are ineligible, IDA may, at its discretion, require the Recipient to (a) refund an equivalent amount to IDA or (b) exceptionally, provide substitute documentation evidencing other eligible expenditures.

Procurement

21. **Procurable items** under the project include construction works for riverbank protection, flood gates, weirs, canals, and associated technical assistants under Component 1; weather stations and technical assistance under Component 2; payment of disaster risk insurance and related technical assistance under Component 3; and Project Management under Component 4. Approximately one third of the project will be expended under Component 1. DOW under MPWT will be responsible for procurement activities under Component 1, DMH under MONRE will be responsible for Component 2, SRD under MOF will be responsible for Component 3, and DOP under MPI will be responsible for

Component 4. The institutional arrangement for Component 5 will be agreed as part of the ERM to be prepared and agreed with the World Bank. All works, goods, and consultants will be procured at the central level within the stated ministries and departments.

22. **Applicable policies and procedures.** The Project Concept Note was approved in 2015 before the effectiveness of the new Procurement Policy. Use of Borrower Regulations under the new Procurement Policy was considered. However, since scope of procurement will involve relatively low- to medium-value packages using traditional approaches, there would be little benefit in switching to the new policy framework. At the same time, preparations were quite advanced at the time of new policy effectiveness. Procurement under the project will therefore be governed by 'World Bank Procurement Guidelines: Procurement of Goods, Works, Non-consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers' and 'Consultant Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers' dated January 2011, revised July 2014, and provisions stipulated in the Financing Agreement. The World Bank Anti-Corruption Guidelines, dated October 2006 and revised in January 2011, will also apply. World Bank standard bidding documents and standard request for proposal documents will be used for all procurement of goods, works, and non-consulting services involving ICB and selection of consultancy services involving international competition. Implementing agencies will use STEP for communicating and requesting World Bank's prior review for procurement activities. NCB will be carried out in accordance with the national regulations including the Procurement Decree #03 dated January 9, 2004, and Implementation Rule and Regulations #0063 issued by MOF on March 12, 2004. These procedures were reviewed by the World Bank and found acceptable subject to some exceptions which are specified in the Financing Agreement. Harmonized national bidding and request for quotations documents will be used for the procurement of goods, works, and non-consulting services under NCB and shopping, respectively. Before implementation of procurement activities under Component 5, the Government will prepare an ERM which will be agreed with the World Bank.

23. **Assessment of the agencies' capacity to implement procurement.** The World Bank carried out a procurement capacity and risk assessment of DOW, DMH, and SRD in December 2016. In addition, MPWT was assessed under the LRSP II in March 2016. MPWT has over 25 years of experience in implementing World Bank-financed projects, and it has completed six World Bank-financed projects. Overall, MPWT has adequate capacity to manage the procurement activities under the project. Within MPWT, DOW will be responsible for developing technical designs, specification of goods, and TOR as well as managing contracts. All procurement will be conducted at central level. DOF within MPWT will recruit an international procurement consultant working under LRSP II, who will also support the coordination and monitoring of procurement activities of DOW under this project. The two departments will work together collaboratively to prepare procurement documents and manage the procurement process. DOW will undertake the bid evaluation and prepare recommendations to a bidding committee chaired by the minister or an alternative authorized person. While at the institutional level, the procurement capacities are appropriate, the assessment found that experienced staff are not available to work on this project, and the currently assigned staff for the project are not fully familiar with World Bank procurement procedures. DOW staff have gained some experience with NCB of goods and works packages under JICA, Korea International Cooperation Agency (KOICA), and ADB-funded projects, but they have only limited experience with ICB. Consequently, the capacity of DOW and DOF will be further strengthened under the project. DOW has assigned a full-time staff to work with the international procurement consultant to receive on-the-job training.

24. While implementing previous projects, a number of allegations of fraud and corruption were reported in MPWT some of which were substantiated by the World Bank Integrity Vice Presidency Department. Under the LRSP II, the World Bank and Government agreed on measures to mitigate incidences of fraud and corruption that included (a) declaration of interest by all evaluation committee members involved in procurement activities; (b) bidding documents/request for proposals will include the Statement of Undertaking requiring bidders and consultants to observe the highest ethical behavior in participation and implementation of procurement activities; (c) instituting a project complaints system that will be disclosed in all tender documents and the implementing agency will submit to the World Bank a quarterly grievance/complaints report; (d) strengthening the capacity of MPWT through employment of an international procurement consultant to provide procurement support and provision of procurement training to the implementing agency throughout project implementation; and (e) procurement information disclosure regime including posting bidding documents, bid opening records, and awards on MPWT's website; and (f) procurement audit as integral part of the annual technical audit. These measures will also apply under this project.

25. DMH of MONRE will be responsible for procurement under Component 2. The department will procure weather stations and technical assistance. DMH's technical staff can provide technical input (specifications) and prepare TOR for procurement activities. The department does not have experience in managing procurement activities even under Government-financed activities. English language skills of the staff are basic. Given the limited capacity and experience of DMH, procurement support from a qualified consultant will be required. DMH has prepared a Procurement Plan and will develop periodic procurement progress reports for Component 2 and send them to DOP of MPI for consolidation.

26. SRD of MOF will be responsible for procurement under Component 3. The department was established four-and-a-half-years ago and has not been involved yet in any donor-financed projects, and consequently, its staff do not have World Bank procurement experience. There will be limited procurement of goods and consultants under this component. SRD has prepared a Procurement Plan and will develop periodic procurement progress report for Component 3, and send them to DOP of MPI for consolidation.

27. DOP of MPI will be responsible for procurement under Component 4. DOP will function as the overall coordinating agency under the project. DOP will assign staff and hire consultants to manage the project. It is anticipated that the procurement consultant hired by DOP will also sign contracts with DMH and SRD to provide procurement support under Components 3 and 4, respectively.

28. **A contractor capacity assessment** for work activities was carried out under the LRSP II for several provinces, including Oudomxay. The assessment identified 19 contractors of various capacities and categories in Oudomxay. The lowest classification for these contactors was Level 3 based on Government classification. Level 3 classified contractors were assessed to have at least eight engineers of various disciplines and a turnover of US$12,000–60,000. These contractors are reported to have carried out similar contracts to the ones envisaged under the project. Participation rates in similar works financed by KOICA and JICA were also reported to be adequate. The assessment concluded that there are adequate numbers of contractors to participate in open tendering at the provincial level.

29. Based on the scope and nature of procurement activities, the capacity of departments that will procure the activities and market assessment, the overall procurement risk is considered High and the

residual risk taking into account implementation of proposed mitigation measures will be Substantial. Table 2.3 summarizes the risk and proposed risk mitigation measures which will be agreed with the Government.

Table 2.3. Identified Procurement-Related Risks and Mitigation Measures

No.	Risk/Challenge	Proposed risk mitigation measure	Responsibility	Deadline
1.	Limited experience of staff in DOW, DMH, and SRD with World Bank Procurement Guidelines	(a) DOW and DMH staff will be provided with procurement training initially by the World Bank and thereafter, by a procurement consultant to be hired under the project. (b) Hire procurement consultant(s) to support the implementation of procurement activities	World Bank and DOW, DMH, and SDR —	During project implementation During implementation
2.	Delays in procurement process	(a) Careful procurement planning and scheduling, procurement advanced as much as possible (b) Procurement monitoring using STEP (c) Close coordination between implementing departments and IDA, and supervision, and follow-up by IDA	DOW, DMH, and SDR World Bank and DOW, DMH, SDR, and DOP World Bank and DOW, DMH, SDR, and DOP	During project implementation During project implementation During project implementation
3	Governance risks associated with conflict of interest and fraud and corruption	(a) Enhanced disclosure of procurement information, including bidding documents, bid opening records, publication of the annual Procurement Plan, and a quarterly summary of the contract award information for all procurement packages, on MPWT's and MONRE's websites, and in newspapers (b) Establish a procurement complaint handling mechanism consistent with the Government procurement rules and regulations of MOF, and the World Bank's requirements. (c) Require staff involved in procurement to declare their interest and sign a declaration form (d) Monitoring and reporting on implementation of actions listed in this table under Point 2 (i) to (iii) and Point 3 (i) to (vi) for strengthening transparency and procurement training for the project	DOW, DMH, SDR, and DOP SRD DOW, DMH, SDR, and DOP DOW, DMH, SDR and DOP	During project implementation — During project implementation During project implementation
4	Inadequate experience in management of contracts especially on safeguard related issues	(a) Tender and contract documents will have specific provisions and remedies in dealing with contract lapses related to safeguard issues agreed with the World Bank.	DOW, DMH, and SDR	Before each works tender process

30. **Procurement Plan.** DOW, DMH, SRD, and DOP have prepared Procurement Plans covering activities under their respective responsibilities.

31. **Prior review threshold.** Procurement decisions are subject to prior review by the World Bank as stated in annex 1 and based on the World Bank's Procurement Guidelines.

Table 2.4. Procurement Prior Review Threshold (Goods, works, and non-consulting services)

No.	Procurement Method	Contract Value Threshold, US$	Prior Review Threshold, US$	Comments
1	ICB and LIB (Goods)	≥600,000	All contracts above US$1.5 million	—
2	NCB (Goods)	100,000–600,000	None	—
3	Shopping (Goods)	<100,000	None	—
4	Direct Contracting (Goods, Works, and Non-Consulting Services)	—	All contracts above US$1.5 million and US$5 million for goods and works respectively	—
5	ICB (Works)	≥2,000,000	All contracts above US$5 million	—
6	NCB (Works)	200,000–2,000,000	None	—
7	Shopping (Works)	<200,000	None	—
8	Procurement from UN agencies (Goods)		All contracts above US$1.5 million	Use World Bank-UN contract template

Note: LIB = Limited International Bidding; UN = United Nations.

Table 2.5. Procurement Prior Review Threshold (Selection of Consultants)

No.	Selection Method	Contract Value Threshold (US$)	Prior Review Threshold (US$)	Comments
1	Competitive methods (Firms) - QCBS and QBS	≥300,000	All contracts above 500,000	—
2	Competitive methods (Firms) - LCS and CQS	<300,000	None	—
3	Single source (firms)	—	All contracts above 500,000	Subject to the World Bank's approval
4	Individual consultants	—	All contracts above 200,000 for entire project duration. All TORs will require World Bank clearance.	Contract extension will be subject to post review

Note: CQS = Selection based on Consultant's Qualifications; LCS = Least-Cost Selection; QBS = Quality-Based Selection; QCBS = Quality- and Cost-Based Selection.

32. **Short list comprising entirely national consultants.** The short list of consultants for services, estimated to cost less than US$200,000 equivalent per contract, may consist entirely of national consultants in accordance with the provisions of paragraph 2.7 of the Consultant Guidelines. If sufficient number of national firms were not available, international advertisement (request for expression of interest on United Nations Development Business) can be applied.

Environmental and Social (including safeguards)

33. **Overview.** The safeguards considerations relate to Components 1 and 2. Component 3 finances disaster insurance premiums and technical assistance for which no safeguards policies are triggered. Component 4 finances technical assistance for which no safeguards policies are triggered. Investments under Components 1 and 2 are unlikely to create any significant negative environmental and social impacts, and the project is proposed to be classified as category B. Category A subprojects will be considered ineligible for project support. Expected impacts are limited to dust, noise, household business disturbance, and waste during construction. These issues are minor and site specific. There may be minor land acquisition and, possibly, the relocation and resettlement of project-affected people and their households due to the construction of riverbank protection and embankments, flood gates, weirs, river-side parks, and drainage canals, and hydromet stations. Safeguards policy frameworks (ESMF, RPF, EGEF) to be applied under the project have been prepared by MPWT with support from a consulting firm. These policy frameworks are designed to guide impact screening or assessment and identification of mitigation measures to be documented in subsequent instruments as required. Funds for the implementation and monitoring of safeguards policies and requirements will be sourced from Subcomponents 1.3 and 2.3 (Project Management) of the project.

34. **Institutional arrangements.** MPWT has the lead responsibility for implementation of the safeguards instruments. DOW of MPWT in association with the Provincial Department of MPWT Oudomxay Waterway Sector Project Implementation Unit will develop and implement the ARAPs/RAPs in their respective footprint for each subproject initiative according to the policies and procedures articulated in the RPF. Compensation will be implemented and managed by the Provincial and District Resettlement Committee, which will be established in accordance to the Decree 84, 2016, on compensation and resettlement. Village Resettlement Subcommittees will also be established as needed in villages where land acquisition and resettlements will occur and which will facilitate compensation and consultation with the project-affected people and their households and manage the grievance redress mechanism at the village level. The implementing agencies will also be responsible for the preparation of social assessments and EGDPs based on a process of free, prior, and informed consultation.

35. Likewise, environmental considerations will be the responsibility of the implementing agencies and covered in the ESMF with appropriate tools. The environmental mitigation and management of the project activities will be monitored and reported on by the client with advice and guidance from the World Bank and the project consultants. Impacts such as river bank erosion/sedimentation, water quality, and natural habitat changes are anticipated and will require monitoring. Additionally, during construction activities, issues related to noise and air pollution, construction site runoff water, waste

management and garbage will all require prior planning. To aid this, an independent consultant will be hired to develop a monitoring process, utilizing both the ECoP and EMPs, with other tools as deemed necessary.

36. Given the challenges associated with implementing the World Bank's safeguard's policies, a social and an environmental safeguards consultant will be hired to work across the implementing agencies to ensure compliance with the World Bank's policy on Involuntary Resettlement and Indigenous Peoples, through implementing the EGEF, RPF, and ESMF. This will involve preparing site-specific RAPs, social assessments, and indigenous peoples plans; managing and facilitating the required consultation and disclosure processes with the relevant village institutions; managing the grievance handling mechanism; and providing regular reports relating to implementation progress and challenges. Environmental monitoring procedures including, but not limited to, the ECoPs and EMPs (including site-specific EMPs) will be developed before implementation to ensure environmental standards are maintained.

37. **Labor influx.** The contractor capacity assessment carried out for the LRSP II indicated that there should be adequate number of works contractors in Oudomxay, with experience completing works similar to those envisaged under this project. Therefore, the level of labor influx is expected to be minimal, while the bulk of the workforce should have a similar socioeconomic and cultural background to that of the local community. The potential impact of the workforce will be further mitigated by the fact that most of the work is taking place in an urban area, which will facilitate local recruitment of workers (including skilled workers), and provide sufficient accommodation and recreational facilities. Because of the urban location, separate worker's camps are not anticipated. The ESMF includes mitigation measures related to gender-based violence, protecting the rights and welfare children, and the risk of increased prevalence of HIV/AIDS. The EGEF presents a framework for the development of site-specific plans to mitigate the potential disruption to the social norms of ethnic group communities. Provisions to minimize these risks will also be included in the bidding documents and contractor ESMP.

38. **Risks related to using IDA financing to cover resettlement costs.** Given that the structural investments to be financed under Component 1 will be taking place in the setback zone of the rivers passing through Muang Xay, it will be impossible to avoid resettlement. This is because this zone has been encroached upon by residential and commercial structures and agricultural land use in several locations. That said, every effort has, and will continue to be made, to focus on investments that will likely minimize potential resettlement. This has included the early elimination of some investments that had to potential for significant household relocation. Because the exact location and footprint of these structural investments will not be available until implementation, it is not possible to provide the exact number of households to be relocated or land to be acquired. However, a preliminary estimate based on a visual survey of a number of potential sites indicates that the project will acquire no more than 10 individual households or commercial establishments (valued at between US$20,000 and US$30,000, and may possibly impact an additional 50 agricultural plots (with an estimated value of between US$5,000 and US$10,000). When an additional US$50,000—100,000 is included to cover expenses such as income restoration and moving allowances, the estimated cost of resettlement is between US$500,000 and US$900,000. These costs will be covered from the IDA Credit at the request of the GoL. The provincial government will contribute to offsetting these costs by contributing land as a replacement for agricultural land or as resettlement costs. It is understood that the cost of resettlement should not exceed US$900,000, and that every effort will be made to minimize resettlement when the subprojects

are being designed. In the unlikely event that the costs of resettlement exceed US$900,000, then the additional costs will be covered by the Exchequer of the GoL.

39. The World Bank does not foresee any particular risks associated with the World Bank financing of compensation measures other than social safeguards risks that will be dealt with through the requests for proposals, RAPs, and recruitment of a social safeguards coordinator by the implementing agency. The Financing Agreement will include a section specifying the process for the RAPs' preparation, review, disclosure and implementation and that the Credit will be used to finance compensation measures and associated resettlement costs. Overall, the World Bank considers the safeguard-related risks to be at an acceptable level, given that the impacts are likely to be minor and that the client has demonstrated its willingness to properly address this issue, and will take steps to increase its capacity to manage the resettlement process through hiring a social safeguards coordinator. It is further the case that the client has experience in successfully managing land acquisition and resettlement for an operation with the ADB and in managing the preventative resettlement of households squatting in precarious zones. Even if it is the case where the land required is public land, the approach taken by the implementing agency has been to negotiate with the occupants and to offer alternative land. As a result, they have received almost no complaints during the last 10 years and experienced no public protests because of land acquisition and resettlement. Furthermore, the implementing agency is seen as a source of good practice on this issue in Lao PDR, with other departments requesting their advice on how to manage land acquisition and resettlement.

40. **Consultations.** A series of public consultations with stakeholders, including women and ethnic minorities, were held in Vientiane on June 20, 2016, and on September 22, 2016, and in Oudomxay in June 21–24, 2016, to discuss the prepared safeguard instruments, namely the ESMF, RPF, and EGEF. Results from this free, prior, and informed consultation process suggest that stakeholders and potential project-affected people largely support project development and implementation.

41. **Disclosure.** Draft safeguard instruments were disclosed on September 14, 2016. The final ESMF and RPF were disclosed in English on April 9, 2017. The final EGEF was disclosed in English and Lao on April 10, 2017. The final Lao ESMF and Lao RPF were also published on April 10, 2017.

Monitoring and Evaluation

42. **M&E design.** The M&E system will cover (a) implementation progress, including physical, social, and financial status; (b) achievement of intermediate and PDO outcome indicators as specified in the results framework; and (c) impact evaluation. Baseline data of some indicators are being established through the feasibility study and will continue to be monitored under the project. The midterm review will be conducted three years after project's effectiveness to review and assess detailed progress and ensure that expected outputs are delivered as scheduled, in line with the project's overall development objective and duration. With financing from the project's Component 4, an M&E consultant will be hired to oversee M&E arrangements and implementation.

43. **Institutional arrangement and utilization of M&E.** MPI will be responsible for planning and coordinating the project's M&E activities, with support and inputs from consultants. A semiannual M&E report will be submitted to the World Bank according to the agreed dates, in time for the implementation support missions, and will cover implementation progress and progress toward the

achievement of the PDO. In addition, monthly and quarterly reports will be prepared and will provide brief updates on implementation progress. In addition to the baseline, information on aspects such as travel time, transportation costs, and road condition will be collected for assessment of impacts of the project at the agreed intervals. A benefit satisfaction survey and socioeconomic impact assessment will be conducted in preparation for the midterm review and at project completion. The M&E reports will be used to inform management of the project performance, and guide budget allocation, planning, and decision-making. At midterm review and at project completion, the project will also provide evidence of the extent to which the PDO have been achieved, the intermediate output and outcome indicators have been met, and the impact of the beneficiaries. An evaluation of how and to what extent the project has contributed to the higher-level development outcomes it had sought to address will also be provided.

ANNEX 3: IMPLEMENTATION SUPPORT PLAN

COUNTRY: Lao People's Democratic Republic
Lao PDR Southeast Asia Disaster Risk Management Project

Strategy and Approach for Implementation Support

1. **The implementation support strategy** addresses the design and implementation requirements of the project, including the implementation of the risk mitigation measures and lessons learned from similar projects in the region/across the world. Key risks identified for this project include stakeholder coordination, institutional capacity to implement the project, fiduciary, and technical design.

2. **A number of steps** were taken as part of project preparation to facilitate effective implementation, including the following:

(a) Stakeholder consultations conducted as part of project identification and design phase.

(b) Procurement and FM assessments of the implementing agencies to determine the soundness of the FM and procurement systems.

(c) For Component 1, a technical study is being undertaken which considers technical parameters, and disaster and climate resilience measures. Findings of this work will continue to shape the designs of the works to be carried out under the project.

(d) For Component 2, apart from consultations in the country, client was engaged through international knowledge exchange in Japan, with lead Japanese hydromet stakeholders sharing lessons learned in modernizing hydromet services.

(e) For Component 3, preparatory studies have been undertaken to inform the design of the DRFI strategy and instruments.

3. **Key elements of the implementation support plan include** monitoring and reporting, capacity building, and quality supervision including project investment site missions. The project foresees augmented implementation support through the employment of national advisors and short- and long-term consultants. Review of the performance of the experts hired under the project will be part of the implementation support missions and midterm review. The task team leader (TTL) will also continually validate that the project objectives, project design, economic justification for the project, and key performance indicators are still relevant to the higher objectives to which the project contributes, primarily through the implementation support arrangements already put in place, but also in response to any issues related to these aspects of the projects that may be raised by counterparts in government or other stakeholders. The TTL will also be proactive in considering the need for project restructuring based on substantive issues that may be raised during missions or on an ad hoc basis by government or other stakeholders.

Implementation Support Plan and Resource Requirements

4. To ensure timely, efficient, and effective implementation support to the client, the implementation plan foresees standard semiannual implementation support missions, complemented with follow-up meetings, field visits, and fiduciary reviews, to gather data that validate that the project is being implemented in accordance with the plan that is set out. The World Bank team members will lead these, the majority of whom are based in the Lao PDR Country Office and other country offices in the region. Additional technical specialists will be engaged as needed to ensure quality of project management and drawing on global experiences. Municipal engineers, flood risk management experts, and disaster risk finance specialists will provide regular implementation support and technical assistance to the counterpart teams during project implementation to address technical risks, provide capacity building to stakeholders, and support coordination. Fiduciary specialists will identify capacity-building needs to strengthen procurement and FM to address fiduciary and governance risks. The project task team will continue to support coordination and engagement of project stakeholders throughout the lifecycle of the project.

5. **Procurement.** Implementation support will include (a) prior review of procurement documents, (b) at least twice a year conduct of ex post reviews, (c) training procurement staff and providing detailed guidance on the World Bank's procurement guidelines, and (d) monitoring of procurement progress in relation to the detailed Procurement Plan.

6. **FM.** Semiannual implementation support missions will focus on the adequacy of the FM system to ensure that funds are used for the intended purpose. In line with the identified FM risks, the reviews may focus on any of the following aspects: (a) review and verification of specific transactions, (b) review of internal controls of financial management, (c) analysis of the financial statements in relation to the funds disbursed by the World Bank, and (d) physical verification of structures and others as to existence. Desk reviews will also be conducted on a regular basis and upon submission of the annual external audit of the project and the biannual IFRs. Issues arising from these reports will be used to revise and adjust the scope of the planned FM implementation support.

7. **Technical advice.** On-demand technical advice will be provided to the client throughout the project, particularly related to (a) MOF’s capacity building on disaster risk finance, (b) urban drainage and integrated flood risk management including capacity building for better management of the drainage asset networks, (c) hydromet system upgrading and sustainable modernization, and (d) gender and citizen engagement elements in the project.

8. **Project management.** Advise on the overall management and supervision of the project will be provided to ensure technical soundness and consistency, transparency and good governance, inclusiveness, and compliance with relevant guidelines and procedures. Assistance will be provided to review the selection and management of national and international advisers and consultants to the project, ensuring the adequacy of expertise and quality of experts employed under the project.

9. **Environmental and social safeguards.** Support will include supervision and provision of technical inputs in the implementation of the ESMP in line with World Bank safeguard policies. Capacity-building will be provided to relevant project staff for the preparation, implementation, and monitoring

of environmental and social safeguard instruments. Risks will also be closely monitored and actively mitigated as far as practicable throughout the lifecycle of the project.

10. Implementation support will be more intense during the first half of the project. As capacity develops, technical support will be able to be reduced.

Table 3.1. Overview of Skills and Resources Needed

Time	Focus	Skills Needed	Resource Estimate	Partner Role
First 12 months	• Supervision of phase 1 investments • Technical and procurement • review of bidding documents • Procurement training • Safeguards training	• Hydromet Specialist • Urban Floods/Civil Engineers • Urban Planner • Procurement • Fiduciary • Social and Environment safeguards • Project management M&E	Supervision budget estimated—US$175,000	n.a.
12–48 months	• Supervision and management of construction contracts • Environmental and social monitoring • Fiduciary	• Technical/construction • Experts • Procurement • FM • M&E • Social • Environmental	Supervision budget estimated—US$175,000	n.a.

Skills Mix Required

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Team leadership	52	8	—
Operations Analyst/Specialist	26	6	—
Flood Risk Management Specialist/Civil Engineer	16	6	—
Disaster and climate risk management	12	6	—
Urban Planner	12	6	—
Hydromet/Early Warning Systems Specialist	12	6	—
Disaster Risk Finance Specialist	12	6	—
Hydraulic modelling	8	4	—

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Catastrophe modelling	8	4	—
Procurement	25	0	In country
Financial management	8	0	In country
Social safeguards	12	0	In country
Environmental safeguards	12	0	In country
Catastrophe Risk Insurance Expert	12	6	—
Economist	8	4	—
Support staff	14	0	In country

ANNEX 4: ECONOMIC AND FINANCIAL ANALYSIS

COUNTRY: Lao People's Democratic Republic
Lao PDR Southeast Asia Disaster Risk Management Project

1. **A cost-benefit analysis was conducted to calculate the EIRR and NPV of Components 1 and 2, by comparing costs and benefits under 'without-project' and 'with-project' scenarios**. For Component 1, the economic analysis covers a period of 20 years (2018-2037) where the stream of benefits is expected to come in after 3 years of implementation. Component 2 covers a period of 15 years (2018-2032) to reflect the lifespan of the equipment, where the stream of benefits is expected to come in after 1 year. Based on the World Bank guidance note on discount rate, a 12 percent discount rate was used for this project.

2. The analysis for Component 1 is based on avoided direct losses to assets in the flooded area. The major economic benefits of Component 1 are expected to come mainly from avoided losses of asset from flash floods. Based on per capita income and population data, Muang Xay's GDP is estimated to be around US$127 million. Assuming 65 percent capital share of value added and 20 percent return-on-capital,[35] the estimated value of asset in Muang Xay are around US$413 million. If the project enables the city to avoid flash flood damages of 3 percent to the city's assets, once every four years (that is, with an Annual Exceedance Probability of 25 percent), the benefits of avoiding such loss will yield the EIRR of 20.5 percent with an NPV of US$7.16 million. It should be noted that additional benefits can also come from improvement of land value due to less flooding but the measurement of such impact is complex and detailed data is not available.

3. For Component 2, a separate analysis was conducted based on hydromet and early warning system's effectiveness to reduce asset losses from natural disasters nationwide as well as to enhance productivity in weather-sensitive sectors. Major economic benefits are expected to come from avoided annual asset losses from seasonal natural events and improvement of weather-sensitive production sectors due to better hydromet system. Based on historic data,[36] natural disasters are estimated to cause damages amounting to about 0.7 percent of GDP. To estimate the reduction in asset loss, this analysis assumes 10 percent potential reduction in asset losses due to improved hydromet system—a conservative estimate for low-income countries. And, to estimate the benefits to weather-sensitive sectors, this analysis assumes that the share of weather-sensitive sectors to GDP is 15 percent (from 27.6 percent agriculture sector share of GDP). A conservative global benchmark is that modern forecast services add value of 0.1 percent to 1 percent in weather-sensitive sectors; this analysis assumes 0.1 percent. Under these assumptions, the EIRR is estimated to be 82.1 percent and NPV is US$95.2 million. Sensitivity analyses on various cost and benefit variations were conducted to test the robustness of the results.

4. Sensitivity analyses on various cost and benefit variations for Components 1 and 2 are shown in table 4.1.

[35] Based on *ADB (2007), Developing an Interregional Input–Output Table for Cross-border Economies: An Application to Lao People's Democratic Republic and Thailand.*
[36] Based on Post-Disaster Needs Assessments of Typhoon Haima and Ketsana.

Table 4.1. Summary of Economic Analysis for Components 1 and 2

	Component 1		Component 2	
	EIRR (%)	NPV (US$, millions)	EIRR (%)	NPV (US$, millions)
Base case	20.5	7.16	82.1	95.20
Investment cost increases by 20 percent	18.7	6.08	73.5	93.42
Cost increases by 20 percent and benefits reduce by 20 percent	13.6	1.42	64.0	72.61
Discount Rate increases to 16 percent	20.5	2.98	82.1	69.69

5. To monitor the project's impact until the exit point, the project will annually collect the following information to measure the actual economic impacts and 'value-for-money' from the investment:

(a) Survey of assets affected by flood in Muang Xay—total value of (asset) damages due to flash flood

(b) Survey of property values in Muang Xay, both in the flood-affected areas (under the project) and in no-flood area

(c) City's local GDP in U.S. dollars

(d) Productivity assessments of weather-sensitive production sectors (to compare with- and without-project)

(e) Estimation of annual damages and losses from natural disasters

6. **The economic and financial analysis of Component 3** compares various catastrophe risk transfer options, as summarized in table 4.2. Option 2 allows for catastrophe risk pooling among the participating countries, which could be implemented through an intermediary such as the World Bank Treasury. Option 3 allows not only for catastrophe risk pooling but also risk retention through joint reserves, which could be implemented through a dedicated regional facility such as SEADRIF.

Table 4.2. Catastrophe Risk Transfer Options

Option	Description
1	Lao PDR transfers catastrophe risk to international reinsurance/capital market with project support.
2	Lao PDR, jointly with Cambodia and Myanmar, transfers catastrophe risk to the international reinsurance/capital markets, without joint reserves, with project support.
3	Lao PDR, jointly with Cambodia and Myanmar, transfers catastrophe risk to the international reinsurance/capital markets, with joint reserves, through the establishment of a regional catastrophe risk pool like SEADRIF, with project support.

7. Catastrophe risk pooling allows countries to aggregate their catastrophe risks into a single, diversified portfolio, which reduces the cost of risk and hence, results into lower insurance premiums. Preliminary actuarial analysis of the portfolio of flood risk including Cambodia, Myanmar, and Lao PDR shows that indicative premium savings are estimated in excess of 27 percent due to catastrophe risk pooling, risk retention of first losses through joint reserves, and economies of scale in operational costs, compared to the insurance premiums, if countries were to access the international reinsurance markets individually.

Table 4.3. Indicative Premium Reductions from Options 1–3, Compared to Option 1

	Option 1	Option 2 (%)	Option 3 (%)
Estimated reduction in indicative commercial premium, prototype policy	—	15–19	24–27

Notes: Premium reductions in Options 2 and 3 are relative to Option 1. The range allows for some correlation of risks across countries (based on a simple analysis of historical data) to no correlation of risks across countries (that is, maximum diversification benefit).

8. These indicative premium reductions are due to a larger, more diversified portfolio of catastrophe risks placed on the international reinsurance markets.

(a) By jointly transferring catastrophe risks through a single, diversified portfolio, Lao PDR could expect to reduce their indicative premium by up to 19 percent. This is based on all three countries joining together to pool and diversify their risks. Generally, the benefit from risk diversification to countries, as a group, increases with the number of countries working together.

(b) By jointly establishing reserves and transferring catastrophe risks through a single, diversified portfolio, Lao PDR could expect to reduce their indicative premium by up to 27 percent. This is based on all three countries pooling their risk in an insurance facility that maintains reserves and transfers part of the risk to the reinsurance market. Generally, the benefit from joint reserves and risk diversification to countries, as a group, increases with the number of countries working together.

9. Economic benefits of insurance premium financing under Component 3 of this project are expected to come from (a) insurance payouts in the occurrence of an insured event and (b) avoided costs, due to avoided delays on response because of rapid insurance payouts (within two weeks) allowing for additional financing for rapid response post disaster.

(a) **Insurance payouts**. While the structure of the insurance program will be finalized through dialogue with countries, the structure proposed in this analysis has a three-year term with both soft triggers (for small events) and parametric triggers (for medium and severe events). Insurance payouts for small events based on soft triggers such a declaration of a disaster and are up to 50 percent of the total premium over three years. Insurance payouts for medium and severe events are predefined and will trigger if calculated losses for a given event exceed a predefined index value. Due to the parametric nature of the product insurance payouts can be made within two weeks of the occurrence of an event. In any

case, the minimum payout received by the Government over three years is 50 percent of the premium (guaranteed payout).

(b) **Avoided costs**. The overall cost of disasters rises over time if immediate relief actions are not undertaken. Should the Government have a lack of immediately available financing and rely on ex post financing of disasters, there may be some delay caused by the ex post mobilization of funding. In many countries, this delay can take several months. Avoided costs of disaster response are costs not incurred as a result of immediate access to funding for emergency response. Avoided disaster costs due to timely and effective disaster response financing are therefore defined in this analysis as the insurance payouts, which are available immediately after a disaster for response and rehabilitation, multiplied by a delay factor. This is another way to capture the marginal benefit of one additional dollar made available immediately after a disaster, which is higher than the marginal benefit of this same dollar in non-disaster years. The delay factor can represent 50 percent or more.[37] This analysis is conservative and assumes in the base case results that the delay factor is 50 percent. This means that US$1 million of insurance payout has an equivalent economic benefit of US$1.5 million. Table 4.4 summarizes the economic benefits of a US$5 million contribution.

Table 4.4. Economic Benefits for a US$5 million Premium Contribution

	Annual Probability of Occurrence (%)	Annual insurance payout (US$, millions)[a]	Annual avoided costs (US$, millions)[d]	Annual economic benefits (US$, millions)
No disaster or small disaster year[b]	73	0.8	0.4	1.2
Medium disaster year[c]	10	6.3	3.2	9.5
Severe disaster year[c]	3.3	12.1	6.0	18.1
Average year [b]	—	1.4	0.7	2.1

Note: (a) Payout based on hypothetical product; (b) Assumes soft trigger payout claimed evenly over three-year period; (c) Assumes soft trigger payout claimed in full at time of medium or severe disaster; (d) Based on delay factor of 50 percent.

10. The economic analysis covers the period of the project (five years), where a three-year disaster insurance coverage is available from the third year of project implementation. When disaster risk insurance is provided through the proposed regional catastrophic risk pool SEADRIF (Option 2), the EIRR is estimated at 30 percent on average, varying from −29 percent if no severe disaster occurs during the three-year period (with a probability of 73 percent) to 262 percent or more if at least one severe disaster (with a probability of 10 percent) occurs during the three-year period. With a 12 percent discount rate, this is equivalent to NPV of US$0.5 million on average, ranging from –US$2.1 million to US$8.0 million. Should disaster risk insurance be intermediated, for example, by the World Bank Treasury (Option 2), the average EIRR is estimated at 23 percent.

[37] A recent study in Ethiopia shows that avoided costs can exceed 200 percent (Clarke et al. 2016).

Table 4.5. Summary of Economic Analysis - EIRR (percentage)

	Probability of Occurrence (%)	Option 1 (%)	Option 2 (%)	Option 3 (%)
Average		13	23	30
No claim during three-year coverage	73	–29	–29	–29
At least one medium event during three-year coverage	27	58	78	90
At least one severe event during three-year coverage	10	183	232	262

Table 4.6. Summary of Economic Analysis - NPV (US$, millions)

	Probability of Occurrence (%)	Option 1 (US$, millions)	Option 2 (US$, millions)	Option 3 (US$, millions)
Average		0.1	0.3	0.5
No claim during three-year coverage	73	–2.1	–2.1	–2.1
At least one medium event during three-year coverage	27	1.5	2.1	2.5
At least one severe event during three-year coverage	10	5.4	7.0	8.0

Note: NPV calculated based on a discount rate of 12 percent. Selection of 12 percent discount rate is per World Bank (May 2016) guidance where discount rate follows growth rate: "Higher (lower) growth prospects would normally imply a higher (lower) discount rate for a particular country. Given reasonable parameters for the other variables in the standard Ramsey formula linking discount rates to growth rates, a 3 percent per capita growth rate translates into a 6 percent discount rate, and per capita growth rates of 1–5 percent yield discount rates of 2–10 percent." With Lao PDR's GDP per capita growth around 6 percent, the World Bank has assumed a 12 percent discount rate for this project.

ANNEX 5: DISASTER AND CLIMATE CONTEXT

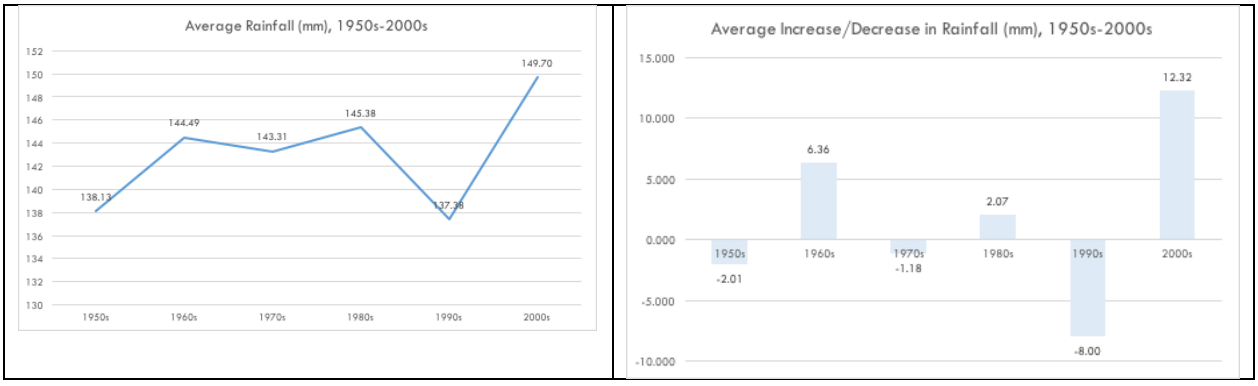
COUNTRY: Lao People's Democratic Republic
Lao PDR Southeast Asia Disaster Risk Management Project

Impacts of Climate Change

1. **Effects of climate change have a tendency to exacerbate the effects caused by these natural hazards.** A particular effect of climate change is that these hazards may occur more frequently and with a higher intensity. In particular, floods and droughts are affecting the agricultural production sector because there is a tendency to increase their severity (in volume or duration); a change in observed pattern (increased intensity or delays); and possible regional changes (dry becomes dryer, and wet, wetter).

2. **Lao PDR is sensitive to climate change impacts.** Historical records of data between 1951 to 2012 show an increase in total rainfall between 1951 and 2012 of an average 1.6 mm per decade, while temperatures have increased on average 0.1°C per decade in this period.[38] For rainfall (see figure 5.1), the downward trend from the 1960s to the 1990s is negated by significant increase in rainfall in the 2000s that led to a higher average in those years. For temperature (see figure 5.2), there is an average increase over the decades but this is a more moderated 0.1°C per decade. The trends moderate slightly when we take into account a longer period (that is, 1901–2012 or 1951–2012) as compared to the original 1961 to 1998. Climate change-induced extreme weather events such as more frequent and intense cyclones which develop in the South China Sea may make landfall along central Vietnam coast before tracking inland to Lao PDR. Although, diminishing in intensity and strength, these extreme weather events bring heavy rainfall to swollen rivers with the resultant effect of flash floods and, possibly, personal and property damage to inundated areas.

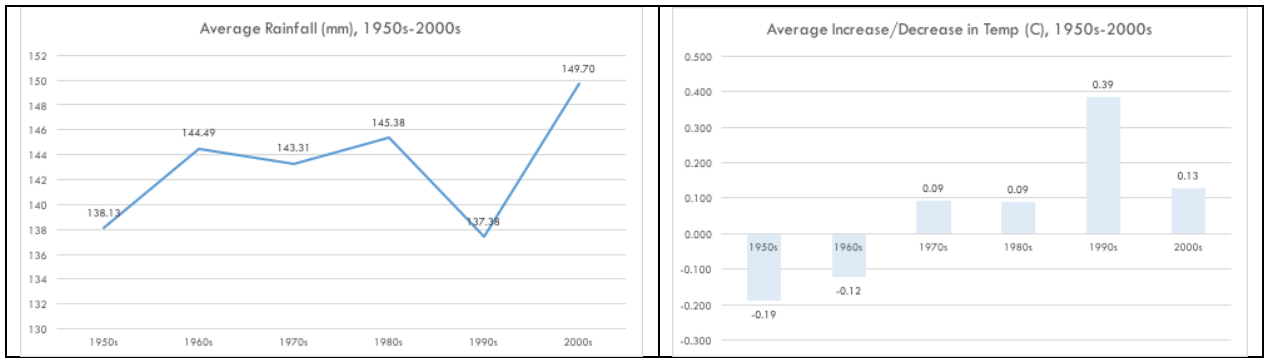
Figure 5.1. Rainfall Average (1950s–2000s)



Source: World Bank staff based on data from World Bank Climate Change Portal. Lao PDR.

[38] Data from World Bank Climate Change Portal. Lao PDR. Data accessed 2016.

Figure 5.2. Temperature Average (1950s–2000s)



Source: World Bank staff based on data from World Bank Climate Change Portal. Lao PDR.

Natural Hazards

3. Without considering any climate change impacts, Lao PDR is already faced with an array of natural hazards which affect the country. Lao PDR is exposed to a range of natural hazards, including floods, landslides, drought, and tropical storms and cyclones. From 1970 to 2010, 33 natural hazard events (mostly floods and droughts) were registered, affecting almost 9 million people and causing economic damages of over US$400 million.

4. **Oudomxay Province** has a moderate monsoon climate, however, because of high elevations (between 300 and 1,800 meters above sea level); temperature variation is greater than other parts of the country. Temperatures in February and March average between 18°C and 19°C, while temperatures from April to May exceed 30°C. Cyclones developing in the South China Sea can make landfall in Vietnam and then inland over northern parts of Lao PDR. Although diminishing in strength as the cyclone tracks inland, it still brings strong winds and heavy rainfall, according to DMH. Landslides and flash floods are common. In recent years, these are becoming more frequent and intense with increased levels of precipitation (annual precipitation ranges between 1,900 and 2,600 mm). Oudomxay Province experienced flash floods with devastating effect to infrastructure and loss of life in the provincial capital, Muang Xay, in 1945, 1985, 2008, and 2013. In 2008, as a result of a diminishing tropical cyclone and heavy rainfall (maximum daily rainfall recorded was 152.7 mm), one fatality and extensive property damage was inflicted on Hagupit and Muang Xay towns. The 2013 flash flood event occurred as a result of torrential rains on August 20–21, 2013, with maximum daily rainfall of 93.6 mm. Flood damage in the provincial capital of Muang Xay was largely caused by inundation from the Nam Kor River which passes through the provincial capital. The flash flood that occurred at midnight in 2013 wreaked havoc with damage to infrastructure and loss of life. In the absence of an early warning and public alert system, Muang Xay residents could not sense the imminent danger nor access evacuation facilities in time.

Urban Development, Climate, and Disaster Exposure

5. To increase the resilience of urban communities to natural hazards and climate change effects can be achieved by different structural and nonstructural measures. This has to be addressed in the planning process of new development or in the upgrade and rehabilitation process of existing infrastructure. Flood risk mitigation structures specifically need to take into account projected changes in rainfall, upstream and downstream flow patterns and based on that, consider the incorporation of

low-cost bioengineering, DRM, and climate-proofing measures into infrastructure design and management can assist in mitigating these impacts.

6. Oudomxay provincial government and different populations understand that recurring floods are part of the natural ebb and flow of a river hydrology. Little, if any, urban DRM countermeasures have been undertaken in the past due to lack of knowledge and limited budget for flood control. A number of insights and lessons can be drawn from Oudomxay provincial capital Muang Xay in the wake of the 2013 flash flood event, including the following:

(a) District-level government has insufficient knowledge and capacity for dealing with a disaster.

(b) The provincial capital lacks sufficient flood control measures like embankments and dikes.

(c) Early warning and public alert system are rudimentary or nonexistent.

(d) Emergency budget delayed restoration in the provincial capital and rural areas.

(e) Budget limitations have impeded attempts at DRM.

Applying Structural and Nonstructural Measures to Increase Climate Resilience

7. The best way to avoid future damages caused by climate change is to increase preparedness and prevention due to structural measures. In any planning process with respect to flood mitigation infrastructure, besides the technical solutions, nonstructural measures also need to be incorporated. Proposed nonstructural measures for improving rural road design may include the following:

(a) Participatory decision and planning process

(b) Community-based capacity building on flood preparedness

(c) Incorporation of early flood warning systems

(d) Capacity building of MPWT staff with respect to climate change resilience

(e) Preparing contingency plans on province and possibly, district level

8. Structural measures pertain mostly to the actual planning, physical construction, and upgrade process. The following is a not an exhaustive listing of possibilities:

(a) Review of design criteria related to water resources and drainage to ensure that the longitudinal drains are sufficiently dimensioned and that drainage cross-structures (mostly culverts and bridges) do not hinder the flood flow which existed before on the flood plains.

(b) Provide technical measures to minimize erosion (for example, vertiver grass, gabions, groynes, rip rap on flow exposed slopes, and so on)

9. Investments in hydromet and early warning systems will help prevent or lessen unnecessary loss of lives and damages trough better risk information and improved end-user communication. Analyses of hydromet investments elsewhere in East Asia, such as China, have demonstrated cost-benefit ratios of between 1:35 and 1:40, while in advanced countries, economic returns are in the order of a magnitude of 1:4 to 1:6.[39]

Climate Change Adaptation and DRM Co-Benefits

10. Based on an analysis of the nature of specific activities within each project component, it is expected that 100 percent of the total financing for Components 1, 2, and 3 of the project will yield climate change adaptation co-benefits. Component 4, while directly related to the project activities, concerns project management and does not specifically address climate change adaptation. In line with the preference for conservative estimates for climate change co-benefits as specified in operational guidance, this component will be excluded from the calculations. Components 1, 2, and 3 are expected to reduce the current and future risks and vulnerabilities that are posed by climate change to Lao PDR, both in the Nam Ou River Basin, where the majority of proposed structural investments are focused, and also nationally. An explanation of the link between project activities and climate change adaptation co-benefits is listed below for each component:

(a) **Component 1.** There is evidence that climate change is exacerbating extreme weather patterns in Oudomxay Province and across northern Lao PDR, leading to more frequent and intense precipitation events such as heavy rainfall, which in turn causes flash flooding in cities such as Muang Xay. The proposed structural investments such as river bank protection, dikes, canal improvements, sluice gates, and river-side parks, complemented by nonstructural investments including capacity building, are designed specifically to enable Muang Xay City to cope better with flash flood incidents, which are expected to become more frequent, given climate change. The technical assistance associated with this component will strengthen the capacity of DOW on integrated urban flood risk management.

(b) **Component 2**. Strengthening hydromet and early warning systems is critical to building the resilience of Lao PDR to increased hydromet risks and extreme weather patterns resulting from climate change. The component will strengthen the capacity of DMH to deliver climate and Early Warning Systems-related services, which ultimately improves the preparedness of the Lao population to climate and weather hazards. Physical investments in weather stations such as in Muang Xay are also envisioned.

(c) **Component 3.** Disaster risk finance planning will increase the capacity of Lao PDR to cope with the financial burdens of increasing disaster impacts that are linked to climate change. Specifically, this component will strengthen capacity of MOF to mainstream disaster and climate resilience into public investment planning and development processes, through the development and implementation of a national disaster and climate risk finance strategy. It

[39] Jha, A., Stanton-Geddes, Z, eds. 2013. *Strong, Safe, and Resilient: A Strategic Policy Guide for Disaster Risk Management in East Asia and the Pacific. Directions in Development*. Washington, DC: World Bank; p. 78.

will also support the Government in building financial resilience in the face of a disaster, by securing it access to sovereign disaster risk insurance through premium payments. These interventions directly aid the Lao PDR Government in managing the increasing fiscal burdens associated with climate risks and disaster events.

(d) **Component 4.** Not included in climate change adaptation co-benefit calculations as this component supports project management.

Table 5.1. Climate Co-Benefits Calculation

Climate Co-Benefits Calculation	Component 1	Component 2	Component 3	Component 4	Total
Total amount of financing (US$, millions)	13.5	10.0	6.0	1.5	**31.0**
Percentage of financing yielding climate change co-benefits (%)	100	100	100	0	—
Amount of financing directly providing climate adaptation co-benefits (US$, millions)	13.5	10.0	6.0	0.0	**29.5**

ANNEX 6: Southeast Asia Disaster Risk Management Program

COUNTRY: Lao People's Democratic Republic
Lao PDR Southeast Asia Disaster Risk Management Project

Regional Context

1. **Disaster context.** The SEA region is highly vulnerable to the impacts of natural hazards. Despite a long tradition of coping with water and weather variability, extreme weather events remain a serious challenge in the region. Nearly 85 percent of disasters and 75 percent of economic losses are caused by recurrent hydromet and climate-related events such as tropical cyclones and storm surges, floods and landslides, forest fires, and droughts (EM-DAT 2014).[40] In recent years, a succession of cyclones has resulted in major loss of life, livelihoods, and economic assets. Seismic risks are also prevalent in some areas of SEA. Due to disasters, Cambodia, Lao PDR, and Myanmar face particularly high annual average expected losses relative to the size of their economies, equivalent to 0.7 percent or more of GDP. Catastrophic events with a return period of 100 years could result in contingent liability in excess of 13.9 percent in Lao PDR for floods.[41] The ability of the region's countries to manage the increasing impact of disasters will have important implications for their growth and development agendas.

2. **Socioeconomic context.** In Cambodia, Lao PDR, and Myanmar, where between 65 percent and 80 percent of the population still lives in rural areas, mostly as subsistence farmers or fishers, extreme weather events are seen as directly linked to the persistent poverty. The yearly catastrophic events are increasingly recognized by the Governments as a core challenge to the pressing priority to achieve higher levels of economic and social development. The poor routinely bear the brunt since their homes are fragile and often in low-lying environments and they the greatest pressure when disasters lead to an increase in food prices. Increasing the resilience to natural hazards directly supports the World Bank's twin goals of eradicating extreme poverty and boosting shared prosperity.

3. **DRM context.** In SEA, disasters are increasingly recognized by the Governments as a core challenge to the pressing priority to achieve higher levels of economic and social development. Economic losses from disasters are an increasing threat to sustainable development, impeding poverty reduction and inclusive growth in countries vulnerable to natural hazards across the region. Disasters can slow down development progress, keep people in poverty, or push them back into it. When countries lack the capacity to respond immediately and effectively in the onset of a disaster, the human costs increase rapidly. Moreover, disasters—whether large and infrequent or small-scale and recurring—can be a significant fiscal burden.

4. While Cambodia, Lao PDR, and Myanmar are committed to building disaster and climate resilience and progress in national-level disaster planning and policies, key challenges remain. The

[40] EM-DAT. The OFDA/CRED International Disaster Database. www.em-dat.net - Université Catholique de Louvain - Brussels - Belgium. Data accessed 2014.
[41] World Bank, and GFDRR. 2012. Advancing Disaster Risk Financing and Insurance in ASEAN Member States. Figures are preliminary estimates and are not based on catastrophic risk modeling.

countries are at different stages of shifting from focusing largely on reactive disaster response to promoting a comprehensive DRM approach including investing in risk reduction and preparedness. Main barriers to increasing resilience include (a) weak institutions and regulatory frameworks, particularly related to risk reduction; (b) insufficient financing for resilient sectoral investments including hydromet forecasting capacity; (c) low financial resilience to both recurrent and extreme disasters due to the lack of sustainable and cost-effective financial protection policies and mechanisms; and (d) lack of technical knowledge. Cambodia, Lao PDR, and Myanmar are all signatories of the Sendai Framework for Disaster Risk Reduction 2015–30 and the regional AADMER.

5. The Governments of Cambodia, Lao PDR, and Myanmar have limited financial protection mechanisms, strategies, and policies in place to finance disaster-related expenditures. Their current instruments have proven insufficient to cover even recurrent disaster losses. These Governments are exposed to less frequent more catastrophic events and rely on international donor funding for post-disaster response and reconstruction. The domestic catastrophe risk insurance markets are very incipient, with no or minimal catastrophe risk insurance coverage for public and residential assets and incomplete insurance coverage for commercial assets. Regional cooperation in disaster risk finance with potential risk pooling benefits remains limited to early discussions facilitated through ASEAN and the World Bank. Assistance could be provided to develop a comprehensive financial protection strategy to complement current efforts on risk retention through contingency budget and reserve funds.

Overall Southeast Asia DRM Program

6. **The proposed Southeast Asia Disaster Risk Management Program will address these challenges, focusing on DRM activities that offer immediate opportunities for mutually beneficial regional cooperation as well as national-level priority investments.** This Series of Projects involves three projects, the Cambodia, Lao PDR, and Myanmar SEA DRM Projects, all of which are scheduled to be approved by the World Bank Board in the first half of 2017. It seeks to reduce the vulnerability to natural hazards through an integrated package of structural and nonstructural investments. The three projects incorporate three main shared themes. First, disaster risk pooling will be promoted as it is proposed to establish SEADRIF under the three projects as the first regional catastrophe risk pool in the region to provide participating countries with immediate liquidity for rapid disaster response. Second, the projects will strengthen the respective Ministries of Finance and Economic Planning as well as the line ministries in the three countries to mainstream DRM into plans and policies and support systematic investments in resilience. Third, examples of climate and disasters resilient infrastructure will be implemented and structural and nonstructural measures in DRM promoted. The regional approach combines investments and activities at the country level and activities at the regional level.

7. **In the DRFI, regional cooperation can facilitate modeling of catastrophic risks, access to international capital markets, establishment of regional reserve funds, or a regional pool**. In particular, this can take advantage of economies of scale through standardization of exposure data collection and risk modelling, standardization of insurance policies, and diversification of the portfolio of insured assets. Comprehensive financial protection strategies are an integral part of the country's DRM and climate change adaptation agenda. Experience has shown that sustainable and effective financial protection strategies integrate a variety of instruments (for example, risk transfer for top layers together with contingent credit/reserves for lower risk layers). For example, insurance can put a price on risk, encourage better risk management, and put in place incentives to reduce risk. Without appropriate risk

financing mechanisms in place before the next catastrophe, post-disaster demands on the national budget could exceed resources or displace funds allocated to other national needs, causing liquidity gaps and significantly increasing long-term debt. As has been seen in other countries, such extreme events can also challenge the political stability of a country.

8. **Cost-effective way to approach hydromet modernization is to maximize harmonization with regional and global systems.** Regionally harmonized and integrated hydromet systems, which are being coordinated and maintained under the auspices of the WMO and International River Commissions, is a prerequisite for effective national hydromet services as atmospheric and hydrological phenomena do not respect national boundaries. In addition, use of global and regional guidance products and services provided through such coordination mechanisms will significantly contribute to the cost-effectiveness in developing a national hydromet system. The regional initiatives in SEA such as WMO-led Severe Weather Forecasting Demonstration project in South East Asia, which facilitates the use of global and regional products through the Regional Center in Hanoi, and ASEAN Climate Outlook Forum underpin the development of hydromet systems in Lao PDR. Improved quality and quantity of real-time/near-real-time transmission of observation data from Lao PDR to the global meteorological community through the Global Telecommunication System will contribute to the improvement of global numerical weather prediction outputs, which will in turn contribute to the quality of forecasts DMH will provide.

9. **Implementation.** The focus, investment scope, and implementation arrangements of national investment would be determined by country priorities and needs. The projects' activities will be implemented through designated national line agencies.

10. **Donor coordination.** The team will ensure strong coordination with the World Bank and other development partner initiatives in the region, in particular, JICA and ADB, who have significant ongoing investments in the three countries, and donors contributing to the DRFI component across the three countries.

11. **Links with development projects and technical assistance.** At the regional level, the project will complement the IWRMP, which will support the implementation of tools and pilot activities for integrated water resource and natural disaster management in Thailand, Lao PDR, Cambodia, and Vietnam, together with improved communications and dialogue; improve institutional capacity for integrated water resources management, including strengthening hydromet systems; and support improved floodplain management and aquatic resources management in areas of regional significance for regional environmental benefits and the enhancement of rural livelihoods in pilot areas. At the country level, in Cambodia, links will be ensured with the ongoing Road Asset Management Project (Cambodia), in addition to the IWRMP. In Myanmar, synergies will be forged with the ongoing Ayeyarwaddy Integrated River Basin Management Project, the National Community Driven Development Project (active and Additional Financing), and the Myanmar Floods and Landslide Emergency Recovery Project. In Lao PDR, the proposed grant and the planned activities build on the results of the ongoing DRM program, including the Lao Road Asset Management Project II.

12. **Cambodia Southeast Asia DRM Project**. Component 1 will strengthen the resilience of regional connectivity and access to markets, during flood events. Component 2 will strengthen the financial resilience of the country, leveraging the benefits of investing in strengthening financial protection across multiple countries.

13. **Lao PDR Southeast Asia DRM Project.** Component 1 will strengthen flood resilience in Oudomxay Province through investments in flood protection, riverbank protection and embankments, flood gates, weirs, river-side parks, and drainage canals. Component 2 will help modernize national meteorological services and early warning systems. Component 3 will increase the financial resilience of Lao PDR, leveraging the benefits of investing in strengthening financial protection across multiple countries.

14. **Myanmar Southeast Asia DRM Project.** Component 2 and Component 3 would focus on structural and nonstructural investments related to flood and seismic risk in the city of Yangon. Component 1 will strengthen financial resilience of the country, leveraging the benefits of investing in strengthening financial protection across multiple countries.

ANNEX 7: IMPLEMENTATION ARRANGEMENTS OF A REGIONAL CATASTROPHE RISK POOL

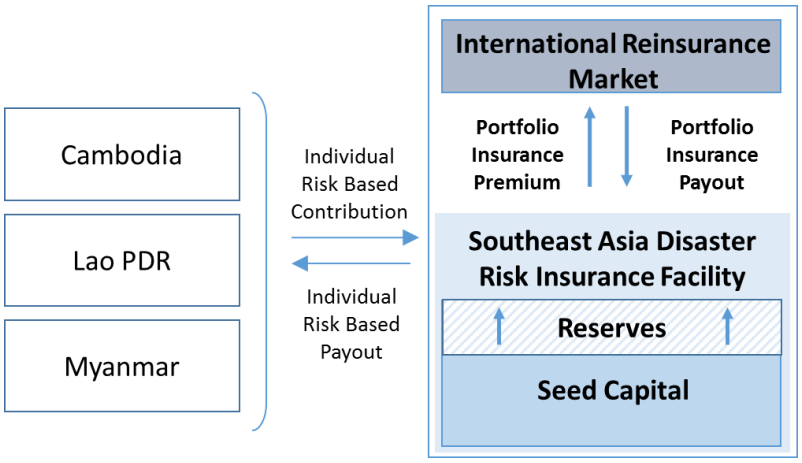
COUNTRY: Lao People's Democratic Republic
Lao PDR Southeast Asia Disaster Risk Management Project

1. International experience has shown that governments should ideally combine different instruments to protect against events of different frequency and severity. Such risk layering ensures that cheaper sources of money are used first (that is, government reserves and contingency funds) for high-frequency and low-severity events, such as annually occurring flooding or landslides during the rainy season. Under this approach, more expensive financial instruments (that is, sovereign risk transfer or insurance) are used only in exceptional circumstances for low frequency high impact events.

2. Regional catastrophe risk pools can help countries manage their catastrophe risks efficiently through a combination of join reserves and access to international reinsurance and capital markets. Example of regional risk pooling vehicles are the CCRIF, which has covered 16 Caribbean countries and Nicaragua against tropic cyclones, earthquakes, and excess rainfall, and the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) which has covered five Pacific island countries against tropical cyclones and earthquakes (including tsunamis).

3. The proposed SEADRIF aims to be a catastrophe risk pooling vehicle for Southeast Asian countries (especially Myanmar, Cambodia, and Lao PDR) that will provide immediate liquidity for rapid response against disasters (starting with floods). It will provide quick cash injections based on clear rules that allow participating governments to receive immediate and predictable financing, within two weeks following a major disaster. This will be achieved through (a) building regional reserves to finance disaster losses; (b) inviting donors to capitalize the Facility through grants; (c) pooling country-specific disaster risks into one, diversified portfolio; and (d) accessing international reinsurance markets in competitive terms to protect the facility against catastrophic losses that would exceed the capital and reserves of the Facility. Country contribution will be risk based, hence avoiding cross-subsidizations. See figure 7.1.

Figure 7.1. Potential Structure of SEADRIF

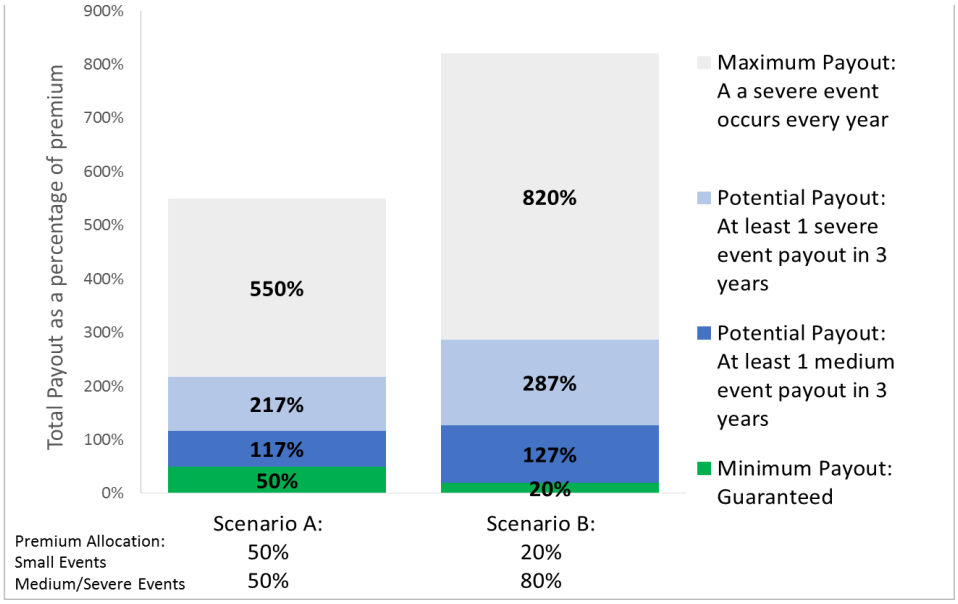


4. The benefits to the participating countries are the following:

(a) Indicative premium savings in excess of 27 percent, through premium reductions due to catastrophe risk pooling (that is, more diversified, less risky portfolio) and risk retention of first losses, compared to the insurance premium if they were to access the international reinsurance markets individually. A hypothetical scenario assuming a US$5 million premium for a three-year coverage illustrates the indicative payout range, as pictured in figure 7.2.

(b) International support. Ownership, accountability, and transparency of the Facility and innovative financial products to cover natural disasters can attract donor support. Financial protection against disaster and climate shocks, especially regional solutions with a focus on Asia, have received significant attention in policy dialogues, such as the recent G7 InsuResilience initiative led by Germany and the ASEAN+3 DRFI initiative led by Japan.

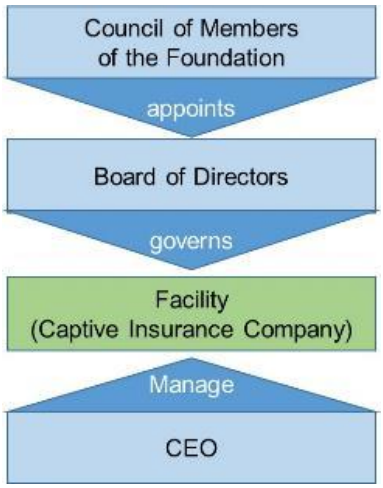
Figure 7.2. Indicative Return on Premium over 3 Years



Legal Structure

5. SEADRIF will be established as an independent legal entity owned by the participating countries. The proposal is to establish a trust or foundation (with participating countries as the sole beneficiaries) and the Trust/Foundation would establish a captive insurance company with the sole purpose of providing catastrophe risk insurance to the beneficiaries of the Trust/Foundation. An indicative governance arrangement consists of three tiers, but the final arrangement would be determined by the participating countries and donor partners (see figure 7.3).

Figure 7.3. Potential Governance Structure of SEADRIF



(a) Foundation, which owns the captive insurance company (the Facility) and has a Council of Members which consists of representatives of participating countries and possibly donor partners. The Council of Members appoints the Board of Directors.

(b) The Board of Directors, appointed by the Council of Ministers, is responsible for the governance of the Facility.

(c) The Chief Executive Officer is appointed by the Board of Directors and manages day-to-day operations as well as the overall accountability for the monitoring and control of the functions of the Facility. He/she will oversee other functions (insurance management, asset management) outsourced to external service providers on a competitive basis.

6. SEADRIF would be domiciled in a jurisdiction to be chosen by the participating countries. A preliminary study reviewing the feasibility of various jurisdictions for hosting such a facility has been carried out and will be shared with the countries. A likely option would be Singapore which has a well-developed and stable captive insurance market. Singapore outperforms on most criteria among a list of potential jurisdictions identified. The final jurisdiction will be chosen by the participating countries.

Proposed Coverage

7. The disaster risk insurance product offered by SEADRIF would include the following:

(a) Three-year coverage

(b) Coverage against small disasters, where Governments can access an initial payout if a given pre-condition has been met (for example, declaration of emergency)

(c) Coverage against medium and severe disasters, which will trigger either a partial or full insurance payout, based on pre-agreed parametric trigger (for example, flood severity index)

(d) Guaranteed payout at the end of the third year (50 percent of premium contribution)

8. A risk assessment is being conducted to inform SEADRIF through innovative methods for flood risk monitoring and assessment. A tool for assessing flood in near real time over large areas will be developed, through a combination of data which allows for a robust and reliable monitoring process. As ground measurements are scarce across the region, remote sensing observations are the most appropriate source of data for large-scale flood extent estimation and also the most reliable source for near-real-time applications. The complicated nature of flood requires using a combination of data sources and methodologies, including river gauge and rainfall data, flood modelling, satellite-based remote sensing, and other geo-information technology. This allows the design of flood indexes that accurately proxy disaster response needs and emergency costs. For the purposes of parametric insurance payouts, as offered by SEADRIF, a flood index will be defined to include a triggering event (medium and severe disaster), payout thresholds, incremental payout scales, and payout limits.

Role of Donors

9. Donor partners will play an essential role in enabling Lao PDR and other SEA countries to join SEADRIF. Generous donor contributions enabled the CCRIF and PCRAFI Facility to build up capital quickly so the cost of insurance is lower for the participating countries and a larger fraction of the premium can be used to build up reserves on top of capital. In addition, donor grants could be used to cover the start-up costs of SEADRIF and capacity building and technical assistance.

10. Donor partners have already expressed strong interest to support a regional catastrophe risk pooling mechanism such as SEADRIF. Preliminary discussions show that they would be willing to provide grants for (a) seed capital of the Facility, (b) start-up costs of the Facility, and (c) technical assistance. Disaster risk finance, and in particular, regional solutions to strengthen financial resilience, have been high on the agenda of many international policy initiatives, including the G7, G20, ASEAN+3, Asia-Pacific Economic Cooperation, and V20.

ANNEX 8: PROJECT MAP

Map #: LAO42605 (April 2017)