SFG3904

LAO PEOPLES' DEMOCRATIC REPUBLIC
MINISTRY OF AGRICULTURE AND FORESTRY (MAF)

Lao PDR Agriculture Commercialization Project (LACP)

ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK

(DRAFT)

November, 2017

PREFACE

This Environmental and Social Management Framework (ESMF) for Lao PDR will be applied to all investments to be financed by the World Bank for technical and/or financial support from the Lao Agriculture Commercialization Project (LACP).

The Central Project Steering Committee (CPSC) of the Department of Planning and Cooperation (DOPC), under the Ministry of Agriculture and Forestry (MAF), is responsible for overall coordination of Lao PDR activities. The respective Project Management Division (PMD) under the DOPC is responsible for day-to-day implementation of specific subcomponents and for ensuring compliance with this ESMF, CRPF and the EGPF, including keeping proper documentation in the project file for possible review by the World Bank.

This document is considered a living document and could be modified and changed in line with the changing situation or scope of the activities. Close consultation with the World Bank and clearance of the revised ESMF will be necessary.

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ABBREVIATIONS

Abbreviation	Meaning
ABs	Agribusinesses
AVCF	Agriculture Value Chain Facility
CRPF	Community Resettlement and Planning Framework
DAEC	Department of Agricultural Extension and Cooperatives
DAFO	District Agriculture and Forestry Offices
DALaM	Department of Land Management
DOA	Department of Agriculture
DOI	Department of Irrigation
DOPC	Department of Planning and Cooperation
EGEF	Ethnic Group Engagement Framework
EMPRIP	Enhancing Milled Rice Production in Lao PDR Project
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
FOs	Farmers' Organizations
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GHG	Greenhouse Gasses
ha	Hectare
IDA	International Development Agency
IPF	Investment Project Financing
LACP	Lao Agriculture Commercialization Project
Lao PDR	Lao People's Democratic Republic
MAF	Ministry of Agriculture and Forestry
MGs	Matching Grants
MOIC	Ministry of Industry and Commerce
MOST	Ministry of Science and Technology
NAFRI	National Agriculture and Forestry Research Institute
NSEDP	National Social-Economic Development Plan

PAFO	Provincial Agriculture and Forestry Offices
POM	Project Operation Manual
PP	Productive Partnerships
SBCC	Social Behavioural Change Communications
SME	Small and Medium Enterprises
SPS	Sanitary and Phytosanitary Standards
USD	US Dollars

1. INTRODUCTION

1. **Lao People's Democratic Republic (PDR) is a small and diverse country in a rapidly changing region**. Its per capita Gross Domestic Product (GDP) was US$1,740 in 2015, making Lao PDR a lower-middle-income country. With two thirds of the population living in rural areas, Lao PDR is still an agrarian economy. That said, the country is urbanizing, with the urban population increased by 40 percent between 2005 and 2015. It is endowed with significant natural capital, giving grounds to aspirations to provide increasing amounts of clean energy and food, and use its spectacular landscapes and rich biodiversity to develop tourism. Population density is the second lowest in East Asia and Pacific (EAP) region, after Mongolia, with less than 30 persons per km^2. Together with being land-locked, this low population density impacts the cost of delivery of public services and export competitiveness.

2. **The Lao PDR has made significant development advances in recent years**. GDP growth averaged 7.8 percent per year over the past decade, making Lao PDR the 13th fastest-growing economy globally. Incomes rose and the extreme poverty fell from 34 percent in 2002/03 to 23 percent in 2012/13. Substantial government spending on improving connectivity have reduced the deficit in hard infrastructure: roads and bridges have been constructed and upgraded and electricity supply and air connectivity have improved, and access to some basic services such as health and education improved considerably. **Still, some development outcomes have fallen short of potential, particularly for agriculture**.

3. **A range of sector-specific issues are imposing serious constraints on agricultural productivity and profitability**. A better-functioning food supply chain can increase value added and incomes in agriculture, but currently there are weaknesses along the entire chain. More specifically:

   (a) At the farm level, low farm productivity reflects poor availability of high-quality seeds and other inputs[1], weak and/or lack of farm advisory services, limited irrigation and drainage infrastructure, and regional differences in social and climatic characteristics. Consequently, the quantity and quality of produce are not consistent. Land under irrigation needs to increase, but also irrigation practices need to change and include drainage and plot-controlled options (currently, most irrigation systems use flood irrigation, which is not suitable for non-rice crops).

   (b) Unsecure land tenure and lack of off-farm jobs in rural areas hamper a farm land rental market that could promote market-based land consolidation, which keep farms small and contract farming with ABs rare. Collective action is increasingly promoted by the government and donors through strengthening farmer organizations, yet most existing farmer organizations focus more on production and less on marketing, quality improvements or collective bargaining.

[1] According to the World Bank's Enabling the Business for Agriculture's cross-country report, Lao PDR lags behind other EAP countries with its scores on the seed and agricultural machinery indicators. Though Lao PDR performs better on seed registration, it faces obstacles in timely introduction and production of high-quality seeds. Dealers importing tractors face delays and high-cost procedures, while the standards and safety for operators of tractors are very low. On the fertilizer indicator, which measures laws and regulations on the registration, import, and quality control of fertilizer products, Lao PDR performs better than a few other EAP countries in regulating quality of fertilizers but it performs below average when compared to the broader sample of 40 countries included in the cross-country assessment.

(c) Market fragmentation on the supply side and concentration on the demand side further weaken the supply chains. Farm-gate prices decline following the harvest as farmers rush to sell their produce while only few larger millers and agro-processors have the financial resources to purchase larger quantities of raw materials. For rice, there are around 9,000 medium and large mills; however, only half of the capacity is utilized as millers lack affordable finance to purchase paddy and store rice. Prices increase fast afterwards as the few larger mills can influence the price at which they sell. Very few mills work directly with farmers and farm groups through contract farming, although some initiatives show the sustained success[2]. Only few mills can access the commercial banks' working and long-term capital.

(d) Most agro-processors and rice mills are of low efficiency. Few millers have modern equipment with typical milling efficiency level of around 50 percent (head rice and broken). For comparison, the prevailing milling efficiency in Cambodia and Thailand is 60-65 percent. It implies that Lao PDR annually losses 10-15 percent of its paddy harvest at milling stage. Apart from rice, post-harvest processing of fruits and vegetables is poor, only few traders have equipment to accurately sort by size, density, and color, and packinghouses and processing plants remain too small to be able to directly participate in larger food chains. To circumvent this, Lao processors often operate through Thai intermediaries, which is also helping them meet increasingly more stringent quality and safety standards of foreign retailers.

4. **The Government of Lao PDR has increasingly recognized these weaknesses and seeks to address them**. Agricultural public spending has been recently increased to about 1 percent of GDP, in par with the neighboring EAP countries. Most programs still focus on paddy production, given that more than 95 percent of all farm households still produce it, but the Ministry of Agriculture and Forestry (MAF), the leading agricultural sector Ministry, increasingly pays more attention to other produce, farming systems and sustainability of production, quality and safety (i.e. Good Agricultural Practices), marketing, and branding of Lao products. Being located among two agricultural powerhouses, Thailand and Vietnam, Lao PDR can compete on quality and Lao brand, not on quantity, and this has been recognized by the government. MAF promotes clean and organic production (e.g., green growth) underpinned by its 8th National Social-Economic Development Plan (NSEDP) for 2016-2020 and actively engages with the Ministry of Industry and Commerce (MOIC) and the Ministry of Science and Technology (MOST) to implement the Strategic Action Plan for Development of Rice Sector in a coordinated manner, through the Food Security Working Group chaired by the Deputy Prime Minister. The objective of food security is being officially complemented by the objective of nutritional security, for which the supply of more diverse, nutrient-balanced, and safe food is considered the MAF's new priorities, and private sector, especially small and medium enterprises (SME), are seen as important partners. Implementation capacity of MAF and other Ministries requires strengthening to achieve the new objectives, for which the donor support is increasingly being requested and provided.

5. **The Lao Agriculture Commercialization Project (LACP)** seeks to enhance the competitiveness and sustainability of Lao PDR's agriculture sector through technical and financial support to

[2] For example, the Enhancing Milled Rice Production in Lao PDR (EMRIP) Project, implemented by SNV and Helvetas in 2010-2011, was able to develop fair trading relations between 21,361 small farms producing paddy and 21 rice mills. They report paddy yields to have increased 30 percent, farm income from rice to have increased 60 percent, and profitability of the targeted rice mills to have increased by 10 percent as a result of the project.

increase in agricultural productivity and commercialization in selected strategic value chains. The project would focus on: (i) the geographical areas with high agricultural development potentials; (ii) the farming systems with high potentials for commercialization (i.e. paddy, maize, vegetables); (iii) promotion of good agricultural practices and climate smart agricultural technologies and farming system diversification to enhance food and nutritional security; (iv) building capacity for farmers' organizations, agribusinesses, public and private service providers; and (v) building on and developing synergies with other government/donor programs. The Project Development Objective (PDO) is to increase commercialization of selected value chains in the project areas. The Project has an estimated budget of USD 29.3 million, including government co-financing of USD 0.5 million, agribusinesses contributions of USD 5.6 million, and an IDA loan of USD 25.0 million. It will be implemented within five provinces (Khammouane, Bolykhamxay, Xayabury, Vientiane province, and Vientiane Capital). The Project implementation schedule is within 08 years (2018-2025). The LACP is comprised of three components:

Component A: Improved Agricultural Efficiency and Sustainability.

Component B: Enhanced Agricultural Commercialization.

Component C: Project Management.

6. **The Project has been classified as Environmental Category B by the World Bank.** To comply with the World Bank Safeguard Policies and environmental management requirements of the Government of Lao PDR, an Environmental and Social Management Framework (ESMF, this document) was prepared to guide project implementing agencies and stakeholders on environmental assessment, mitigation of impacts, monitoring and reporting procedures during project implementation. The ESMF will be adopted by MAF.

7. **The overall objective of the ESMF is to ensure that World Bank safeguards requirements are met.** It will guide the implementing agencies including MAF, PAFO, and DAFO to adequately screen and address environmental and social impacts of subprojects, thereby determining the appropriate environmental category. Specifically, the objectives of this ESMF are:
   - to assess the potential environmental and social impacts of the proposed project, whether positive or negative and propose mitigation measures which will effectively address these impacts;
   - to establish clear procedures for the environmental and social planning, review, approval and implementation of subprojects to be financed under the project;
   - to specify appropriate roles and responsibilities, and outline the necessary reporting procedures, for managing and monitoring environmental and social concerns related to subprojects;
   - to consider different alternatives, options, and relevant mitigation measures during project preparation and implementation;
   - to determine the training, capacity building and technical assistance needed to successfully implement the provisions of the ESMF;
   - to address mechanisms for public consultation and disclosure of project documents as well as redress of possible grievances; and
   - to establish the project funding required to implement the ESMF requirements and to provide practical resources for implementing the ESMF

2. PROJECT DESCRIPTION

8. The proposed Laos Agriculture Commercialization Project (LACP) seeks to enhance the competitiveness and sustainability of Lao PDR's agriculture sector through technical and financial support to increase in agricultural productivity and commercialization in selected strategic value chains. The project would focus on: (i) geographical areas with high agricultural development potentials; (ii) farming systems with high potential for commercialization (i.e. paddy, maize, vegetables); (iii) promotion of good agricultural practices and climate smart agricultural technologies and farming system diversification to enhance food and nutritional security; (iv) building capacity for farmers' organizations, agribusinesses, public and private service providers; and (v) building on and developing synergies with other government/donor programs.

9. **Lending Instrument**: The proposed Project would have a total cost of USD 29.3 million and would be supported by the World Bank through an Investment Project Financing (IPF) in the form of an IDA Credit for USD 25.0 million equivalent.

10. **Project Costs and Financing**: The table below presents the total costs and indicated IDA financing for the project. In addition to the proposed IDA credit, the government would provide an estimated USD 0.5 million in counterpart financing for the project, while farmers, farmer groups and agribusiness entities would provide an estimated USD 3.8 million associated with their matching grants.

Table 1: Project Cost and Financing (USD million)

Project Components	Project Cost	IDA Financing	% IDA Financing
A- Improved Agriculture Efficiency and Sustainability	18.8	16.8	89
B- Enhanced Agriculture Commercialization	6.9	4.6	67
C- Project Management	3.6	3.6	100
Total	29.3	25.0	85

2.1 Project Development Objective(s)

11. **The Project Development Objective** (PDO) is to increase commercialization of selected agricultural value chains in the project areas.

2.2 Project Components

12. The LACP is comprised of the following three components: (1) Improved Agriculture Efficiency and Sustainability; (2) Enhanced Agriculture Commercialization; and (3) Project Management.

13. **Component A: Improved Agriculture Efficiency and Sustainability (est. US$ 18.8 million, of which International Development Association (IDA) would finance around US$ 16.8 million)**. This component will support: (a) the increased adoption of improved varieties and high quality seeds, (b) the increased application of good agriculture practices, (c) the provision of critical productive infrastructure, and (d) the strengthening of public services delivery.

14. **(A1): Promoting adoption of good varieties and quality seeds (est. US$ 2.7 million, of which IDA would finance around US$ 2.4 million).** The project will support the establishment and strengthening of farmer seed multiplication groups through provision of training on proper practices and matching grants to procure farm and post-harvest machinery to improve productivity and ensure effective packaging, storage, and marketing of seed. The project will also support PAFOs and DAFOs and MAF's technical agencies, such as NAFRI (and its centers), Department of Agriculture (DOA), Department of Agricultural Extension and Cooperatives (DAEC) to enable them to train the seed multiplication groups and to assure quality and certify the marketed seed.

15. **(A2): Promoting Good Agriculture Practices (est. US$ 7.4 million, of which IDA would finance around US$ 6.2 million)**. The project will support the establishment and strengthening of farmer production groups through the provision of training in GAP (including on sustainable soil and water management, integrated pest management, and other themes) and of matching grants to upgrade (individual) on-farm infrastructure and (collective) post-harvest systems consistent with the principles of GAP. The project will also support PAFOs and DAFOs and MAF's technical agencies, such as DAEC and DOA, to enable them to better provide training for farmer groups and to certify GAP and organic production systems and outputs, and support the Department of Agricultural Land Management (DALaM) in soil analysis and soil fertility management as well as farmer training on organic fertilizer production and organic farming.

16. **(A3): Providing Critical Infrastructure (est. US$ 6.1 million, of which IDA would finance around US$ 5.6 million)**. The project will finance rehabilitation of selected public infrastructure (mainly irrigation schemes). The project will also support PAFOs and Department of Irrigation (DOI) of MAF to provide training in new irrigation models aiming at reducing operating costs and improving water productivity through establishment and strengthening of water user groups to effectively operate and maintain existing and the newly built infrastructure supported by the project.

17. **(A4): Strengthening Public Services Delivery (est. US$ 2.6 million, of which IDA would finance US$ 2.6 million)**. The project will provide training and additional equipment for PAFOs, and DAFOs to improve their extension skills, building capacity for DAEC in support the establishment of farmer production groups, support DALaM in mapping and demarcation pilots for agricultural land in irrigated areas and the Department of Planning and Cooperation (DOPC) in conducting studies on integrated farming systems/diversification for nutrition and social behavioral change communication (SBCC) especially for adolescent and young adult women and local change agents on identification of available edible resources, dietary diversity, adequate care practices, and processing/cooking for improved nutrition.

18. **Component B - Enhanced Agriculture Commercialization (est. US$ 6.9 million, of which IDA would finance around US$ 4.6 million)**. The project will support: (a) establishing an Agriculture

Value Chain Facility (AVCF), (b) measures to better link farmers to markets, and (c) study to improve the enabling environment for agro-enterprise and value chain development.

19. **(B1): Establishing an Agriculture Value Chain Facility (est. US$ 5.4 million, of which IDA would finance around US$ 3.1 million)**. The project will support the establishment and functioning of an AVCF which will provide technical and financial support to agribusinesses (ABs) to enable them to upgrade processing and postharvest handling facilities and their management capacities to improve product quality, increase operational efficiency, and reduce physical losses. Some 30 eligible ABs in rice, maize, and horticulture value chains will be selected through a transparent selection process against set eligibility criteria to receive matching grants (MGs) managed by the AVCF which will be an independent technical entity.

20. **(B2): Linking farmers to markets (est. US$ 1.0 million, of which IDA would finance US$ 1.0 million)**. The project will support linking small farmers to markets by promoting joint marketing by farmers in groups and by associating these groups with specific downstream buyers through contract farming or other productive partnership arrangements (PPs). The project will support PAFOs and PICOs to assist small farmers to organize themselves into production groups to strengthen their horizontal production cooperation and at the same time establish vertical linkages to ABs that undertake further processing and marketing of the produce. The project will also support the ministries to improve the agriculture market information system.

21. **(B3): Improving the Enabling Environment (est. US$ 0.5 million, of which IDA would finance US$ 0.5 million)**. The project will support MAF and MOIC to improve laws and regulations that support agribusiness investment as well as adopt more progressive agricultural trade policies. The project will support (i) MAF departments to develop and promote improved Sanitary and Phytosanitary (SPS) Standards including through better monitoring, evaluation and reporting; MOIC departments to study and develop a rice standards promotion policy and rice export policy, review and improve import and export legislations focusing on agriculture inputs and equipment.

22. **Component C – Project Management (est. US$ 3.6 million, of which IDA would finance US$ 3.6 million).** The component will support (a) project management; and (b) monitoring and evaluation.

23. **(C1): Project Management (est. US$ 3.3 million, of which IDA would finance US$ 3.3 million)**. The project will provide technical support, capacity building, and necessary facilities to ensure the project is implemented in accordance with the project legal documents and the Project's Operational Manual. It will finance office equipment, vehicles, training, and operating costs to ensure effective coordination and good project management at the ministry and provincial levels, including safeguards, financial management and audits, reporting and supervision.

24. **(C2): Monitoring and Evaluation (est. US$ 0.3 million, of which IDA would finance US$ 0.3 million)**. The project will support the establishment and operation of the monitoring and evaluation (M&E) system under the project. This will include the design and implementation of the various surveys and other tools for monitoring and evaluating the progress of project implementation and the results of the project, including the impacts on the project beneficiaries, nutritional outcomes, and GHG emission reduction.

2.3 Lessons Learned and Reflected in the Project Design

25. **Value Chain and Cluster Approach**. Lessons from many World Bank-financed agricultural projects have shown that the possibility of more transformative impacts is increased where technological adoption, infrastructure upgrades, and improved commercial relationships are pursued in tandem, through selected, geographically clustered, value chains—with the targeting of value chains being based upon their growth or improvement potential. Agricultural value chains in Lao PDR are largely unstructured in which individual stakeholders are unable to resolve multiple problems alone. Direct interventions can help improve productivity, build social capital and reduce transaction costs. Such technical and facilitative interventions are necessary yet not sufficient. Experience has shown these investments are effective only when minimum conditions are met in terms of physical infrastructure and enabling conditions for market-driven agriculture. Such lessons have informed multiple elements of the design of this project, including the commodity and locational targeting, the attention to both hard and soft infrastructure, and the inclusion of measures to address the agribusiness enabling.

26. **Small Farmer -Agribusiness Linkages**. Global experience has highlighted the transformative potential of organizing farmers and enabling them to build regular and sustained commercial relationships with upstream and downstream agro-enterprises. Many World Bank-financed projects have supported the development of contract farming, productive alliance or similar relationships. The keys to success include the coherence and effective management of farmer organization (FO), the overall competitiveness of the company partner, and there being strong technical and/or market factors or incentives for the FOs and companies to want to closely collaborate. This calls for both selectively and a realistic time horizon when promoting more complex relationships between FOs and agribusiness companies. Newly formed groups without any history of collective action will tend to be poor partners for companies. For new or weak FOs, support first should begin with developing core management skills and effective governance arrangements and undertaking a few basic functions. Incremental steps in collective action (i.e. 'partnerships among farmers') should precede efforts to directly link them with specific downstream buyers. The circumstances in Lao PDR call for this incremental and cautious approach to farmer – agribusiness linkages, with the interventions in this project expected to provide the foundations for broader linkages of this type longer-term.

27. **Supporting SME Agribusiness**. In low and middle income countries, SME agribusinesses typically face multiple constraints in growing their companies and competing at home and abroad. These tend to include weak access to long-term (and often) working capital, limited technical, commercial, and supply chain management skills, and difficulties maneuvering through complex and sometimes inconsistent regulatory regimes. These and other issues apply in Lao PDR. For both supply and demand reasons, several existing SME credit lines have had limited disbursements. The project will provide matching grants to support SME capacity upgrades, enabling the firms to access both the equipment and the advisory services they need to improve their operations and competitiveness. Experience and successful lessons from the previous project in Lao PDR: 'Enhancing Milled Rice Production Project[3]' (EMRIP) has been used to inform the design of the program - including having an independent (non-government) entity manage the scheme, having the selection process be rigorous,

[3] The project was financed by the Europe Commission – Food Facility Program with additional funding from Helvetas and SNV.

transparent and competitive, and having the grant proportion set to ensure strong commitment on the part of the enterprises.

28. **Improving Public Agricultural Service Delivery**. Lessons learned from the past extension in Lao PDR showed that the top-down approach was ineffective because the contacts between government extension workers and farmers were only made on an irregular basis; the technologies being promoted were not always appropriate to local conditions and not always in accordance with the needs of farmers; the advice given to farmers was highly generalized and not always useful; there was a lack of ownership and poor motivation among provincial and district extension staff; and there was weak coordination between different sectors. While the Government has a policy of giving District offices the responsibility for managing extension activities in response to farmers' needs, to put this policy into practice capability at district level needs to be built. The past experience in Lao PDR showed that participatory planning at the village level, with village authorities playing a coordinating role, was key to success. In addition, training should also be designed to solve real problems faced by farmers and involve the practice of skills under real conditions. Last but not least, incentives and transportation should be provided for field staff to improve motivation and efficiency. These lessons learned have been incorporated into project design of the LACP.

3. LEGAL FRAMEWORKS AND APPLICABLE WORLD BANK SAFEGUARD POLICIES

3.1 Lao PDR Environmental and Social Legislation

29. The key Lao PDR legislation and policies relevant to the environmental and social management of the project include:

a. Constitution of the Lao People's Democratic Republic (1991, amended 2003 and 2015);
b. Environmental Protection Law (EPL, 2013);
c. Regulation on the Control of Pesticides in Lao PDR (2014);
d. Ministerial Instruction No. 8030/MONRE on Environmental and Social Impact Assessment (ESIA) and Initial Environmental Examination (IEE) of Investment Projects (2013);
e. Decree on Protected Area (No.134/G, May 2015)
f. Public Involvement Guideline (2012);
g. Guideline for Consultation with ethnic groups (2012)
h. Water and Water Resources Law (1996);
i. Forestry Law (2007);
j. Wildlife Law and Aquatic Law (2007);
k. Decree on Compensation and Resettlement of People Affected by Government Projects (No. 84/GOL, 5 April 2016);
l. Law on Grievance Redress 012/NA (December 5, 2014)
m. Land Law (2013).
n. Law on Handling of Petitions (2015)
o. Decision on Good Agriculture Practices for Produce Quality Management Standards No 0539/MF, issued on 09/02/2011;
p. Decision on GAP for Labor Safety, Health and Welfare issued on 9/02/2011 No. 0540/MAF;
q. Decision on Good Agriculture Practices for Environmental Management No 0538/MF, issued on 09/02/2011;
r. Decision on Good Agriculture Practices for Produce Quality Management Standard No 0539/MF, issued on 09/02/2011.

30. Lao PDR has formulated many laws, decrees, regulations and guidelines for assessment and management of environmental and social impacts associated with development projects. The revised Environmental Protection Law (EPL, 2013) is the nation's principal environmental legislation. The EPL set up unified environmental management for environmental resources with the objective of preserving and facilitating sustainable use of natural resources. The EPL includes measures for the protection, improvement, mitigation and restoration of the environment and guidelines for environmental management and monitoring. MONRE is responsible for implementation of the EPL and various ministries have issued guidelines for implementing provisions of the EPL.

31. Government regulation related to pest management in Lao PDR includes Regulation 2860/MAF (Annex 2), which is a recent update (from 11 June 2010) to the previous Regulation 0886/MAF, which was established in March 2000 with support from the Japan International Cooperation Agency (JICA) and the Food and Agriculture Organization (FAO). The regulation was developed based on the WHO recommended Classification of Pesticide by Hazard and Guideline to Classification 1994-1995. In January 2010, the GoL registered companies who import pesticides, fertilizers and seeds into Lao PDR. Registered pesticides were also adjusted in May 2010, based on the new regulation. The Department of Agriculture (DoA) under MAF is mandated to oversee all usage of pesticides.

32. Decree on Protected Area No. 134/G Vientiane Capital-Dated 13/5/2015- This decree determines principles, regulations and standards related to the establishment, allocation, protection, development, utilization and inspection of Protected Areas in order to make the Areas become abundant and sustainable by focusing on the environment protection, watershed protection, prevention from erosion, protection of soil quality, protection of strategic zone for national defense & security, adaptation and reduction of climate changes, solving the global warming, contributing to the improvement of living condition for people of all ethnic groups and developing the national socio-economy. The government allows to use Protected Areas only in an allocated zone and must use in accordance with related regulation and law and ensure that there is no negative impacts on forest, quality of soil, natural and social environment. The use of protected areas for public benefit is the use for a research & testing, use as a recreation and tourism site, a source of medicines, a place for protecting watershed, biodiversity, natural & historical environmental and cultural source. The use of protected areas for public benefit shall be permitted by MONRE. Local people, who resides in and around Protected Areas and contribute to the protection and regeneration of forest and Non-Timber Forest Products in the Protected Areas, have the rights to use forest and forest products as determined in the allocation plan of Protected Area and related regulation and law. For the business use, individuals, legal entities and organizations can use Protected Areas in the way that does not impact on natural eco-system namely the use for developing into a natural, cultural and historical tourism site, use for filming a movie or documentary and use for other activities. Specifically, the use for these purposes shall be permitted from related organizations and shall follow the allocation plan, regulated law and regulation.

33. Lao PDR has introduced a framework for Lao Good Agriculture Practice and Organic Agriculture Standard since 2004 and 2005. Until now, the Ministry of Agriculture and Forestry has issued four ministerial decisions:

(i) Decision on Good Agriculture Practices for Produce Quality Management Standard No 0539/MF, issued on 09/02/2011. The Decision is provisioned to supervise as a tool for practicing Good Agriculture Practice Quality Management Standard of fruit and vegetable production; as to create

value added for fruit and vegetable; as well as to improve quality of supply chain in fruit and vegetables production to meet the requirements of domestic and international market.

(ii) Decision on Good Agriculture Practices for Environmental Management No 0538/MF, issued on 09/02/2011. The Decision is an instrument to manage fresh vegetables and fruits based GAP to conserve and project the environment in and out of farm sites.

(iii) Decision on Good Agriculture Practices for Produce Quality Management Standards No 0539/MF, issued on 09/02/2011. The Decision is provisioned as an instrument to ensure GAP implementation for agricultural products especially fruit and vegetable production in order to add more values and supply quality food in response to demand of domestic and international markets.

(iv) Decision on GAP for Labor Safety, Health and Welfare issued on 9/02/2011 No. 0540/MAF. This decision is an instrument to ensure protection of health, safety and welfare for workers who are working in GAP.

34. Lao PDR regulations applicable to the development of infrastructure projects include the Ministerial Instruction No. 8030/MONRE (2013) and the Environmental Assessment Guidelines (2012) which provide direction to the environmental and social assessment process in Lao PDR. Additionally, the more recent Ministerial Instructions on Public Involvement in the Process of Environmental Impact Assessment of Investment Projects provide updated guidance on the environmental and social assessment process.

35. Established in 2005 and revised in 2016, the Decree on Compensation and Resettlement of People Affected by Development Projects has particularly relevance to the ACP. The decree describes the principles, rules and measures to mitigate adverse social impacts and to compensate for damages that result from involuntary land acquisition or repossession of land and fixed or movable assets, including changes in land use and/or restriction of access to community or natural resources affecting Project Affected Persons (PAP) livelihood and income sources. The decree aims to ensure that PAP and households are compensated and assisted to improve or maintain their pre-project incomes and living standards, and are not made worse off than they would have been without the project. The provisions will be applied during the preparation and implementation of the social impact assessment (SIA), the social impact mitigation and monitoring plan, and/or the ARAP/ RAP.

36. The World Bank states that economic development requires, to varying degrees, providing infrastructure and facilities that improve livelihoods and well-being through the expansion of economic opportunities. WBG investment projects must pass the litmus test of its own environment and social safeguards polices and the borrower country for a sub-project to receive funding. These safeguards policies help decision-makers to identify, prevent (avoid), minimize or mitigate harms to people and their environment. The World Bank safeguards policies also require borrower governments (GoL) to address specific environmental and social risks as a prerequisite to obtaining WBG financing for development projects.

37. The project is characterized by a number of proposed sub-projects for rehabilitation of existing irrigation schemes in the five target provinces. This ESMF provides an overarching safeguards document governing the approach, processes and specific instruments to guide and inform the

Environmental and Social Management Plan (ESMP), ARAP/RAP and Ethnic Group Development Plan (EGDP), and other safeguard instruments and measures (if applicable) during sub project infrastructure investment feasibility and design studies.

3.2 Relevant International Conventions and Treaties

38. A number of international conventions are relevant to use of pesticides in project areas under the LACP. Even though the project will not procure pesticides and will likely result in the decrease of pesticide use due to good agricultural practices, the following conventions are relevant to general pesticide use within the project area:

39. *Rotterdam Convention:* Lao PDR ratified the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and their Disposal in 2010. Most of the pesticides on Annex III of the Rotterdam Convention have actually been banned in Lao PDR. The few compounds that have not been banned are nevertheless prohibited as there are no registered products containing these active ingredients. The one exception is alachlor.

40. *Stockholm Convention:* Lao PDR signed the Stockholm Convention in 2002, and ratified in June 2006. The Water Resources and Environment Administration serves as contact for the Stockholm Convention. A National Implementation Plan (NIP) was prepared with assistance from UNIDO and UNITAR. Implementation focusses on PCBs. The main POP problems in Lao are PCBs and dioxin contamination due to past American use of the herbicide agent orange during the war. DDT has been used for malaria control, but this ended in 19781. Except for chlordecone, HCB, mirex and pentachlorobenzene all POP pesticides listed in Annex A of the Stockholm Convention have been banned. These remaining four compounds, however, are not registered, imported or used. In practice, all POPs are thus prohibited. An inventory of pesticides available on the market in 2000 only found a total of 36 Kg of chlordane spread over 10 locations. This chlordane originated from Thailand, which banned the use of chlordane as of May 2000. A survey of 6 Provinces in 2005 did not find any POP pesticides on the market. The National Implementation Plan for the Stockholm Convention reports the results of a survey that only found insignificant quantities of 7.6 Kg chlordane and 0.25 Kg heptachlor. No DDT was found at former storage sites of Provincial health authorities, which used DDT up to the seventies for malaria control. Nation-wide inspections of pesticide retailers in provincial capitals during 2012-2013 did not find any POP pesticides.

41. *Other relevant bans and conventions for pesticides in Lao PDR:*

a. Methyl bromide has been banned in line with the Montreal Protocol.
b. Lao PDR is party to the Basel Convention, the Convention on Biodiversity and member of the World Organization for Animal Health (OIE), the Codex Alimentarius Commission, and the Asia and Pacific Plant Protection Commission (APPPC).
c. Lao PDR also is a Contracting Party to the Convention on Wetlands (Ramsar Convention) to which is acceded in 2010. It has 2 sites designated as Wetlands of International Importance, with a surface area of 14,760 hectares. Lao pursues an active policy to prevent pesticide contamination of these areas in line with a Ramsar-Agriculture-Wetland Interactions: rice paddy and pest control resolution (XI-15), notably through promotion of IPM and organic rice production in vulnerable areas. In general, the Government of Lao PDR pays much attention to biodiversity and has taken various initiatives in support of wetlands conservation and sustainable use.

42. *International conventions and treaties in Lao PDR relevant to social safeguards:* The Constitution of Lao PDR has been amended to incorporate human rights principles outlined in the international treaties and conventions of which Lao PDR is a signatory party. Chapter four, articles 34 to 51 explain the basic rights of Lao citizens. In addition, basic rights as delineated in international instruments are included in many other national laws, such as the law on the protection of the rights and the interests of children, 2006 (see Table 2). The GoL set up the National Human Rights Research Centre in Vientiane, whose main objective is to support, encourage, and implement human rights within the country. Its mandate also considers the carrying out of research on ethnic groups. The Centre was approved by decree, No. 95, dated 11/07/06 and by Prime Minister's decree, No. 137, dated 24/07/2006. The Lao PDR has been a member of the International Labour Organization (ILO) since 1964. Though the country has ratified a total of eight ILO Conventions, including five of the eight ILO core Conventions, Convention 169 on Indigenous Peoples has not been ratified.

Table 2. International treaties and conventions in Lao PDR relevant to social safeguards

No	Name of Convention	Date of Signature	Date of Ratification/ Accession
1	International Covenant on Civil and Political Rights	7 December 2000	29 September 2009
2	Convention on the Rights of Persons with Disabilities	15 January 2008	29 September 2009
3	International Convention for the Protection of All Persons from Enforced Disappearance	29 September 2008	Not yet ratified
4	International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families	Not yet signed	Not yet ratified
5	Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment	21 September 2010	26 September 2012
6	Convention on the Rights of the Child		8 May 1991 (a)
7	Convention on the Elimination of All Forms of Discrimination against Women	17 July 1980	14 August 1981
8	International Covenant on Economic, Social and Cultural Rights	7 December 2000	13 February 2007
9	International Convention on the Elimination of All Forms of Racial Discrimination		22 February 1974 (a)
10	UN Convention Against Corruption	10 December 2003	29 September 2009
11	UN Declaration on the Rights of Indigenous Peoples		13 September 2007

3.3 World Bank Safeguard Policies Triggered

43. The proposed project investments are designed to have positive social and environmental benefits. The LACP has been classified as EA Category "B" and it is expected that the project activities, as mentioned in Chapter 2, will trigger the following Bank Environmental Safeguard

Policies-Operational Policies (OP): Environmental Assessment (OP 4.01); Pest Management (OP 4.09); Indigenous Peoples (OP 4.10); Physical Cultural Resources (OP 4.11); Involuntary Resettlement (OP 4.12); Safety of Dams (OP 4.37); and International Waterways (OP 7.50). To comply with these policies, given that not all the subproject activities could be identified during appraisal, specific safeguard instruments were identified in Table 3. Key issues and mitigation measures are discussed below, and the actions to be carried out during the implementation of the project are summarized.

Table 3. List of World Bank safeguard policies triggered for the Project

	WB Safeguard Policies	Triggered	Safeguard Instruments
1	Environmental Assessment OP 4.01	YES	ESMF-ECOP
2	Natural Habitats OP 4.04	NO	Non-Eligible activities
3	Pest Management OP 4.09	YES	ESMF – simplified Pest Management Plan (PMP)
4	Indigenous Peoples OP 4.10	YES	EGPF
5	Physical Cultural Resources OP 4.11	YES	ESMF – Chance finds Procedure
6	Involuntary Resettlement OP 4.12	YES	CRPF
7	Forests OP 4.36	NO	Non-Eligible activities
8	Safety of Dams OP 4.37	YES	TOR of Panel of Experts (POE) – findings and recommendations by POE.
9	Projects on International Waterways OP 7.50	YES	The World Bank, on behalf of the Lao PDR government, will notify the Mekong River Commission (MRC) and the Myanmar and Chinese governments about the project.
10	Projects in Disputed Areas OP 7.60	NO	

44. **Environmental Assessment OP 4.01. This policy is triggered.** The policy is applied to all elements of a World Bank-financed operation. This policy requires that environmental assessments must be carried out at early stage of project preparation so that safeguard tools (such as the Environmental and Social Management Framework, Environmental Impact Assessment, and Environmental Management Plan) can be determined and prepared in a timely manner to avoid or address potential negative environmental impacts. The Bank would not finance projects that, in the Bank's opinion, would cause adverse impacts to the environment in biologically important areas.

45. LACP has been classified as Environmental Category B by the World Bank due to its small scale and the impact from the project activities is minimal, localized and can be managed through appropriate mitigation measures. The project's overall socio-environmental impacts are expected to be positive. The project will finance improving agriculture productivities through providing good seed quality, promoting good agriculture practices (minimize water and chemical fertilizer and pesticide use), and water management practices. Investments may also include small scale infrastructure (rice

mill, storage facilities, processing house, irrigation and drainage refurbishment and upgrades, etc.), procurement of combined harvester machines, equipment provision as well as training. The envisaged investments are typical to similar agriculture development projects and are not expected to have adverse and unprecedented environmental and social impacts. Implementation of irrigation and drainage infrastructure and land improvements investments on farmer fields under Component 1 are mainly rehabilitative by their nature and are not expected to have significant negative environment and social impacts. The civil works on some small-scale infrastructure such as storage facilities, dryer, irrigation canals would cause some small impacts such as dust, noise, waste and wastewater generation and safety concerns during construction phase. Most of the negative impacts are short term, temporary, localised and immitigable. However, some proposed irrigated areas depend on 5 potential dams, the dam safety must be taken into an account to those sub-project financing activities downstream of those dams.

46. Given that the nature of the project is demand driven and the scope and targets of the project will be dependent on farmers' participation during project implementation, this ESMF has been developed for application by the project. This ESMF provides policy provisions, principles and processes to address the environmental and social impacts. It describes procedures for impact assessment, consultation, preparation of subsequent safeguard instruments and implementation arrangements. As the Project has subprojects that will be identified during project implementation, the Bank required the Borrower (represented by MAF) to prepare this Environmental and Social Management Framework (ESMF) to guide the screening of potential impacts for subprojects. OP 4.01 also requires that public consultations must be conducted during the preparation of the safeguard documents. The final draft of these documents should be disclosed locally and at the Bank for public access.

47. **Natural Habitats OP 4.04. This policy is not triggered.** The policy requires that the project's siting avoid impacts on environmentally sensitive areas. Where project siting could not be avoided, weighting between positive and negative impacts would be considered, and mitigation measures must be proposed and implemented.

48. The LACP will provide support towards good farming practices in existing farm land and will not acquire new land for farm expansion into the natural habitats. It will also not extend irrigation systems beyond their original design/planning. As such, the project is unlikely to result in adverse impacts on environmentally sensitive areas such as protected areas, national parks, forests or special areas for biodiversity conservation. As the locations of small-scale infrastructure are not yet known at project appraisal, environmental screening will exclude subprojects that might cause adverse impacts on environmental sensitive areas.

49. **Pest Management OP 4.09. This policy is triggered.** The policy requires projects involving procurement of pesticide to prepare and implement a Pest Management Plan to ensure that the handling, transportation, usage, disposal of pesticide be safe for both human and the environment.

50. The LACP will not promote the procurement of any chemical pesticides or herbicides. However, if pest invasion occurs, small amount of eligible and registered pesticides in the project provinces is allowed if supplemented by additional training of farmers to ensure pesticide safe uses in line with World bank's policies (OP 4.09). And given that the project is designed to promote the reduction in chemical pesticide and fertilizer use in existing farm land by enhancing sustainable farming practices, a simplified Pest Management Plan was prepared, along with a negative list. The

simplified PMP will be informed by the Regulation on the Control of Pesticides in Lao PDR (2014) as well as guidelines on Integrated Pest Management (IPM) provided by the Food and Agriculture Organization of the United Nations (FAO). The ESMF included the simplified PMP in Annex 3.

51. **Indigenous Peoples OP 4.10. This policy is triggered.** This policy address issues related to ethnic groups affected – either positively or negatively by this project. Some ethnic groups are present in some part of the project area. Since location and detailed design of subprojects have not yet known – the time of project preparation, an EGEF was prepared to guide the preparation of EGDP for subprojects to be confirmed during project preparation. During project implementation, where ethnic groups are present in the identified subproject area – as indicated by the social screening result, a quick social assessment will be carried out – in accordance with Bank's OP 4.10 (Indigenous Peoples) to identify potential impacts that the subprojects may to have on ethnic groups. Consultations will be conducted ethnic people in the subproject area will be carried out in a free, prior, and informed member – as per project's EGEF to (a) solicit feedback from local ethnic peoples, including their concerns, recommendations, expectation based on the potential impact of the proposed subproject, (b) develop mitigation measures to address such adverse impact, including ways to enhance the intended development effectiveness of the subprojects. EGDP for relevant subprojects aims to ensure ethnic peoples – either adversely or positively affected by the subproject, have opportunities to participate in subproject planning and implementation to receive project's socioeconomic benefits that are culturally appropriate to them.

52. **Physical Cultural Resources OP 4.11. This policy is triggered.** The policy requires that siting of subprojects should avoid impacts on any known physical cultural resources. Mitigation measures must be proposed and implemented if a physical cultural resource be affected. Chance find procedures was developed as preventive measures for projects involving earthworks. The siting of small infrastructure under LACP will avoid relocation of any known existing physical cultural resources. As sub-projects, also may involve limited earth work, a "chance finds" procedure has been developed and will be included in an ECOP and construction contracts as preventive measures.

53. **Involuntary Resettlement OP 4.12**. **This policy is triggered** because the project may require land acquisition to support the rehabilitation of existing irrigation channels. Because the exact locations of small scale infrastructure schemes have not been known at the time of project preparation, the project has developed a CRPF to ensure affected peoples are compensated for their affected assets and income generation activities. The purse of CRPF is to ensure livelihoods of the affected households and their income-generation activities are no worse off because of the subproject. During project implementation, identified subproject will be subject to social screening. If land acquisition or non-land livelihoods related impact are likely, a Resettlement Action Plan will be prepared in accordance with project's CRPF. All RAPs prepared for subproject must be submitted to Bank for review and concurrence prior to implementation. For Technical Assistance (TA) activities, potential social and environmental impacts will be screened and managed in accordance with the World Bank's Interim Guidelines on the Application of Safeguard Policies to TA Activities in the Bank-Financed Project**.**

54. **Forest. OP 4.36. This policy is not triggered.** The policy requires impacts on forests should be avoided or mitigated. The project envisions no investment in management of natural forests or plantations or involving conversion or degradation of critical forest areas. Activities to be financed under the project will be implemented in existing cultivated lands.

55. **Safety of Dams. OP 4.37. This policy is triggered. This will be re-confirmed during project implementation after screening has been made for the infrastructure sub-projects.** Among 70 small infrastructure sub-projects which the projects plan to finance, there are five subprojects which plan to upgrade from earthen canals to cement canals and these canals rely on water supply from reservoirs. The headworks of these five reservoirs are classified as large Dams as per the World Bank Operational Manual OP 4.37 for Safety of Dams. The The policy requires that appropriate measures are taken to ensure the safety of the dam, either a new dam or an existing dam which the Bank-financed project is directly dependent on. In this ESMF, a TOR of Panel of Experts (POE) has been prepared. During the project implementation, the POE will conduct: (a) inspect and evaluate the safety status of the existing dam, its appurtenances, and its performance history; (b) review and evaluate the owner's operation and maintenance procedures; and (c) provide a written report of findings and recommendations for any remedial work or safety-related measures necessary to upgrade the existing dam to an acceptable standard of safety. Detailed roles assigned and mandated for dam inspection to the relevant agencies and organizations; strengthening the inspection, operation and maintenance officers as well as improving of inspection procedures and reporting system will be proposed in the Dam Safety Management Plan as part of the recommendation by POE.

56. **Projects on International Waterways. OP 7.50. This policy is triggered.** The LACP will involve project areas and irrigation systems located in tributaries which are part of the Mekong river basin. To comply with this policy, as requested by the Government of Lao PDR, the WB will send a letter informing other riparian countries (China, Myanmar, Thailand, Cambodia, and Vietnam) through MRC mechanism.

57. **Projects in Disputed Areas. OP 7.60. This policy is not triggered.** The sites for the LACP will not fall within disputed areas of Lao PDR and, therefore, the OP 7.60 will not be triggered.

3.4 Summary of Objectives and Principles for Implementation of CRPF and EGEF

58. **CRPF.** The CRPF was prepared as a component of the ESMF for the ACP to provide guidance to decision-makers if a proposed sub-project requires use of land on a temporary or permanent basis and/or acquisition of land. Accordingly, the CRPF was prepared to establish policies and procedures for preventing (avoiding), minimizing, mitigating and compensating for negative (adverse) impacts related to land acquisition resulting from a proposed sub-project.

59. *Objective.* The objective of the CRPF is to establish resettlement principles, organizational arrangements, funding mechanisms, eligible criteria, entitlements matrix, grievance redress mechanism and monitoring and evaluation process for RAP(s) that may be required for subprojects to be identified during project implementation.

60. *Principles*. The principles that govern the CRPF, including principles for compensation, resettlement, and livelihoods restoration, are in accordance with the World Bank's OP 4.12, as follows:

- Physical displacement, economic and physical adverse impacts should be avoided where feasible or, if not possible, minimized by examining all available design alternatives, technology, and/or site selection. Where avoidance is not possible, impacts have to be mitigated;

- If the need for resettlement is unavoidable, resettlement activities should be conceived and executed as an integral part of the project, providing sufficient investment resources to enable the persons displaced by the project to enjoy the project benefits; and
- All project affected people will be meaningfully consulted, and have opportunities to participate in planning and implementing resettlement programs.

61. The CRPF also aims to minimize involuntary resettlement and provide a framework for assessing concerns of PAP and PAH which may be subject to loss of livelihoods, assets and well‑being because of the proposed sub-project. The World Bank *Involuntary Resettlement* policy (OP/BP 4.12) is triggered when a development project (or sub-project) financed by the World Bank results in people losing land, other assets, or access to productive resources which may cause disruption to, or loss of, livelihood (i.e., property and assets), well-being and/or other entitlements. The CRPF provides decision-makers with guidelines and processes for ensuring that PAP and PAH will improve their livelihoods and well-being or, at least, to restore them to levels prevailing at project commencement.

62. The CRPF provides details on the instruments to be prepared, and the measures to be taken, during specific stages of sub-project design and feasibility assessment, and during implementation. The CRPF sets out the guideline for determining compensation eligibility and a description of what that compensation might entail. An CRPF (as opposed to a resettlement action plan) is the appropriate instrument at this stage of project preparation, as the project is in the planning stages and a decision has not been made by the GoL and the WB about which proposed sub-projects will be funded, and the features of those sub-projects. Such a determination until the project is under implementation when more comprehensive and up-to-date sub-project information is available, and a resettlement action plan (or abbreviated resettlement action) may be prepared.

63. The CRPF will be considered applicable if proposed sub-projects affect households and communities which may be displaced, even on a temporary basis. Situations which may be subject to acquisition of land or relocation of PAP and PAH involve investment in civil works and infrastructure development, including rehabilitation and expansion of existing irrigation schemes and construction of agricultural production and processing equipment such as harvesting machines, drying and storage facilities to be financed under the Matching Grant. In such situations, impact screening process and forms will help decision-makers determine the safeguards measures for preventing (avoiding) or mitigating adverse effects.

64. **EGEF.** As a prerequisite for a project approval, OP 4.10 requires the borrower to conduct free, prior and informed consultations with potentially affected ethnic groups and to establish broad-based community support for project objectives and activities. It is important to note that the OP 4.10 refers to social groups and communities, and not to individuals. The primary objectives of OP 4.10 are to ensure:

- Such groups are afforded meaningful opportunities to participate in planning that affects them;
- Opportunities to provide such groups with culturally appropriate benefits are considered; and
- Any project impacts that adversely affect them are avoided or otherwise minimized and mitigated.

65. The EGEF provides a guideline document (OP/BP 4.10) to decision-makers early in the project preparation process to ensure that due consideration is given to adequate consultation and engagement

of ethnic groups, including ethnic minority groups. As such, the level of social assessment conducted will depend on the nature and scale of the proposed sub-projects and its potential impact on ethnic groups. The EGEF provides guidance on how to engage potential PAP of ethnic groups in a free, prior and informed consultation process and for the development and implementation of sub-project EGEPs to be financed under the ACP Project (See project's EGEF for details).

4. DESCRIPTION OF THE PROJECT PROVINCES

4.1 Geographical Locations and Topography

66. Lao PDR encompasses a total of 236,800 square kilometers and water area of 6,000 km2 with the terrain characterized by three distinct regions - mountains, plateaus, and plains. Mountains and plateaus make up three-quarters of the total area. The elevation varies throughout the country from the north to the south. High mountains, rising to an average height of 1,500 meters, dominate the Northern region. The lowest point is Mekong River at 70 m. above mean sea level. The Phou Luang (Annamite Range) stretches southeast on the Phouane Plateau down to the Cambodian border; the other plateaus are the Nakai Plateau in Khammouane Province, and the Bolaven Plateau in Southern Lao PDR, which is over 1,000 meters above sea level.

67. The agriculture commercialization project area covers five provinces: Vientiane Capital, Vientiane Province, Bolikhamxay, Xayabouly, and Khammouane province. The project is generally located from highland areas or the mountainous province of Xayabouly downward to the plain areas of Vientiane province, Vientiane Capital, Borikhamxay, and Khammoun province. The elevation varies from around 1,000 meters above sea level in Sayaboury and decreases downward to approximately 200 meters above sea level along the Mekong. The two districts in Vientiane Province range in elevation from 210 meters to 180 meters above sea level. The area is generally flat or gently sloping throughout the project area, with mild elevation occurring between natural drainage channels and occasional mountainous rises. Flatness is a distinguishing feature: the elevation difference between one given point along the Mekong and another point located inland, perpendicularly, by a distance of 24km in Savannakhet are essentially the same; similarly, the approximate gradient for Xe Bang Heing throughout the region is 0.02-0.03 percent. The project map area is shown below in Figure 1.

Figure 1. Map of Project Area

Topography

68. The hilly to mountainous regions in the Center and the South exhibit elevations from 500 to 1,000 meters, with some individual peaks over 2,000 meters, but with generally more moderate slopes than those found in the north. The area is dominated by the southwest monsoon climate, which brings heavy seasonal rainfall averaging annually 2,500 to 3,500 mm. The soils are like those in the North

except for on the localized area of the Boleven Plateau in the far South, which has deep, well-structured, and less acidic soils with the ability for good water retention and drainage.

69. The alluvial river plains along the Mekong and its tributaries in the central and southern parts of the country are where more than 50% of the population lives. These areas include the Vientiane Plain, a narrow plain in Bolikhamsay and Xebangfay plain in Khammouane Provinces, a larger plain of Savannakhet Provinces. These plains are the most productive areas of the country, dominated by a moist tropical climate that brings an annual average rainfall ranging from 1,500mm to 2,000mm.

70. According to the survey and conduction of agriculture land zoning at the provincial and District levels throughout the country, the total agriculture land is approximately 4.5 million hectares (equivalent to 19% of national land area) which is divided into 3 types such as:

- Flat area and suitable for cultivation of rice and short-life plants/cash crops is approximately 2 million hectares.
- Land area with moderate slope, deep soil layer which is suitable for cultivation of food crops such as corn, bean, green bean, fruit trees, industrial plants or commercial crops with the area of about 1.8 million hectares.
- Land area with natural grass that is suitable for animal raising such as cattle, buffaloes with an area of about 0.65 million hectares. In addition, there is also the forested area such as dry dipterocarp forest area, unstocked forest area, scrub forest area and savannah area which is suitable for animals raising with an area of about 1.14 million hectares.

4.2 Basic Features of Proposed Project Provinces

4.2.1 Soil Quality

71. According to the report of soil types and soil classification by the Department of Agriculture Land Management (DALaM), the total agriculture land is approximately 4.5 million hectares (equivalent to 19% of national land area) soil types are classified into 15 groups (Classifies by FAO UNESCO 1987): Arenosols (AR), Acrisols (AC), Alisols (AL), Cambisols (CM), Calcisols (CL), Fluvisols (FL), Ferralsols (FR), Gleysols (GL), Luvisols (LV), Leptosols (LP), Lixisols (LX), Nitisols (NT), Regosols (RG), Solonetz (SN) and Solonchacks (SC).

72. The largest coverage of any given soil group within the country comes from Acrisols which account for a total of 11,579,913ha (48.90%) of the total area in the country. Alisols account for 4,444,215ha (18.77%); Luvisols account for 2,999,305ha (12.67%); and Cambisols account for 2,353,227 ha (9.94%), respectively. Coverage of the remaining soil groups amount to 1% or less of the total area in the country.

73. **Acrisols** are acidic soils with a layer of clay accumulation. Parent material is most extensive on acid rock weathering, notably in strongly weathered clays which are undergoing further degradation. Physical characteristics include low structural stability; low cation exchange capacity; low base saturation; poor chemical properties; low nutrient availability; P-sorption and Al-toxicity; and being an acidic, sandy-loamy surface soil.

74. **Alisols** are a new soil class, formerly part of Acrisols, with clays that have high cation exchange capacity. They are strongly acidic soils of the humid tropics and subtropics, with accumulation of high activity clays in the subsoil. Aluminum (Al) occupies more than 50 % of the exchange complexes. In many Alisols, toxic quantities of Al are present, whereas other plant nutrients are low and unbalanced.

75. **Luvisols** are soils with a strong accumulation of clay in the B-horizon and are not dark in colour. These soils have clays with high cation exchange capacity. The productivity of the Luvisols is limited mainly by their physical characteristics: low structural stability; susceptibility to surface crusting, soil compaction, and erosion; low water retention capacity; and susceptibility to drought. Deficiencies of N and P are common, while deficiencies of K, Mg, S. Fe, and Zn occur under intensive cultivation.

76. **Cambisols** are soils that have a slight profile development and that are not dark in colour. They are soils with beginning horizon differentiation evident from changes in colour, structure and/or carbonate content. The mineralogical, physical, and chemical characteristics are not possible to sum up in one generalised account, because Cambisols occur in such widely differing environments. Most Cambisols are medium-textured and have a good structural stability, a high porosity, good water holding capacity, and good internal drainage. They also tend to have a neutral-to-weakly acid soil reaction, a satisfactory chemical fertility, and an active soil fauna.

77. Acrisols and Alisols are acidic soils, with low levels of plant nutrients and low in Ca and K. They have a low pH about 5.5, present large quantities of iron oxide, and are conducive to P-immobilization. These soils are recommended for growing acid-tolerant crops. In contrast, irrigated paddy field soil will have a pH of about 6 to 6.5 that is more suitable for rice growing. Applying organic fertilizer, in conjunction with long-term crop rotation, could increase nutrition uptake by crops. Luvisols and associated soils support a wide variety of cereal crops, root and tuber crops, and grain legumes.

Table 4. Soil Characteristics in the Project Area

No.	Soil groups in Laos	Areas (ha)	% of Soil groups cover	Soil Group in Target Province			
				XBL	VTE Plain	BLX	KHM
1	**ARENOSOLS (AR)**	**233,154**	**1.43%**	**x**	**x**		**x**
2	**ALISOLS (AL)**	**4,444,215**	**18.77%**		**x**	**x**	**x**
3	**ACRISOLS (AC)**	**11,579,913**	**48.90%**	**x**	**x**	**x**	**x**
4	**CAMBISOLS (CM)**	**2,353,227**	**9.94%**	**x**	**x**	**x**	**x**
5	**CALCISOLS (CL)**			**x**			
6	**FLUVISOLS (FL)**	**104,650**	**0.45%**	**x**	**x**		**x**
7	**FERRALSOLS(FR)**			**x**			
8	**GREYSOLS (GL)**	**127,189**	**0.54%**		**x**	**x**	**x**
9	**LEPTOSOLS (LP)**	**442,497**	**1.80%**	**x**	**x**	**x**	**x**

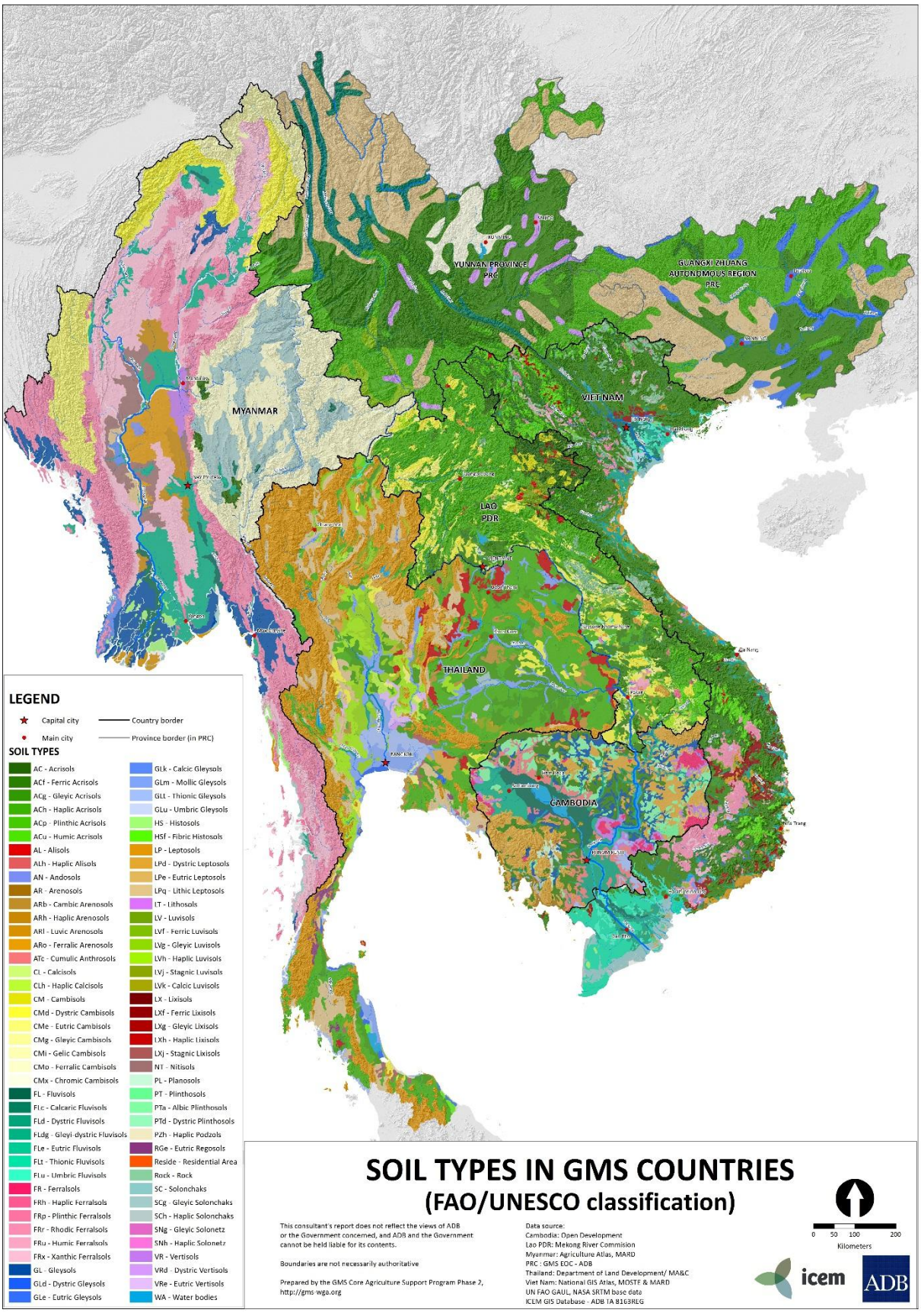
10	**LIXISOLS (LX)**	**391,495**	**1.63%**		**x**		**x**
11	**LUVISOLS (LV)**	**2,999,305**	**12.67%**	**x**		**x**	**x**
12	**NITISOLS (NT)**			**x**			
13	**REGOSOLS (RG)**	**515,279**	**0.94%**		**x**	**x**	**x**
14	**SOLONCHACKS (SC)**	**7,503**	**0.03%**				
15	**SOLONNETZ (SN)**	**5,945**	**0.02%**		**x**		**x**

78. According to Roder et al (2006)[4], soil fertility studies in Lao PDR for upland rice and lowland rice showed that soils used for rice production are generally of low fertility, with low organic matter and N-availability. Despite this, fertilizers are rarely used for upland rice cultivation. In contrast, the use of chemical/inorganic fertilizer inputs for lowland rice has risen dramatically over the past 10 years (though still less than 20 kg/ha, on average). Rice straw and manure from cattle and buffalo were found to be the most important nutrient sources (Roder et al, 2006). Lowland rice soils are predominantly acrisols, which have inherently low fertility, are highly weathered, and have low pH and cation-exchange capacity.

79. The map in Figure 2 shows an overview of the soil types in Lao PDR.

Figure 2. Soil Map

[4] Roder, W., Schurmann, S., Chittanavanh, P., Sipaseuth, K., and Fernandez, M. (2006). Soil fertility management for organic rice production in the Lao PDR. Renewable Agriculture and Food Systems: 21(4); 253-260. (URL: http://doc.rero.ch/record/293900/files/S174217050600161X.pdf)


YUNNAN PROVINCE PRC
GUANGXI ZHUANG AUTONOMOUS REGION PRC
MYANMAR
VIET NAM
LAO PDR
THAILAND
CAMBODIA
LEGEND
Capital city
Main city
Country border
Province border (in PRC)
SOIL TYPES
AC - Acrisols
ACf - Ferric Acrisols
ACg - Gleyic Acrisols
ACh - Haplic Acrisols
ACp - Plinthic Acrisols
ACu - Humic Acrisols
AL - Alisols
ALh - Haplic Alisols
AN - Andosols
AR - Arenosols
ARb - Cambic Arenosols
ARh - Haplic Arenosols
ARl - Luvic Arenosols
ARo - Ferralic Arenosols
ATc - Cumulic Anthrosols
CL - Calcisols
CLh - Haplic Calcisols
CM - Cambisols
CMd - Dystric Cambisols
CMe - Eutric Cambisols
CMg - Gleyic Cambisols
CMl - Gelic Cambisols
CMo - Ferralic Cambisols
CMx - Chromic Cambisols
FL - Fluvisols
FLc - Calcaric Fluvisols
FLd - Dystric Fluvisols
FLdg - Gleyi-dystric Fluvisols
FLe - Eutric Fluvisols
FLt - Thionic Fluvisols
FLu - Umbric Fluvisols
FR - Ferralsols
FRh - Haplic Ferralsols
FRp - Plinthic Ferralsols
FRr - Rhodic Ferralsols
FRu - Humic Ferralsols
FRx - Xanthic Ferralsols
GL - Gleysols
GLd - Dystric Gleysols
GLe - Eutric Gleysols
GLk - Calcic Gleysols
GLm - Mollic Gleysols
GLt - Thionic Gleysols
GLu - Umbric Gleysols
HS - Histosols
HSf - Fibric Histosols
LP - Leptosols
LPd - Dystric Leptosols
LPe - Eutric Leptosols
LPq - Lithic Leptosols
LT - Lithosols
LV - Luvisols
LVf - Ferric Luvisols
LVg - Gleyic Luvisols
LVh - Haplic Luvisols
LVj - Stagnic Luvisols
LVk - Calcic Luvisols
LX - Lixisols
LXf - Ferric Lixisols
LXg - Gleyic Lixisols
LXh - Haplic Lixisols
LXj - Stagnic Lixisols
NT - Nitisols
PL - Planosols
PT - Plinthosols
PTa - Albic Plinthosols
PTd - Dystric Plinthosols
PZh - Haplic Podzols
RGe - Eutric Regosols
Reside - Residential Area
Rock - Rock
SC - Solonchaks
SCg - Gleyic Solonchaks
SCh - Haplic Solonchaks
SNg - Gleyic Solonetz
SNh - Haplic Solonetz
VR - Vertisols
VRd - Dystric Vertisols
VRe - Eutric Vertisols
WA - Water bodies
SOIL TYPES IN GMS COUNTRIES
(FAO/UNESCO classification)
This consultant's report does not reflect the views of ADB or the Government concerned, and ADB and the Government cannot be held liable for its contents.
Boundaries are not necessarily authoritative
Prepared by the GMS Core Agriculture Support Program Phase 2, http://gms-wga.org
Data source:
Cambodia: Open Development
Lao PDR: Mekong River Commision
Myanmar: Agriculture Atlas, MARD
PRC : GMS EOC - ADB
Thailand: Department of Land Development/ MA&C
Viet Nam: National GIS Atlas, MOSTE & MARD
UN FAO GAUL, NASA SRTM base data
ICEM GIS Database - ADB TA 8163REG
0 50 100 200
Kilometers
icem
ADB

4.2.2 Surface Water Hydrology/Groundwater

80. The country has rich water resources, with predominantly good quality fresh water. Water is essential to the life and culture of Lao people: it also contributes to the socio-economic development goals of the country. The contribution of the water sector to Lao PDR's overall development has been examined through water sub-sectors: Irrigation, Hydro-power, Navigation, Fisheries, Urban Water Supply, and Rural Water Supply. The amount of water used by each of these sub-sectors, respectively, has increased significantly over time.

The total of annual water flow in Lao PDR is estimated at 270 billion cubic meters, equivalent to 35% of the average annual flow of the whole Mekong Basin. The monthly distribution of the flow of the rivers in Lao PDR closely follows the pattern of rainfall: about 80% during the rainy season (May-October) and 20% in the dry season, from November to April. For some rivers in the central and southern parts of the country (particularly Se Bang Fai, Se Bang Hieng and Se Done) the flow in the dry season is less: around 10 to 15% of the annual flow. The rivers outside the Mekong Basin flow through Viet Nam into the South China Sea. These rivers are Nam Ma, Nam Sam, and Nam Neune.

81. Freshwater resources mainly coming from lakes, rivers, and groundwater have tropical characteristics. Lao PDR has the largest per capita volume of internal renewable water resources in the Asia region. The country is divided into 64 watersheds. Fifty-three watersheds, or 91% of the land area, drain into the Mekong River (the world's 12th-longest river and the 7th-longest in Asia). The remaining eleven watersheds, located in Xieng Khouang and Huaphan provinces, drain into rivers in Vietnam. The Mekong River dominates Lao PDR's water resources. Originating from the gorges of southern China, the river travels though Burma, Lao PDR, Thailand, Cambodia and Vietnam, and eventually empties into the South China Sea. The river level varies greatly between the wet and dry seasons, and the river's annual flooding plays a vital role in the country's maintenance of both its biodiversity and its economy. Flood-deposited sediments help to improve soil fertility, clean the water of pollutants and recharge groundwater tables.

82. Lao PDR is crisscrossed with a myriad of rivers and streams. The largest is the Mekong River, flowing for 1,898 kilometers from the North to the South, with 919 kilometers of the river forming the major portion of the border with Thailand. It is estimated that some 60% of all the water entering the Mekong River system originates in Lao PDR. There are major tributaries of the Mekong which are completely or primarily in Lao PDR. The catchment of these first order rivers exceeds 4000km^2 and includes: Nam Ou 448 km, NamTha 325 km, Nam Beng 215 km Nam Khane 90km, Nam Ngum 354 km, Nam Ngiep 156 km, Nam Kading 103 km, Nam San 120 km, Xebangphay 239 km, Xebanhhieng 338 km, Xedone 192 km , Xekong 320 km and there are many small rivers are flowing to Mekong. . Project activities will be implemented using surface water resources, particularly drawing from the Mekong River and its tributaries. The average rainfall reported by Lao PDR is 1935mm, or 462km^2, with an average runoff of 1055 mm, or 250km^3. High rainfall areas occur in both the central province of Bolikhamxay and in the south of the Saravan province.

83. The main rivers and Mekong tributary flowing through target provinces as follow: in Xayabouly there is Mekong, Vientiane province is NamNgum, Vientiane Capital is Mekong and NamNgum, Bolikhaxay is Nam Kading, Nam Xan and Mekong, Khammouane is Xebangfai and Mekong.

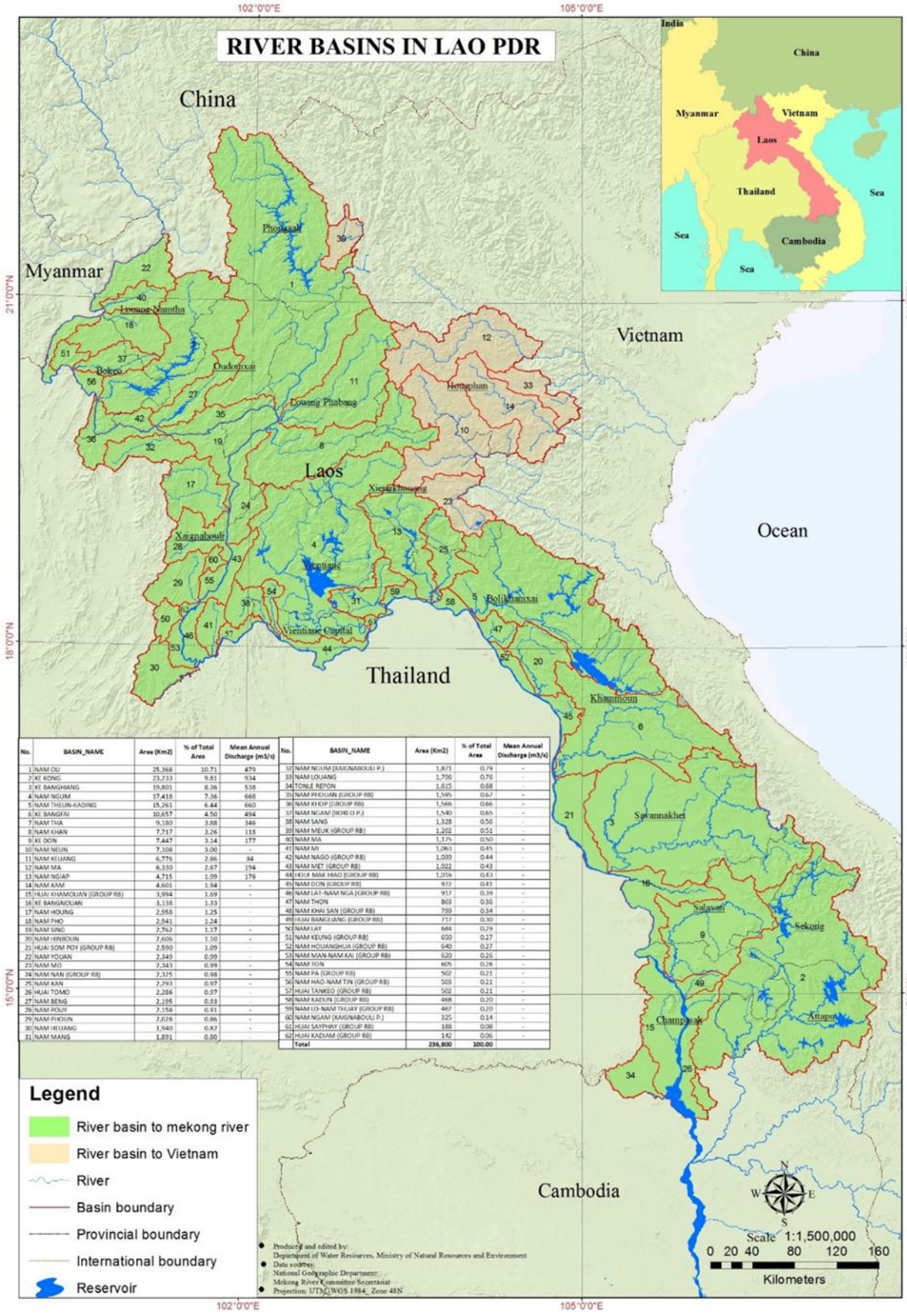
84. The source of water use for agriculture areas in target provinces**:** Water is key importance part

for crop production. Thus, there are many sources of water i.e. rainfall, surface water from rivers, reservoirs, well/groundwater are using to grow crops in target provinces, depending on social and environmental condition of each province and crops pattern. In targeted provinces, access to surface and ground water resources are limited. Therefore, rain-fed agriculture is dominated. Status of rain-fed agriculture and irrigated-agriculture in targeted provinces are summarized below:

 Xayabouly – Main water sources for paddy, and maize cultivation are from rain water and water from sub-tributary of Mekong;
 Vientiane Province- Main water sources for Paddy and horticulture are from rainfall and Nam Mang, Nam Ngum, and Nam Ngum tributaries. Some villages use groundwater (well and tube well) for horticulture;
 Vientiane Capital – Main water sources for paddy and horticulture are from rainfall, Nam Ngum, Nam Ngum tributaries and Mekong. Some villages use groundwater (well and tube well) for horticulture;
 Bolikhamxay province – Main water sources for paddy are from rainfall, Nam Mang tributary, Nam Xan tributary and Mekong;
 Khammoune province- Main water sources for paddy are from rainfall, Xebangfai and Xebangfai tributary.

85. Maize cultivation in Xayabouly province is totally depend on rainfall (no irrigated system), but rice cultivation is divided into rain-fed and irrigated agriculture.
In Lao PDR, rain-fed agriculture is starting from May to October each year. Irrigated agriculture is staring from November to April. Main sources of the irrigated agriculture are from Mekong and its tributaries. Ground water will commonly use only for horticulture.

Figure 3. River Basins in Lao PDR



No.	BASIN_NAME	Area (Km2)	% of Total Area	Mean Annual Discharge (m3/s)
1	NAM OU	25,368	10.71	479
2	XE KONG	23,233	9.81	934
3	XE BANGHIANG	19,801	8.36	538
4	NAM NGUM	17,418	7.36	668
5	NAM THEUN-KADING	15,261	6.44	660
6	XE BANGFAI	10,657	4.50	494
7	NAM THA	9,180	3.88	346
8	NAM KHAN	7,717	3.26	118
9	XE DON	7,447	3.14	177
10	NAM NEUN	7,108	3.00	-
11	NAM XEUANG	6,776	2.86	84
12	NAM MA	6,330	2.67	194
13	NAM NGIAP	4,715	1.99	176
14	NAM KAM	4,601	1.94	-
15	HUAI KHAMOUAN (GROUP RB)	3,994	1.69	-
16	XE BANGNOUAN	3,138	1.33	-
17	NAM HOUNG	2,958	1.25	-
18	NAM PHO	2,941	1.24	-
19	NAM SING	2,762	1.17	-
20	NAM HINBOUN	2,606	1.10	-
21	HUAI SOM POY (GROUP RB)	2,590	1.09	-
22	NAM YOUAN	2,349	0.99	-
23	NAM MO	2,343	0.99	-
24	NAM NAN (GROUP RB)	2,325	0.98	-
25	NAM XAN	2,293	0.97	-
26	HUAI TOMO	2,286	0.97	-
27	NAM BENG	2,195	0.93	-
28	NAM POUY	2,158	0.91	-
29	NAM PHOUN	2,028	0.86	-
30	NAM HEUANG	1,940	0.82	-
31	NAM MANG	1,891	0.80	-

No.	BASIN_NAME	Area (Km2)	% of Total Area	Mean Annual Discharge (m3/s)
32	NAM NGUM (XAIGNABOULI P.)	1,871	0.79	-
33	NAM LOUANG	1,795	0.76	-
34	TONLE REPON	1,615	0.68	-
35	NAM PHOUAN (GROUP RB)	1,595	0.67	-
36	NAM KHOP (GROUP RB)	1,566	0.66	-
37	NAM NGAM (BOKEO P.)	1,540	0.65	-
38	NAM SANG	1,328	0.56	-
39	NAM MEUK (GROUP RB)	1,202	0.51	-
40	NAM MA	1,175	0.50	-
41	NAM MI	1,063	0.45	-
42	NAM NAGO (GROUP RB)	1,039	0.44	-
43	NAM MET (GROUP RB)	1,022	0.43	-
44	HOUI MAK HIAO (GROUP RB)	1,016	0.43	-
45	NAM DON (GROUP RB)	972	0.41	-
46	NAM LAT-NAM NGA (GROUP RB)	917	0.39	-
47	NAM THON	863	0.36	-
48	NAM KHAI SAN (GROUP RB)	799	0.34	-
49	HUAI BANGLIANG (GROUP RB)	717	0.30	-
50	NAM LAY	684	0.29	-
51	NAM KEUNG (GROUP RB)	650	0.27	-
52	NAM HOUANGHUA (GROUP RB)	640	0.27	-
53	NAM NAN-NAM KAJ (GROUP RB)	620	0.26	-
54	NAM TON	605	0.26	-
55	NAM PA (GROUP RB)	502	0.21	-
56	NAM HAO-NAM TIN (GROUP RB)	503	0.21	-
57	HUAI TANKEO (GROUP RB)	502	0.21	-
58	NAM KADUN (GROUP RB)	468	0.20	-
59	NAM LO-NAM THUAY (GROUP RB)	467	0.20	-
60	NAM NGAM (XAIGNABOULI P.)	325	0.14	-
61	HUAI SAYPHAY (GROUP RB)	188	0.08	-
62	HUAI KADIAM (GROUP RB)	142	0.06	-
	Total	236,800	100.00	

Flood Plain

86. Flooding in Lao PDR may result from seasonal high flows in the Mekong River (inundation of areas along the river and backwater effects in the lower part of the Mekong tributaries), high flows in the Mekong tributaries themselves, and from high local rainfall. The Mekong plain is prone to annual flooding. This is particularly common in areas of the Vientiane plain, Bolikhamxay plain from Pakson to Pak Kading, and the Sebangfay plain in Khammoune province.

87. Flooding from local rainfall can occur anywhere when the rainfall exceeds 60mm/day. The mountainous watersheds in the northern region are subject to flash floods and landslides.

Table 5. Historical Flood Occurrences (2000-2015)

No.	Year	Types of damage	Places
1.	1999	Flood	Central
2	2000	Flood	Central and Southern
3	2001	Flash flood	Central and southern
4	2002	Large flood, flash flood and land slide	Northern, Central, and Southern
5	2004	Flood	Southern
6	2005	Flash flood and land slide	Central and southern
7	2006	Flash flood and strong wind	Northern, Central and Southern
8	2007	Flood and drought	Central
9	2008	Large flood	Northern and central
10	2009	Flood (typhoon Ketsana)	Central and southern
11	2011	Flood (Haima and Nokten)	Northern and central parts
12	2013	Flood	Southern provinces
13	2014	Flood	All part of country
15	2015	flood	Northern province

88. Human activities and other interventions in natural resources should be carefully taken into consideration for watershed management. Shifting cultivation is often blamed as the primary cause of erosion, forest degradation and unsustainable agriculture, which indirectly cause flooding and droughts. The most vulnerable flooding and drought areas are the tropical lowland plains, which include the Mekong River Basin. The disaster profile in Lao PDR has been published by EM-DAT (EM-DAT, 2014). The profile shows that drought has affected a large population. More than 4.25 million people were affected in five drought events. Epidemics have proven to be the biggest killer with about 863 people killed in nine events. More frequent events are floods in the Mekong River, which have affected more than 4.0 million people. Table 5 summarizes the disaster profile of Lao PDR from 1900 to 2014 (MRC-GIZ, 2004).

Table 6: Natural disaster profile of Lao PDR during 1900 to 2014 (EM-DAT, 2014)

Disaster		No. of Events	No. of Persons Killed	Total No. of Persons Affected	Damage (000 USD)
Drought	Drought	5	-	4,250,000	1,000
Epidemic	Unspecified	3	44	9,685	-
	Bacterial Infectious Diseases	2	534	8,244	-
	Viral Infectious Diseases	4	285	38,000	-
Flood	Unspecified	10	76	1,878,600	2,480
	Flash Flood	1	34	430,000	-
	General Flood	10	392	1,723,258	70,128
Storm	Unspecified	2	8	38,435	302,301
	Tropical Cyclone	3	64	1,397,764	103,650

89. Lao PDR's mountainous geography also gives rise to significant hydropower potential. As a mountainous country with abundant water resources and biodiversity, there is high potential for hydropower development in various scales. Demand for electricity for the purpose of socio-economic development in the country (as well as the neighboring countries) has increased, providing opportunities for hydropower development in Lao PDR. As such, Lao PDR has a policy to base electricity generation mainly on hydropower.

Groundwater

90. There is very little monitoring of groundwater quality in Lao PDR, even though it is the main source of rural water supply. The study made by the Interim Mekong Committee (1986) observed that the country is divided into two geological areas: the Annamian Strata occupying most of northern and eastern part of the country and the Indosinian sediments mainly along the Mekong. There are three different aquifer systems:

91. **The Annamian aquifers** occur randomly. These are local systems that discharge locally to the river or its tributaries. As local flow systems, they are not part of the regional flow system and will not carry pollution into the regional groundwater system. The potential water supply from groundwater in the northern part of the country is considerable in view of the high amount of recharge available. Water quality should be reasonably good and for the most part potable but will be iron rich. Yields up to 5 liters/sec can generally be anticipated.

92. **The Indosinian group of aquifers**, which have regional flow, includes rock of the Indonisian Moyennes and Superieures and is relatively young. They are mostly freshwater sediments, although there are horizons of brackish water, and one major zone of saline water. Yields of 12-24 liters/sec can be developed.

93. **The alluvial aquifers** associated with the sedimentary deposits of the Mekong River are not rated highly as aquifers.

94. Limestone in the Central Lao PDR is strictly Annamian in age, but its location places it logically in the Indosinian flow system. It has been described as having enormous groundwater resources.

95. To date, the only regional assessment of groundwater potential is the on-going study of groundwater in the Provinces of Champassack and Saravane funded by JICA. There are, however, studies and use of groundwater at specific locations for urban water supply purposes, and several hundreds of wells have been drilled throughout the country mainly for rural supply but also for a few cottage and small-scale industries. Information relating to drilled wells for rural water supply generally includes a location sketch, depth of the wells, type of pump and ground water level. Geological logging and yields tests are only occasionally undertaken. The information of drilled wells for rural water supply is kept at the offices of the Provincial Rural Water Supply Center. In most cases, the depth of the rural water supply wells in lowland areas varies from 30 to 45 meters and the yields varies from about 1 liter/sec to less than 5 liters/sec.

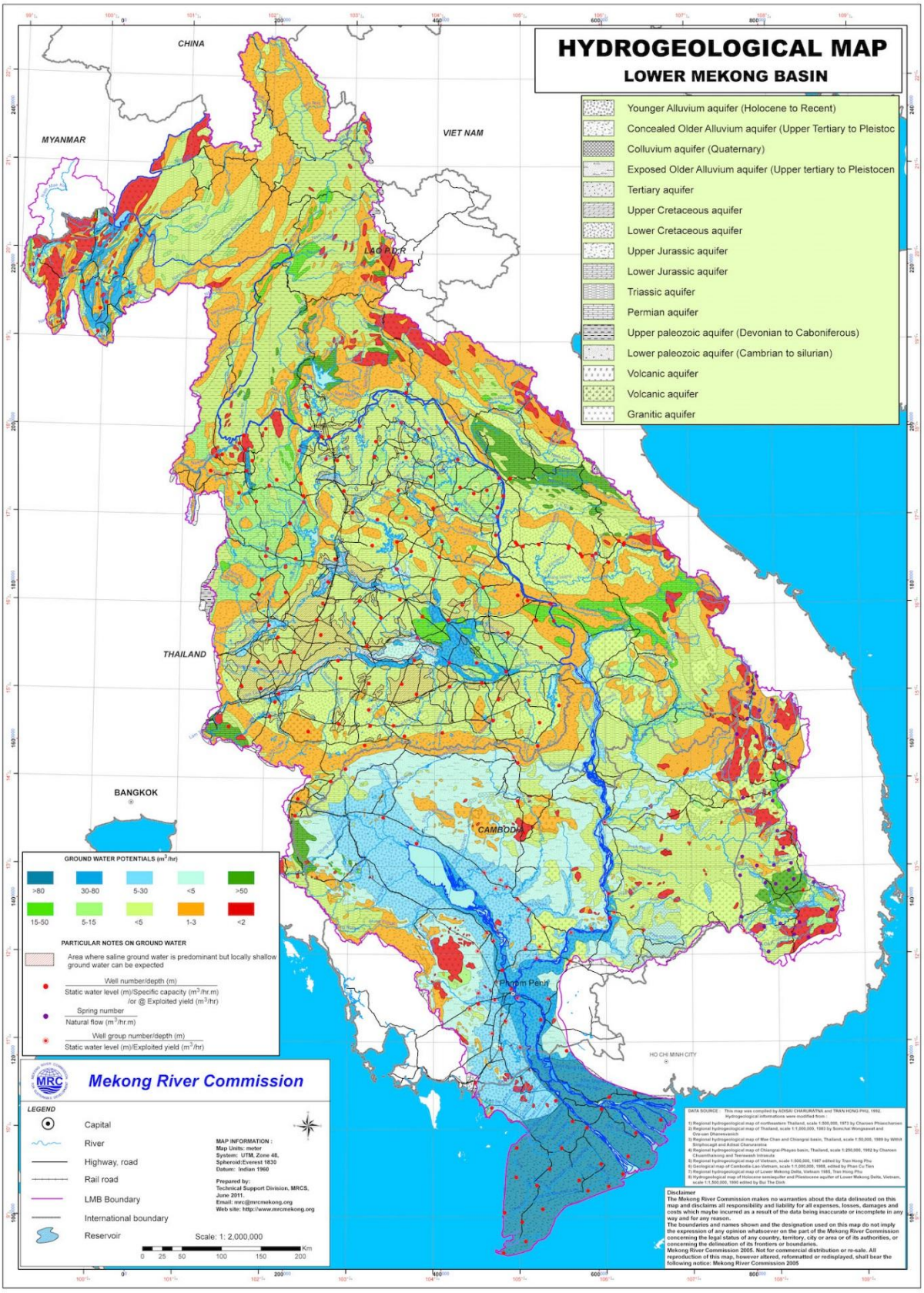
96. The groundwater is and will probably remain the main source of potential rural and small-town water supply, especially in lowland areas located far from the surface water sources such as the southern and western parts of Champassack Province, the hinterlands of the Senbangfay, Sebanghieng and Sedone valley. Anecdotal evidence suggests that poor sanitation and sewage facilities are contributing towards the contamination of surface and groundwater.

97. In Lao PDR, most people living in rural areas prefer to use surface water and ground water for their domestic purposes. In the project area, with the exception of Vientiane and Vientiane capital, there are a large number of communal tube-wells that were mostly provided by external agencies. The distribution and depth of the groundwater table in the project area varies considerably. The water table changes with rainfall, specific local geomorphological conditions, and the distance to the permanent water bodies.

98. According to the local communities and residents, the ground water is mainly taken from two types of wells: tube wells and open wells. Ground water from tube well is used for washing, cooking as well for consumption. It is of good quality for daily use. In the project areas, open wells are mostly used for horticulture purposes only. There is limited available information on groundwater application for agricultural production in Lao PDR.

99. The hydrogeological map of the Lower Mekong Basin (Figure 4) provided by the Mekong River Commission gives a visual overview of the aquifers in Lao PDR, as they overlap with the project provinces.

Figure 4. Hydrogeological Map of the Lower Mekong Basin


HYDROGEOLOGICAL MAP
LOWER MEKONG BASIN
Younger Alluvium aquifer (Holocene to Recent)
Concealed Older Alluvium aquifer (Upper Tertiary to Pleistoc
Colluvium aquifer (Quaternary)
Exposed Older Alluvium aquifer (Upper tertiary to Pleistocen
Tertiary aquifer
Upper Cretaceous aquifer
Lower Cretaceous aquifer
Upper Jurassic aquifer
Lower Jurassic aquifer
Triassic aquifer
Permian aquifer
Upper paleozoic aquifer (Devonian to Caboniferous)
Lower paleozoic aquifer (Cambrian to silurian)
Volcanic aquifer
Volcanic aquifer
Granitic aquifer
CHINA
MYANMAR
VIET NAM
LAO P.D.R
THAILAND
CAMBODIA
BANGKOK
Phnom Penh
HO CHI MINH CITY
GROUND WATER POTENTIALS (m³/hr)
>80
30-80
5-30
<5
>50
15-50
5-15
<5
1-3
<2
PARTICULAR NOTES ON GROUND WATER
Area where saline ground water is predominant but locally shallow ground water can be expected
Well number/depth (m)
Static water level (m)/Specific capacity (m³/hr.m) /or @ Exploited yield (m³/hr)
Spring number
Natural flow (m³/hr.m)
Well group number/depth (m)
Static water level (m)/Exploited yield (m³/hr)
Mekong River Commission
LEGEND
Capital
River
Highway, road
Rail road
LMB Boundary
International boundary
Reservoir
MAP INFORMATION :
Map Units: meter
System: UTM, Zone 48,
Spheroid:Everest 1830
Datum: Indian 1960
Prepared by:
Technical Support Division, MRCS,
June 2011.
Email: mrc@mrcmekong.org
Web site: http://www.mrcmekong.org
Scale: 1: 2,000,000
0 25 50 100 150 200 Km
DATA SOURCE :
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Mekong River Commission 2005. Not for commercial distribution or re-sale. All reproduction of this map, however altered, reformatted or redisplayed, shall bear the following notice: Mekong River Commission 2005

4.2.3 Meteorology and Air Quality

100. Lao PDR has a tropical monsoon climate, with a pronounced rainy season from May through October, a cool dry season from November through February, and a hot dry season in March and April. Monsoons generally occur at the same time across the country, although the timing of the monsoons may vary significantly from one year to the next. Monthly rainfall also varies regionally. Temperatures range from average highs around 40 degrees Celsius along the Mekong in March and April to lows of 5 degrees Celsius (or less) in the uplands of Xiangkhoang and Phongsali in January.[5] The southwest monsoon prevails from mid-May to early October, while the northeast monsoon dominates from early November to mid-March. Generally, the average annual rainfall ranges between 1400mm and 2500mm and exceeds 3500mm over the central and southwest regions. With the exception of the country's northern parts, temperatures remain high throughout the year, with an average highest temperature range between 35-38^{o}C and lowest temperature range of about 16-18^{o}C. In the subtropical regions of the north, the temperature range is much wider; cold air from China and Siberia occasionally penetrates during the dry season, lowering the air temperature to near zero. The maximum temperature is 40°C (March, over lowlands) and the minimum temperature is 0°C (highlands).

Precipitation and the Effects of Climate Change

101. The pattern of average rainfall across the country from 2010-2015 is seen in Table 7 and Figure 5. With the exception of Pakse in the south, the amount of rain decreased dramatically between those years. The situation would suggest that climate change adaptions will be required for community livelihoods.

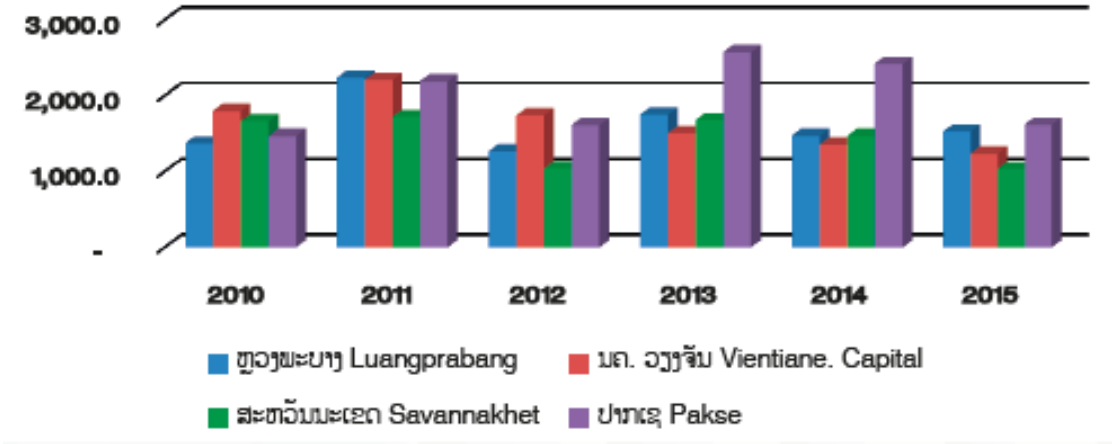
Table 7. Average precipitation in Lao PDR (2010-2015)

Year	Meteorology Station			
	Luangprabang	**Vientiane, Capital**	**Savannakhet**	**Pakse**
2010	1,368.6	1,794.2	1,658.9	1,464.3
2011	2,233.5	2,202.4	1,717.9	2,182.5
2012	1,259.4	1,735.6	1,034.9	1,607.4
2013	1,747.6	1,499.7	1,672.3	2,567.5
2014	1,468.5	1,349.4	1,461.3	2,415.8
2015	1,525.1	1,232.2	1,030.0	1,612.9

Source: Department of Meteorology and Hydrology, Ministry of Natural Resources and Environment, 2015

[5] Weather average and climate in Lao PDR, https://weather-and-climate.com/average-monthly-Rainfall-Temperature-Sunshine-in-Lao PDR

Figure 5: Average precipitation in Lao PDR (2010 – 2015)



Source: Department of Meteorology and Hydrology, Ministry of Natural Resources and Environment, 2015

102. Climate change is happening globally and affects all countries. For Lao PDR, scientists predict that temperatures will continue to rise and that dry seasons will get longer. Rainfall, storms, droughts and floods will become more severe and frequent. Rainfall will become more erratic and weather events such as droughts or floods will become more extreme.[6] The results of the USAID Mekong ARCC Climate Change Impact and Adaptation Study indicate that Lao PDR will experience pronounced changes in rainfall and temperature patterns by 2050, with significant ramifications for ecosystems, communities, and the livelihoods that support those communities.[7] With around 70% of the Lao population relying on subsistence agriculture for their livelihoods, climate change effects (e.g. unpredictable rains and extended dry seasons) will have a significant impact on the lives of people across the country.[8]

103. Floods and droughts are the main hazards in Lao PDR, and both are dependent on rainfall amounts. If the annual rainfall is less than 2000mm, drought-sensitive areas are affected. When more than 200mm of rainfall accumulates in 2 days, this leads to flooding along the Mekong plain. Tropical cyclones are not a direct hazard, since their force is normally diminished once they have reached Lao PDR from the South China Sea, but they can also produce floods as a consequence of heavy rainfall.

104. Figure 5 illustrates this effect for the projected basin-wide precipitation in 2030. These projections come from CSIRO's work with 11 models 'best' representing the Mekong Basin. As such, the results are presented in terms of average monthly values for the *entire basin*; this is not an outcome that inspires confidence in the simulation ability of the IPCC AOGCMs. In Figure 6, it is seen that for August and September, range of model estimates above the median value tends to be greater than the range of estimates below the median value. This characteristic indicates that the models as a whole are biased 'wet' in these months (MRC, 2011-2015).

[6] ProCEED – Promotion of Climate-related Environmental Education, Department of Environmental Quality Promotion Ministry of Natural Resources and Environment, Nahaidiau Rd, Ban Nahaidiau, Chanthabouly District Vientiane Capital, Lao PDR
[7] LAO PDR CLIMATE CHANGE VULNERABILITY PROFILE, USAID Mekong Adaptation and Resilience to Climate Change, (USAID Mekong ARCC). 11th Floor, Mahatun Plaza Building, 888/118 Phloenchit Road, Lumpini, Pathumwan, Bangkok, 10330, Thailand
[8] http://www.la.undp.org/content/lao_pdr/en/home/library/environment_energy/climate_change_strategy.html

Figure 6. Projected average monthly rainfall in 2030, Lao PDR (MRC, 2011-2015)

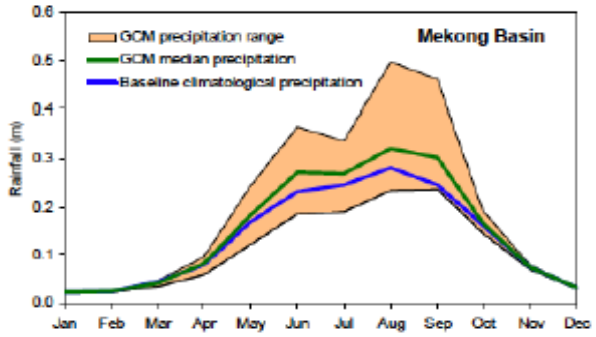


Figure B 2 Projected Average Monthly Rainfall in 2030 compared to Baseline Conditions 1951-2000, Mekong Basin

(Source CSIRO, 2008: Figure 3.6, p. 24)

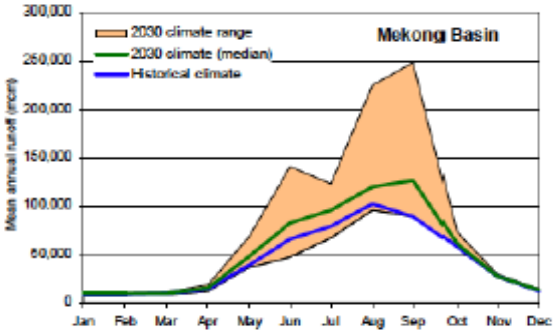


Figure B 3 Projected Average Monthly Runoff in 2030 compared to Historical Conditions, Mekong Basin

(Source CSIRO, 2008: Figure 4.1, p. 35)

Temperature

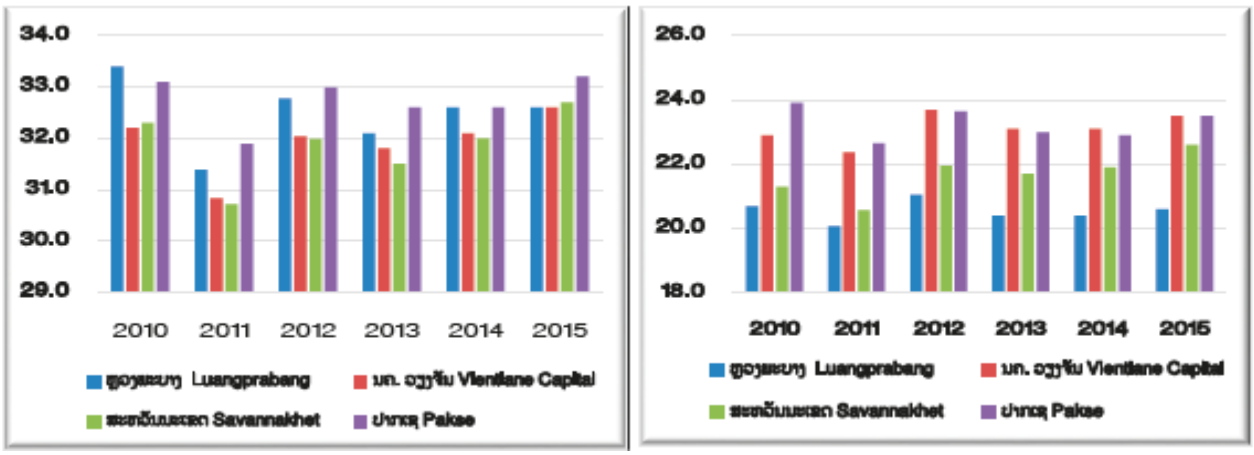
105. The average maximum temperature found in the north and south is 33.4^{O}C, while the lowest temperature is found mostly in northern parts of Lao PDR, which is 20.4^{O}C. As shown in Table 8, the average temperature has slightly increased over six years between 2010 and 2015. This increase could be the result of the climate change or the result of deforestation – forest degradation caused by other human development activities.

Table 8. Average maximum and minimum temperature by year

Year	Meteorology Station							
	Luangprabang		Vientiane, Capital		Savannakhet		Pakse	
	Max	Min	Max	Min	Max	Min	Max	Min
2010	33.4	20.7	32.2	22.9	32.3	21.3	33.1	23.9
2011	31.4	20.1	30.8	22.4	30.7	20.6	31.9	22.6
2012	32.8	21.1	32.0	23.7	32.0	21.9	33.0	23.6
2013	32.1	20.4	31.8	23.1	31.5	21.7	32.6	23.0
2014	32.6	20.4	32.1	23.1	32.0	21.9	32.6	22.9
2015	32.6	20.6	32.6	23.5	32.7	22.6	33.2	23.5

Source: Department of Meteorology and Hydrology, Ministry of Natural Resources and Environment, 2015

Figure 7. Graph of average temperature by year in main stations of the country



Graph A: Average maximum temperature **Graph B: Average minimum temperature**
Source: Department of Meteorology and Hydrology, Ministry of Natural Resources and Environment, 2015

4.2.4 Utilization of Pesticides/Insecticides/chemical fertilizers

106. In general, Lao farmers apply less pesticides/herbicides and chemical fertilizers in their farm practices, especially in rainfed low land rice farming pesticides/herbicides and chemicals fertilizer apply significant lower rates or no application. Farmers use herbicides on upland crop cultivations and in dry cropping seasons. However, overall, the application rates of the chemicals are still lower than the recommended rates.

107. **Utilization of Herbicides.** Normally, herbicides have been using by farmers in the upland for instance maize cultivation and rubber plantation and recently Chinese-investment-banana cultivation. Generally, herbicides are applied in one or two applications per cropping season. The main application is on maize farm areas, such as Sayaboury province, and other provinces for banana plantations. Types of herbicides are common found in the local market including: Glyphosate-Isopropylammonium, Paraquat Dichloride, 2,4-D-Dimethylammonium, Atrazine and Acetochlor.

108. One of the commonly used herbicides is paraquat, despite the chemical being banned more than five years ago, under Regulation 2860/MAF (Bartlett, 2016). The product is widely available and openly sold. Various brands of paraquat come from Vietnam and Thailand, which range in price from 'Fansipan' at 40,000 LKP per litre to 'Gramoxone' at 170,000 LKP per litre (Bartlett, 2016). Three other herbicides being used are listed in Table 9:

Table 9. Herbicide Use in Lao PDR

Chemical Name	Brand Name	Toxicity (WHO)	Use	Legal Status	Environmental Impacts
Paraquat dichloride	Gramoxone, Fansipan	II	Non-selective, contact	Banned	Aquatic species
2,4-D	Outlaw	II	Broad-leaved, systemic	permitted	Fish, bees
Glyphosate	Roundup, Lymphoxim	III	Broad-leaved, systemic	permitted	Aquatic species
Atrazine	Atamex	III	Broad-leaved,	permitted	Aquatic species

			systemic		

109. **Utilization of Pesticides.** Pesticides have been use both upland and lowland cultivations. Pesticides is widely use on long yard bean cultivation, some legumes and vegetables. Famers apply some pesticides in dry season rice cropping. Pesticides that are commonly used in general farming including; Methyl parathion and Diazinon are mentioned to control Brown Hopper, rice Bug and stem Borer infestations.

110. **Utilization of Chemical fertilizers**: Fertilizer use in Lao PDR has been historically low, but there is evidence it is increasing. From 1980-1990 fertilizer use averaged about 4 kg/ha on rice crops, as compared with 400-500 kg/ha for Taiwan, Japan and South Korea. (Ahmed, undated) international rice research institute (IRRI) in Lao PDR on farm budget for rice estimates application of phosphate and urea at 100 kg/ha/yr. this application rate can be expected to occur or be exceeded in circumstances where farmers have a secure supply and sufficient investment capital.

111. **Fertilizer application**: In general, Lao rice farmer utilize fertilizers lower than recommended rates due to two main reasons; (i) high prices of chemical fertilizer and (ii) risk in investment and benefit due to flood and drought.

112. **For rice farming**: field discussions revealed that in the rainy seasons Lao rice apply low rate of fertilizer application. In dry seasons, farmers reported that 100kg/ha of Urea (46-00-00) or 150 Kg per ha of TSP (16-20-00) is applied compared to recommendation rate of 250kg/ha of combined chemical fertilizers (Urea -100kg; TSP- 100kg; and KCl -50kg).

113. For maize production: there is no chemical fertilizers use for wet season maize cultivation, while the recommendation rate is about 180kg/ha of Urea (46-00-00) and mix formula (N: P2O5: K2O) 150kg/ha (15-15-15).

For vegetable production, general vegetable farmers apply both chemical and organic fertilizers on vegetable commercialization production. The recommendation rate is about 150kg/ha of urea (46-00-00) for coriander, shallots, and lettuce (i.e. the common vegetables grown in greenhouses).

114. For detailed information on pesticide and chemical fertilizer use within the project areas, please see Chapter 5: Environmental Issues.

4.2.5 Natural Habitats

115. The Lao system of National Protected Areas (NPA) covers nearly 14% of the country's land area and is recognized as one of the best designed protected area systems in the world. With large tracts of tropical monsoon forest, diverse wildlife populations and bizarre karst limestone formations honeycombed with caves, Laos protected areas have an abundance of extraordinary things to see. A complete map of NPAs can be seen in Figure 8, with full names and area coverage provided in Table 10.

Figure 8. National Protected Areas of Lao, PDR

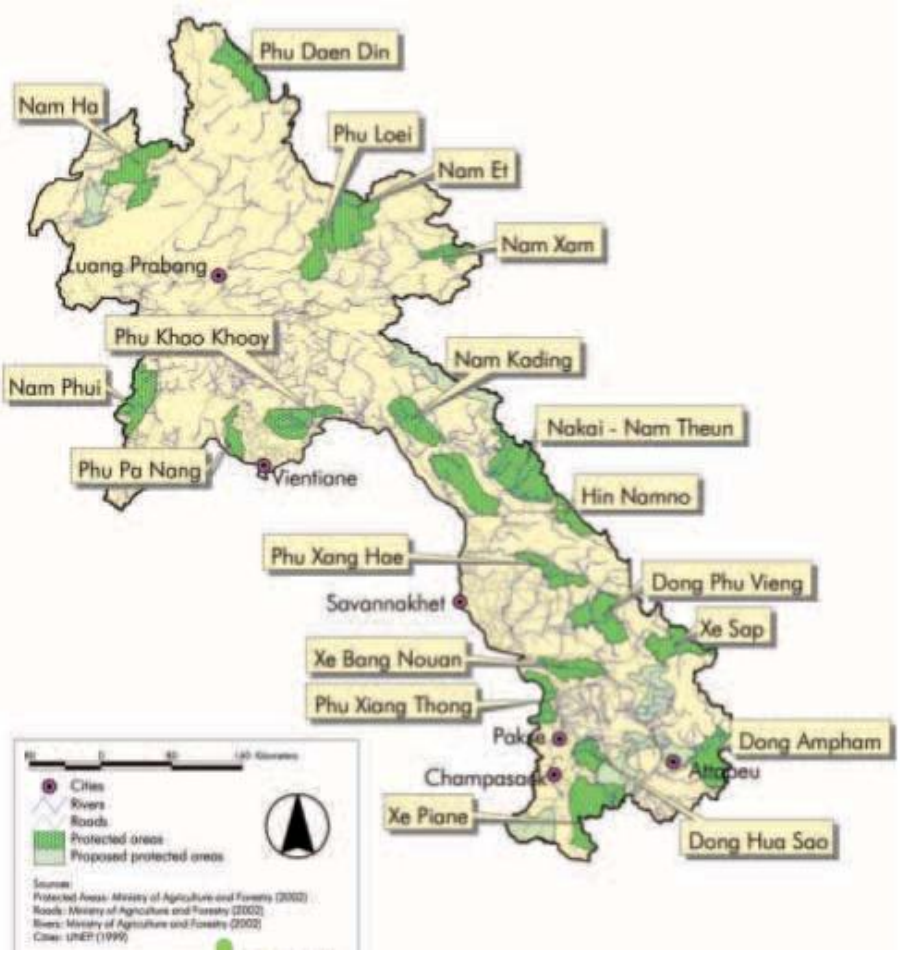


Table 10: National Protected Areas (Biodiversity Conservation Areas)

Name of Protected Area	Areas (Ha)	Province(s) covered
Phou Daen Din	222,000	Phongsaly
Nam Ha	222,400	Luang Namtha
Nam Et	170,000	Houaphan
Phou Loei	150,000	HP, Luang Prabang
Nam Xam	70,000	Houaphan
Nam Phui	191,200	Saiyabouri
Phou Pha Nang	70,000	Vientiane
Phou Khao Khoay	200,000	Vientiane, Borikhamsay, Saysomboun
Nam Kading	169,000	Borikhamsay
Na Kai-Nam Theun	353,200	Khammouan, Borikhamsay
Hin Nam Nor	82,000	Khammoune
Phou Xang He	109,900	Savannakhet

Doung Phou Vieng	197,000	Savannakhet
Xe Xap	136,897	Salavanh,Sekong
Xe Bang Nouan	150,000	Salavanh, Savannkhet
Phou Xiang Thong	120,000	Champasak, Salavanh
Dong Hua Sao	110,000	Champasak
Dong AmPham	200,000	Attapeu,Sekong
Se Pian	240,000	Champasak, Attapeu
NaKai-Namthuen Corridor	73,860	Borikhamsay, Khammoune
NaKai-Namthuen-Hin Nam Nor corridor	3,310	Khammoune

Source: DFRC/DoF/MAF

116. In addition to the NPAs, Lao PDR boasts provincial and district conservation forests and protected forests. The summary of total biodiversity conservation land area in Lao PDR is seen in Table 11. When considering landscape conservation efforts promoted by NGOs like the World Wildlife Fund, Lao PDR has been included in three of the eight priority landscapes for conservation in the Greater Mekong: (i) Southern Laos/Central Viet Nam Landscape (SLCVL); (ii) Nong Khai, Nakhon Phanom, Bolikhamsay, Khammeun (NNBK); and (iii) Siphandone, Stung Treng, Kratie section (SSK). The areas "support many of the rarest and most distinctive species in the region", including tigers, elephants, and saolas (WWF, 2017).

Table 11: Total Biodiversity Conservation Land Area in Lao PDR

Category	No. of areas	Total areas (ha)	% Lao PDR area
National Protected areas	20	3,313,596	13.99
Provincial Conservation Forests	57	931,969	3.94
Provincial Protected Forests	23	461,410	1.95
District Conservation Forests	144	503,733	2.12
District Protection Forests	52	55,733	0.23
Corridors	2	77,170	0.33
Total	**278**	**5,343,591**	**22.56**

Source: DFRC/DoF/MAF

Wildlife

117. Lao PDR boasts richly diverse wildlife, including mammal, bird, reptile, and amphibian species with high rates of endemism and national or global importance (Greatorex et al., 2016). Nonetheless, high levels of hunting for domestic and international wildlife trade coupled with habitat loss are increasingly threatening the population. Wildlife has been declining and many populations are now at alarmingly low levels (Greatorex et al., 2016). Wild protein sources were traditionally important for the diets of Lao communities on a small scale, limited to subsistence consumption, but this has grown since the 1980s. Wildlife has since been introduced for trade in wet markets and, following the country's economic opening with the New Economic Mechanism, it is no longer related to subsistence consumption (Greatorex et al., 2016). Wildlife is primarily sold for food, but can also be used for

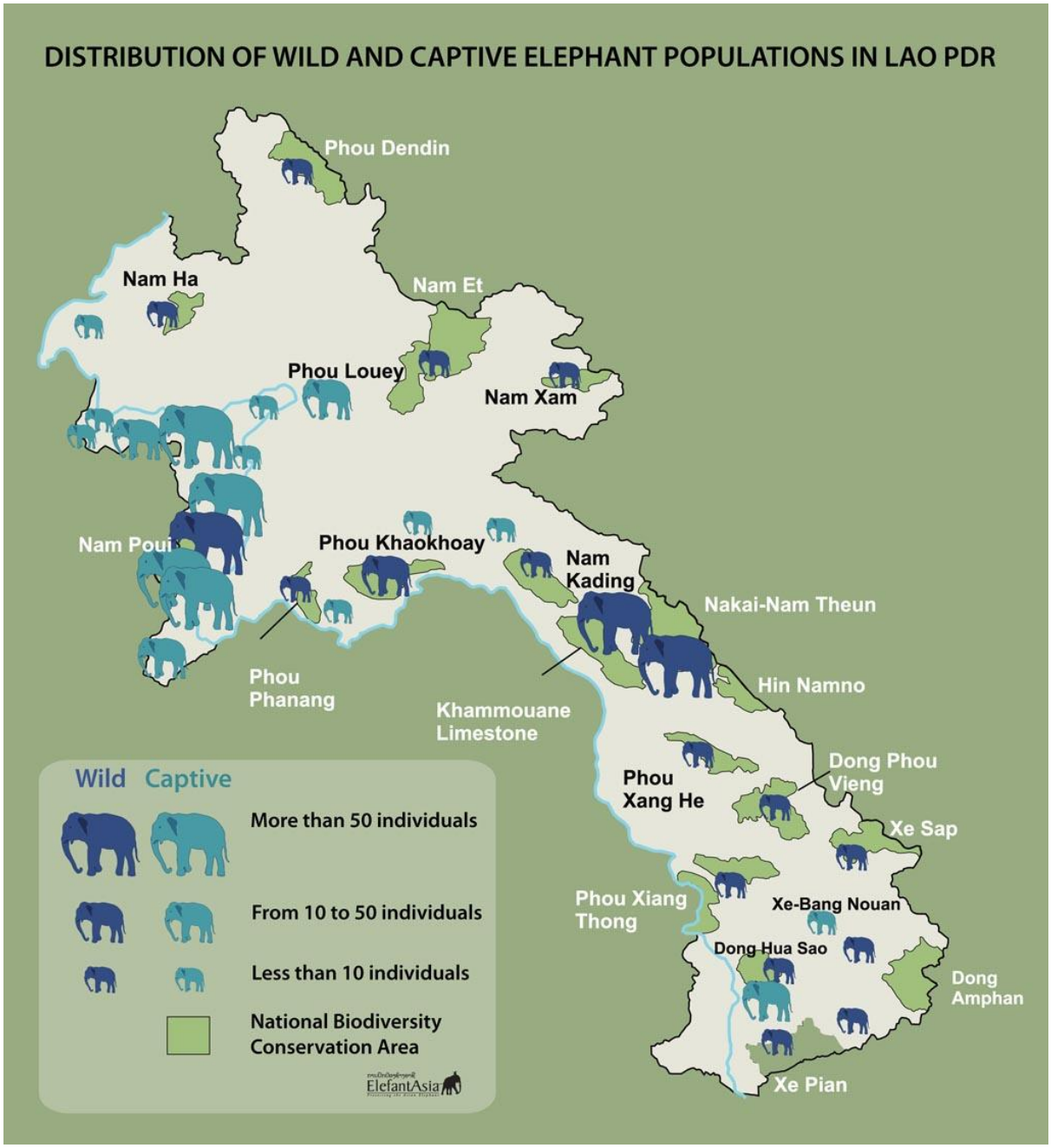
traditional medicine, pets and ornaments.

Endangered Species

118. According to reports from the World Wildlife Fund (WWF), Lao PDR is home to rare and distinct species, including the Mekong giant catfish, tiger, Asian elephant, and saola. The saola, which was only recently discovered, is already listed as an endangered species. It is distributed in scattered locations in the Annamites, along the northwest-southeast Vietnam/Lao PDR border. Within Lao PDR, there are confirmed reports of the saola in the southern part of the Nakai-Nam Theun National Biodiversity Conservation Area (spanning both Borikhamsay and Khammoune provinces). Hunting and fragmentation of range due to habitat loss are the main threats to the saola. Snares that are set in forests for wild boar, sambar, or barking deer also trap saola. The saola is also poached specifically for its horns, which are considered prized trophies. Infrastructure development is also a concern because it often infringes on the saola's natural habitat.

119. Asian elephants are another endangered species found in Laos, with only 7,000-10,000 remaining in the wild across the Greater Mekong region. According to the Elephant Conservation Centre (2015) in Xayaboury, there are only about 400 wild elephants remaining in Laos, in addition to 450 domesticated elephants. Figure 9 shows their distribution across the country. The prime danger posed to these animals is habitat loss due to expansion of settlements, agriculture, the logging industry, and industrial infrastructure like dams and roads. Despite conservation efforts, they also remain targets of illegal hunting and trade for their meat and, in the case of the males, their ivory tusks. Wild elephant capture for the purposes of domestication is also problematic. Domesticated elephants are typically engaged in timber harvesting operations, ironically assisting with the destruction of their own natural habitat. Approximately 9000 people in Lao PDR directly depend on revenue generated by the domesticated elephants' work. Reproduction rates are extremely low, which has exacerbated the issue of their small population. The Nam Pouy NPA in Xayaboury was identified as a top priority conservation area for wild elephants (elephant recovery, more specifically) by the Government of Lao PDR back in 2008 at the National Elephant Conservation Meeting. Human-elephant conflicts have also arisen as a result of close proximity between natural habitats and human settlements.

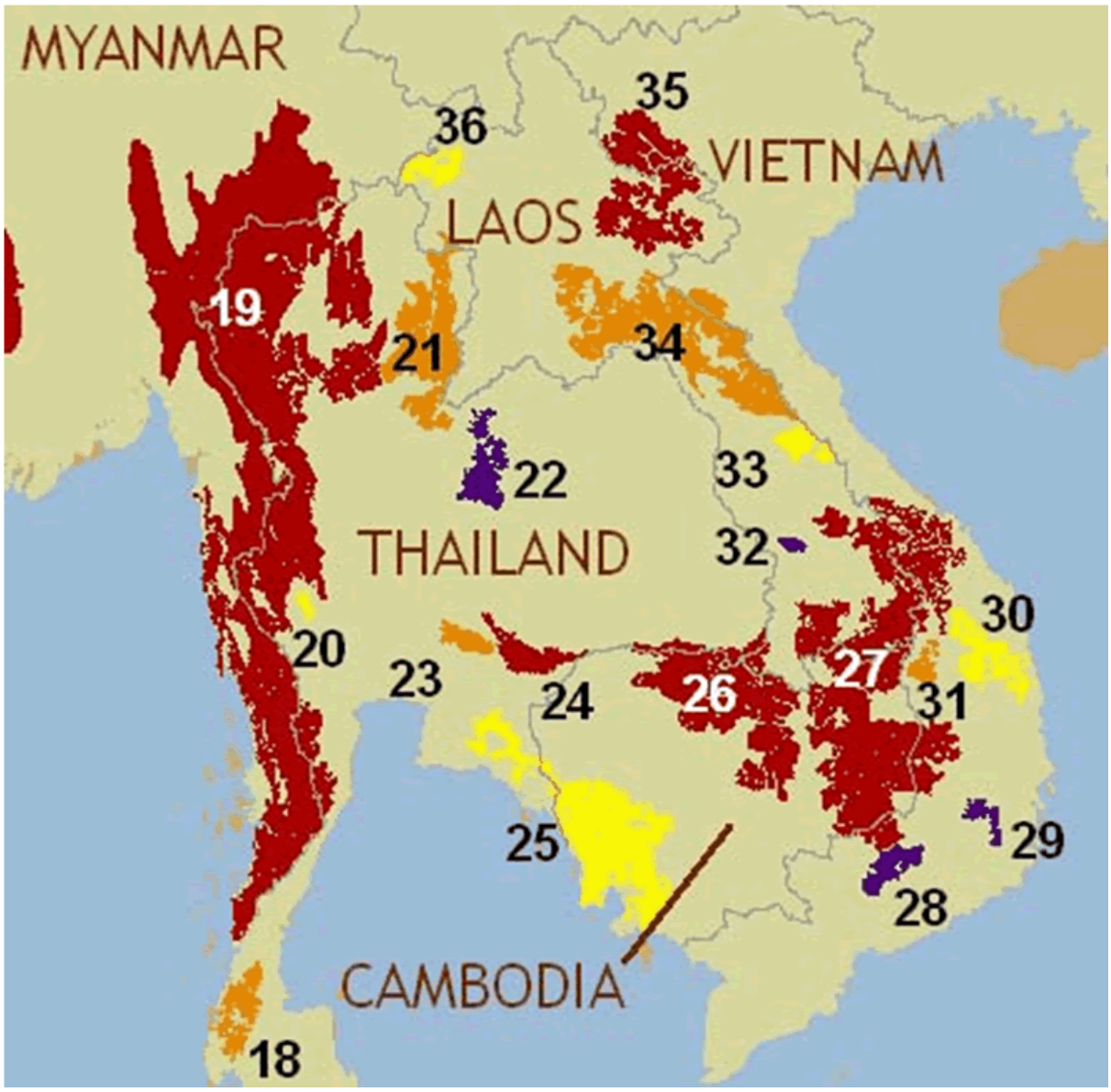
Figure 9. Distribution of Wild and Captive Elephant Populations in Lao PDR



Source: Elephant Conservation Centre, 2015

120. Tigers in Lao PDR are considered functionally extinct, with only a handful of tigers in the evergreen forests of the Northern Annamites and the Dry Forests/Central Annamites further south. The last tiger sighting was more than five years ago, and recent surveys would indicate that no tigers remain in the country (WWF, 2017). Key threats to the species include poaching, habitat fragmentation, and poaching of the tiger's prey wildlife (reducing available prey for tigers to hunt). Figure 10 shows the identified tiger landscapes in the Greater Mekong region. While Lao PDR is identified as having tiger landscapes in Xayaboury/Khammoune, it remains that the species is considered functionally extinct within the country.

Figure 10. Tiger Landscapes of the Greater Mekong Region



Source: WWF, 2017

121. The Mekong giant catfish used to be common along the northern Lao-Thai border, but is now extremely rare. At present, the species is found in the mainstream of the lower Mekong River in Lao, Myanmar, Thailand, Cambodia, and Viet Nam. As the largest freshwater fish, the Mekong giant catfish is a species endemic to the Mekong River that migrates huge distances to spawn. Scientists estimate that the population has decreased by approximately 90% over of the last ten years, with potentially only a few hundred individuals remaining (WWF, 2017). The main threat to the Mekong giant catfish is infrastructure developments, like dams, that block migration routes and isolate populations. Reduced mobility along the river means that fish have fewer opportunities to breed. Over-fishing also threatens the species' population, as do pollution, siltation, and navigation projects that have destroyed critical spawning grounds.

122. Given that there are protected areas and natural habitats within all of the project provinces, the LACP will only select sites that lie outside of these areas/do not conflict with or impact these areas.

4.2.6 Forests

123. Lao PDR has the highest proportion of its land area in natural forest cover among the countries in mainland Southeast Asia. That said, the total area of natural forests has declined from 70% of the total land area (approximately 16.6 million ha) in 1940 to 61% (about 14.0 million ha) in 2000, then to 60% (13.9 million ha) in 2005, 59% (13.6 million ha) in 2010, and eventually to 57% (about 13.2 million ha) in 2015. The average annual loss in natural forest cover in recent years (2000-2015) has been about 53,400 ha (approximately 0.23% of the land area), while it had averaged about 42,800 ha (0.19%) in the earlier 60-year period (1940-2000).

124. According to FAO (2009) and Clarke (2008), the following main forest types in the country include:

- Dry evergreen forest in the northern area
- Tropical montane evergreen forest along highland areas of the Annamite Mountains and Bolovens Plateau
- Lowland semi-evergreen dipterocarp forest at the Mekong River Plain
- Tropical montane deciduous forest scattered in the Northern area
- Dry dipterocarp forest in the southern area
- Mixed deciduous forest in the southern area
- Limestone forest in the Annamite Mountains
- Pine forest in the Annamite Mountains
- Subtropical montane forest in the Northern area

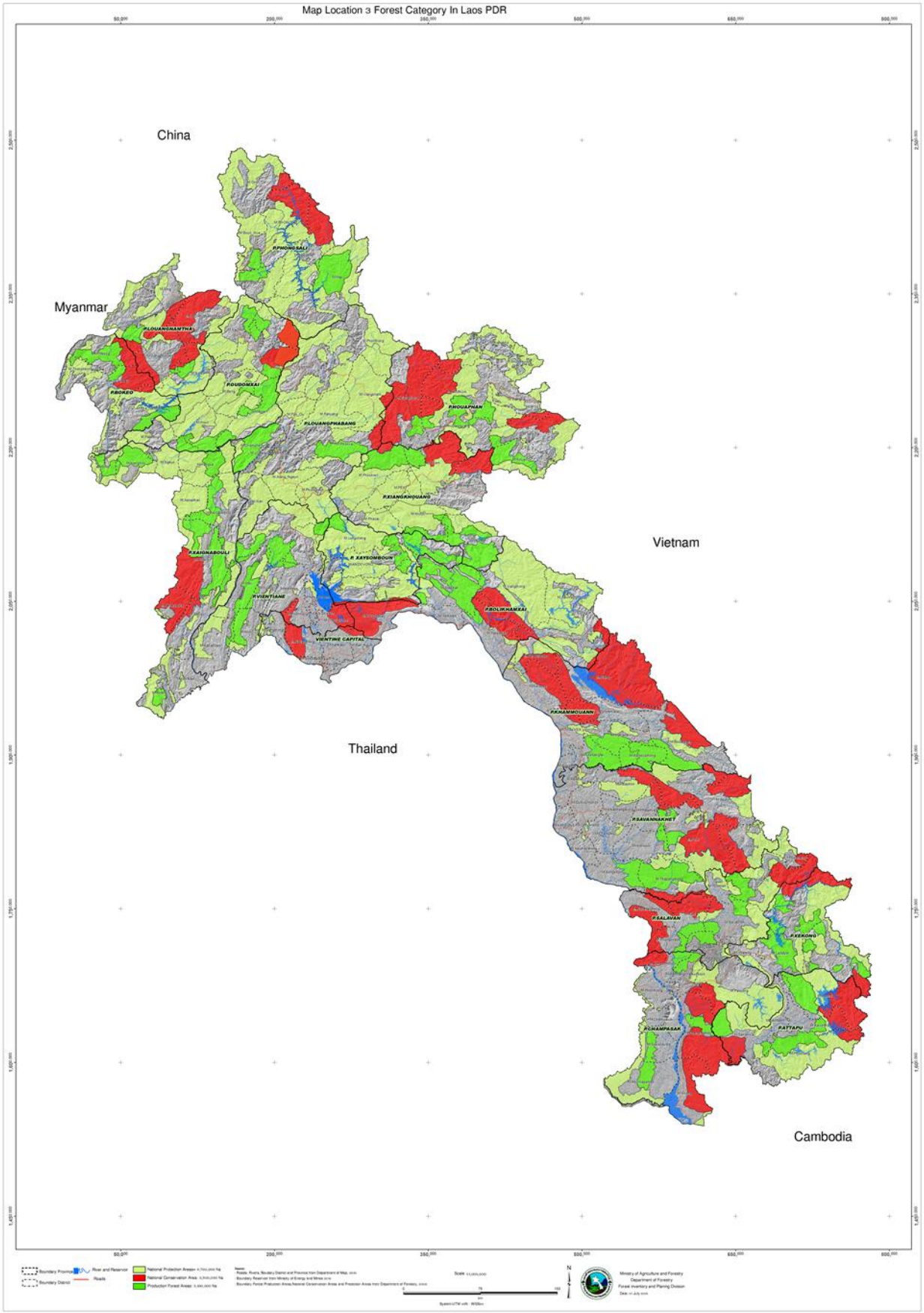
125. Land-use statistics derived from satellite images taken in 2015 show that the country had 13,231,443 ha of forests consisting of five types (evergreen forest, mixed deciduous forest, dry dipterocarp forest, coniferous forest, and mixed conifer and broadleaf). Together with 137,965 ha of forest plantations, the forest cover of the country in 2015 was about 58% of total land area. Bamboo and regenerating vegetation cover some 6,162,481 ha or 27% of the total land area. Agricultural land including upland crops, rice paddies, agricultural plantations, and other agriculture had an area of 2,486,297 or 11% of the total land area. The remaining 4% of the land cover includes 75,638 ha of urban areas, 138,308 ha of savannah, scrub, and grassland, and 567,750 ha of water and other open land.

126. The Forestry Law originally recognized five forest classes: protection forest, conservation forest, production forest, regeneration forest, and degraded forest land/barren land. This was reduced to three forest categories under the latest amendment (Forestry Law 2007) to include: protection forest, conservation forest, and production forest. A description of each forest type is provided below:

- **Protection Forests**: forest areas selected to protect Laotian natural resources, such as water, river ecosystems, soil quality, protection from natural disasters, and environmental conservation, etc.;
- **Conservation Forests:** forest areas classified for the purpose of conserving nature, preserving plant and animal species, ecosystems, and other valuable areas of natural, historical, cultural, educational, and scientific significance.
- **Production Forests:** forest areas of both natural forests and planted forests that are classified for use and production. There are designated as such to support the production of wood and forest products, and to satisfy the needs of national socio-economic development where necessary.

127. All of these forest areas may include land cover that is dense forest, degraded forest, base forestland, or land for village use – they are not strictly forest spaces. The state may act in allocating forestland for rational usage, to individuals, communities, and organizations. Village forests are poorly recognized and not included in the three forest types as described in the current version of the Lao forest law (WRI, 2017). A map of the three forest types can be found in Figure 11.

Figure 11: Three Forest Categories – Location of Forests in Lao PDR.


Map Location ɜ Forest Category In Laos PDR
China
Myanmar
Vietnam
Thailand
Cambodia
P.PHONGSALI
P.LOUANGNAMTHA
P.OUDOMXAI
P.BOKEO
P.LOUANGPHABANG
P.HOUAPHAN
P.XIANGKHOUANG
P.XAIGNABOULI
P.XAYSOMBOUN
P.VIENTIANE
VIENTIANE CAPITAL
P.BOLIKHAMXAI
P.KHAMMOUANN
P.SAVANNAKHET
P.SALAVAN
P.KEKONG
P.CHAMPASAK
P.ATTAPU

128. The government has identified the direct causes for deforestation as unsustainable shifting cultivation, uncontrolled logging and conversion to agriculture and other land use with the underlying causes of wide spread poverty, rapid population increase and weak law enforcement (MAF, 2005). Nevertheless, the government aims to achieve 70% forest cover by 2020 (FAO, 2009). In addition to deforestation, MAF and NAFRI have been concerned about insect damage on tree plantations and natural forests.

129. Regenerating vegetation, which consists of bamboo and fallow land of shifting cultivation, has also declined in recent years (2000-2015) by an average annual rate of 4,500 ha. Forest plantations including those of acacia, eucalypts, teak, and rubber developed at an average annual rate of 8,000 ha over the same period.

4.2.7 Irrigation System

130. Sub-component A.3 aims to enhance irrigation service and water productivity in the targeted project area, in order to support agriculture commercialization and enhance climate resilience. It is comprised of three major activities: (i) improvement of irrigation canals (main, secondary and tertiary canals, pontoons, pumps, motors, structures, pipes, changing electricity wire, etc.); (ii) establishment and re-organization of water users' associations; and (iii) capacity development on irrigation O&M. An indicative list of 71 irrigation schemes and 25 groundwater management groups have been proposed by the provinces to be supported by the project. Out of the total 71 irrigation schemes in targeted provinces, 51 are pumping irrigation schemes taking water from the Mekong and its tributaries, 15 are gravity irrigation schemes supplied by small weirs, and 5 are gravity irrigation schemes fed by reservoirs. In those 71 irrigation systems, detailed repairs will be defined in detailed at survey and design step. At this initial stage, it is tentatively projected that upgrading and rehabilitation of existing irrigation infrastructures may include: (i) 43 distribution structures such as water gate, diversion boxes, regulation; (ii) a total of 36 floating pump pontoons (iii) a total of 51 electric pumping units and 70 motors out of 102 existing motors (iv) a total of 5 km of flexible discharge pipes, (v) and a total of 159 km of canals. The 25 groundwater management groups are village groups using groundwater for vegetable irrigation. Rehabilitation plan as well as environmental and social screenings will be carried out for each scheme during project implementation to ensure they are in full compliance with the World Bank's social and environmental safeguards prior to implementation.

131. Out of the target 71 irrigation subprojects, 5 canal upgrade subprojects are related to dams as they rely on water supply from dams. The other 15 gravity irrigation schemes are weir or check dams that do not create any water storage or reservoir. Thus, they do not qualify as dam structure. Below is the list and main characteristics of the 5 irrigation reservoirs:

Table 12. Indicative list of reservoir irrigation systems

	Province	District	Reservoir Name	Dam Height	Dam crest length	Storage capacity (million cu.m)
1.	Vientiane	Thoulakhom	Nam Phot	18 m.	2,101 m.	16.0
2.	Sayabouly	Sayabouly	Nam Tien	28 m.	628 m.	28.0

	Province	District	Reservoir Name	Dam Height	Dam crest length	Storage capacity (million cu.m)
3.		Sieng Hone	Nam Mao	21 m.	180 m.	8.3
4.		Sayabouly	Houay Khen	20 m.	150 m.	2.23
5.	Bolikhamxay	Borikhan	Nam Kap	13 m.	220 m.	4.34

132. The above information indicates that all 5 reservoirs headwork classify as large dams as per the World Bank Operational Manual OP 4.37 for Safety of Dams. The project interventions do not intend to do any repair or change on the irrigation reservoir headwork themselves. But the reservoirs are expected to be used as the main source of irrigation water supply to the target command cropping areas. The proposed interventions focus on increasing water management efficiency in the distribution network. The rehabilitation works will consist in upgrading existing earthen canals to concrete lined canals or U-shape brick masonry canals. Associated regulation and distribution structures will also be included; their number and exact position will be decided in conjunction with the Water Users Groups at detailed survey and design stage.

133. To comply with Dam Safety requirements and due diligence, the following preventive measures are included in this ESMF and will be carried out during project implementation: (i) conduct dam inspection (see Terms of Reference of Panel of Expert in Annex 7) (ii) assign detailed roles and mandate for dam inspection to the relevant agencies and organizations (iii) strengthen capacity of technical staff in charge of dam inspection, operation and maintenance (iv) improve the inspection procedure and the reporting system. It is expected that the repairs in those sub-project irrigation canals downstream of 5 dams will not occur before the third year of project implementation so it will provide sufficient time to comply with Dam safety requirements and due diligence.

134. Building on the initiatives taken by various government and donor investments on irrigation and drainage improvement in the targeted project area, this Sub-component is proposed to complement all the implemented, on-going and planned infrastructure investments, to focus more on completion of downstream and on-farm systems, and improvement of the remaining key bottlenecks, which are critical to realization of commercialized agriculture production. Below are indicative interventions summarized below:

- **Activity 1:** Improvement of irrigation infrastructures in 71 systems will include: (i) rehabilitation of 43 distribution structures; (ii) replacement of 36 pump pontoons; (iii) repair of 51 pumps and 70 motors; (iv) rehabilitation of 5 km flexible discharge pipes; (v) and a total of 159 km of canals.

- **Activity 2:** Establishment and re-organization of water users' associations, including (i) re-organization and strengthening of 44 WUAs for the targeted irrigation schemes; and (ii) establishment and strengthening of 31 WUAs for the village vegetable groups.

- **Activity 3:** Capacity development on irrigation O&M, including trainings to: (i) 36 irrigation professionals, mainly DAFO irrigation staff in the project districts; (ii) 702 WUAs members of the irrigation schemes and village vegetable groups; and (iii) 8,290 irrigation farmers.

135. Major benefits expected from implementation of this Sub-component are improvement of the existing irrigation command area and restoration of lost command areas due to unreliable water supply and deterioration of infrastructure systems in the past decades. Total current irrigation command area of the targeted irrigation schemes and groundwater management groups are 23,712 ha in wet season and 16,785 ha in dry season. After project implementation, the total command area will be 25,716 ha in wet season and 20,852 ha in dry season, which means a restoration of command area by 2,004 ha in wet season and by 4,067 ha in dry season. Together with the effects of institutional strengthening and capacity development, these will consequently improve irrigation service, promote crop diversification, enhance water productivity, reduce fertilizer use and energy consumption, and increase farmers' income.

136. While specific interventions in the LACP will tentatively include the replacement of pontoons, pumps, pipes, and motors, and the rehabilitation of canals (e.g. lining of canals that were previously earthen canals), pipes and structures, any restorations would occur within the existing system. They would not involve:

- Changes to/construction/rehabilitation of dams
- Changes to/construction/rehabilitation of reservoirs
- Widening canals beyond their original design
- Extending canals beyond their original design

137. Moreover, the above lists of proposed schemes are only indicative and are still subject to technical, social, environmental screening during implementation to ensure selection of only those most suitable for investments.

4.3 Agriculture in Proposed Project Provinces – An Outline

Rice production:

138. Rice farming practices vary and depend on social and environmental conditions at the village level. In irrigated areas where rice farming is mainly done for selling/commercial purposes, farmers are using improved rice varieties (DTK-11, DTK-8, TSN-7 and VTE-450). Improved rice varieties are of high yield compare to the traditional varieties and they are able to grow well in both rain-fed and irrigated environments, while local rice varieties (Hom-Mahaxay, Doryuane, Dorkhao, Sanpatong, and Dorkmai) are resistant to pests, suitable in flood prone areas, unfertile soil and good taste. There are early and late maturity varieties. Normally, farmers in a village use mixed types of varieties including early, medium, and late maturity rice varieties to avoid competing labor during the harvesting period. The traditional rice varieties are resistance to pests. When they are grown in the rainy season, farmers often do not have to use pesticides for pest control. In many target villages, most farming activities are done manually (i.e. broadcasting, transplanting and harvesting, etc.).

139. In the last decade, more farmers are adopting improved rice varieties and applying chemical fertilizers to improve productivity and adopt intensive cropping systems. However, intensive rice farming is still facing problems of soil degradation, pest outbreaks, and high investments. In addition, farmers still have limited access to good quality seed. It is often hard to ensure the purchasing of quality seeds, particularly from uncertified Seed Multiplication Centers.

Table 13: Current and Recommended Agricultural Practices for Rice

Parameters	Farmer' practices	Recommendation technology
Seed	Farmers are keeping seeds from generation to generation. They use seeds at a high rate (80-150kg/ha)	Use good quality seed (purity, good germination, no contamination, homogenous type, suitable with paddy field and environmental condition). Seed rate should be 45-60kg/ha. Treat with *Dithane M-45* and *Benlate* at the rate of 3 grams kg-1 for fungus.
Variety selection	Use the same rice variety as previous season	Screen for the suitability of rice varieties (high yield and resistance to pests), use two or three varieties for rain-fed and irrigated areas.
Soil preparing	Plough soil and harrow on the same day in submerged soil conditions for transplanting.	Plough soil two weeks in advance for composting vegetation without water, harrow afterwards in muddy conditions (i.e. not much water)
Transplanting	Use old seedlings (25- 40days), number of seedlings per hill is 5-7, spacing is 30-40cm.	Use young seedlings (15-25day), use 2-3 seedlings per hill, spacing is 25 x 25cm.
Fertilizer application	Apply organic fertilizers two months before ploughing (200 -500kg.ha)	Apply one week before ploughing with 10 tons/ha
	• In rain-fed environments: do not apply chemical fertilizers. • In irrigated environments: mainly use fertilizers with formula 46-00-00, 16-20-00 and 15-15-15 (Urea-Phosphate-Potassium), rate of application depends on crop performance, otherwise it is about 150-200kg/ha.	• In rain-fed environments: recommended to apply 100kg of 46-00-00 (split into two times 25 and 45 days after transplanting (based on leaf color chard) and 100kg of 16-20-00 as basal and apply leguminous seed after harvesting with rate 10-20kg of seeds. • In irrigated environments: apply 100kg of 46-00-00 (split into two times 25 and 45 days after transplanting and 50kg of 16-20-00 mix with 50kg of fertilizer formula 00-00-60 apply as basal, and 50kg of 16-20-00 apply 10-day after transplanting. Leguminous seed after harvesting with rate 10-20kg of seeds.
	No burning and wind flowing out.	After harvesting: rice stump and other crop residues will be decomposed by used cellulose solubilizing micro-organisms.
Weed control	Hand weeding	Use rotary machine.

Parameters	Farmer' practices	Recommendation technology
Water management	Irrigate after transplanting and keep the paddy plot submerged for the whole cultivation period.	Keep moisture up to one week and submerge paddy plot for one week and release water one week before applying fertilizer.
Pest management	No pest observation until outbreak	Weekly monitoring by using light trap at vulnerable periods and applying botanical control agent before an outbreak.
Harvesting	Farmers observe by looking at plant colour.	• When 80–85% of the grains are straw-coloured (yellow in color). • In the dry season, harvest 28–35 days after heading. In the wet season, harvest 32–38 days after heading.
Post-harvest	Sun-dry for two days after hand harvesting, after that pilling and threshing after threshing machine available.	Use combine harvesters and rice grains will be dried on specific sun pad or use dryers and keep paddy after get 14% of moisture.
Storage	No clean storage, in some corners they keep rice seed and old rice for consumption.	Rice seed and paddy rice for consumption will be kept separate. For paddy rice for sale, farmers contact to business partners come to take it. Moisture content is 12–13% 8 to 12 months. Insect bags, bulk, or hermetic containers.

Maize production:

140. For decades, farmers in the target provinces have been producing maize, predominantly for export to neighboring countries like Thailand, Vietnam, and China. Domestic consumption of maize is minimal. Farmers use hybrid maize varieties from Thailand (QQQ, 888, 777, and others) and Vietnam (LVN-10). Soil conditions are a very important factor in maize growing in the target provinces. Continuous mono-cropping affects pest outbreaks, the soil's chemical and physical properties, and results in low productivity. Current practice is for farmers to use tractors for ploughing soil; practice high-density planting (e.g. using 20-25kg of seeds/ha); apply herbicides for weed control; and harvest manually. Despite the productivity decline from 8 tons/ha to 4.5 tons/ha and high labor costs, farmers continue to grow maize. Nevertheless, there are no alternative crops introduced in this area with which to generate income. Current problems with maize production include declining soil fertility, increased agriculture inputs, and labour costs (e.g. for harvesting, one ha needs at least 20 labors). To minimize investment costs, farmers are using machines in farming and apply herbicides to control weeds.

Table 14: Current and Recommended Agricultural Practices for Maize

Parameters	Farmer' practices	Recommendation technology

Parameters	Farmer' practices	Recommendation technology
Seed	Use hybrid seed, use 20-25kg/ha of seed	Use hybrid seed about 15-18kg/ha
Variety selection	Use variety providing by traders	Use suitable varieties after testing
Soil preparing	Plowing in horizontal direction of sloping	Plowing in vertical direction of sloping
Growing	Use direct seeding machine, but do not identify suitable spacing and density	Use direct seeding machine, spacing between plants is 20-25cm and between rows is 75cm or 80cm depend on variety.
Fertilizer application	Farmer doesn't apply fertilizers	Apply optimum chemical fertilizer formula 46-00-00 120-150kg/ha after 25-30days and 45-50days AG and 15-15-15 150- 180kg/ha. Use leguminous crops for rotation, mulch keeping and minimize tillage.
Weed control	Plowing, use herbicide to control weed	Plowing, rotary using
Water management	Farmers are growing in rain-fed environment only	Will introduce drought tolerance variety; improve soil water holding capacity by mulch and farm's residual keeping.
Pest management	Farmers don't apply any technical measures to control pests.	Introduce integrated pest management, use tolerance varieties, apply crop rotation, intercropping and apply bio control agents.
Harvesting	Manual harvesting	Use combine harvesters
Post-harvest	Sun-dry at plantation	Will introduce both dryers and sun-dry means.
Storage	No measures to control pests	Keep low moisture (15%), cleaning warehouse.

Vegetable production:

141. Farmers from many types of vegetable crops during the dry season. Given that some vegetable crops are not resistant to rain, growing during the rainy season requires the use of a greenhouse. Growing vegetables in greenhouses is of high cost, so it is suitable for high value crops only. Dry season vegetable growing is also prone to insect attacks. The main vegetable insects include *flea beetle, Colden bug, vegetable Caterpillars, Leaf folder and Aphids*. Farmers' lack of technical information and knowledge makes it hard for them to produce good quality vegetables during both the rainy and dry seasons.

Table 15: Current and Recommended Agricultural Practices for Vegetables

Parameters	Farmer' practices	Recommendation technology
Seed	Purchase from agriculture shops.	Produce seed in dry season during which prices of vegetables drop.
Variety selection	No selection process.	Select high value varieties, resistance to pests.
Soil preparing	Use hoe to prepare plots.	Introduce machine to prepare soil and make plots
Planting	Hand planting.	Hand planting
Fertilizer application	Purchase farm's wastes and produce organic fertilizers.	Introduce various sources of materials for compost making, use micro-organisms to fix nitrogen and solubilizers and optimum chemical fertilizer apply cation.
Weed control	Hand weeding.	Hand weeding.
Water management	Conversional method (use water pipe for watering).	Moisture control system, improve water holding capacity, apply infiltration systems.
Pest management	Botanical control agents.	Bio-extract, botanical control agents, trap cropping systems and release predators.
Harvesting	Hand harvesting.	Hand harvesting.
Post-harvest	Washing and keep in baskets for distribution.	Introduce packing house, labeling
Storage		Cool room

5. EXISTING ENVIRONMENTAL ISSUES RELATING TO AGRICULTURAL PRODUCTION

5.1 Environmental Issues

5.1.1 Utilization of pesticide and chemical fertilizers

142. During the field investigations, a range of fertilizer application rates were reported. Farmer groups said that farmers in the area of Mahaxay village use NPK fertilizer at about 100 kg/ha for the dry season. Fertilizer is most commonly associated with HYV varieties of rate on the dry season crop. FAO reports that the recommended application rate for HYV rice is 90 kg N, 90 kg P and 60 kg K per ha. Overuse of fertilizer in Lao PDR is not a prevalent issue in Lao PDR at present as described in 4.2.4.

143. There is no major issue found related to chemical fertilizer utilization in rice farming in Lao PDR as described on section 4.2.4. However, insecticide is commonly use in association with high yield rice varieties planted along the Mekong River. *Methyl parathion* and *Diazinon* are used to control Brown Hopper, rice bug, and stem borer infestations. The main issues on insectoids uses are (i)

impropriate use and (ii) insecticide containers management, which may impact on environment and human health.

144. Herbicides are generally applied in one or two applications per cropping season. The main application is on maize farming areas, such as Sayaboury province, and in other provinces for banana plantations. Commonly found in the local market include: Glyphosate-Isopropylammonium, Paraquat Dichloride, 2,4-D-Dimethylammonium, Atrazine and Acetochlor.

145. **For vegetable production.** Long yard bean; cucumber; tomato; chilies; cauliflower; broccoli; cabbage; Chinese Cabbage; collard green; bok choy; and choy sum are mostly affected by insects invasion and need insecticides applications. Main pests include the flea beetle, Colden bug, vegetable caterpillars, leaf-folder and aphids. To prevent insects, some farmers apply insecticides, such as Lannate 90-Methomyl; Sevin 85%; Thamalone; Bydin 24%; Cypermethrin; Cholrpyrifos; Abamectin; and sulfur. The highest value vegetables are coriander, lettuce and shallot, which are growing in greenhouses and low insecticides application.

146. During the field discussions, inappropriate use of herbicides/pesticides has been reported. Improper use of pesticides and other chemicals in agricultural production, including those for preservative purposes, has been a significant limiting factor to the competitiveness of agricultural products in Lao PDR. Farmers are not well informed about banned herbicide/pesticides, while enforcement to control providers is weak and limited.

Utilization of Pesticides at Rice Mills

147. Most of the rice mills located in the project areas are small scale, with a capacity of 1-2 tonnes per day. Currently, there is no pesticide use at the rice mills and associated storage facilities. It is not a common practice to keep commodities at the storage facilities for more than a day, nor is it common practice to conduct fumigation. The maximum duration for rice storage at the storage facilities is 7 days.

Rice mills in targeted district

5.1.2 Farm Waste Management

148. Farm wastes from project activities comprises of rice husk, rice straw, maize stem, maize cob, and vegetable wastes. Rice straw and risk husk as well as maize stem are commonly decomposed in the field and reuse as mulch. Maize cob and vegetable wastes will be processed for animal feeding.

149. As herbicide is a common practice in the Northern provinces, including Sayaboury province, hazardous waste, such as herbicide containers, are usually left and buried in the farm areas where animals and people can come into contact with them. Currently, lack of farmers' awareness and unavailability of solutions (including technology and resources) have been major constraints for treatment of agricultural waste and hazardous waste materials.

5.1.3 Waste Management for Vegetable Packaging

150. Waste from vegetable packaging is not an issue for Lao PDR due to the small scale of processing agri-businesses. Waste from vegetable packing includes wastewater from the cleaning process and vegetable waste. Vegetable waste will be recycled as feed for livestock-raising and/or decomposed, as per common practice. No plastic waste arises from this type of business.


Vegetable packaging facilities in Vientiane Capital

5.1.4 Ineffective Irrigation Systems

151. Recent weather irregularities, such floods and droughts, have impacted the irrigation systems in Lao PDR. Most irrigation systems in the project areas have been damaged and are deteriorated because of the climate situation. As such, the systems can no longer allocate and provide sufficient water to existing and proposed agricultural areas. While many irrigation systems have been rehabilitated, some projects have not had adequate budgets for operations and maintenance (O&M). Without O&M, the systems have fallen into a state of disrepair and cannot meet the needs of increased levels of crop production required for commercialization. Some project areas are rain-fed areas with no irrigation scheme available for crop production, which brings food insecurity.

5.2 Available Options for Improving Traditional Agricultural Practices

152. **For rice production:**

- Use good quality seed and varieties which are adaptive to environmental conditions (i.e. pest resistance, flood and drought tolerance, high market demand);

- Introduce new agricultural techniques and technologies with low investment costs, such as direct seeding; drum seeders; wet and dry direct seeding; transplanting machines; and other technology;
- Introduce soil fertility management by using leguminous crops after harvesting; practicing crop rotation; using green manure, compost, and decomposed farm residues; applying organic fertilizers to paddy fields; and optimizing fertilizer application;
- Use integrated pest management (IPM), apply bio-control agents and biological extracts, conduct pest monitoring with used light traps, diversify crops, and use pest resistant varieties, break the life cycle of pests, produce and release predators.
- Apply water management techniques, wet and dry technology, introducing water holding capacity.
- Introduce new agriculture machinery such as rotary for weeding, transplanting machine, harvesting machine or combine and dryer for improve paddy rice quality.
- Conduct demonstration plots, organize farmer field schools, sharing information and access to technology information.

153. **For maize production:**

- Selection good quality and suitable varieties adaptive to local environment.
- Improve soil quality by using crop rotation, intercropping, and mulch keeping, decomposed farm residues, and introduce nitrogen fixation and phosphate solubilizing microorganisms, optimum fertilizer application.
- Introduce trapping crop for minimizing insects, use IPM; apply bio-control agents and biological extracts.
- Introduce machinery for controlling weeds, harvesting and drying after harvesting.
- Conduct demonstration plots, organize farmer field schools, sharing information and access to technology information.

154. For vegetable production:

- Introduce off-season vegetable cultivation.
- Seed production in dry season.
- Apply agriculture tools for preparing plots, watering systems.
- Introduce organic fertilizer production and bio-fertilizer application.
- Improve water holding capacity, apply water infiltration systems
- Use botanical control agents and botanical extracts to control pest, product predators and release at vegetable plantation.
- Introduce packing technology and cool rooms.
- Setting up crop calendar and vegetable menus for marketing.
- Conduct demonstration plots, organize farmer field schools, sharing information and access to technology information.

155. Many farmers have recently indicated willingness to grow organic vegetables and employ Good Agricultural Practices (GAP) due to the high market value of organic produce and the increased safety for farmers associated with the associated reduced pesticide and herbicide use. One of the constraints in growing organic and GAP vegetables is the certification process – specifically the quality management, which is required in marketing the products.

6.0 POTENTIAL IMPACTS

6.1 Environmental Impacts

156. The ACP has been designed with various activities including research and technology transfer, supporting businesses by establishing partnerships, and investments on small scale infrastructure, etc. Overall, the ACP is expected to bring about major positive impacts as the overall objectives of Project activities are to increase the competitiveness of agricultural products and create better access to more stable markets for farmers, thus improving income security for farmers. On the other hand, Project activities under Component A also aim at reducing the impacts of traditional agricultural farming practices (by promoting the application of IPM and GAP) and trialing more environmentally-friendly farming models, including options for agricultural waste treatment.

157. Beside these major positive impacts, the ACP may also cause moderate negative impacts. The potential negative impacts have been assessed by means of site visits, discussions with local authorities and beneficiaries, and the use of secondary sources for information. This section summarizes the potential environmental impacts and required mitigation, which will be incorporated into Environmental Management Plans prepared for any subprojects, as required. The potential environmental issues and concerns identified were: (i) environmental effects of agricultural activities, (ii) small scale infrastructure works, and (iii) solid waste management from agri-business processing. Each of these concerns are detailed below.

Component A: Improved Agriculture Efficiency and Sustainability

158. Under Component A of the ACP, there may be some investments in small-scale civil works for irrigation scheme rehabilitation (e.g. canal networks), improving pumping stations for irrigated paddy field and diversified crops and on-farm demonstration sites (e.g. fencing, roofing, and watering systems). Considering the small scale and localized nature of the demonstration models, it is expected that only minor impacts, such as increase local noise and dust levels, may occur, and some waste may be generated on-site. These minor impacts can be mitigated and appropriate mitigation measures will be implemented at sites that close to houses and/or sensitive receptors. In cases where increased dust levels may affect people, farmers will spray water to reduce dust level. Safety for farmers during installation of these works must be taken into consideration, otherwise accidents such as falling into excavated channels, holes, or electrical shocks may happen. The mitigation measures proposed in Section 7 shall be carried out by farmers to prevent these risks.

159. Similarly, environmental impacts of demonstration cultivation farms should also be considered with respect to the broader picture. The main environmental issues regarding cultivation would relate to the use of chemical fertilizers, herbicides/pesticides, and environmental pollution due to waste generation. Improper use of herbicides/pesticides and other chemicals will lead to health hazards for those who have direct or indirect contact with the chemicals and/or are consuming products containing chemical residues exceeding recommended limits. The measures for mitigating the impacts of herbicides/pesticides practices (IPM and PMP) as well as GAP were described in Section 8.

Component B: Enhanced Agriculture Commercialization

160. Under this component, the Project will provide financial assistance to co-finance the

implementation of partnership business plans, including investments in advisory services and long term assets (e.g. goods and works) enhancing post-harvest and production activities of the potential partnerships. There may be some investments in small-scale civil works for improving of rice mill facilities, construction of small scale storage facilities, small cold room, and value added processing facilities such as vegetable packaging house. Good engineering practices, clean technology will be applied to avoid and minimize the adverse impact from the implementation of these activities. Appropriate refrigerants (non-Ozone Depleting Substances-(ODS) and low Global Warming Potential (GWP) substances) will be selected taking into the consideration of the non-eligible activities listed in Annex 1 to reduce the impact from project activities to climate change.

161. At the time of EA and ESMF preparation, some proposed types of partnerships and details on production activities to be supported by the LACP have been suggested; specifically: rice mills, seed graders, and storage facilities. Subsequent impacts from those activities have also been considered and are detailed below:

(a) Rice mills: Due to its small scale (maximum capacity about 1-2 ton/day), the impact from dust, noise pollution, and rice husk waste are considered minimal in their effect on human health and environment. Particulates are generally of large size, so they deposit rapidly without long distance drift; dust emissions are of no specific damage to health (non-toxic), nor does the fallout despoil surfaces. Cyclone separation is an effective removal mechanism for small mills, sometimes in series (cascading cyclones); larger mill need to install bag filters.

(b) Post-harvest machinery is also associated with related safety issues. Farmers and agribusiness workers may be trained on how to operate machinery, including proper use and regular maintenance.

(c) For cold room facilities, ODS based-refrigerant with high GWP may be used that may cause negative impact to climate change. Under this component, selection of refrigerants for cold room facilities will be taken into an account to minimize the negative impact to the global warming issue.

(d) For vegetable packaging, wastewater from cleansing process should be minimized.

Component C: Project Management

162. This component would provide equipment and incremental operating costs for project monitoring, financial management, and procurement activities; ensure compliance with the safeguards; support the short and long-term technical assistance to the project management team in selected areas; and support analysis and dissemination of findings related to the effectiveness and challenges associated with the different institutional and technical models being applied or piloted under the project.

Table 16. Anticipated impacts from the Implementation of the Project

Impacts/Issues from Proposed Project Activities	Descriptions of Impact

Improved Agriculture Efficiency and Sustainability	
1.1 Excessive application of fertilizer.	Overuse of fertilizers may lead to eutrophication of downstream water bodies.
1.2 Overuse of herbicides/pesticides	Overuse of herbicides/pesticides may cause damage to untargeted species and deteriorate the environment.
1.3 Small scale infrastructure works	1.3.1 Effects of the construction of temporary vehicle access track.
	1.3.2 Temporary closure of the irrigation system
	1.3.3 Release of silt
	1.3.4 Dust and noise generation from the construction
	1.3.5 Effects of intensified agricultural production
	1.3.6 Obstruction of water flows in the canals from sediment or other deposits
Enhanced Agriculture Commercialization	
Postharvest type of equipment	Recycle use of agriculture waste
Post-harvest technology and practice	Safety issues due to unfamiliar with technology
	Solid waste such as rice husk, corn core, and job-tear husk
Rice mills	Dust, noise pollutions and rice husk waste are present from milling but considered slightly impact on human health and environment.
Introduce qualified rice seed for farmers	Increase yield and avoid using more chemical fertilizer
Improved productivity	Misuse of chemical fertilizers and pesticides negatively affect soil and water quality, causing health and pollution problems. Removed pressure to forest increases biodiversity.

6.2 Social Impacts

163. The project impact is anticipated to be overall positive given that project will provide farmers with opportunities to a) learn new farming knowledge and access high quality seed, b) improve their income by diversifying their crops on the basic of local knowledge and practices, c) work together with their fellow farmers to supply their farm product to private companies under productive partnerships, d) benefit from improved irrigation systems, and e) improved nutritional status for their families. Through

various project activities at community level, there would be more opportunities for men and women to participate in project planning, implementation, monitoring and evaluation. Ethnic groups will be included have chance to participate in continuous consultation of the project to become beneficiaries. They can choose to join project activities that are appropriate to them in terms of farming practices and their culture.

164. In terms of adverse impact, the adverse impact is envisaged to be minor. Of the three project components, component A (Improved Agriculture Efficiency and Sustainability), is the one that could potentially result in land acquisition because of construction activities that will be done to rehabilitate existing irrigation systems. Based on the nature of the rehabilitation work, and the scope of work, no physically resettlement is envisaged. However, minor land acquisition (permanent and temporary) is anticipated as lining activities is done for existing water channels that may affect land and crops of local people. Some temporary minor non-land impact, such as noise, dust, temporary disruption of water access for small agricultural area, are anticipated, which may affect agricultural production or income generation activities of local peoples (local shops, businesses, etc.). Loss of land or access to resources in relation to mapping, demarcation, and registration of irrigation land/systems in the project area on a block basis (e.g. the process disregarding land under customary management and/or fallows) are likely. However, the likelihood of occurrence is low because of the nature of this exercise.

165. **Gender analysis**: A gender analysis was conducted for this project to **identify gaps** between males and females in agricultural production. Then, on the basis of the identified gaps, **assess the extent** to which the identified gaps are likely to affect the likelihoods of achieving the intended project development outcomes and **propose actions** that close the gaps - to enhance the achievement of the intended results (outcome level). The results of the analysis, from both secondary data sources, and consultation with local peoples, indicated that:

- Division of labor between men and women in the project areas is similar to the traditional gender stereotype in Laos.
- Men assume heavy works such land preparation, fetching water, irrigation, and poisonous works such as pesticide spraying, attend community events whereas women undertake home roles, including child care, food preparation, feeding animal.
- However, empirical data indicated positive changes for the case of maize and rice farmers adopt contract farming, suggesting there is an intra-household adjustment of labor division to meet the requirements as agreed under the contract).
- Division of labor in contract farm model was adjusted towards optimization to overcome family labor shortage to be able to respond to contract requirements. This adjustment contributes to reducing work burden on women – on a daily basis - through reduction of time, while at the same time improving women's decision power given their increased influential role with regards to adoption of new technologies. This opens up opportunities to them to learn and socialize.
- **Agricultural extension.** Farmers however are not pleased with the current extension services – from both government (given the limited number of visits for technical support), and from the millers, who did not provide them technical support as they wished.
- **Contract Agreement and Trust**. Farmers rely on millers/retailers who provide them agricultural input (for their crop). However, they think the prices they got paid by millers are very low. Also, risks of crop failure are not shared by millers. This also affect the way they set up the contract. Farmers tend to prefer verbal agreement, which allows them chance to sell their

rice (upon harvest) at a higher price with other millers (not with the miller they make verbal agreement with at the beginning of the crop).

- **Lack of organization of contract farming.** Interview with farmers at the study sites suggested that they are dealing with miller on their own, not as a group which affect their price negotiation power.
- **Nutrition.** Farmers use most of the food they grow to ensure nutrition for their families. However, many farmers who focus on main crop may not have a diversity of foods to ensure well balanced diet for their family.

7.0 MITIGATION MEASURES & APPROACH TO ENHANCE POSITIVE IMPACTS

Environment

166. This section discusses about impacts and mitigation from two prospective components. The first component, Component A, focuses on improved agriculture efficiency and sustainability that will be generated. Impacts are considered with respect to the agricultural production activities and the small scale civil works. Following table is described the impacts and mitigation measure from the agricultural production activities.

Table 17. Proposed Mitigation Measures

Potential Impacts/Issues	Mitigation Measures
Improved Agriculture Efficiency and Sustainability	
Excessive application of fertilizer	Application of appropriate extension technology through the agriculture extension agencies. Provision of IPM and GAP procedures and train to farmer groups at demonstration sites.
Overuse of herbicides/ pesticides	Provision of IPM and GAP procedures and train to farmer groups at demonstration sites. Use proper equipment on days with no wind and rain.
Introduction of new crops and fodder or imported breeds	Promote tested species/breeds or hybrid seeds hat produce infertile offspring
Effects on homes and property	Completion of land acquisition and compensation tasks as detailed in the Resettlement Plan
Effects on homes and property	Completion of land acquisition and compensation tasks as detailed in the Resettlement Plan
Effects of the construction of temporary vehicle access track.	Completion of land acquisition and compensation tasks as detailed in the Resettlement Plan

Temporary closure of the irrigation system	Selection of the alignment of the access track to minimize extent of earthworks, necessary; securing of agreements with affected landowners
Release of silt	Adequate supervision of the works, (confining excavation works to the dry months, discretionary use of silt traps where warranted and careful placing of excavated material
Dusts and noise generation	Wetting of excavation sites and stockpiled material during dry and windy weather, when within 50m of an occupied dwelling
Effects of intensified agricultural production	instruction in purchase and use of pesticides, promotion of the informed use of mineral fertilizers, promotion of the concept of integrated pest management, and emphatic discouragement of the use of persistent herbicides/ pesticides
Obstruction of water flows in the canals from sediment or other deposits	Support to water user groups so that users discourage or prevent any placing of material or solid waste in the canals

167. Similarly, the impacts of issues relating to Component B – Enhanced Agriculture Commercialization are listed and the identified impact mitigation measures can be used during implementation stages. The following table shows the impacts and mitigation measures.

Potential Impacts/Issues	**Mitigation Measures**
Enhanced Agriculture Commercialization	
Increase quality of agricultural wastes Solid waste such as rice husk, corn core	Potential make composting and use as organic-fertilizer.
Safety issues	Training and demonstrate the procedure of post-harvest equipment for end users
Dust, noise pollutions and rice husk waste are present from milling but considered slight in their effect on human health and environment	larger mill need to install bag house. Rice husk can be composting and use as organic fertilizer.

Increase yield and avoid using more chemical fertilizer	Train farmer to improve rice seed and rice production technique
Misuse of chemical fertilizers and pesticides negatively affect soil and water quality, causing health and pollution problems. Removed pressure to forest increases biodiversity	Train farmers on environmentally appropriate farming practices. Promote organic fertilizers and integrated pest management techniques
Waste water from Vegetable packaging	Clean technology to reuse water for cleansing purpose (counter flow) and minimize waste will be applied.

Social.

Mitigation measures

168. The project will try to avoid all adverse impact, particularly physical resettlement, as a result of construction operations related to rehabilitation of irrigation channels. Avoidance of such impact could be done through selection of appropriate engineering design. However, since avoidance of such impact is not always possible, some permanent and temporary impact – related to land acquisition and construction operation, are anticipated. These impacts would affect local people's land, production activities, and livelihoods – either permanently or temporarily, or both for some cases. However, given the nature of the rehabilitation works (which focus on existing structures), these impacts are estimated to be minor, localized, and as such, manageable and reversible.

169. Where avoidance of such adverse impact is not possible, affected people will be consulted with and compensated for the impact in accordance with project's Compensation & Resettlement Policy Framework (CRPF). Subprojects (to be identified during project implementation) that result in the above impact will prepare a Resettlement Action Plan (RAP) in accordance with guidance provided in the CRPF. An abbreviated RAP will be prepared (instead of a full RAP) in case the number of affected people are less than 200 persons and there is no physical resettlement of people (Please see CRPF for detailed guidance).

170. In case where ethnic peoples are adversely affected as a result of land acquisition, or construction operations, they will be consulted in a free, prior and informed manner – as per project's EGEF, and are compensated for the loss of assets, and/or income in accordance with CRPF. Consultation with ethnic peoples will be conducted in the form of a social assessment - in line with the project's EGEF. The livelihoods restoration of the affected ethnic peoples is subject to project's monitoring and evaluation until a full recovery is confirmed.

Potential risks for ethnic groups:

171. For the potential risks related to potential limited effectiveness of project activities that target ethnic groups because of the lack of intervention methods that could fully and appropriately address the existing socio-cultural constraints of target ethnic groups so as to promote adoption of project recommended farming practices, free, prior and information consultation will be maintained during project implementation – for all project activities that target ethnic groups. This aims to assure

sociocultural concerns/constraints of target ethic groups are brought into consideration when designing and implementing intervention methods for specific activities, such as agricultural extension trainings, participation in productive partnerships, management of irrigation systems. Please see also Recommendation 1 (Section 5.2) for the approach to promote participation and ownership of project beneficiaries, including ethnic groups, to ensure activities provided to ethnic groups are culturally appropriate to them.

172. For the potential loss of land or access to resources in relation to mapping, demarcation, and registration of irrigation land/systems in the project area on a block basis (e.g. the process disregarding land under customary management and/or fallows). The risk is anticipated to be low because of the nature of the exercise will be primarily field observation and measurements – at land block basis. No physical intervention to land and on-farm activities of the farmers are envisaged. In cases where loss of land or limited access to farming resources arise as a result of this exercise, consultation with affected households will be conducted as per CRPF (as per EGEF for the case of affected ethnic households). Compensation will be made to affected households as per project's CRPF if such potential impact happen.

Approach to enhance development effectiveness.

173. As the World Bank focuses on the development effectiveness, and project's impact, it's important the following aspects be considered and mainstreamed throughout the project implementation.

174. **Inclusion**. Poor farming households, including poor ethnic groups, may potentially left behind in a way they could not become project beneficiaries in productive partnership, for instance, because of their small farm size, remote geographical location (hardly accessible), limited farming practices, cultural norms, and existing farming practices. Given this, criteria should be developed to provide opportunities for households who meet the criteria of participation into the productive partnership to receive benefit from the project. Criteria should be developed and be part of the Project Operations Manual to facilitate implementation, monitoring and evaluation. The World Bank Group defines social inclusion as:

(a) The process of improving the terms for individuals and groups to take part in society, and
(b) The process of improving the ability, opportunity, and dignity of those disadvantaged based on their identity to take part in society.

175. Social inclusion is an integral part of—and vital to—achieving the World Bank Group's twin goals of ending extreme poverty and boosting shared prosperity. To ensure the project promote social inclusion, the following aspects should be implemented carefully and consistently over the course of the project.

176. **Participation Criteria.** To ensure poor households and ethnic minority who meet minimum participation criteria have opportunity to benefit from the project, considerable weights should be given to criteria checklist to encourage the participation and the chance of success for poor/ethnic minority households who are keen to participate in productive partnerships.

177. **Participation Preparedness**. There may be households who meet all participation criteria but are not qualified in terms of farming experience/technology to meet the technical requirements set out by the productive partnerships. When screening for participation, these households should be

encouraged to attend training series - on both technical expertise and business protocol so that they could prepare themselves better. The project should also have such a preparedness plan improve the chance of success for farmers participating the partnerships.

178. **Consultations.** Meaningful consultations can contribute to improved design, implementation, and sustainability of development interventions. The objectives of consultation with project stakeholders, particularly with project beneficiaries include receiving input for improved decision-making about the design and implementation arrangements of a development project, to contribute to improved results and sustainability. In this context, consultations can potentially give voice to the needs of different target groups, including vulnerable and marginalized groups; improve risk management by identifying opportunities and risks from and to a project (World Bank, 2012b); and increase transparency, public understanding, and citizen involvement in development decision-making. Consultations with key stakeholders also including project-affected people and civil societies. While consultations are frequently used during World Bank project preparation, engagement is less systematic during implementation.

179. The Bank suggested that consultation should start with clear subject and purpose, adequate stakeholder representation and methods of consultation, and disclosure of and timely access to understandable, relevant, and objective information and documentation. Meaningful consultations also require stakeholder identification and analysis, including due consideration of representativeness and inclusion of women, disadvantaged, vulnerable groups, ethnic minority peoples. In addition, safeguard policies require adequate documentation of consultations as part of the project documentation. Consultation should also be informed well ahead of the event to enable participants to prepare themselves.

180. Governments need to make relevant information available to citizens in accessible and understandable formats, and to build the capacity and systems to provide adequate responses to citizen feedback. Citizens need to acquire minimum skills to engage, and they need to be interested in the issue.

181. **Information disclosure.** Open access to information does automatically lead to participation and impact, which also depend on such context factors as enabling legislation and grassroots activism. Information formats and activities need to be part of the design of citizen engagement processes and be based on an understanding of the target audience. Project information will be posted at community centers as well as disseminated through community meetings to ensure farming households who are potential beneficiaries of the project could study and participate as they wish. The Bank will ensure people in the project area have access to project's information to determine how they participate in the project activities. As a good practice, the Bank's suggested that the information provided be relevant (responsive to citizens' interests), timely (sufficient notice), and understandable (language, format, and local context).

182. **Languages.** Ethnic minority groups may be potentially excluded simply because the language used during information sessions, consultation meetings, trainings, project planning sessions are not in the language that they use on a daily basis. According to World Bank (2013, Inclusion Matters), language is an important aspect of identity and claim to political and cultural space. Language can thus be an important driver of both exclusion and inclusion. Thus, consideration should be given to frequent use of local languages during consultation, meetings, and trainings with the participation of ethnic minority groups.

183. **Sociocultural norms.** Social norms can considerably affect that way men and women participate in training. Social norms contribute to establishing farming practices. Thus, changing a current farming practice mean changing a social norm that is deeply rooted in one's belief system, which may affect farmers' social network that is close to them, such as their family members, relatives, friends, neighbors, their business partners. Women in Laos spend remarkable amount of time doing house chore and farm works. They are considered appropriate more for the household role. As such, more men (than women) attend events (meetings, trainings, etc.) outside their home. Under the project, depending on the training topics, women should be encouraged to participate as they apply the knowledge to make a joint decision with their husband.

184. **Grievance Redress Mechanisms (GRM).** GRMs are increasingly recognized as a means to address complaints early on and manage risks in project preparation and implementation before they escalate providing multiple channels for soliciting complaints; registering complaints in a log; publishing timely and service standards for acknowledgement, response, and resolution; and ensuring transparency about the grievance procedure as well as options for mediation and appeal. The capacity of local and national institutions to address grievances also needs to be assessed. Staff training on GRMs is being rolled out.

185. **Gender Mainstreaming.** Women play an important role in agricultural production. However, most of the time and effort they made usually go unnoticed. By having women participating more in capacity development activities, particularly in technical trainings, women can improve crop yield, diversify their crops, and thus, increase their income and family's nutritional status. Promoting the participation in agricultural production and agribusiness are important in the context of the changing market in Laos that requires higher quality of farm produce, and stable supply to develop the supply and value chain. A specific action plan for gender mainstreaming is of high importance – not only for households who are affected because of land acquisition but also for households who benefit from agricultural training and productive partnerships (Please see Gender Action Plan and Monitoring Plan from Annex 3 of Social Assessment report, and the suggestive Gender Action Plan for land affected households at Annex 4 of Social Assessment report.

8.0 GOOD AGRICULTURAL PRACTICES (GAP), INTEGRATED PEST MANAGEMENT (IPM); PEST MANAGEMENT PLAN (PMP) AND SUSTAINABLE FARMING PRACTICES

8.1. Good Agricultural Practices

186. GAP in Lao PDR is currently focused on food safety, sustainability for the environment, and economic sustainability. A multiplicity of Good Agricultural Practices (GAP) codes, standards and regulations have been developed in recent years by the food industry and producers' organizations, as well as by governments and NGOs, who have all aimed to codify agricultural practices at farm level for a range of commodities. Their purpose varies from fulfilment of trade and government regulatory requirements (with particular regard to food safety and quality), to more specific requirements of specialty or niche markets. The objective of these GAP codes, standards, and regulations include (to a varying degree):

- ensuring safety and quality of produce in the food chain
- capturing new market advantages by modifying supply chain governance
- improving natural resources use, workers' health and working conditions, and/or
- creating new market opportunities for farmers and exporters in developing countries.

187. Good Agricultural Practices are "practices that address environmental, economic and social sustainability for on-farm processes, and result in safe and quality food and non-food agricultural products" (FAO COAG 2003 GAP paper). These four 'pillars' of GAP (economic viability, environmental sustainability, social acceptability and food safety and quality) are included in most private and public sector standards, but the scope which they actually cover varies widely. The concept of Good Agricultural Practices may serve as a reference tool for deciding, at each step in the production process, on practices and/or outcomes that are environmentally sustainable and socially acceptable. The implementation of GAP should therefore contribute to Sustainable Agriculture and Rural Development (SARD).

188. At present, agricultural farming in Lao PDR is still largely subsistent or low input - low output. According to the government's 8th NSEDP, the future push of the agriculture sector is on commercialization based on land-use planning, focusing on rice self-sufficiency, and aiming to increase yields of key prioritized commodities for domestic consumption and export. This is the current trend and it will be accelerated in the coming years. However, agriculture commercialization in a country where 70% of the labor force is employed by the agriculture sector with average landholdings of 1-2 hectares is not straightforward. This requires nuanced efforts to ensure the expected efficiency, equitability, and sustainability. Lessons learned from neighboring countries in the region indicated that increased use of inputs in farming do not necessarily result in increase in profits and incomes for farmers. Lessons from rice farming Vietnam showed that farmers used certified seeds and adopted sustainable farming practices (i.e. reduced fertilizers, pesticides, postharvest losses, and water use) could obtain higher profits about 20-30% thanks to higher quality of paddy, increased yield by 5-10 percent, and reduced production costs by 20-30 percent. Therefore, investments and efforts to improve quality and value of agricultural products and reduce postharvest losses and production costs for farmers should be the right direction to enhance competitiveness of farmers and sustainability of the agriculture sector in the long run.

8.2 Integrated Pest Management

189. Integrated Pest Management (IPM) refers to the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms.

190. Under the Ministry of Agricultural and Forestry, the Plant Protection Centre and its branches in the provinces as well as the Agricultural Extension Centres at district level are the authorities coordinating and working on Integrated Pest Management Programs. The National IPM program was

initiated with assistance from FAO, DANIDA and other donors since the early 1990s and is largely being continued national resources.

191. IPM activities implemented by these local authorities and technical backstopping by experts from DOA include conducting field surveys, preparing forecasts, monitoring and checking the progress of main pest development in the field. Using the forecast based on the timing, scale and level of damages that the main pest(s) may cause, the provincial plant protection authorities recommend policies, plans, and measures for pest management.

192. They also conduct training to farmers to carry out sets of integrated measures such as pest identification, pest control, conduct pest analysis, pest list and pest surveillance, measure to control and apply chemical and botanical control agent, promote the application of biological measures for pest management, reduce chemicals and practice sustainable IPM. They also provide training for farmers on proper use of chemical pesticide to ensure high efficiency for pest management, safe for human beings, farm pests and the environment. These authorities also carry out communication campaigns on plant protections and quarantine legislations and advance IPM technics to the farmers etc.

193. Running costs of these plant protection agencies has been state fund allocations. Their staff also have also working in projects and programs financed from other sources for research and to conduct additional trainings for farmers annually.

194. *Pesticide Use and IPM implementation in Project Provinces:* A DoA survey in 2014 and nation-wide inspections in 2013 of pesticide and herbicide suppliers in provincial capitals and other main distribution hubs, indicate that the most commonly sold products include: abamectin, chlorpyrifos, cypermethrin, glyphosate, imidacloprid. In the Northern provinces, where a large part of the herbicide use is on corn and rubber plantations, the main products sold are the herbicides Glyphosate, Paraquat and Atrazine. Nowadays, on Rice and Maize cultivation farmers don't use pesticide accept some vegetables. These inspections have also shown that the most problematic highly hazardous products, such as monocrotophos, methyl parathion, methamidophos, mevinphos, endosulfan, etc., are no longer found on the market with the exception of the occasional old bottle. The only banned products that still are found regularly are paraquat and methomyl. This is because these products were banned only recently (2010) and are still permitted in the neighbouring countries from where they are informally brought in by users or retailers. The banning of highly hazardous pesticides in China does not seem to have led to dumping of old stocks in Lao PDR. There are no known large stocks of obsolete pesticides.

195. Insecticides are used mainly on vegetables (such as Long Yard Bean, Chilly, Cabbage, Chinese Cabbage) marketable high-value crops and plantation crops, notably rubber. Field surveys by the national IPM programme and DoA indicate there still is wide-spread abuse of pesticides among farmers. Lack of knowledge among farmers is a major constraint. Abuse includes mixing without justification (just to be sure), use of wrong pesticides, use of wrong dosages, etc. Adequate protective gear is hardly being used. Shops often have gloves and masks for sale, but these tend to be inadequate for protection against hazardous chemicals. Buyers of pesticides rarely also buy protective gear and shops do not provide it for free. Half used pesticide bottles or packages are often stored within the house or near homesteads, often in easy reach of children. Empty pesticide containers are often

discarded at the border of fields or in drainage ditches.

196. The DoA Plant Protection Centre (and its national IPM programme) has developed a 3-day curriculum for a Farmer Training on Pesticide Risk Reduction (FT-PRR) which is intended to raise awareness, develop capacity and help rural communities formulate and implement their own action plans for pesticide risk reduction. As of June 2014, some 4,900 Lao farmers (including 1,600 women) have participated in FT-PRR courses in 149 villages of 34 Districts in 9 provinces.

197. Season-long Integrated Pest Management training through Farmers Field Schools (FFS) often includes these short-duration FT-PRR courses. These FFSs allow farmers to learn about and adopt Integrated Pest Management as to reduce overuse of pesticides in crop production.

198. The National IPM Programme has implemented 806 season-long IPM Farmers Field Schools, with over 24,350 rice, vegetable and fruit farmers trained. More, however, remains to be done. Pesticide Risk Reduction and IPM adoption at farm level remains a priority for the Government.

199. As per the International Code of Conduct on the Distribution and Use of Pesticides, the following rules are observed for IPM:

- The standards of conduct set forth in this Code: 1.7.6. are designed to promote Integrated Pest Management (IPM) (including integrated vector management for public health pests);
- Concerted efforts should be made by governments to develop and promote the use of IPM. Furthermore, lending institutions, donor agencies and governments should support the development of national IPM policies and improved IPM concepts and practices. These should be based on scientific and other strategies that promote increased participation of farmers (including women's groups), extension agents and on-farm researchers.
- All stakeholders, including farmers and farmer associations, IPM researchers, extension agents, crop consultants, food industry, manufacturers of biological and chemical pesticides and application equipment, environmentalists and representatives of consumer groups should play a proactive role in the development and promotion of IPM.
- Governments, with the support of relevant international and regional organizations, should encourage and promote research on, and the development of, alternatives posing fewer risks: biological control agents and techniques, non-chemical pesticides and pesticides that are, as far as possible or desirable, target-specific, that degrade into innocuous constituent parts or metabolites after use and are of low risk to humans and the environment.
- Governments should: 5.1.7 provide extension and advisory services and farmers' organizations with adequate information about practical IPM strategies and methods, as well as the range of pesticide products available for use.
- Governments should: 8.1.4 ensure that any pesticide subsidies or donations do not lead to excessive or unjustified use which may divert interest from more sustainable alternative measures.

8.3 Pest Management Plan

200. It is anticipated that there will be no procurement of pesticides under the project and that pesticide use, overall, will decline as a result with the introduction of good agricultural practices. That said, pesticides are being used by farmers in the project area, so this plan will be applied to the project activities involving any changes in agricultural practices and/or rehabilitation of or development of existing irrigation schemes that may prompt farmers to increase their use of pesticides if no training or monitoring is provided. The plan is comprised of three parts: (i) application of government regulation on pesticide control; (ii) training of the integrated pesticides concept and/or other approaches for the safe use of pesticides; and (iii) monitoring. A full overview of Regulation Number 2860/MAF is available in Annex 2, and a simplified PMP is available in Annex 3. Both should be consulted for any subprojects under the LACP.

8.4 Sustainable Farming Practices

201. There are several sustainable farming practices that can be used in conjunction with IPM and GAP. These include:

- Improving product quality by using the local environment to its full potential and abiding by specific guidelines (e.g. organic products, GAP, high nutritional varieties, or Geographical Index).
- Applying organic manure, green manure, mulch keeping, intercropping, crop rotation for improve soil organic matter. Applying bio-fertilizer and increase microbial population in cultivation areas.
- Identifying the crop calendar to avoid disasters (Typhoon, Flood and Drought, Pest) and to harvest products according to market demand.
- Introducing and setting up agriculture machinery; maintaining, strengthening model farmers or smart-farmers' groups.
- Building up farmers' network to access to technical information and marketing information. Establishing farmers field schools

9.0 PRINCIPLES AND PROCEDURES TO MITIGATE IMPACTS FROM THE LACP

202. In order to ensure that the environmental and social issues are addressed properly in accordance and in compliance with the World Bank Safeguards Policies, all project activities in particular small scale infrastructure in particular construction of seed storage facilities, value added processing facilities and rehabilitation of existing irrigation schemes (main, secondary and tertiary canals and drainages) shall undergo screening, assessment, review, and clearance process before execution of the physical activities. The project will use a structured approach to environmental and social management to allow the project development process, follow the hierarchy of avoidance, minimization, compensation/mitigation for negative impacts and enhancement of positive impacts where practically feasible and advantageous. This chapter describes the process for ensuring that environmental and social concerns are adequately addressed through the institutional arrangements and procedures used by the project for managing the identification, preparation, approval, and implementation of subprojects.

203. Detailed environmental and social safeguard process are as follows:

Table 18: Steps for E&S Screening, E&S impact Assessment, Appraisal, Monitoring and

Reporting

LACP E&S Capacity & Sub-projects Process	Responsible Entity/person	**Resource / Toolkit ***
Step 1: E&S Screening and Review ***1.1 Eligible screening*** • Check against non-eligible activities	PMU with PAFO/DAFO (E&S coordinator/consultant support)	• STEP1: Annex 1: Non-eligible activities
1.2 E&S Impact/Risk screening • Screening site sensitivity to identify potential issues; • Identify sub-project Category and if safeguard instrument will be required. (No safeguard instrument will be required for Category C sub-project) • Identify if dam inspection will be required.	PMU with PAFO/ DAFO (E&S coordinator/consultant support)	• Site sensitivity matrix in Chapter 9 • Annex 5: STEP 2- Guidance for Sub-Project Categorization • Annex 5: Table 1- Screening E&S impact/risk form • Annex 5: Table 2- Due Diligence form for agribusiness, value added facilities • Annex 7: TOR of POE
Step 2: E&S Impact Assessment • Identification of environmental and social impact and determine safeguard instrument • First consultation	PMU with PAFO/ DAFO (E&S coordinator/consultant support)	• Use of PMU and Consultant support • Annex 5: Table 1- Screening E&S impact/risk form

Step 2: Appraisal with Environmental and Social Safeguard instrument • Prepare IEE and get clearance from PoNRE if the sub-project required IEE • Prepare Environmental Code of Practices (ECoP), and EGDP • Second public consultation (as necessary)	Farmers with E&S coordinator/consultant support IEE clearance by PoNRE	• Annex 5: STEP 3- Environmental Code of Practice (ECOP) and Annex 6 • Use of registered environmental and social consultants to prepare IEE • Assistance from Irrigation department/agriculture extension division, etc. • Annex X: Ethnic Groups Development Plan (EGDP) • Annex X: Grievance Redress Mechanism
Step 4: Monitoring and Reporting • Annual E&S Report from PAFO/DAFO • Annual MAF Report to WB	PAFO/DAFO (E&S coordinator/consultant support) MAF	• Annex 5: STEP 4- Monitoring and Reporting • E&S Supervision/Audit Report

* All referenced tools and guidance are found in the Annex and separate **Social safeguard instrument.**

9.1 Step 1: Environmental and Social Screening

204. This screening is essential to quickly assess potential environmental and social impacts of the subproject interventions. The screening identifies the consequences of the proposed subprojects in the broader sense, without having very much detailed investigation. Critical issues are also identified through the screening which needs detailed investigation during the impact assessment. Based on the extent of environmental and social impact obtained from the screening result, the decision for further environment and social impact assessment will be taken. The screening includes eligibility screening and E&S impact screening for assessment of potential impacts, policies triggered and instruments to be prepared. The E&S impact screening needs to be carried out all the major components of the subprojects.

9.1.1 Eligibility Safeguard Screening

205. The project aims at improving good agriculture practices and critical infrastructure (storage facilities, rice mill, value added processing facilities, and improving of irrigation channels, pumping station, etc.) in selected areas to support development of commercial agriculture. This is done through (a) finance missing elements for improving good agriculture practices and critical infrastructure for farmer groups, agri-business as well as rehabilitation of public infrastructure to improve operation and efficiency of existing irrigation systems (pumping stations and irrigation channels, etc.) ; (b) introducing various irrigation models aiming at reducing operating costs and improving water

productivity; (c) support establishment and strengthening of water user groups to effectively operate and maintain existing infrastructure. Screening will be based on an assessment of project components and site sensitivity. List of non-eligible activities was provided in Annex 1. It is not anticipated that sub-project activities that required IEE as per Lao PDR Law will be proposed as project activities due to its small scale in nature. However, if the plantation of industrial crops more than 20 hectares, an IEE need to be prepared and submitted to PoNRE for its clearance prior to the project implementation. And plantation of industrial crops more than 400 hectares will require EIA and clearance by MoNRE. The project will finance IEE required sub-projects with the condition that IEE was approved by PoNRE prior to sub-project implementation.

9.1.2 E&S Screening (Determination of sub-project Category and Safeguard Instrument Requirement)

206. After subprojects are determined to be eligible for financing, a E&S impact screening will be carried out. The purposes of the E&S screening are to: (i) identify the World Bank safeguard policies triggered; (ii) classify subprojects into B or C categories as per site sensitivity matrix in Table 19 and Guidance to classify level of impact from the sub-project activities; and (iii) to determine if the safeguard instrument needs to be prepared for the sub-project.

207. The screening also provides brief descriptions of the nature and extent of potential negative impacts on natural and environmental resources and local people related to land acquisition, resettlement, land donation, and/or involvement with ethnic minority. For the Category C sub-project, no safeguard instrument will be required and Table 3 form in Annex 5 will be filled up as an attachment to the sub-project proposal. For the sub-project type that requires IEE, it is likely to be classified as Category B sub-project. However, it is unlikely that the proposed sub-project activities i.e. irrigation canal improvement, rice mill and its storage facilities improvement, vegetable packaging facilities improvement and agriculture farming will be required IEE. Table 1 Annex 5 will be used to screen agriculture farming sub-project category and assess the project and identify type of safeguard instrument needs to be prepared and implemented by the sub-project. Table 2 Annex 5 will be used to screen project category for the proposed improved value added facilities such as rice mill, storage facilities and vegetable packaging facilities.

208. For the proposed irrigated areas, downstream of dam, the sub-project implementation need to be on hold until the Panel of Expert (POE) completed the dam inspection and provided recommendation to proceed without any remedial work or safety-related measures necessary to upgrade the existing dam or DUC to an acceptable standard of safety. MAF has drafted TOR for POE as shown in Annex 7. MAF will take an action follow the POE recommendations at their own cost. Dam safety related procedures is shown in Annex 8.

Table 19: Site Sensitivity and Safeguard Policies

	SITE SENSITIVITY		
Safeguard Policy or Site Characteristic	**Low Sensitivity**	**Medium Sensitivity**	**High Sensitivity**
Natural Habitats	No natural habitats	No critical natural habitats;	Critical natural habitats present

(OP 4.04)	present of any kind	other natural habitats occur	
Forest (OP 4.36)	No production, conservation and protection forest present of any kind	Production forest present but no conservation and protection forest present	Conservation and protection forest present
Physical Cultural Resources (OP 4.11)	No known or suspected physical cultural resources as per OP 4.11 including sacred grove present	No physical cultural resources (PCR) as per OP 4.11 including sacred grove present but has historical record from villagers or local authorities' potential to chance find the PCR	Physical cultural resources as per OP 4.11 including sacred grove present
Resettlement (OP 4.12)	No new sites are required. Project site is already acquired and is free of squatter; legal tenure is well- defined.	Project site has tenant renters. Yet to be acquired.	Project site will entail resettlement of vulnerable or required land more than 10% of agriculture land
Indigenous Peoples (OP 4.10)	No indigenous population	Dispersed and mixed indigenous populations; mainstream (highly acculturated) indigenous populations	Indigenous territories and reserves; vulnerable indigenous populations
Natural hazards vulnerability; floods, soil stability/erosion	Flat terrain; no potential stability/erosion problems; no known volcanic/seismic/flood risks	Medium slopes; some erosion potential. Medium risks to erosion. Volcanic/seismic/flood/ hurricanes	Mountainous terrain; steep slopes; unstable soils; high erosion and land slide potential; volcanic, seismic or flood risks

9.2 Step 2: Impact Assessment (Determination Type of Safeguard Instrument Requirements)

209. After an E&S impact screening was conducted and the sub-project Category was identified, the sub-project category B detailed impact assessment will be carried out. The purpose of the impact assessment is to identify from the level of the impact and determine the type of safeguard instrument that needs to be prepared for the subproject (e.g. IEE, or ESMP or ECOP). The impact assessment will be used as an input to set scope of mitigation measures. The impact assessment will give the environment and social issues due importance in the decision-making process by clearly evaluating the environmental and social consequences of the proposed sub-project before action is taken. Early identification and characterization of critical environmental and social impacts allows the public and the government to form a view about the environmental and social acceptability of a proposed development sub-project and what conditions should apply to mitigate or minimize those risks and impacts. The scope of the impact assessment will depend on the screening results. Data collection, field survey, and consultation with local communities and affected population will be carried out.

210. As the project activities are small scale in nature, it is unlikely that the proposed sub-project activities will be classified as Category A of which will require EIA. For the sub-project category B, it

is unlikely that IEE will be required as agriculture farming will be less than 20 hectares. ECOP, RAPs and/or EGDPs will be prepared in line with this ESMF, Compensation & Resettlement Policy Framework (CRPF) and/or the Ethnic Groups Engagement Framework (EGEF) which has been developed for the Project. Due attention should also be given to address the issues related to gender, ethnic groups, and other disadvantaged groups, especially when they are likely to be affected by the natural disaster.

211. In brief, depending on the results of the screening exercise and level of the Category B -sub-project impact, following documents will be required at subproject level:

- Initial Environmental Examination (IEE)
- Environmental Codes of Practice (ECOP);
- Resettlement Action Plan (RAP);
- Ethnic Group Development Plan (EGDP);
- Gender Action Plan, including Gender Monitoring Plan that are integrated into any applicable instruments (RAP/EGDP).

Table 20 Definition of required subprojects' safeguard document

Type of Category B Sub-Project	**Level of Impact**	**Required Safeguard Instruments**
Type and size of project that required IEE	Likely significant negative impact that can be mitigated through appropriate mitigation measures	Initial Environmental Examination (IEE)
Type and size of project that not required IEE	Moderately negative impact that can be mitigated through appropriate mitigation measures	Environmental and Social Management Plan
Type and size of project that not required IEE	Low negative impact that can easily mitigate through code of practices to be attached as part of contractor contract	Environmental Code of Practices

212. The key steps of impact assessment are: planning, scoping, impact assessment and consultation. The impact assessment will clarify: (i) how will the particular sub-project activity give rise to an impact? (ii) how likely is it that an impact will occur? (iii) what will be the consequence of each impact? and (iv) what will be the spatial and temporal extent of each impact? The assessment of impacts largely depends on the extent and duration of change, the number of people or size of the resource affected and their sensitivity to the change. Potential impacts can be both negative and positive (beneficial), and the methodology defined in Step 3 will be applied to define both beneficial and adverse potential impacts and propose mitigation measures.

9.3 Step 3: Appraisal with Environmental and Social Safeguard Instrument

213. After the sub-project categorization and the safeguard instrument/s is/are identified, those instruments will be prepared and completed before project implementation. Annex 5: STEP 3- provided Environment Code of Practices (ECOP) related to the four type of potential sub-project activities.

Mitigation Measures and Public Consultation

214. *Mitigation Measures*: Appropriate mitigation measures will be identified according to the nature and extent of the potential negative impacts. ECOP for specific type of sub-projects will be used to minimize adverse impacts and enhance positive impacts. For all Category B subprojects to be implemented under the project, the ECOP should be a part of the Contract Document.

215. *Public Consultation*: Preparation and implementation of the subproject safeguards documents during project preparation need to follow the Bank requirements for public consultation under OP 4.01. The objectives of consultation are to generate public awareness by providing information about a sub-project to all stakeholders, particularly the sub-projects affected persons (PAPs) in a timely manner and to provide opportunity to the stakeholders to voice their opinions and concerns on different aspects of the project. Consultation would help facilitate and streamline decision making whilst fostering an atmosphere of understanding among individuals, groups and organizations, who could affect or be affected by the subprojects.

216. Consultation is a continuous process by which opinion from public is sought on matters affecting them. The opinions and suggestions of the stakeholders would assist PAFO in taking appropriate decisions for effective environmental and social management of the sub-projects. It would help facilitate and streamline decision making whilst fostering an atmosphere of understanding among individuals, groups and organizations, who could affect or be affected by the sub-projects. The specific objectives of public consultation are:

- To keep stakeholders informed about the sub-projects at different stages of implementation,
- To address the environmental and social concerns/impacts, and device mitigation measures taking into account the opinion/ suggestions of the stakeholders,
- To generate and document broad community support for the sub-projects,
- To improve communications among interested parties; and
- To establish formal complaint submittal/resolution mechanisms.

217. At least 2 stages consultation with the project affected people, project beneficiary and relevant stakeholders will need to be carried out. The first stage consultation for environmental and social impact assessment is required during the subproject E&S screening level. And second level consultation should be carried out once the impacts are clearly identified and draft management plan are prepared. If required, more than two consultations should be carried out. The following are the guidelines for carrying out consultation:

- The mode of consultation will be either public consultation (PC) or focus group discussion (FGD). The consultative meeting or discussion will provide opportunity to the participants to raise their concerns freely about the sub-projects and their impacts on their life, livelihood and their community as a whole. Discussion will also be focused on subproject(s) specific environment and social issue, so that stakeholders can contribute their knowledge on better environmental and social management.

- The composition of participants may differ depending on the nature and location of the sub-projects. A stakeholder analysis needs to be carried out to identify the key stakeholders and Project Affected Persons (PAPs). Depending on the social formation and interest of different groups, separate meetings should be organized.
- Information on the PC/FGD needs to be announced locally using loud speakers and putting notices in public important places at least 7 to 10 days prior to the consultations. In general, it must be ensured that the PAPs and other stakeholders are informed and consulted about the sub-project, its impact, their entitlements and options, and allowed to participate actively in the development of the sub-project. This should be done particularly in the case of vulnerable PAPs, such as affected ethnic groups. This exercise should be conducted throughout the sub-project preparation, implementation, and monitoring stages. An open-door policy should be maintained for community people, so that stakeholders feel comfortable approaching PAFO/DAFO directly to ask questions and raise concerns on environmental and social issues. Create a responsive management system should be created for recording and responding to comments and concern on environmental and social issues. It should be ensured that the PAFO/DAFO and its consultant capable of responding to questions/comments, appropriately.

9.4 Step 4: Monitoring and Reporting

218. *Monitoring Plan*: The primary objective of the environmental and social monitoring is to record environmental and social impacts resulting from the sub-project activities and to ensure implementation of the "mitigation measures" identified earlier to reduce adverse impacts and enhance positive impacts from project activities. Apart from general monitoring of mitigation/enhancement measures, important environmental and social parameters will be monitored during the construction and operation phases of the subprojects. The requirement and frequency of monitoring would depend on the extent and scope of sub-project and field situation. Matrix of monitoring screening was shown in Annex 5: STEP 4-Monitoring and Reporting.

RAP Monitoring

219. Monitoring is a continuous evaluation process of the project implementation which is related to the unified implementation schedule on the use of the project inputs, infrastructures and services. Monitoring provides concerned agencies with continuous reflections on the implementation status. Monitoring determines the reality, successful possibility and arising difficulties as soon as possible to facilitate the due adjustment in the project implementation.
Monitoring includes 2 following purposes:

(i) Monitor whether the project activities complete efficiently or not, including quantity, quality and time.

(ii) Assess whether these activities reach the objectives and purpose of the Project or not, and how much do they reach.

220. The executive agency (DPIF) as well as the independent monitoring Consultants which are contracted with the DPIF shall monitor and supervise the RAP implementation regularly.

Internal Monitoring

221. Internal monitoring of the RAP implementation of the Sub-projects is the main responsibility of the implementation agency with the assistance of the project consultants. The implementation agency will monitor the progress of RAP preparation and implementation throughout the regular progress reports. The criteria of internal monitoring include but not limit

(i) Compensation payment for affected households for the different types of damage pursuant to the compensation policies described in the resettlement plans

(ii) Implementation of technical assistance, relocation, allowance payment and relocation assistance.

(iii) Implementation of income recovery and entitlement to recovery assistance.

(iv) Dissemination of information and consultation procedures.

(v) Monitoring of complaint procedures, existing problems that require the manageable attention.

(vi) Prioritizing affected persons on the proposed selections.

(vii) In coordination to complete RAP activities and award construction contract.

222. The executive agencies will collect information every month from the different resettlement committees. A database tracking the resettlement implementation of the Project will be maintained and updated monthly. The executive agencies will submit internal monitoring reports on the RAP implementation as a part of the quarterly report they are supposed to submit the WB. The reports should contain the following information:

(i) Number of affected persons according to types of effect and project component and the status of compensation, relocation and income recovery for each item.

(ii) The distributed costs for the activities or for compensation payment and disbursed cost (iii) for each activity.

(iv) List of outstanding Complaints

(v) Final results on solving complaints and any outstanding issues that demand management agencies at all levels to solve.

(vi) Arisen issues in the implementation process.

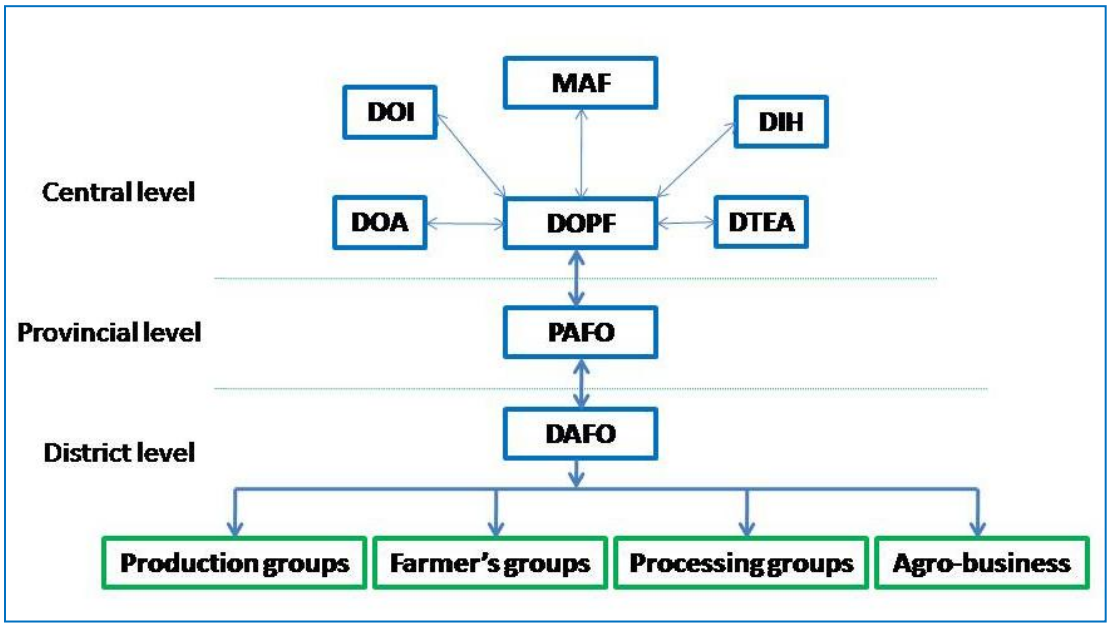
(vii) RP Schedule is actually updated.

10.0 IMPLEMENTATION ARRANGEMENTS

Project Management

223. The implementation of the environmental and social safeguard will follow the Project Implementation arrangement. The project implementing agencies will be MAF, MOIC, and the five project provinces. At central level, MAF will be responsible for overall implementation and effectiveness, coordinatee with concerned ministries, including Ministry of Finance and Ministry of Planning and Investment, to process necessary legal amendments or project restructuring to facilitate project implementation, enhance disbursement, and improve the efficiency of the use of IDA funds.

Figure 12 Responsibility of concerning Department for LACP on Environmental Safeguards



224. LACP is joining implementing by MAF and MOIC; MAF- is the central agency responsible for coordination with concerning stakeholders and overall project implementation.

225. MAF - is core of implementing project activities and focusing on component A, C and coordinate with Component, working with farmer and production group, upgrading on-farm infrastructure, farmer's production facilities and farm equipment.

226. DOPF – According to the Minister's Decision of Ministry of Agriculture and Forestry has assigned mandate to coordinate with concerning technical department, monitoring project activities day to day and reporting. The project implementing unit under DOPF will working closely with national and international consultant for preparing environmental safeguard framework, conduct consultation, make farmers and stakeholders to understand and follow safeguard policy and lead technical department to monitor project activity.

227. DOA – Base on the Minister's Decision of Ministry of Agriculture and Forestry, this Department will responsible on quality control of agriculture input and production, including plant production, production areas, seeds or genetic resources, managing, monitoring, and inspecting the

import-export of production means, such as: plant seeds, scientific fertilizers, organic fertilizers, stimulant chemical matters for plants , insecticides, herbicide in compliance with technical norms, regulations, laws and, without negative impacts to environment and human society. Establishing and developing plant hygiene systems in compliance with laws and regulations, as well as international conventions and treaties of which Lao PDR is a signatory member. Developing plant protection systems through surveys, classification, study, analysis, inventory of plant pest, forecast, surveillance of plant pests, protection-elimination and, establishing plant protection networks in the country wide. Developing clean agriculture technology, post-harvest technology to be applied in concrete production;

228. DOI – Mainly will focus on construction of irrigation and build up the capacity of water user groups and introduce optimum water use for crops commodity production. To carryout carry out irrigation studies, survey & design, and undertaking the development, management, drainage, flood prevention and draught alleviation in the entire country. To support monitoring, collecting and analyzing data of irrigation and drainage in the agricultural production areas throughout the country, in order to ensure an effective and advanced study, survey & design, construction. To monitor and evaluate the construction, rehabilitation of irrigation and drainage facilities of all sizes and types, in order to meet regional and international standards, ensuring an effective and systematic water supply to agricultural production, according to the division of management levels;

229. DTEA – its technical department responsible on utilization of machinery, tools and advanced methods in crop cultivation and livestock husbandry in the potential areas for intensive and modern agriculture, in order to increase productivity, improve quality and, reduce production costs. To create information dissemination and service system, with regard to agriculture production techniques, processing, marketing, water uses. Promoting sustainable development facilitating benefits and efficiency, in order to create favorable conditions and opportunities for business production or services of the production groups, application of scientific and technical inputs, access to domestic and foreign markets, training for upgrading the knowledge in various subjects. To elaborate draft regulations to define principles and methods of organizing production groups. Managing, monitoring and supporting the activities of production groups, agribusiness entrepreneur units and cooperatives according to the statement of the related laws and regulations;

230. MOIC - is part of the project responsible for implementing their respective activities under Component B (Enhancing agricultural commercialization) such as establishing productive partnerships between ABs and FOs and Matching grants for agribusinesses (ABs) and famer groups (FGs) to leverage investments in on-farm infrastructure, post-harvest machines, drying facilities, storages, cool rooms, packing facilities. Hence, MOIC assign to Department of Planning and Cooperation to coordinate with technical department such as Department of Industry and Handicraft (DIH) to work on rice mill, processing facilities including packing house to ensure that compliance with GMP standard and no harmful to environment and health safety. Department of Domestic Trade (DDT) is responsible on improving local market, to ensure hygiene and meet the standard.

231. PAFO – will take will take a lead responsible role at provincial level to supervise E&S consultant and PMU to conduct screening process, review and endorse sub-project proposal, monitor compliance of sub-project proposal implementation. For sub-project proposal that required IEE, PAFO will communicate with PoNRE to set out line and timeframe for IEE approval process to ensure the sub-project will be completed within the project closing date. PAFO together with DAFO and PMU as well as E&S will conduct regular meeting with PoNRE and other line agencies related to sub-project activities such as DOSMAP to receive feedback if any recommendation to support the project implementation or any complaint arise due to the sub-project implementation and provide way to resolve the issues.

232. DAFO – will take a lead responsible role at district level to supervise E&S consultant and PMU to conduct screening process, review and endorse sub-project proposal, monitor compliance of sub-project proposal implementation. For sub-project proposal that required IEE, DAFO will communicate with PoNRE to set out line and timeframe for IEE approval process to ensure the sub-project will be completed within the project closing date. DAFO together with PAFO and PMU as well as E&S will conduct regular meeting with PoNRE to receive feedback if any complaint arise due to the sub-project implementation and provide way to resolve the issues.

233. E&S Consultant- E&S consultant will work closely with PMU to provide support to farmers and project proponents to prepare sub-project proposal, conduct E&S screening and prepare appropriate safeguard instrument. E&S consultant will also supervise and monitor the implementation of the ECOP.

234. PMU-Project Management unit will take a coordinator role and provide technical support to E&S consultant to ensure safeguard compliance of sub-project. PMU will coordinate with concerned agency such as department of agriculture extension and irrigation department to provide alternatives options/appropriate GAP to farmers/project proponent. PMU will supervise the implementation of the ECOP and will contract qualified laboratory for the monitoring including laboratory testing and reporting. PMU will contact PoNRE to determine if the project implementation is meeting all specified ESMF, IEE and ECOP and related social safeguard requirements. PMU will perform supervision site visit during construction works as well as operation stage of the project to confirm the ECOP are being adequately implemented.

235. Panel of Expert (PoE) will be hired by MAF to: (a) inspect and evaluate the safety status of the existing dam, its appurtenances, and its performance history; (b) review and evaluate the owner's operation and maintenance procedures; and (c) provide a written report of findings and recommendations for any remedial work or safety-related measures necessary to upgrade the existing dam or DUC to an acceptable standard of safety. The POE will submit its findings and recommendations to MAF and DOPF for their further action. Necessary additional dam safety measures or remedial work will be financed by MAF. When substantial remedial work is needed, the following actions need to be taken: i) the work be designed and supervised by competent professionals, and (b) four dam safety plans, i.e. Construction Supervision and Quality Assurance Plan (CSQA), Instrumentation Plan, O&M Plan, and Emergency Preparedness Plan (EPP) need be prepared and

implemented. MAF will hire a consulting firm to conduct the detailed investigation and design study for remedial works during project implementation based on the TORs to be cleared by the Bank.

11.0 MONITORING AND EVALUATION

Independent Third Party Monitoring

236. The Department of Planning and Cooperation will hire the services of an Independent Third Party Monitor will carry out regular, independent monitoring and evaluations of project activities. The evaluation will be carried out against the approved framework documents for the technical and safeguard components, approved plans, including the detailed designs, financial management, procurement, contract and construction management and disbursements.

237. The Third-Party Monitor will also evaluate compliance with the applicable the Safeguard Policies and implementation of the various safeguard instruments, including the Environmental and Social Management Plans/Environmental Codes of Practice, Compensation & Resettlement Policy Framework/Resettlement Action Plans, Ethnic Engagement Policy Framework/Ethnic Groups Development Plan, and Gender Action Plans among others.

Table 21: Implementation Arrangements for Each Component

Component/subcomponent	Primary Responsibility	Supporting Agencies
Improved Agriculture Efficiency and Sustainability **A1- Adopting good varieties and quality seeds** **A2- Promoting good agriculture practices** **A3- Providing critical infrastructure** **A4- Strengthening public services delivery**	NAFRI, DOA, DAEC, PAFO DOA, DAEC, DALaM, PAFO DOI, PAFO DAEC, DaLaM, DOPC, PAFO	MAF technical departments
Enhanced Agricultural Commercialization **B1- Establishing**	PAFO/PICO DAEC, DOSMEP, DTD,	MAF & MOIC technical departments

Agriculture Value Chain Facility **B2- Linking farmers to markets** **B3- Improving the enabling environment**	DTP, PAFO, PICO DOA, DOIH, DIMEX, DTP	
Project Management **C1- Project management** **C2- Monitoring and evaluation**	DOPC (MAF), DPC (MOIC), PAFO	MAF & MOIC technical departments

Notes: Primary responsible agencies are responsible for making decisions for project implementation; supporting agencies will provide technical advice and collaborate when necessary, but will not possess any approval powers for project implementation.

Incorporation of ESMF into Project Operational Manual

238. For smooth planning, implementation and supervision, a Project Operational Manual (POM) will be prepared before the inception of the Project. The POM will have sections on environmental issues/procedures, resettlement and compensation and ethnic minorities plans. These sections will provide links to: (i) subproject screening; (ii) appropriate mitigation actions and/or ECOP; (iii) practical pre-tested safeguard forms used at field subproject level; (iv) development of supplemental tools/guidance; (v) details on how monitoring and evaluation for safeguards will be undertaken; and(vi) definition and role of third party auditing. The consultant responsible for preparing the ESMF will ensure that the above areas are well covered in the POM.

12.0 CAPACITY BUILDING

12.1 Justification of institutional capacity assessment

239. Effective implementation of this Environment and Social Management Framework (ESMF) will require technical capacity in the human resource base of implementing institutions as well as logistical facilitation. Implementers need to understand inherent social and environmental issues and values and be able to clearly identify indicators of these. Even with existence of policies and laws such as the Environmental Protection Law (EPL, 2013) evidence on the ground, still indicates that there is significant shortcoming in the abilities of local and district level stakeholders to correctly monitor, mitigate and manage environmental performance of development projects.

240. Sufficient understanding of the mechanisms for implementing the ESMF will need to be provided to the various stakeholders implementing subprojects of LACP. This will be important to

support the teams appreciate their role in providing supervision, monitoring and evaluation including environmental reporting on the projects activities.

241. During the ESMF preparation, the overall capacity at central level and provincial level has been reviewed. There are few officials who have professional training and affiliation with safeguard operation. In order to ensure proper ESMF implementation and supervision, additional consultant support required both at provincial and central level during the project implementation phase. However, MAF will also support in developing its staff capacity on environmental and social issues utilizing the project technical assistance provision.

12.2 Human Resource Capacity Requirements

242. Human capacity challenges for stakeholders involved in the implementation of the ESMF are of two types:

- Low technical capacity of current staff, and
- Inadequate (low) numbers of staff.

243. While adequacy in staffing requirements was found to be varied between the various stakeholders, there is very limited presence of directly trained and dedicated staff for environmental and social management purposes within institutions, in particular at the local levels. Staffs from other departments are usually assigned duties related to environmental and social management. As a result, sufficient knowledge on environmental and social management principles, project screening, impact mitigation, monitoring and follow up action was limited within most institutions. In many institutions, staffs have been retained for core activities leaving little if any human resources to directly oversee environmental and social management activities. As a result, this portfolio which in many cases is given little attention is handled by staff members not adequately conversant with it.

12.3 Capacity Building and Training

244. Education and training of the agency staff and the dam owner are important elements of any program. Newer staff needs training focused on dam safety engineering. Because state-of-the-practice technology for dam design, construction, and inspection activities is constantly changing, even experienced professional and technical staffs must be continually educated in these new techniques and trained in their use. Various levels and types of education and training can be employed to keep staff personnel up to date in their particular areas of expertise.

245. Awareness creation, training and sensitization will be required for personnel of the following institutions:

- NAFRI, DOA, DAEC, PAFO
- DOA, DAEC, DALaM, PAFO
- DOI, PAFO

- DAEC, DaLaM, DOPC, PAFO
- Community Implementing Units e.g. women's Unions, youth unions, leaders of ethnic groups,
- Contractors managers and personnel
- Private Sector millers personnel

246. Training will concern:

- Environmental and social impact screening process and using ESMF screening forms/checklist
    - Screening process
    - Assignment of environmental categories
    - Rationale for using Environmental and Social Checklists
    - The importance of public consultations and participation of households in the screening and planning process
    - How to monitor ESMF implementation
- Safeguard policies, procedures, and sectoral guidelines
    - Review and discussion of national environmental policies, procedures, and legislation
    - Review and discussion of the Bank's safeguard policies
- Selected topics on environmental protection and social safeguards
    - Air, water, and soil pollution
    - Health and safety
    - Waste management and disposal
    - Natural resource utilization
    - Selection of viable, small and medium-scale enterprises
    - GAP, IPM and Pest Management Plan

247. Selection of training courses should identify potential guidelines or good practice documents on environmental management for the key sectors to be financed. The objective is to help staffs move beyond just compliance to cleaner production and improved environmental sustainability that would help reduce costs (e.g., due to use of less water and energy, generation of less wastes, etc.) and potential environmental problems. World Bank environmental safeguard specialists will provide periodic supervision and training relative to the identification and management of environmental risk in project evaluation and implementation.

248. During the implementation, further capacity development need assessment will be carried out and the capacity building program will be redesigned according to the need and targeted improvement in project implementation.

13.0 COSTS AND BUDGET

13.1 ESMF implementation

249. As the technical details of sub-projects have not yet been finalized for the project investments, an estimated lump sum amount has been designated to address the potential number of IEE, ECOP which will have to be prepared as well as monitoring requirements for the ESMF. Table shows an estimate and will need to be updated once the sub-project proposals have been finalized during project implementation.

Activity	Budget
Dam inspection for Rehabilitation irrigation canal downstream of 5 dams	$30,000/scheme
Preparation of IEE/ECOP	$70,000/scheme
Budget for Implementation of each ESMF, monitoring and reporting	$25,000/year
Training on IPM/Pest Management Plan implementation	$10,000/year
Training on GAP, soil conservation, water management	$70,000/year
1-day training for highlighting potential environmental and social impacts and mitigation measures (project launch workshop)	$5,000/training
Technical assistance (international consultant)	$50,000 for first year

13.2 Monitoring program

250. The monitoring program will be concentrated on key indicators of the possible adverse impact identify by the environmental impact assessment, in particular surface water quality downstream of irrigation canal, water quality in public well. The estimated annual cost of such monitoring program is about US$20,000/scheme. Identification and quantification of environmental indicators will be done during project implementation of which the monitoring program will be prepared in adequate detail, setting out the location and frequency of measurements, parameters to be measures and tested. Training and capacity building for ECOP monitor will be provided by Bank experts.

251. The PMU and E&S consultant will help farmer by provide advice and supervise the implementation of the environmental code of practices as well as contract qualified laboratory for the monitoring, including the laboratory testing and reporting. The PMU will check with PoNRE to determine if the project implementation is meeting all specified ESMF, ECOP and related social safeguard requirement. These measures will be complemented by the participatory M&E under which project affected people and direct beneficiaries report issues they experience to the project.

252. The PMU and E&S consultant in close consultation with DAFO/PAFO will also perform supervision site visits during works as well as operation stage of the project to confirm the ECOP and social safeguard instruments are being adequately implemented. A supervision report covering the environmental and social management issues should be included in the overall site visit report: a summary of the environmental issues encountered should be reported in the bi-annual Implementation Report to the Bank. The bank will also review these reports during twice implementation support mission.

14.0 GRIEVANCE REDRESS MECHANISM

253. The grievance redress institution/mechanism (GRI/M) is an integral project management element that intends to seek feedback from beneficiaries and resolve of complaints on project activities and performance. The mechanism will base on World Bank requirements and most important is based on Lao PDR's grievance redress mechanisms to solve the uprising problem between project owner and local resident, specially affected person by the subprojects.

254. Affected people, either from ethnic groups or Lao people, share the same Grievance Redress Institutions/Mechanism (GRI/M).

255. Consultation with local people, including members of the affected ethnic group community, if any, will take place early in the process of the project planning. Prior to sub-project commencement, community leaders will consult with members of the affected community and the whole process is to be well documented.

256. To ensure that complaints and grievances from affected peoples can be received, a grievance redress institution/mechanism (GRI/M) will be established within the project affected community based on the existing structure from the village mediation unit (VMU) established in all villages, District Office of Justice (DOJ) and DAFO at district level and the Provincial Assembly and PAFO at the provincial level. These institutions will be used and strengthened to receive, evaluate and facilitate the resolution of concerns, complaints and grievances emanating from within the affected community in accordance with the Law on Handling of Petitions (2015).

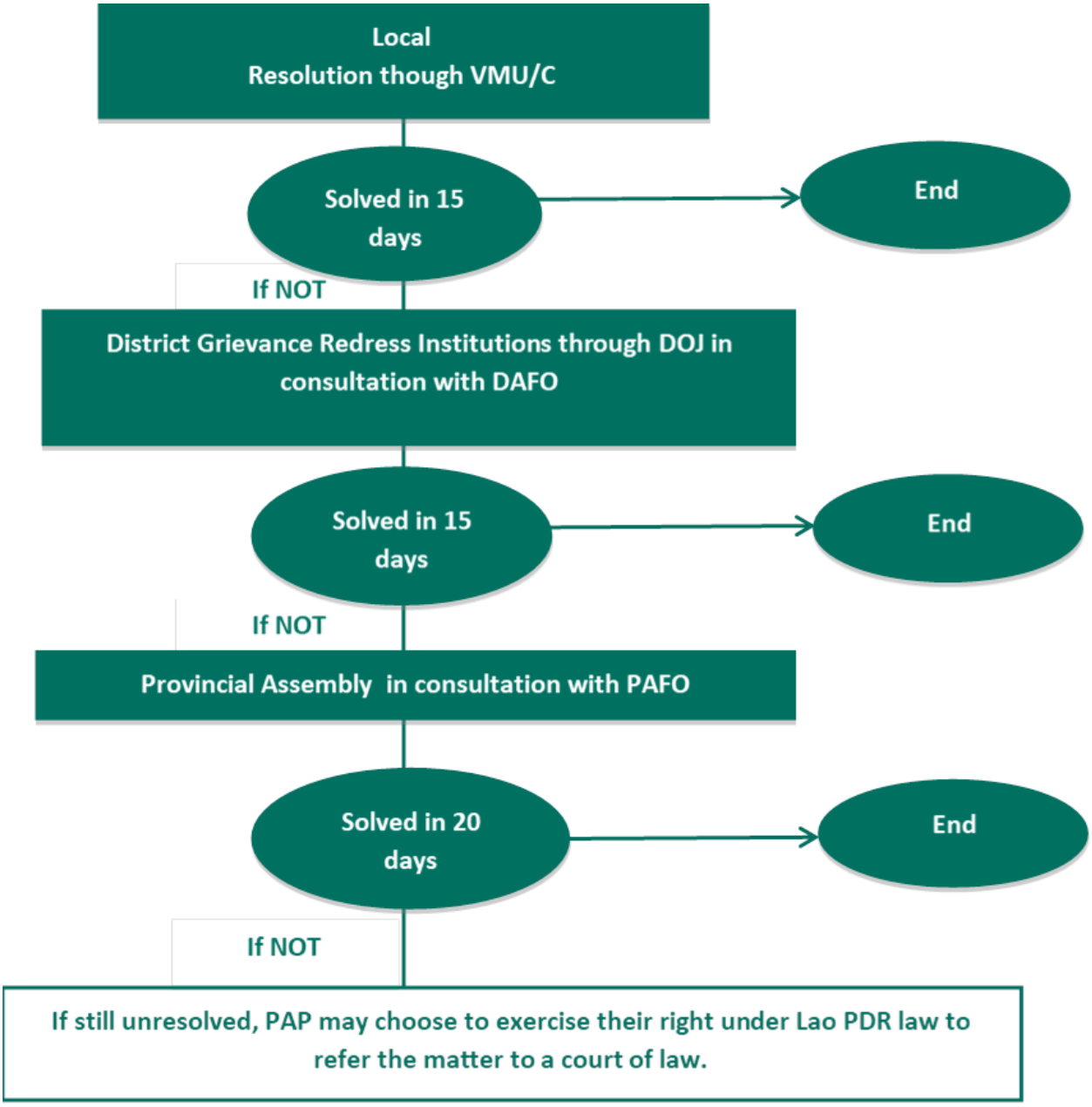
257. For subprojects where members of ethnic groups are affected, VMU at the village level will comprise of ethnic group community leaders representing the affected peoples, and head of mediation unit, or village elder person. The grievance redress institution will function, for the benefit of the members of the ethnic group community, during the entire life of the sub-projects, including the defects liability period.

258. Social and environmental related grievances – either from directly or indirectly affected people, (including affected people from ethnic groups) will be resolved through the Grievance Redress Institution/Mechanism (GRI/M) – as indicated in the flowchart at Figure 1 below.

259. However, complainant retains the right to bypass this procedure and as such can direct their grievance directly to the PAFOs or the Provincial Assembly, as provided by law in Lao PDR. At each level within the GRI/M process, discussions and outcomes of logdged complaints will be documented and recorded in a grievance logbook. The status of the grievances submitted and grievance resolution will be reported to PAFOs in monthly reports. In order to effectively and quickly resolve grievances of PAP, the following process will can be followed:

- Stage 1: if PAP and PAH are not satisfied with the resettlement plan or its implementation, PAP and PAH can issue a verbal or written complaint to the Village Mediation Unit or Committee (VMU/C). If it is a verbal complaint, the village should deal with this complaint and document it in a written record. The VMU/C should resolve the complaint or grievance within two weeks or calendar 15 days;
- Stage 2: if PAP and PAH are not satisfied with the result in Step 1, PAP and PAH can file an appeal with the District Office of Justice (DOJ) via DAFOs after PAP and PAH receives the decision made in Step 1. The DOJ should make a decision within two weeks or 15 calendar days;
- Stage 3: if PAP and PAH are not satisfied with the result of Step 2, PAP and PAH can file an appeal with the Provincial Assembly (PA) via PAFO for administrative arbitration after receiving the decision made by the DOJ. The administrative arbitration organization should make the arbitrated decision within 20 calendar days; and
- Stage 4: if PAP and PAH are still unsatisfied with the arbitrated decision made by the administrative arbitration organization, after receiving the arbitrated decision, PAP and PAH can file a lawsuit in a civil court according to the relevant laws and regulations in Lao PDR.

Figure 13 - GRI process



260. Members of ethnic group communities can make a complaint or appeal on any and all aspects of sub-projects' design and implementation, compensation and resettlement. A complaint and grievance feedback form, as well as a pamphlet explaining the mechanism, will be developed under the project and distributed to ethnic group communities for their use. Ethnic group community members will be clearly informed of the complaint and appeal channels (as described above) in community meetings and other forms of communication that are convenient to them. Information and communications technology and media tools should be used to disseminate information. Opinions and suggestions related to resettlement which are provided by concerned people and/or organizations should be well documented. Resettlement organizations, at various levels, should study and address any issue in a timely manner.

15.0 CONSULTATION AND INFORMATION DISCLOSURE

15.1 Requirement of Consultations

261. The WB requires consultations held with the project affected peoples, local community and other relevant stakeholders. This consultation should provide information on the following aspects: a) purposes of the project; b) results of the environmental and social assessment; and c) presentation of the complementary studies required in the case that they apply. The ESMF has been prepared through a detailed consultative process both at the field level and central level.

15.2 Consultations at Provincial and Village Levels

262. A consultation taken place at the provincial levels before appraisal mission in November 2017. These consultations provided valuable information for the project objectives, its components, environmental and social assessment as well as developing the ESMF.

Requirement of consultations at Provincial and Village Levels.

263. The WB requires consultations held with the local community. This consultation should provide information on the following aspects: a) purposes of the project; b) results of the environmental and social assessment; and c) project implementation plan. The results of consultation were summarized in respective documents, including CRPF, EGEF, Social Assessment, and ESMF.

264. Consultation through a community outreach during implementation is a good practice that can be adopted to ensure that the potential negative impacts and concerns are properly addressed during construction and operation of a project. Required extensive consultation with affected population and ethnic minority are required when the activities involve land acquisition, temporary environmental impact that affected the income generation activities/livelihoods/agricultural production of local people, including people from ethnic groups.

Consultation Process Summary.

265. Public consultation was a key component of the LACP and it was pivotal in preparation of the following safeguards documents:

- Environmental and Social Management Framework (ESMF),
- Compensation and Resettlement Policy Framework (CRPF),
- Ethnic Groups Engagement Policy (EGEF), and
- Social Assessment (SA) report, which include Gender Analysis report integrated into SA.

266. Two consultation rounds with local communities and communes were carried out in September and October 2017 to:

- Inform affected households and communities of project potential impacts,

- Collect information and initial feedback of local people, including representative of ethnic groups in potential project area.
- Confirm the broad community support by potentially affected ethnic groups for project implementation. Confirmation of ethnic groups were made on the basis of presentation of project's potential impact, project purpose, its activities, and implementation plan.

15.3 Public Consultation Results

15.3.1 Environmental Consultation Process and Results

267. According to the OP4.01, the environmental assessment process should be available to the public. As such, MAF will consult with all of the involved/relevant stakeholders on project safeguard documents (ESMF) once during the process, prior to appraisal mission. The Public Consultation with all significant stakeholders on the project draft safeguard instruments (i.e. the ESMF and SA) will take place in Vientiane capital during November 2017. Invitations were already issued and documents were circulated and posted on the MAF website in both English and Lao language, prior to the expected meeting date.

268. The LACP consultations aimed at: (i) providing background information to various stakeholders on the LACP, (ii) receiving feedback from concerned stakeholders, both targeted communities/enterprises and concerned government agencies, as well as civil society and NGOs to take into an account gender aspects on issues and proposed mitigation measures and institutional arrangements pertaining to the ESMF of LACP; and (iii) discussing ways to maximize LACP environmental and social performance.

269. During project preparation, the communities and provincial authorities provided the following feedbacks on the project objective, components and their associated potential impacts as follows:

- Possibility for project to finance rehabilitation of the existing gravity fed irrigation canals from large dam/reservoirs
- Farmers expressed the need for good seed and good agricultural practices and regular support from the provincial agricultural extension officers
- Famers indicated that they would be interested in using matching grants for the purchasing of threshers and harvesters;
- Overall, communities acknowledged the list of adverse impacts mentioned by the safeguards specialists, but did not feel that they were a problem for continuing the project (e.g. it was explained that the need for more water through irrigation outweighed the temporary interruptions in service they would encounter); all agreed that the adverse impacts seemed reasonable and temporary;
- Water User Group (WUG) leaders requested that their respective WUGs be provided reasonable notice (as soon as possible) with respect to when the canals would be under construction in order to inform their WUG members accordingly.

15.3.2 Social Consultation Results

270. On the basis of potential project impact, the community consults provide the following feedback.

- **Potential Project Impact:** Participants agreed that the project would have positive impacts, and concurred with the positive social and environmental impacts described.
- **Land acquisition.** Main canal in this area passes through community land, and secondary/tertiary canals impact individual household lands. Participants think the benefits from the irrigation scheme improvements outweigh land acquisition impact. Participants said they are happy to donate their affected land. Upon listening to the compensation principles of the project, participants confirmed they understand and agree with this. They support the project.
- **Grievances Redress Mechanism** (GRM). Ethnic peoples typically lodge any complaints to the village organization. Some prefer going to the head of the ethnic group before going to the villages.
- **Participation.** Ethnic peoples should be encouraged to participate in project activities by designing activities that are appropriate to them in terms of culture, farming practices.
- **Gender.** Women are involved with crop production (growing, transplanting, harvesting) and livestock. Men work more with pest management and fertilizer application which are generally heavy work. Men typically coordinate water with other members in the water user group to ensure sufficient water for their crop.
- **Community Support**. Given the potential social and environmental positive impacts, and that the project benefits outweigh the limited adverse impact, the participants, both ethnic minorities and Lao majority, indicated their support for project implementation.

15.4 Disclosure

271. Information disclosure: According to the World Bank's policy on access to information, all draft safeguard instruments under this project, including the SA, CRPF, EGEG, and ESMF must be disclosed locally in an accessible place and in a form and language understandable to key stakeholders and in Lao language and English on the Bank's website before the project appraisal mission. This allows the public and other stakeholder to comment on the possible environmental and social impacts of the project, and the frameworks to be strengthen as necessary, particularly measures and plans to prevent or mitigate any adverse environmental and social impacts.

272. In line with the Bank's Public Consultation and Disclosure Policy, for the LACP, the draft ESMF SA, CRPF, and EGEG have been disclosed in Lao language on DateXYZ at village level, and both Lao and English version on the MAF websites and was also disclosed on the Infoshop of the World Bank on prior to commencing appraisal mission. The final document have been revised to incorporate feedback from public consultation held in November 2017 and have been re-disclosed in country and in Infoshop.

ANNEXES

ANNEX 1: NON-ELIGIBILITY LIST

1. The following activities are prohibited under the LACP (ineligible or the "Non-eligibility list") in order to avoid adverse irreversible impacts on the environment and people, the following activities are explicitly excluded from funding:

(i) Relocation and/or demolition of any permanent houses or business.

(ii) Use of LACP investment or subproject as an incentive and/or a tool to support and/or implement involuntary resettlement of local people and village consolidation.

(iii) Land acquisition that affect more than 200 persons or 20 households.

(iv) New settlements or expansion of existing settlements inside "Total Protected Zone" as defined in a government decree.

(v) Likely creation of adverse impacts on ethnic groups within the village and/or in neighboring villages or unacceptable to ethnic groups living in an ethnic homogenous village or a village of mixed ethnic composition.

(vi) Imposing ideas and changing priorities identified by the community and endorsed at the Kumban level meeting without community consultation, prior review and clearance from the PMT.

(vii) Damage or loss to cultural property, including sites having archeological (prehistoric), paleontological, historical, religious, cultural and unique natural values.

(viii) Resources access restriction that could not be mitigated and will result in adverse impacts on the livelihoods of ethnic groups and disadvantage peoples.

(ix) New roads, road rehabilitation, road surfacing, or track upgrading, new irrigation system, of any kind inside natural habitats and existing or proposed protected areas.

(x) Purchase of guns; chain saws; asbestos, dynamites, destructive hunting and fishing gears and other investments detrimental to the environment.

(xi) Purchase of banned pesticides, insecticides, herbicides and other unbanned pesticides, unbanned insecticides and unbanned herbicides and dangerous chemicals exceeding the amount required to treat efficiently the infected area. However, if pest invasion occurs, small amount of eligible and registered pesticides in Lao PDR is allowed if supplemented by additional training of farmers to ensure pesticide safe uses in line with World Bank's policies and procedures (Bank clearance is needed). And no pesticides, insecticides and herbicides will be allowed in the buffer zone of protected area, protected forest and natural habitats.

(xii) Forestry operations, including logging, harvesting or processing of timber and non-timber products (NTFP).

(xiii) Unsustainable exploitation of natural resources.

(xiv) Introduction of non-native species, unless these are already present in the vicinity or known from similar settings to be non-invasive.

(xv) Significant conversion or degradation of natural habitat or where the conservation and/or environmental gains do not clearly outweigh any potential losses.

(xvi) Production or trade in any product or activity deemed illegal under Lao PDR laws or regulations or international conventions and agreements, or subject to international bans.

(xvii) Labor and working conditions involving harmful, exploitative, involuntary or compulsory forms of labor, forced labor[9], child labor[10] or significant occupational health and safety issues.

(xviii) Trade in any products with businesses engaged in exploitative environmental or social behavior.

(xix) Subprojects that will use or induce the use of hazardous materials (including asbestos) or any banned chemicals.

Preference list

i) promote rotation farming and sustainable agriculture practices

ii) promote conservation of water resources

iii) promote utilization of natural/organic pesticide from herb instead of chemical pesticide as well as IPM

iv) promote skill development to increase income revenue

v) promote improvement of rice mill equip with dust control system

[9] Forced labor means all work or service, not voluntarily performed, that is extracted from an individual under threat of force or penalty.

[10] Harmful child labor means the employment of children that is economically exploitive, or is likely to be hazardous to, or to interfere with, the child's education, or to be harmful to the child's health, or physical, mental, spiritual, moral, or social development.

ANNEX 2: REGULATION NUMBER 2860/MAF

People's Democratic Republic

Peace Independence Democracy Unity Prosperity

Ministry of Agriculture and Forestry No 2860/MAF

Vientiane Capital, date June 11, 2010

Regulation

on the control of pesticides in Lao PDR

- Pursuant to the Law on Agriculture No. 01/98/NA, dated 6 November 1998.
- Pursuant to the Environment Protection Law No. 02/99/NA, dated 3 April 1999.
- Pursuant to Law on Local Administration No. 03/NA of 5 October 2003;
- Pursuant to the Law on Food No. 04/NA, dated 15 May 2004.
- Based upon the proposal of the Minister of Agriculture and Forestry No...../MAF, dated.....2009.

The Minister of Agriculture and Forestry issues the Regulation on the Control of Pesticide as follows:

PART I

General provision

Article 1. Objective

This regulation defines the principles, rules and measures for controlling activities involved with pesticide in Lao PDR in order to protect human health, animal plant and environment, and to be consistent with agreements and international regulations.

Article 2. Output

This regulation is as a tool of monitoring, control of the production processing, import-export, distribution, transport, storage, usage, destroy, disposal properly and safety to human health, animal plant and environment; to ensure the usage, making the business units and pesticide activities smoothly undertake accordingly to the defined rules and principles.

Article 3. Definitions

Terms used in this regulation shall be interpreted as follows:

Pesticide means any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs, or substances which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as a plant growth regulator, defoliant, desiccant or agent for thinning fruit or preventing the premature fall of fruit, and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport.

Banned pesticide means a pesticide for which all uses have been prohibited by final regulatory action, in order to protect human health or the environment. The term includes a pesticide that has been refused approval for first-time use, or has been withdrawn by industry either from the domestic market or from further consideration in the domestic approval process, and where there is clear evidence that such action has been taken in order to protect human health or the environment.

Unwanted plant means the plant is not in the target of growing.

Pesticide industry means all those organizations and individuals engaged in manufacturing, formulating or marketing pesticides and pesticide products.

Trader means anyone engaged in trade, including export, import and domestic distribution.

Formulation means the combination of various ingredients designed to render the product useful and effective for the purpose claimed; the form of the pesticide as purchased by users.

Active ingredient means the biologically active part of the pesticide.

Registration means the process whereby the responsible national government or regional authority approves the sale and use of a pesticide following the evaluation of comprehensive scientific data demonstrating that the product is effective for the intended purposes and does not pose an unacceptable risk to human or animal health or the environment.

Label means the written, printed or graphic matter on, or attached to, the pesticide or the immediate container thereof and also to the outside container or wrapper of the retail package of the pesticide.

Manufacturer means a corporation or other entity in the public or private sector or any individual engaged in the business or function (whether directly or through an agent or entity controlled by or under contract with it) of manufacturing a pesticide active ingredient or preparing its formulation or product.

Distribution means the process by which pesticides are supplied through trade channels to local or international markets.

Advertising means the promotion of the sale and use of pesticides by printed and electronic media, signs, displays, gift, demonstration or word of mouth.

Personal protective equipment means any clothes, materials or devices that provide protection from pesticide exposure during handling and application.

Disposal means any operation to recycle, neutralize, destruct or isolate pesticide waste, used containers and contaminated materials.

Residue means any specified substances in or on food, agricultural commodities or animal feed resulting from the use of a pesticide. The term includes any derivatives of a pesticide, such as conversion products, metabolites, reaction products and impurities considered to be of toxicological significance. The term "pesticide residue" includes residues from unknown or unavoidable sources (e.g. environmental) as well as known uses of the chemical.

Risk is a function of the probability of an adverse health or environmental effect, and the severity of that effect, following exposure to a pesticide.

Toxicity means a physiological or biological property which determines the capacity of a chemical to do harm or produce injury to a living organism by other than mechanical means.

Integrated Pest Management (IPM) means the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms.

Natural enemies' means disease and insect usefully controlling pest in the nature include predators, parasitoids, and pathogens.

Article 4. Scope

This regulation applies to all persons, juristic persons or organizations engaged in manufacturing, importing, exporting, selling, using, transport, storage, destroying and disposal of pesticide in Lao PDR.

PART II
Business on pesticides

Article 5. Business on pesticides

A person, juristic person or organization having the intention to conduct business on pesticide shall submit a request licenses through agriculture sector and others related sector for getting an approval and shall register its enterprise with industrial and commerce sector as determined in the Law of Enterprise.

Article 6. Import and export, selling license

Registered Pesticide prior to import and export shall be applied document to Agriculture Sector prior import or export 3 working days, 20 days for selling.

Article 7. Recording

A Person, juristic person or organization intend to import, export, manufacture, store pesticide shall record on whole of quantities of pesticides and other related information for using as a statistic providing to pesticide management.

Article 8. Responsibility on pesticide business

A person conducting pesticide business shall ensure the safety to minimize risks to human health, animal and the environment. In the case of accident where pesticide caused damage to human, animal and environment the pesticide business operator shall be responsible according to the laws. In addition the pesticide business operator shall be cooperated and facilitated to pesticide inspectors and other related authorities.

PART III

Registration of pesticides

Article 9. Registration of pesticide

All pesticides that are produced, imported, exported, distributed and used in Lao PDR must be registered with the Department of Agriculture, Ministry of Agriculture and Forestry.

Article 10. Exception pesticide registration

1. Registration is not required for botanical pesticide that are not packed for sale;
2. Provisional registration can be granted for products imported for the purpose of research, trial or exhibition, but need to be requested from DOA, MAF, with requires evidence that the products register in the country of origin.

Article 11. Qualifications for pesticide registration

A person, juristic person or organization who wants to register pesticide shall have the following qualifications:

1. Person holding license as described in article 19 of this regulation;
2. Imported pesticide shall be registered in exported country.

Article 12. Application for registration

A person, juristic person of organization having intention to register pesticide shall submit application to pesticide registration committee in Ministry of Agriculture and Forestry.

The registration application shall consist of following documents:

1. Copy of enterprise registration certificate;
2. Copy of pesticide registration certificate of exporting country or/and original country;
3. Nomination letter for registration from manufacturer or exporting country;
4. Instruction of pesticide use;
5. Sample of pesticide.

Article 13. Registration consideration

Pesticide registration Unit of DOA shall consider application whether to register or denied registration within 60 days from the date the application is received. In the case of denial of registration, the written notice shall be given to applicant by the DOA.

Article 14. Pesticide registration certificate

Pesticide registration certificate is an official document issued by Director General of DOA, Ministry of Agriculture and Forestry and valid for two year. Prior two months of expiration, the Certificate Owner shall submit a request for renewal certificate to the DOA. The application and process of consideration will be proceed as described in article 12 and 13 of this regulation.

Article 15. Withdrawal of pesticide registration certificate

The pesticide registration certificate may be withdrawn prior to its expiration date by the Director General of Department of Agriculture in any following case:

- there is a material violation of this regulation or other related laws by the certificate owner or his authorized representatives;
- the pesticide is no longer effective for its intended use;
- the pesticide has been withdrawn from the market;
- in case of cancellation of a registration, the Registration Committee shall fix a reasonable phasing-out period for the distribution and use of the product concerned.

Withdrawn certificate of registration shall be informed to related agencies.

Article 16. Pesticide registration Unit

Pesticide registration Unit is a unit under administration of the Department of Agriculture, Ministry of Agriculture and Forestry, which has the main role and task as following:

1. Review application for registration of pesticide and take registration decision;
2. Regularly review the list of registered of pesticide to determine whether they still meet the requirements, taking into consideration the latest scientific information;

3. Edit and approve labels of pesticide;
4. Implement others right and task as described in related legislations.

PART IV

Management of production, import, export, distribution, transportation, Storage and transit of pesticide

Article 17. Formulating pesticide

A person, juristic person or organization having the intention to formulate pesticides shall submit an application to Ministry of Agriculture including socio-economy document and production technique.

Article 18. Import-Export of pesticide

Only registered pesticides can be imported or exported. Registration has to be applied for from the Department of Agriculture, Ministry of Agriculture and Forestry and shall comply with other related laws, exclude the pesticide determined in article 10 of this regulation.

Article 19. Distribution or selling pesticide

Distributors or traders must have criteria as following:

1. Attended in training of pesticide and have related certificate;
2. Have material safety data sheets, instruction of pesticide for customer using properly;
3. To ensure there are not harmful to neighboring people or environment;
4. To supply plant protection clothes for customers;
5. Storage must strictly follow article 21;
6. Must have records purchase orders and selling.

Prohibitions of distributors or traders of pesticide are following:

1. Distribute without license of related authorities;
2. Sale pesticides which:
   - did not register in Lao PDR
   - have exceeded their expiry date, or have changed their physical appearance or behavior, such as color, sedimentation, inability to disperse, etc.… or container break or leak container;
   - lack of sign or was destroyed that could not read;
   - repack for sale

Article 20. Transportation

Transporters/carriers of pesticide shall adhere to the following rules:

1) For consignment of Pesticides, either of same or different groups, exceeding 100 liters (fluids) or 1000 kg (solids), separate documentation must be issued and be kept with the driver. The documentation shall have the following content:
   1. Name, address, phone number of owner and shipper;
   2. Trade name or common name of transported Plant Protection Products;
   3. Formulation types and concentrations of Plant Protection Products transported;
   4. Volume of Plant Protection Products;

5. Emergency procedures, in the case of breakage or spill;
6. A safety data sheet for each of the materials transported.

2) For consignments, greater than 1000 liters or 1000 kg the transport route must be declared in advance;
3) Plant Protection Products carried by means of public transport, shall not exceed 20 1 for liquids or 20 kg for solids. However, they shall be wrapped properly and kept separately from the passengers and other goods;
4) The drivers of vehicles carrying Plant Protection Products shall be selected properly – they shall be reliable and competent;
5) Prohibit to transport pesticides with living organism and others goods.

Article 21. Storage

If pesticides are store more than 10 liters/kilograms, the following requirement should be met:

1) A pesticide storage facility should be located in an area where flooding is unlikely and far from people and domestic animal farm at least 100 m;
2) All pesticides must be kept in a facility that can be locked and posted as a pesticide storage area;
3) Kept pesticide far from sources of heat or directly in the sun;
4) Separate pesticide from others goods;
5) Lay out pesticide by group and hazard classification;
6) Kept pesticide in original containers with label;
7) Absorbed substances such as charcoal, sawdust, sand;
8) Take care floor clean and dry, clean up when spillage of pesticide occurred, leaking from container;
9) Soap and water are available for washing when contact with pesticide;
10) Use stand or pallets for placing pesticide and avoid direct on floor;
11) Kept empty containers in safety place prior to disposal.

Article 22. Transition

All pesticides passing through Lao PDR in transit shall comply with relevant bilateral or multilateral agreements to which Lao PDR is a party.

PART V

Use of pesticide and disposal

Article 23. Use of pesticide

A person intending to use pesticide shall recognize its characteristic and pay attention to following matters:

1. Use Integrated Pest Management especially controlling pest by using natural enemies;
2. Use pesticide in proper way and implement as described on the label;
3. Wear protective equipment whenever apply pesticide; employers should provide proper equipment including training on pesticide application for employees;
4. Ensure preventing dangerous effects of pesticide to human health, animal and environment;
5. Any accident involving pesticides that requires specialist assistance or poses a threat to human health or the environment should immediately be reported to the relevant authority.

Article 24. Disposal of pesticide

Substandard pesticide, counterfeit, expired products, pesticide waste including empty containers shall be properly disposed or buried in an approved landfill without effecting to environment, the location is on flat ground, far from water resource and well or underground water and follow technical guideline as specified by Water Resources and Environment Administration (WREA).

PART VI

Packaging Labeling and Advertising

Article 25. Packaging

Repackaging of pesticide is prohibited unless specific permission has been obtained from pesticide registration unit, DOA.

Pesticides should be in original package which safety while import, transport, store or distribute and ensure safe when handle to protect harmful to human health, animal and environment.

Article 26. Labeling

All packaging of pesticide should be affixed label on or attached label in the pesticide container. The label must be in Lao language and/or English which could easily to read, clear and does not easily to tear.

1. The contents and form of label shall be approved by the pesticide registration unit, and contains the following information:
   - 1.1 Trade name;
   - 1.2 Chemical (common) name, formulation and concentration of active ingredient;
   - 1.3 Purpose of usage, e.g. which crops and pests;
   - 1.4 Dosage and mode application;
   - 1.5 Signs and instructions see paragraph 2 of this article;
   - 1.6 Directions for storage, mixing, usage, packaging and recommended personal protection from hazards;
   - 1.7 Pre-harvest interval;
   - 1.8 Warnings;
   - 1.9 Symptoms of poisoning, methods of mitigation, directions for physician;
   - 1.10 Hazard classification (WHO or GHS);
   - 1.11 Name of producer;
   - 1.12 Volume of package;
   - 1.13 Production or expiry date;
   - 1.14 License number;

2. Instruction for labeling
   - 2.1 Pesticide under WHO hazard Class Ia must be labeled with a clear danger sign, the skull and crossed bones, and bear the text ‘extremely toxic’ which should be accompanied by the appropriate signs as under 3 below.
   - 2.2 Pesticide under WHO hazard Class Ib must be labeled with a clear danger sign, the skull and crossed bones, and bear the text ‘highly toxic’, accompanied by the appropriate signs as under 3 below.
   - 2.3 Pesticide under WHO hazard Class 2 must be labeled with a clear danger sign, flash, and bear the text: ‘dangerous’, accompanied by the appropriate signs as under 3 below.
   - 2.4 Pesticide under WHO hazard Class 3 must bear the text: ‘attention’ accompanied by the appropriate signs as under 3 below.

3. The following phrases shall be used to mark characteristics of usage and to Mark of usage and characteristic precautions:

3.1  Keep away from children

3.2  Wash after handling

3.3  Dangerous to animals

3.4  Dangerous to fish and aquatic animals, prohibited to contaminate water ways

3.5 The following phrases shall be used in either "usage" or "mixing" directions, as appropriate:

3.5.1  Wear eye protection

3.5.2  Wear breathing protection

3.5.3  Wear mask

3.5.4  Wear gloves

3.5.5  Wear protective clothing during spraying or handling

3.5.6  Wear rubber boots

Article 27. Advertising

A person, juristic person or organization shall only advertise registered pesticide.

Prohibit advertising over reality or not correctly as characteristic of pesticide which lead misunderstanding of customers and users.

PART VII

Management and inspection

Article 28. Management and inspection of pesticides

Pesticide management and inspection sections comprise of:

- Department of Agriculture, Ministry of Agriculture and Forestry;
- Provincial Agriculture and Forestry Office;
- District of Agriculture and Forestry Office.

These three sections will assign pesticide inspection unit which include trained staffs on pesticide management from DOA.

Article 29. Inspection of pesticide

Inspection of pesticide refers to monitoring of pesticide manufacture process, import – export, distribution, advertising, storage, using and disposal of expired pesticide or pesticide waste include empty containers on farm, concession farm, individual farm, governmental and private farm to compliance with laws of Lao PDR.

Article 30. Types of pesticide inspection

There are three types of pesticide inspection:

1. Regular inspection;
2. Inspection with advance notice;
3. Immediate inspection.

Regular inspection refers to an inspection performed regularly according to plans at pre-determined times which shall conduct at least once a year.

Inspection by advance notice refers to an inspection which is not included in the plan, which is performed when deemed necessary and for which advance notice is given.

Immediate inspection refers to a sudden inspection performed without advance notice to the person to be inspected.

Article 31. Right and duties of Department of Agriculture

In the management and inspection of pesticide, the Department of Agriculture has following rights and duties:

1. To conduct research on policies, laws and regulations on management and inspection of pesticide and then propose to Minister for consideration;
2. To disseminate and train policy, laws and regulations on pesticide management and inspection;
3. To cooperate with related agencies and local administration for pesticide management and inspection;
4. To implement the pesticide registration and make available regular update of the lists of registered and banned pesticides;
5. To monitor the licensing for the import-export of pesticide;
6. To train and upgrade officials involving to pesticide management and inspection on politic, ideology, moral, and technique;

7. To appoint inspectors taking into consideration based on proposal and to provide them with the necessary badge that empower them to conduct their task;
8. To provide training to traders to obtain basic knowledge about pesticide and their risks;
9. To cooperate with international organizations on pesticide management and inspection;
10. To regularly report to government on the implementation of its duties in pesticide management and inspection throughout the country.
11. To exercise other rights and duties as stipulated in related legislations.

Article 32. Right and duties of Provincial Agriculture and Forestry Office (PAFO)

In the management and inspection of pesticide, Provincial Agriculture and Forestry Office has following rights and duties:

1. To supervise the implementation of laws and regulations on pesticide management and inspection within its own province;
2. To issue the imported license to person or juristic person which registered pesticide, or to be representative of pesticide distributor, and must be based on requirement of use of pesticide in local province to avoid over supply leading to expire date;
3. To issue sell and/or imported license to person or juristic person which meet the requirement for such business;
4. To implement the inspection of pesticide shops in their provinces and to follow up in cases of violation;
5. To make available the necessary staffs and budget to exercise the duties assigned under the regulation;
6. To make proposal regarding appointment of pesticide inspectors under its control to the Minister of Agriculture and Forestry;
7. To cooperate with other involving agencies on pesticide management and inspection;
8. To regularly report to the Ministry of Agriculture and Forestry on the implementation of its duties in pesticide management and inspection;
9. To exercise other rights and duties as stipulated in the laws.

Article 33. Right and duties of District Agriculture and Forestry Office (DAFO)

District Agriculture and Forestry Office has following rights and duties:

1. To implement the laws and regulations on pesticide management and inspection within its responsible area;
2. To cooperate with other involving agencies on pesticide management and inspection;
3. To regularly report to PAFO on the implementation of its duties in pesticide management and inspection;
4. To exercise other rights and duties as stipulated in the laws.

Article 34. Rights and duties of pesticide inspectors

The pesticide inspectors have following rights and duties:

1. Inform traders (import-export, sale, storage) of their obligation under this regulation;
2. While conducting inspection of pesticide, inspectors shall show the nominated certificate and identity card to persons subject to the inspection and shall duly and strictly comply with the laws and regulations;
3. carry out periodic inspections of all persons, juristic person or organizations who involved in import, export, manufacture, pack, repack, label, store, distribute, advertise or use pesticides to determine whether the provisions of this Decree are being complied with;
4. require for inspection, the production of certificates, permits, licenses, records or any other document or authorization granted or issued under this Decree;
5. take samples of any pesticide, substances or other objects related to pesticide for analysis;
6. seize any equipment, pesticide, document, record, or other thing which the Inspector believes has been used in, or which appears to afford evidence of, a contravention of national legislation, so long as:
   - the inspector gives a receipt in the prescribed form to the person from whose custody the item was taken;

   - the item is returned to that person once the inquiry has been completed, except for illegal pesticides, which if so declared by the court, shall be disposed as prescribed in article 11 of this regulation;

7. Take the appropriate action with the responsible authorities to follow up on violation;

8. Report violation that required fining to the PAFO on the result of inspection to the Head of Provincial Agriculture and Forestry Office and Director General of DOA.

PART VIII

Fees and Service charges

Article 35. Fees and service charges

Fees and service charges for registration certificate or licenses of pesticide shall be based on curricular of Ministry of Finance on fees and service charges which have been promulgated from time to time.

PART IX

Rewards and sanctions

Article 36. Rewards

Any person, juristic person or organization having good deeds in implementing this regulation shall be adequately rewarded and privileged from treatments determined by Ministry of Agriculture and Forestry.

Article 37. Rewards for government officials

Government official work involved pesticide continuously over 5 years shall be received pension before the date as described in article 59 of Labor Law.

Article 38. Measures towards violators

Any person, juristic person or organization having violated of this regulation shall be educated, warned fined and punished, depending on the gravity of the cases as follow:

1st violation: educate, warn and record in file;

2nd violation: seize goods and fine 50% of the goods according to the market price and record in the file;

3rd violation: seize goods and fine twice of the goods value according to the market price, record in the file, collaborate and submit to the concerned authority for temporally or closing the business depending on the case.

Any violation in the first time, second or third, if it being strong consequences to the human health, animal, plant or environment shall be punished according to criminal law.

Any person who suffers from the imports, exports, manufacture, packaging or storage of pesticides which are unqualified and dangerous to human health and the environment, or from their illegal use, shall be compensated by the competent court.

In case of disposal pesticides or send back to exported country the violators must be responsible for all expenditure.

PART X

Final provision

Article 39. Implementation

The Department of Agriculture, Ministry of Agriculture in collaboration with concerned organizations has to develop and implement this regulation for effectively result.

Article 40. Effectiveness

This regulation comes into force after the date of its signing.

Regulations and provisions which are contradicted to this regulation shall be null.

Minister of Agriculture and Forestry

List of eligible and banned Pesticide in Lao PDR. May 2010 - List of eligible and registered pesticides

No	Common name	a.i (%)	Trade name	Type of application	Countries of origin	Toxicity class
1	2,4- D	80%	Zico 80 WP	Herbicide	Vietnam	WHO II
2	2,4-D dimethy Lammonium	84%	Dee Jai	Herbicide	Thai	WHO II
3	2,4-D dimethyl ammonium	82.1%	Obet	Herbicide	Thai	WHO II
4	2,4-D dimethyl ammonium	84%	B K Amin	Herbicide	Thai	WHO II EPA II
5	2.4 D	60%	ZICO 720 SL	Herbicide	Vietnam	WHO II
6	2.4 D	48%	Zico 48 SL	Herbicide	Vietnam	WHO II
7	45% buprofezin + 15% Imidacloprid	60%	DIFLOWER ® 600WP	Insecticide	Vietnam	WHO U
8	Abamectin	1.80%	Khum Pleum	Insecticide	Thai	EPA IV
9	Abamectin	1.8%	Coundown	Insecticide	Thai	EPA IV
10	Abamectin	1.8%-3.6%-5%	DIBAMEC®1. 8EC-3.6EC-5WG	Insecticide	Vietnam	EPA IV
11	abamectin	1.8%	Intake	Insecticide	Thai	EPA IV
12	Abamectin 0.9% + Bacillus thuringensis 1.15	2%	ABT 2 WP	Insecticide	China	EPA IV
13	Acetochlor	50%	Dibstar 50 EC	Herbicide	Vietnam	WHO III
14	Acetochlor	80%	Saicoba 80 EC	Herbicide	Vietnam	WHO III
15	Acting		AI-Net Acting	Plant Growth regulator	Thai	
16	Agrio-streptomycin	72%	Agrio-streptomycin	Bactericide	China	
17	Alachlor	48%	Anchor	Herbicide	Israel	WHO III
18	Alpha cypermethrin	5%	Sapen-Alpha 5 EC	Insecticide	Vietnam	WHO II
19	Alpha-Cypermethrin	2%	Dominex	Insecticide	Thai	WHO II
20	Alpha-	5%	DANTOX®5E	Insecticide	Vietnam	WHO II

List of eligible and banned Pesticide in Lao PDR. May 2010 - List of eligible and registered pesticides

No	Common name	a.i (%)	Trade name	Type of application	Countries of origin	Toxicity class
	Cypermethrin		C			
21	Ametryn	50%,80%	Sametrin 50 WP, 80 WP	Herbicide	Vietnam	WHO III
22	Atrazine	80%	Mizin 80 WP	Herbicide	Vietnam	WHO U
23	Atrazine	90%	B K Mac P 90WG	Herbicide	Thai	WHO U EPA III
24	Azoxystrobin + Propiconazole	32,5 %	Saiprobin 325 SC	Fungicide	Vietnam	WHO U
25	Bensulfuron methyl	10%	Beron 10 WP	Herbicide	Vietnam	WHO U
26	Bifenthrin	24%	Biflex - TC	Termiticide	Thai	WHO II
27	Bifenthrin	0.50%	Fentax 10 WP	Insecticide	Thai	WHO II
28	Bifenthrin	1.25%	Bistar- D	Insecticide	Thai	WHO II
29	Bifenthrin+Malathion	2%+40%	Bistar - M	Insecticide	Thai	WHO II
30	buprofezin	40%	Lang van	Insecticide	Thai	WHO U
31	Butachlor	5%-10%	DIBUTA®60 EC	Herbicide	Vietnam	WHO U
32	Butachlor	60%	Butaxim 60 EC	Herbicide	Vietnam	WHO U
33	Butachlor + Propanil	70%	Por Jai	Herbicide	Thai	WHO U
34	Butachlor+Bensulfuron Methyl	21%+4%	ALOHA®25WP	Herbicide	Vietnam	WHO III
35	Carbendazim	50%	Sabay Dee	Fungicide	Thai	WHO U
36	Carbendazim	50%	DIBAVIL® 50FL -50WP	Fungicide	Vietnam	WHO U
37	Carbendazim	50%	Carbendazim 500 FL	Fungicide	Vietnam	WHO U
38	Carbendazim	50%	Carbendazim 50 WP	Fungicide	Vietnam	WHO U
39	Carbendazim + Mancozeb	6.2%+73.8%	C M plus	Fungicide	Thai	WHO U
40	Carbosulfan	20%	Kanir	Insecticide	Thai	WHO II

List of eligible and banned Pesticide in Lao PDR. May 2010 - List of eligible and registered pesticides

No	Common name	a.i (%)	Trade name	Type of application	Countries of origin	Toxicity class
41	Cartap	95%	Big cock 95 SP	Insecticide	China	WHO II
42	Cartap	4%	Big cock 4 G	Insecticide	China	WHO II
43	Cartap hydrochloride	50%	Chodsanit	Insecticide	Thai	WHO II
44	Chlorothalonil	75%	Mention	Fungicide	Thai	WHO U
45	Chlorothalonil	53.0%	Daconil 720 SC	Fungicide	Japan	WHO U
46	Chlorpyifos methyl	3%	Sago-Super 3 G	Insecticide	Vietnam	WHO U
47	Chlorpyifos methyl	20%	Sago-Super 20EC	Insecticide	Vietnam	WHO U
48	Chlorpyrifos	40%	Temsoob	Insecticide	Thai	WHO II
49	Chlorpyrifos	40%	Casto	Insecticide	Thai	WHO II
50	Chlorpyrifos	40%	CJ - 40	Insecticide	Thai	WHO II
51	Chlorpyrifos Ethyl + Cypermethrin	532g/l+55g/l	Golden dragon 585 EC	Insecticide	Vietnam	WHO U
52	Chlorpyrifos+cypermethrin	50%+5%	New teen 55	Insecticide	Thai	WHO II
53	Chorothalonil	75%	Chorothalonil	Fungicide	China	WHO II
54	Copper hydroxide	77%	Microbucob	Fungicide	Thai	WHO III
55	Copper Oxycloride	85%	Saicoxy 85 WP	Fungicide	Vietnam	WHO III
56	Cyhalofop-Butyl	10%, 20%	Sagolince 100 EC,200 EC	Herbicide	Vietnam	WHO U
57	Cyhalofop-Butyl + Pyribenzoxim	50% + 20%	Sagoshots 70 EC	Herbicide	Vietnam	WHO U
58	Cymoxanyl + Mancozeb	8% + 64%	Saicymance 72 WP	Fungicide	Vietnam	WHO III
59	Cypermethrin	10%	Jud Hai	Insecticide	Thai	WHO II
60	Cypermethrin	35%	Rup four 35	Insecticide	Thai	WHO II
61	Cypermethrin	5%-10%-25%	DANTOX®5EC-10EC-25EC	Insecticide	Vietnam	WHO II

List of eligible and banned Pesticide in Lao PDR. May 2010 - List of eligible and registered pesticides

No	Common name	a.i (%)	Trade name	Type of application	Countries of origin	Toxicity class
62	Cypermethrine	25%	Secsaigon 25 EC	Insecticide	Vietnam	WHO II
63	Cypermethrine	10%	Secsaigon 10 EC	Insecticide	Vietnam	WHO II
64	Cypermethrine	5%	Secsaigon 5 EC	Insecticide	Vietnam	WHO II
65	Cypermethrine	50%	Secsaigon 50 EC	Insecticide	Vietnam	WHO II
66	Cyst-Forming protozaon	200,000-§ò¡ªþ	Prorodent	Rodenticide	Thai	
67	Denotefuran + Imidacloprid	5%+15%	EXPLORER ® 200WP	Insecticide	Vietnam	WHO II
68	Diazinon	10%	Diaphos 10 G	Insecticide	Vietnam	WHO II
69	Diazinon	50%	Diaphos 50 EC	Insecticide	Vietnam	WHO II
70	Dimethoate	40%	Dimenate 40 EC	Insecticide	Vietnam	WHO II
71	Dimethoate + Fenvalerate	21.5% +3.5%	Febis 25 EC	Insecticide	Vietnam	WHO II
72	dinotefuran	20%	Sagoshin 20 WP	Insecticide	Vietnam	WHO U
73	Diuron	80%	Ansaron 80 WP	Herbicide	Vietnam	WHO U
74	Effective Microorganism (EM)	5%	GENO-MI® 5 SL	Plant Growth regulator	Vietnam	
75	Emamectin + Benzoate	5%+2%	COMDA 5WDG,2EC,2SC, 5EC,5SC	Insecticide	Vietnam	WHO II
76	Emamectin benzoate	0.20%	Emamectin benzoate	Insecticide	China	WHO III
77	Ethephon	2,5%	Sagolatex 2.5 PA	Plant Growth regulator	Vietnam	
78	Fenobucard	50%	Bascide 50 EC	Insecticide	Vietnam	WHO II
79	Fipronil	5%	Sagofipro 5 SC	Insecticide	Vietnam	WHO II
80	Fipronil	5%-0.3%-80%	LEGEND®5SC-0.3G-	Insecticide	Vietnam	WHO II

List of eligible and banned Pesticide in Lao PDR. May 2010 - List of eligible and registered pesticides

No	Common name	a.i (%)	Trade name	Type of application	Countries of origin	Toxicity class
			800WG			
81	Fluazifop-p-butyl	15%	Hekio	Herbicide	Thai	WHO III
82	Flumetralin	25%	Flumetralin	Plant Growth regulator	China	WHO U
83	Fomesafen	25%	Dilamma	Herbicide	Thai	WHO III
84	Fosetyl aluminium	80%	Kan Aeng	Fungicide	Thai	WHO U
85	Fosetyl aluminium	80%	Alpine 80 WP; 80 WDG	Fungicide	Vietnam	WHO U
86	Fosetyl aluminium	80%	DIBAJET®80 WP	Fungicide	Vietnam	WHO U
87	Glyphosate	41%	Lyphoxim 41 SL	Herbicide	Vietnam	WHO III
88	Glyphosate IPA Salt	48%	Dibphosate 480 SL	Herbicide	Vietnam	WHO III
89	Glyphosate isoproylammonium	48%	Burn up 48	Fungicide	Thai	WHO III
90	Glyphosate isoproylammonium	48%	Glyfosate 48	Herbicide	Thai	WHO III
91	Glyphosate isoproylammonium salt	48%	Grafic	Herbicide	Thai	WHO III
92	Glyphosate isoproylammonium salt	48%	Baca up 48	Herbicide	Thai	WHO III
93	Glyphosate isoproylammonium salt	48%	Baka up 48	Herbicide	Thai	WHO III
94	Greenfast		AI-Net Greenfast	Plant Growth regulator	Thai	
95	haloxyfop-R-methylester	10.8%	Hork	Herbicide	Thai	WHO II
96	Hexaconazole	5%,10%	Saizole 5SL,	Fungicide	Vietnam	WHO U

List of eligible and banned Pesticide in Lao PDR. May 2010 - List of eligible and registered pesticides

No	Common name	a.i (%)	Trade name	Type of application	Countries of origin	Toxicity class
			10EC,10SC			
97	Hexaconazole	5%-10%	DIBAZOLE ® 5 SC-10SL	Fungicide	Vietnam	WHO U
98	Imidacloprid	10%	Saimida 100 SL	Insecticide	Vietnam	WHO II
99	Imidacloprid	5%-10%-70%	ARMADA®50 EC-100SL-100EC-100WG-700WG	Insecticide	Vietnam	WHO II
100	Imidacloprid	50%	Imidacloprid	Insecticide	China	WHO II
101	Iprobenfos	50%	Kisaigon 50 EC	Insecticide	Vietnam	WHO III
102	Iprobenfos+ Tricyclazole	14%+6%	Lua vang 20 WP	Fungicide	Vietnam	WHO III
103	Isoxaflutole	75%	Balance	Herbicide	Thai	EPA III
104	Lamda Cyhalothrin	2,5 %	Vovinam	Insecticide	Vietnam	WHO II
105	Magnesium Phosphide	66%	MAGTOXIN	Fumigant	Germany	EPA 1
106	Malathion	73%	Malate 73 EC	Insecticide	Vietnam	WHO III
107	Mancozeb	80%	Dipomate 80 WP	Fungicide	Vietnam	WHO U
108	Mancozeb	80%	Kroche	Fungicide	Thai	WHO U
109	Mancozeb	25%	Khob Jai	Fungicide	Thai	WHO U
110	Mepiquat chloride	97%	Animat 97 WP	Plant Growth regulator	China	WHO III
111	Metalaxyl	25%	Chiket	Fungicide	Thai	WHO III
112	Metalaxyl	25%	Chud Jen	Fungicide	Thai	WHO II
113	Metalaxyl + Mancozeb	8% + 64%	Mexyl MZ 72 WP	Fungicide	Vietnam	WHO II
114	Metsulfuron Methyl	20%	DANY®25 DF	Herbicide	Vietnam	WHO III
115	N - ONE		AI-Net N- One	Plant Growth regulator	Thai	

List of eligible and banned Pesticide in Lao PDR. May 2010 - List of eligible and registered pesticides

No	Common name	a.i (%)	Trade name	Type of application	Countries of origin	Toxicity class
116	N- TWO		AI-Net N- Two	Plant Growth regulator	Thai	
117	N-Function		AI-Net N-Function	Plant Growth regulator	Thai	
118	Nitrogen	4%	GENO-SUPER	Plant Growth regulator	Vietnam	
119	Nitrogen	21%	GENO-N-SUA	Plant Growth regulator	Vietnam	
120	Pacecilomyces lilacinus	50%	Palila 500 WP	Fungicide	China	
121	Paclobutrazol	15%	Saigon P1 15 WP	Plant Growth regulator	Vietnam	WHO III
122	Pendimethalin	330g/l	Pendimethalin	Herbicide	China	WHO III
123	Phosalone + Cypernethrin	17,5% + 3%	Sherzol 205 EC	Insecticide	Vietnam	WHO II
124	Pretilachlor	30%	Venus 300 EC	Herbicide	Vietnam	WHO U
125	Propanil	36%	Protocom	Herbicide	USA	WHO III
126	Propiconazole+ Prochloraz	49%	Sai Jai	Fungicide	Thai	WHO II
127	Propineb	70%	Saitracone 70 WP	Fungicide	Vietnam	WHO U
128	Pyrazosulfuran ethyl	60%	Red dragon60WDG	Herbicide	Vietnam	WHO U
129	Pyribenzoxim	3%	Pyanchor 3 EC	Herbicide	Vietnam	
130	Quinalphos	25%-5%	FAIFOS®25E C-5G	Insecticide	Vietnam	WHO II
131	Quinclorac	50%	DANY®25 DF	Herbicide	Vietnam	WHO U
132	Seaweed Extract	6%	GENO-ROOTS	Plant Growth regulator	Vietnam	
133	Sulfur	80%	Sulox 80 WP	Fungicide	Vietnam	WHO U
134	Tebuconazole	2,5% + 4,5 %	Saifolicer 250 WG, 430 SC	Fungicide	Vietnam	WHO III
135	Tebuconazole + Trifloxystrobin	5% + 2.5 %	Sainative 750 WG	Fungicide	Vietnam	WHO III

List of eligible and banned Pesticide in Lao PDR. May 2010 - List of eligible and registered pesticides

No	Common name	a.i (%)	Trade name	Type of application	Countries of origin	Toxicity class
136	Temephos	1%	Chemfleetsan dagarid	Insecticide	Thai	WHO U
137	Thiophanate methyl	70%	Thio - M 70 WP	Fungicide	Vietnam	WHO U
138	Thiophanate methyl	50%	Thio-M 500 FL	Insecticide	Vietnam	WHO U
139	Thiophanate methyl + Tricyclazole	36%+14%	Pysaigon 50 WP	Fungicide	Vietnam	WHO U
140	Tricyclazole	20% + 75 %	Trizole 20WP, 75WP.75WG	Fungicide	Vietnam	WHO II
141	Validamycin	5%	Vanicide 5 SL	Fungicide	Vietnam	WHO U
142	Validamycin	3%	Kwan Jai	Fungicide	Thai	WHO U
143	Validamycin A	5%	Vanicide 5 WP	Fungicide	Vietnam	WHO U
144	Validamycin A	3%	vanicide 3 SL	Fungicide	Vietnam	WHO U

List of banned pesticides

Insecticides and acaricides

1. Aldrin
2. BHC
3. Chlordane
4. Chlordimeform
5. Chlorfenvinphos
6. Chlorthiophos
7. Cyhexatine
8. DDT
9. Dieldrin
10. Dimefox
11. Dinitrocresol
12. Demeton
13. Endrin
14. Endosulfan
15. Ethyl Parathion
16. EPN
17. Heptachlor
18. Hexachloro cyclohexane
19. Leptophos
20. Lindane
21. Methamidophos
22. Methomyl
23. Methyl parathion

24. Monocrotophos
25. Pholy chlorocamphene
26. Phorate
27. Schradan
28. TEPP
29. Toxaphene

Fungicides

30. Binapacryl
31. Captafol
32. Cycloheximide
33. Mercury and mercury compounds
34. MEMC
35. PMA
36. Selenium compound

Rodenticides

37. Chlorobenzilate
38. Sodium fluoasetate

Herbicides

39. 2,4,5 -T
40. Dinoseb
41. Dinoterb acetate / Dinitrobutyphenol
42. Paraquat
43. Sodium chlorate

Fumigants

44. EDB
45. Ethylene oxide
46. Methyl bromide

Others

47. Arsenic compound
48. Calcium arsenate - Herbicide, rodenticide, molluscicide, insecticide
49. DBCP - Nematocidide
50. Daminozide - Plant growth regulators
51. Fluoroacetamide - Insectide, rodenticide
52. Oxamyl - Insecticide, acaricide, termiticide
53. Phosphamidon - Insecticide, nematodicide
54. Sodium Arsenite - Insecticide, fungicide, herbicide, rodenticide
55. Thallium (i) sulfate) - Rodenticide, insecticide

ANNEX 3: PEST MANAGEMENT PLAN

Annex 3 is the Pest Management Plan (PMP). It aims to provide basic knowledge to the national, provincial and district government, the LACP team, consultants, Kumban (KB) staff, village officials, private and public sector agencies with adequate guidance for effectively addressing the safeguard issues in line with OP 4.09. The process will be implemented as part of the LACP project cycle and fully integrated into the subproject selection, approval, implementation, and monitoring and evaluation process. The LACP does not include procurement of pesticides, but the ESMF identifies key issues related to the existing use of pesticide and chemical fertilizers and identified mitigation measures required in relation to prohibited items, training, and guidelines on safe use and disposal of pesticides. The PMP will be applicable for all LACP activities related mostly to:

- Component A: Improved Agriculture Efficiency and Sustainability, which supports (a) Adopting good varieties and quality seeds, (b) Promoting good agriculture practices, (c) Providing critical infrastructure, and (d) Strengthening public services delivery.

In instances where activities under Component B would potentially impact pesticide use and reduction, the PMP will also apply for:

- Component B: Enhanced Agriculture Commercialization, which supports: (a) Establishing Agriculture Value Chain Facility (AVCF), (b) Linking farmers to markets, and (c) Improving the enabling environment.

Village visits indicted that chemical based fertilizers and pesticides are currently being used in the project areas, particularly in instances where monoculture is practiced.

Responsible agency: The LACP staff at central and local levels will be responsible for implementation of the PMP and ensuring full compliance, including keeping proper documentation in the project file for possible review by the World Bank.

This document is considered a living document and could be modified and changed as it is appropriated. Close consultation with the World Bank and clearance of the revised PMP will be necessary.

SECTION I. POLICY AND REGULATIONS

World Bank's safeguard policy on pest management (OP 4.09)

OP 4.09 (pest management). The policy requires projects involving procurement of pesticide to prepare and implement a Pest Management Plan to ensure that the handling, transportation, usage, disposal of pesticide be safe for both human and the environment. The LACP will not promote the procurement of any chemical pesticides or herbicides. However, if pest invasion occurs, small amount of eligible and registered pesticides in the project provinces is allowed if supplemented by additional training of farmers to ensure pesticide safe uses in line with World bank's policies (OP 4.09). And, given that the project is designed to promote the reduction in chemical pesticide and fertilizer use in existing farm land by enhancing sustainable farming practices, this simplified Pest Management Plan was prepared, along with a negative list. While the project will not procure and promote use of chemical pesticides and fertilizers, which are included in the non-eligibility list, it may be unrealistic to completely prevent all farmers from applying chemical inputs. Specifically, rehabilitation of irrigation, building of small irrigation/agriculture production, and/or control of infestation of diseases may involve the use of pesticides, herbicides, and insecticides. To mitigate this potential impact, this simplified PMP has been prepared outlining clear regulations and procedures for management of pesticides and/or toxic chemical as well as providing knowledge and training on health impacts and safe use of pesticides and/or, when possible, promotion of non-chemical use alternatives such as organic farming. The simplified PMP is informed by the Regulation on the Control of Pesticides in Lao PDR (2014) as well as guidelines on Integrated Pest Management (IPM) provided by the Food and Agriculture Organization of the United Nations (FAO).

The LACP will work closely with agriculture sector to apply the Conservation Agricultural Technology approved by Ministry of Agriculture and Forestry (MAF) in 2006 for the agricultural activities. This PMP is adopted and simplified from the PMP prepared for PRF III project.

Government regulation related to pest management

In March 2000, with support from Japan International Cooperation Agency (JICA) and Food and Agriculture Organization (FAO), the MAF established the Regulation number 0886/MAF and recently updated it on June 11, 2010 into Regulation 2860/MAF (Annex 2) on Pest Management in Lao PDR. The regulation was developed based on the WHO recommended Classification of Pesticide by Hazard and Guideline to Classification 1994-1995. The GoL had registered in January 2010 the companies who import pesticides, fertilizers and seeds into Lao PDR. The list of registered pesticides has been adjusted in May 2010 based on the updated regulation. The Department of Agriculture (DoA) under MAF is mandated to oversee all pesticide use.

SECTION II. KEY ISSUES AND MITIGATION MEASURES

Key issues related to use of pesticide and chemical fertilizer

The PMP is developed to support project community and a responsibility of all parties to support the implementation and proper applicability of the WB OP 4.09. Negative impacts from the use of pesticides and chemical fertilizers are expected to be minor and localized and could be mitigated during the planning and implementation of the project. Given that uses of pesticides and inorganic fertilizers are normal practices of some farmers, the LACP will promote IPM to avoid inappropriate use of them. However, it is important for MAF staff and local communities to understand the nature of such activities to encourage farmers to reduce the uses of pesticides and inorganic fertilizers.

Below summarize the possible activities which could be associated with the uses of pesticides and inorganic fertilizers under LACP.

- Implementation of subprojects related to increasing agriculture productivity (rice, corn and vegetables production) for commercialization as well as improving irrigation systems may lead to increase of pesticide, chemical, and fertilizer uses.

- Utilization of insecticide at rice mills.

From the experience dealing with farmers and rice millers in 5 provinces, they do not use pesticides but inorganic fertilizers in their farming. No fumigation activities at rice mill.

Actions for mitigation

The negative impacts from the use of pesticides and chemical fertilizers from LACP activities would be minor and localized and could be mitigated during the planning and implementation of the project. During the consultation stage with villages, there are opportunities to enhance positive impact during the planning and selection of the subprojects. Below summarize the activities to be carried out during the planning and implementation of LACP on pest management.

(a) Prohibition

To avoid adverse impacts due to pesticides, procurement of pesticides will not be promoted and this has been included in the "non-eligibility list".

(b) MAF staff training

The LACP will continue providing basic knowledge on alternative options for agriculture development and /or livelihood activities, including safe use of pesticides and other toxic chemicals. Budget would be allocated for project staff training to understand 1) overall policy on Pest Management (government and Bank policy); 2) basic knowledge on possibly negative impact on environmental and health from the use of pesticide and chemical fertilizer; and 3) basic knowledge on how to prevent it including what are the prohibited items in the country for pesticide and chemical fertilizer, how to prevent or mitigate the negative impact from the use etc. (staff training could be done jointly with other topics). This training would be provided for subprojects that involve the use of fertilizer, pesticides, and/or toxic chemicals.

(c) Provide knowledge to farmers

Prior consultation would be provided to project KBs. Pest management will be included as one topic for village consultation meeting at the KB. If likely that the agriculture support would be priority for a particular village either agriculture

infrastructure and livelihood support, training on pest management should be provided in the following areas:

- Pest management training: The objective is to provide basic knowledge to the target farmer on prohibited pesticides, the negative impacts of the use of pesticides and chemical fertilizers both on environmental and human health, and how to mitigate their negative impacts if there is a need for using them. It is also to inform farmers that, the GoL is not intended to support the use of any pesticides and chemical fertilizers in any agricultural productivity but promote conservation agriculture instead. However, the country has experienced severe pest invasions, and could lead to the usage of pesticides and chemical fertilizers in some cases to limit losses and damages to the agriculture products. The procurement of pesticide and chemical fertilizer will not be funded under LACP budget except for the special circumstances of the insect invasion occurred and the proper training has been provided to farmers.

- Training on GoL regulations: The country is experienced in the use of pesticides and chemical fertilizers and learnt from its neighboring countries. The LACP will train target farmers on Regulation number 2860/MAF on Pesticide Management before any subprojects are implemented, subject to compliance with the Bank's safeguard policy OP 4.09 on Pest Management.

- Technical training: This training would aim at providing the target farmers to understand clearly the technical aspects of pesticides and skills in using them such as what are the eligible and prohibited items of pesticides in Lao, the level of negative impacts of each eligible item, how to use them, how to protect and minimize the negative impacts while using them, how to keep them before and after used etc. Thus, the trainers would be someone from PAFO or DAFO who is knowledgeable on this. LACP will finance the training cost and per diem and transportation cost for the trainers.

- Procurement, storage, and usage of pesticide: the LACP will not involve procurement of pesticides. That said, any pesticides currently used in the project areas would require proper storage and usage monitoring throughout the course of the LACP, and this responsibility will lie fully with the DOA. The DOA should strictly follow with articles 18 and 19 of the MAF's regulation number 2860/MAF for procuring the pesticide; articles 20, 21 and 22 for transportation, storage and trans-boundary transportation of pesticides; and articles 23 and 24 for the safety use of pesticide. The DOA or user may refer in addition to the article 25 and 26 for the storage and usage of pesticide.

- Continued monitoring of pesticide use: As part of the regular monitoring of project activity, the World Bank and LACP teams will continue to monitor changes in pesticides, insecticides and chemical fertilizers use in all project related activities. Programs and trainings will be specifically amended to address any such changes.

Promotion of non-chemical agriculture

The LACP has been designed also to promote good agricultural practices and conservation of natural resources when possible. It is anticipated that linking the LACP agriculture activities with conservation agriculture techniques will be important for improving quality of life among farmers. Subprojects for LACP are still being determined, but for instances where subprojects are located in remote areas, the sustainable use of natural resources would be critical for farmers' livelihoods development and poverty reduction. If protected areas or critical natural habitats are located nearby, it is necessary to also take measures to minimize potential negative impacts and/or enhance positive impacts through community-driven processes. In this context, a "conservation agriculture technique" should be introduced for target communities, if and when applicable. During the planning process, actions will be carried out jointly between the LACP and DAFO to plan and train farmers.

Implementation arrangement and budget

(a) Planning and implementation

In close cooperation with PAFO, LACP staff at central level will be responsible for providing training to LACP staff at province and local level and Kumban facilitator during the consultation and planning stage. Budget for training will be included in the subproject cost or capacity building as appropriate.

(b) Monitoring

LACP staff at local level will work with DAFO staff for the monitoring of the use of pesticide in target community including: a) ensure the procured pesticide is not in the non-eligibility list provided in Annex 1: b) ensure procured pesticides are properly kept and transport them to the target area; c) ensure training delivery to the user before distribution; and d) monitor compliance usage of pesticide according to the MAF's regulation number 2860/MAF (in Annex 2). The World Bank and LACP team at central will carry out a joint Implementation Support Mission in every six months' period to review the compliance. The World Bank will use its Pest Management Guidebook as a standard to monitor compliance of the use of pesticide procured under the project.

ANNEX 4: CHANCE FIND PROCEDURES

The following *"chance find"* procedures to be included in all civil works contract:

If the Contractor discovers archeological sites, historical sites, remains and objects, including graveyards and/or individual graves during excavation or construction, the Contractor shall:

- Stop the construction activities in the area of the chance find;
- Delineate the discovered site or area;
- Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities or the National Culture Administration take over;
- Notify the supervisory Project Environmental Officer and Project Engineer who in turn will notify the responsible local authorities and the Culture Department of Province immediately (within 24 hours or less);
- Responsible local authorities and the Culture Department of Province would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archeologists of National Culture Administration. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values;
- Decisions on how to handle the finding shall be taken by the responsible authorities and Culture Department of Province. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration and salvage;
- Implementation for the authority decision concerning the management of the finding shall be communicated in writing by relevant local authorities; and
- Construction work could resume only after permission is given from the responsible local authorities or Culture Department of Province concerning safeguard of the heritage.

ANNEX 5: ENVIRONMENTAL AND SOCIAL SCREENING FORM

The Environmental and Social screening form to identify project impact, check lists to monitor impact of the sub-project implementation are provided as follows:

Environmental Screening Form

Step 1: Project Screening Checklists

The non-eligible list in Annex 1 of this ESMF will be used to screen the sub-project activities. Table 19 of Chapter 9 of this ESMF and Table 1 of this Annex will be used to screen the sub-project risk and its sensitivity. Table 1 also use for screening if the POE for dam inspection will be required.

Step 2: Guidance for Sub-Project Categorization

Categorization: To ensure that the extent of the review is commensurate with the nature of risk, categorization is a useful step in procedures where based on basic information about a project such as sector and scale, the level of E&S risk the project could pose is determined. This also enables the PMU to determine the extent and sophistication of the E&S review. Examples of categorization are High, Medium, and Low risk or Category A, B, C.

Category A Sub-project

The sub-project proposal and its operative setting must be explained to be able to determine the appropriate environmental category. The following characteristics of possible impacts of the transaction typically trigger Category A designation.

The location of the farmers/project enterprise or activity may be:

- Near sensitive and valuable ecosystems, protected areas and habitat of endangered species;
- Near sensitive receptor such as hospital, school, temple, etc.;
- Near areas with archaeological and/or historic sites or existing cultural and social institutions;
- Near or in areas occupied by vulnerable ethnic minorities or indigenous peoples, or lands to which they are collectively attached;
- In densely populated areas, where resettlement may be required or potential pollution impacts and other disturbances may significantly affect communities;
- In regions where there are conflicts in natural resources allocation;
- Near watercourses, aquifer recharge areas or in reservoirs used for potable water supply; or in or close to lands or waters containing valuable resources.

Examples of sensitivity issues are those where the sub-project can:

- Cause adverse global or regional environmental impacts;
- Concern the rights of indigenous people or vulnerable ethnic minorities;

- Require large scale land acquisition or subsequent change in land use that produces loss or damage of assets or income for local residents;
- Lead to involuntary settlements or displacement of people from their livelihoods;
- Impact protected or otherwise recognized areas of high biodiversity or cultural value; or
- Lead to toxic waste disposal.

Acquisition of small parcels of land, even if obtained on a negotiated basis with property owners or those with recognized rights to the land, should be considered as sensitive if expropriation or other compulsory measures would have resulted upon the failure of negotiation

Examples where the nature of the sub-project may:

- Cause irreversible degradation or unsustainable exploitation of natural resources; or
- Pose serious risks of significant harm to human health and safety.

Examples of the magnitude of the sub-project where:

- A high amount of scarce resources may be put at risk;
- The timing and duration of the negative impacts are long; or
- The cumulative effects of many similar, but individually small transactions together lead to serious impacts.

Category A sub-project are perceived to have significant adverse environmental and/or social impacts, and are not permitted to form part of the target portfolio.

Category B Sub-project

Transactions with a limited number of potentially adverse environmental or social impacts that are generally site-specific, largely reversible, and readily addressed through mitigation measures that reduce the risk to moderate or low levels are normally classified as Category B. The following characteristics indicate a Category B transaction.

- Environmental and social risks for the most part are mostly limited to and readily mitigated through application of good industry practice as described in relevant Environmental, Health and Safety Guidelines;
- Labor and working conditions are unlikely to include harmful child labor, involuntary or compulsory labor, or significant occupational health and safety issues;
- Significant land acquisition or significant land use change is not expected, nor is there expectation of displacement of people or significant loss of livelihoods due to project activities; and
- Socially or economically disadvantaged groups, such as tribal or ethnic groups or similar communities, are not known to occur in the project's area of direct impact, nor does the activity involve use of lands to which they are collectively attached.

In the agribusiness sector, the issue of supply chains for raw materials can be complex and, in some instances, this issue poses a significant reputational risk. In screening a sub-project, the PMU in close consultation with PAFO/DAFO will consider the matter of supply chains, especially under the

following three circumstances: (a) the source of the raw materials is clearly defined and dedicated; (b) there is recognized risk with respect to harmful child labor, involuntary or compulsory labor, or significant occupational health and safety issues associated with the supply chain; or (c) the source of raw materials are lands occupied by or traditional lands of indigenous peoples as defined in the World Bank Safeguard Policy on Indigenous Peoples.

3.3 Category C Sub-project: Sub-project proposal that are perceived to have minimal or no adverse environmental or social impacts are classified as Category C, and no further environmental or social assessment work needs to be done after initial screening and categorization.

Table 1- Sub-project E&S Assessment Form B (form #) for agriculture farming (Sub-Project Category B)

Farmer/Enterprise:	Proposal name:	Proposal number:
Amount Request		
Screened by:	E&S Applicable Requirements: □ Mitigation Plan Required □ No Mitigation Required □ No ESMF Clearance	Date:
E&S Consultant recommendations for proposal improvement before submit ting to DAFO/PAFO /PMU for review: Remarks:		

General Instructions:

- *This checklist is to be completed to support the verification of a Subproject Proposal. It is to be attached to the Subproject Agreement that is to be prepared and submitted to the DAFO/PAFO/PMU.*

This form is to be used by PMU and E&S consultant to screen for project category and potential environmental and social issues of a sub project, determine the instruments to be prepared for the sub- project

Subproject Name	
Subproject Location	
Subproject Proponent	
Subproject Type/Sector	
Estimated Investment	
Start/Completion Date	

Description of project: (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off site features necessary for its implementation. Attach additional sheets if necessary.)

_____

Checklist for identifying vulnerable to natural disaster and sensitive site subjective to water stress and risk of peak flood and draught under extreme weather event- to be described in the description of the sub-project proposal.

Checklist for examining	Yes (or) No
1. Are there people living along the creek within your village vicinity? If yes, Number of household/family……. Population …….	
2. Are these people vulnerable to peak flood?.....Frequency of flood……Duration…	
3. Are there water sources along the creek supplying water for	
Drinking use? Dependent Household …….	
Domestic use? Dependent Household …….	
Animal use?.....	
Fisheries?.....	
4. Are there agriculture land along the creek vulnerable to peak flood under extreme weather event? If yes, total hectare likely to be affected …….	
5. Are there alluvial cultivated land on stream bed or along the canal susceptible to water stress due to low flow regime? If yes, Estimated hectare……. Dependent farmers …….	
6. Are there any draught occurred in your village? If yes, Estimated hectare……. Dependent Farmers ……	
7. Are there any large dam, weir, reservoir within your village vicinity? What is the size of it? Is the height greater than 15 meters? Or the height between 10-15 m with one of the following three conditions are met: i) reservoir capacity greater than 3 million m3; ii) Crest length greater than 500 m. or iii) Spillway capacity greater than 2,000 m3/s	
8. Are there any habitats important for locally important fish species?	
9. Are there any severe erosion or landslide during extreme weather event in your village?	
10. Are there any known Unexploded Ordinances (UXOs) in your village?	
11. Are there any known Archaeological material, Stupa, high aesthetic and recreation value, sacred grove in your village?	
12. Are there any protected area, conservation, protection and production forest within or nearby your village?	
13. Are there any sensitive receptor such as temple, hospital, schools close to your sub-project area?	

Screening for sub-project categorization

Screening Questions	**Answer**		**If Yes**	**Document require if yes**
	Yes	No		
Is the proposed project likely to have minimal or no adverse environmental imp acts? Please provide brief justification:			Category C	No action needed beyond screening
Are the proposed project implementation acts limited, site specific and readily mitigated with known mitigation measures? Please provide brief justification:			Category B	ECOP
Are the proposed project implementation acts limited, site specific and readily mitigated with known mitigation measures and required IEE preparation to be approved by PoNRE? Please provide brief justification:			Category B	IEE that approved by PoNRE prior to sub-project implementation
Screening Questions	**Yes**	**No**		**Mitigations Require?**
Non-eligible list review				
Do the proposed activities or budget include any of the Project negative list (see Annex 1 of this ESMF				If Yes, proposal must be rejected. If Unknown, additional information is required before proposal can be considered.

Potential Environmental Impact

a) Impact on Environment	**Assessment of Impact on Environment**	**Level of Impact (Low, Medium, High)**
Physical Resources		
Changes are likely to occur due to wastewater discharge from sub-project to public waterway	□ (YES – Tick ✓)	
Impact on ground water yield to vicinity area and ground water quality	□ (YES – Tick ✓)	
Cause of Air pollution (dust, odour and Greenhouse Gas Emission)	□ (YES – Tick ✓)	

Cause of noise pollution	□ (YES – Tick ✓)	
Changes are likely to deteriorate soil quality	□ (YES – Tick ✓)	
Cause soil erosion/siltation	□ (YES – Tick ✓)	
Impact on soil quality	□ (YES – Tick ✓)	
Increasing of solid/hazardous waste	□ (YES – Tick ✓)	
Promote conservation of natural resources (water, soil)	□ (YES – Tick ✓)	
Biological Resources		
Impact to biological resources (flora and fauna), and aquatic life from siltation, wastewater from processing process, utilization of pesticide, insecticide and herbicide.	□ (YES – Tick ✓)	
Involve sustainable harvest/use of NTFP, fishes, and other aquatic life, etc.	□ (YES – Tick ✓)	
Promote conservation of natural resources (wildlife, biodiversity) and habitats	□ (YES – Tick ✓)	
Human Use Values		
Changes are likely to impact water use of vicinity area due to increasing of water demand from sub-project	□ (YES – Tick ✓)	
Changes are likely to impact electricity and energy use in the vicinity	□ (YES – Tick ✓)	
Increasing of Traffic volume	□ (YES – Tick ✓)	
Impact on land use change	□ (YES – Tick ✓)	
Quality of Life Values		
Impact on worker health and safety	□ (YES – Tick ✓)	
Promote cleanliness, hygienic, road safety, and/or public health	□ (YES – Tick ✓)	
Promote income generation to farmers and related agribusiness	□ (YES – Tick ✓)	
Increasing SMEs related to agribusiness	□ (YES – Tick ✓)	
Improve access to market	□ (YES – Tick ✓)	
Others: *Specify* _____	□ (YES – Tick ✓)	

b) Impact on pest management	**Assessment of Impact on pesticides**	
Procurement of pesticides	□ (YES – Tick ✓)	
Training on safe use of pesticides	□ (YES - Tick ✓)	
Promoting non-chemical uses	□ (YES - Tick ✓)	
Promoting Integrated Pest Management (IPM)	□ (YES – Tick ✓)	

Require Safeguard Document	
Initial Environmental Examination (IEE)	□ (YES - Tick ✓)

Environmental Code of Practices (ECOP)	□ (YES - Tick ✓)
Pest Management Plan	□ (YES - Tick ✓)
Recommendation report from POE	□ (YES - Tick ✓)
SIGNING OFF: Implementing AGENCY: Name: ……. Position: ……. Date: ……	Project Safeguard Coordinator: Name: …… Position: …… Date: ……

Table 2 Screening Form for Due Diligence of Existing Agribusiness and Value-added Facilities (Improvement of Rice Mill, Storage Facilities and Vegetable Packaging Facilities)

ENVIRONMENTAL AND SOCIAL SAFEGUARDS DUE DILIGENCE	
1. Contact Information	
- Is there any staff assigned by the company to be responsible for environment and social safeguard review and monitoring? □ Yes □ No If yes, please provide name and information for contact.	Name Tel
2. Screening and determination of environmental category	
- Confirm this sub-project is not in negative list - Is this a category B or category C Sub-project □ B □ C	□ Yes Category C – proceed without any further E&S due diligence and submit Table 3 Form Category B – continue with this Form contents
3. Compliance to Environmental Social Safeguards Laws and Regulations	
Has the sub-project proponent acquired all permits/approvals from authorities (Ministry of Natural Resources and Environment/MONRE or its provincial offices/PONREs or Ministry of Industry and commerce)? □ Yes □ No	List
Has the enterprise had any environmental incidents in the last 2 years that requires notification to the regulator?	
Has the enterprise been issued with, in the last 2 years, any violation of environmental permits, licenses or improvement notices by the regulator?	

Has the enterprise had any health and safety incidents or accidents, including fatalities, in the last 2 years involving death or multiple serious injuries and/or significant environmental damage?	
Has the site/Company has all the relevant permits/approval from government authorities and key environmental opera ting permits, for example Consent to Operate and Hazardous Waste Authorization if applicable?	
4. Consultation with Neighbors and Households	
If there is going to be construction, building, expansion and has business consulted with those potentially impacted?	□ yes □ no Brief description
5. Environmental Aspects	
What are the key potential impacts and/or risks ✓ Check box is applicable □ Use of hazardous material, chemicals □ Generation of hazardous wastes □ Use of wood/lumber □ Discharge of wastewater from business □ Air emissions □ Noise issues from business	Provide comments about severity and measures to reduce minimize, avoid such impacts. Please indicate if the Business will use any applicable mitigation checklist/management plan. List what checklist, Guidance or ECOP will be used. Please attach any document. There are sample of ECOPs for four type of sub-project activities under this ESMF.
Do national or local environmental regulations require this business to prepare any environmental or social impact assessment reports or review?	□ yes □ no If the IEE report under Lao PDR legislation will be required, the sub-project proponent may proceed to process the sub-project proposal, but will not disburse until the IEE is reviewed and approved by World Bank and the applicant provides a notice of approval from MONRE or PONRE. An environmental and social impact audit may be carried out on proposed sub-project as well as on existing facilities to ensure compliance of existing facilities and operations with relevant environmental and social laws, regulations and applicable World Bank policies requirements. This includes the environmental and social impacts from past/on-going activities and sub-project proposals.

6. Occupational health and safety	
Will this business pose a serious risk of major accidents (such as fires, explosions, release of toxic or hazardous chemicals)?	□ yes □ no If yes, what measures are in place to address
Does the business require a health, safety and/or emergency response plan?	□ yes □ no If yes, are there permits, inspections, certifications?
Are proper safety measures in place for workers?	□ yes □ no If yes, what measures are in place if no, what are the issues of concern
8. Labor	
What is the expected size of the workforce?	
What is their minimum work age?	
Are there any outstanding labour disputes?	

IV. CONCLUSION	
Other Information Any other information which may be useful, e.g. information from customers' clients and competitors, quality of supervision by regulatory authorities, any complaint record, etc.	**Comments:**
Date:	
Recommendation of Authority ***Approve*** **Signature** **Name:** **Confirmation of E&S Coordinator/Consultant** **Signature** **Name:**	**Sub-project** **Name:**

Table 3 Subproject E&S Assessment Form A (form #) –with no impacts

Name of Project and Sub-project

Applicant:	Proposal name:	Proposal number:
Sub-project type: □ □		Amount requested:
I certified that this subproject does not involve land acquisition, ethnic group, or civil works, and therefore does not require neither safeguard measures nor ESMF clearance Screen by: …….		Date:
Remarks: *Provide more details on the nature of the subproject*		

General Instructions:

- *This checklist is to be completed to support the verification of a Subprojects Application. It is to be attached to the Subproject Agreement that is to be prepared and submitted to the Project Management Unit (PMU).*

Social Screening Form

Proposed Activity: …….

Brief Description: …….

……..……..

Location: ……

Filled out by: …….

Organization: …….

Date: ……

Attachments: ……

Prepared with the following Partner Organizations / Community Representatives:

Remarks:

General Instructions:

 This checklist is to be completed to support the verification of the project activity or sub-project that involves land acquisition, compensation, and/or restriction of resources access. It focuses on social issues to ensure that social dimensions are adequately considered during selection of the activities/sub-projects. If applicable, please use the

"remarks" section to discuss any suggested mitigation measures. The information should be collected in consultation and coordination with local government, communities, NGOs and leaders of affected community.

QUESTIONS	No	Yes	MITIGATION MEASURES REQUIRED?
Project Siting **Are there any of the following structures or resources in the Sub-project construction area?**			
Private households	□	□	
Private small businesses/shops	□	□	
Roads, footpaths or other access routes	□	□	
Agricultural land	□	□	
Natural resources shared by community members	□	□	
Cemetery or other area/structures of religious or cultural significance	□	□	
Other:	□	□	
Additional remarks/suggestions:			
Potential Social Impacts **Will the Sub-project cause:**			
Temporary loss of land or resources for any families?	□	□	
Permanent loss of land or resources for any families?	□	□	
Conflicts in water supply rights and related social conflicts?	□	□	
Impediments to movements of people and animals?	□	□	
Dislocation or involuntary resettlement of people?	□	□	
Potential social conflicts arising from land tenure and land use issues?	□	□	
Deterioration of livelihoods or living conditions of women or the poorest families in the sub-project service area?	□	□	
Other:	□	□	

……			
Other Remarks:			
Involuntary Resettlement Category[1] **After reviewing the answers above, the PMT or PMT consultants agree, subject to confirmation, that the project is a:** **"The affected people are not physically displaced and less than 10% of their productive assets are lost", an abbreviated Resettlement Action Plan is required** **[ ] The proposed sub-project may result in more significant impacts, i.e. displacement of people and more than 10% of their productive assets are lost, then a RAP will be prepared.** **[ ] No anticipated displacement, and loss of assets are negligible**			
Potential Social Impacts on vulnerable groups, if any: **Will the Sub-project:**			
Affect poverty group?	□	□	
Affect women headed households?	□	□	
Affect Ethnic Groups or Indigenous	□	□	

People?			
Affect other vulnerable groups?	□	□	
Other Remarks:			
Required Safeguard Documents:			
Resettlement Action Plan/Abbreviated RAP?	□	□	
Ethnic Group Development Plan (IPDP)?	□	□	
Land Titles or Documentation?	□	□	
Community Declarations?	□	□	
Other? ……	□	□	
Other Remarks:			
Conclusions/Recommendations:			
SIGNING OFF: **Implementing AGENCY:** **Name:**			Project SafegUard Coordinator: Name:

……..……			……
Position:……..			Position:……..……
Date:			Date:
……..			……

[1] World Bank OP 4.12, Policy on Involuntary Resettlement

Step 3: Environmental Code of Practices (ECOP)

As it is unlikely that the sub-project proposals under this project will have a significance impact to the environment due to it small scale by nature. The agriculture farming area will not be more than 20 hectares and the small matching grant will not be anticipated significant impact to the environment. The Environmental Code of Practices (ECOP) for four type of sub-project activities were prepared in Annex 6.

Step 4: Monitoring and Reporting

Checklist for Screening Environmental and Social Impact in Project Village During Operation Phase

No	Potential adverse impact	Magnitude of the impact			Remark (Area extent or No of Household to be affected (Small/Medium/Large)
		Low	Moderate	High	
1	GHG Emission from paddy field	a few irrigated field with inefficient water management	Some of the irrigated paddy field with inefficient water management	Most of the irrigated paddy field with inefficient water management	
2	Water contamination by pesticide use	None or water sources for animal use are subjective to contamination	Some water sources for drinking, household uses & animal uses are subjective to contamination	Main water sources for drinking, household use & animal use is subjective to contamination	
3	Soil salinity/alkali	None or slightly difficult for farming	Becoming difficult for farming	Impossible for continuing farming	
4	Decline of soil fertility	Crop yield decrease slightly	Crop yield gradually decrease	Crop yield sharply decrease	
5	Water logging	None or little farming constraint	Difficult for farming and damage to crop	Impossible for farming	
6	Soil erosion	Surface erosion in farmland	Rill erosion in farmland	Gullies in farmland	
7	Sedimentation	A few sections of canal and distributaries are	Some section of canal and distributaries are	Most parts of canal & distributaries are	

		likely to be affected	likely to be affected	likely to be affected	
8	Loss of grazing land	None or seasonally difficult for grazing	Difficult for grazing animal throughout the year	Impossible to keep grazing animal	
9	Threat to biodiversity (local/seasonal bird)	None of a few habitats to be damaged	Population affected due to habitat damaged	Population disappeared due to habitat losses	
10	Threat to biodiversity (reptile/fish)	None of a few habitats to be damaged	Population affected due to habitat damaged	Population disappeared due to habitat losses	
11	Increase pest & weed	Slightly increased cost	Moderate losses due to increased cost	Severe losses due to crop yield decrease & increased cost	
12	Aquatic weed invasion	Started invasion	Grow vigorously & Disturb irrigation system	Damage canal and farming	
13	Public health concern Water borne diseases & Mosquito infection	Morbidity same as other region	Higher morbidity rate compare to regional average	Higher morbidity and mortality rate compare to regional average	
14	Fear of dam collapse	No fear or a little concern	Fear when extreme weather	Fear all the time	
15	Accessibility constraint	None or inconveniences some time to commute	Difficult to commute	Unsafe to commute	
16	Weak people participation conducive to ineffective irrigation management	Trustworthy leadership but still low participation	Monopolistic factional leadership (two three capable people) within ale dominated committee and passive participation occasionally	No women executive, lack of people trust, one man show leadership	
17	Socio-politico tension	Frequent disputes among villagers	Growing conflicts of the factions within villages	Confrontation among the factions	

ANNEX 6: ENVIRONMENTAL CODE OF PRACTICE (ECOP)

Objectives

The Environmental Codes of Practice (ECOP) is prepared to manage environmental impacts of small scale infrastructure construction and or rehabilitation during construction phase. The ECOPs will apply to manage small scale infrastructure investments subproject under component A and B. ECOP will be a mandatory part of construction contract or bidding documents so that contractor complies with environmental covenants. PMU and construction supervisors will be responsible for monitoring of compliance with ECOP and preparing the required reports.

1. ECOP for Rehabilitation of Irrigation Schemes

Potential Negative Impacts	**Mitigating Measures**
Pre-Construction Stage	
Safety Hazards to workers and local people, and effects of temporary worker populations in the area	The contractor shall conduct the following: • Preparation of plans by the Contractor, allocating responsibilities for safety, health and welfare to senior staff; preparation of plans for first aid and emergency procedures; preparation of plans for satisfactory accommodation of workers. • Before construction, carry out consultations with local government and community and with traffic police (if any) and select access route that has less impact to the community. • Increasing in number of vehicle trips on local road must be covered in a construction plan previously approved. Routing, especially of heavy vehicles (not exceed the controlled weight), speed control limit (40 km/hr) needs to take into an account sensitive sites such as schools, hospitals, and markets.
Effects on homes and property	• Completion of land acquisition and compensation tasks as detailed in the Resettlement Framework for the subproject
Effects of the construction of a temporary vehicle access track	• Selection of the alignment of the access track to minimize extent of earthworks necessary; securing of agreements with affected landowners
Impacts from Construction	
Traffic management	• Installation of lighting at night must be done if this is necessary to ensure safe traffic circulation. • Place signs around the construction areas to facilitate traffic movement, provide directions to various components of the works, and provide safety advice and warning. • Employing safe traffic control measures, including road/rivers/canal signs and flag persons to warn of dangerous conditions. • Avoid material transportation for construction during school time. • Signpost shall be installed appropriately in both water-ways and roads where necessary (school).
Dust generation/ Air pollution from handling or transportation of aggregates, cement, etc.	• The Contractor implement dust control measures to ensure that the generation of dust is minimized and is not perceived as a nuisance by local residents, maintain a safe working environment, such as: - water dusty roads and construction sites; - covering of material stockpiles; - Material loads covered and secured during transportation to prevent the scattering of soil, sand, materials, or dust; - Exposed soil and material stockpiles shall be protected against wind erosion - Limit of excessive truckload
Noise and vibration	• All vehicles must have appropriate quality to avoid exceeding noise emission from poorly maintained machines. If possible, avoid construction activities during night time. • Plan activities in consultation with communicates so that noisiest activities are under taken during periods that will result in least disturbance

Potential Negative Impacts	**Mitigating Measures**
Water pollution	• Portable or constructed toilets must be provided on site for construction workers. • At completion of construction works, septic tanks shall be covered and effectively sealed off. • Waste lubrication/oil will not be allow to discharge into the waterway and drain into the soil. • Separate as best as possible concrete works in waterways and keep concrete mixing separate from drainage leading to waterways
Drainage and sedimentation	• The Contractor shall follow the detailed drainage design included in the construction plans, to ensure drainage system is always maintained cleared of mud and other obstructions. • Areas of the site not disturbed by construction activities shall be maintained in their existing conditions. • Earthwork should be conducted during dry month period.
Erosion and scour	• Concrete lining and on embankment slopes • Masonry walls (along the road) or stone riprap should be built to prevent erosion on a sloped bank. • Use of canals lined with rock • Design suitable slop protection • Proper design and layout of furrows or field avoiding too steep gradient • Design of terraces on hillsides to minimize surface erosion hazard • Provide maintenance procedure • Design of canal system to minimize risk of scouring of canals • Schedule construction during dry season
Borrow pit	• construction materials should be obtained from certified quarries

Potential Negative Impacts	**Mitigating Measures**
Solid waste	• At all places of work, the Contractor shall provide litter bins, containers and refuse collection facilities. • Solid waste may be temporarily stored on site in a designated area approved by the Construction Supervision Consultant and relevant local authorities prior to collection and disposal. • Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof. • No burning, on-site burying or dumping of solid waste shall be allowed. • Collect and properly dispose of small maintenance materials such as oily rags, oil filters, used oil, etc. Never dispose spent oils on the ground and/or water courses as it can contaminate to soil and groundwater. Safe disposal of spent by burning as a fuel. • Recyclable materials such as wooden plates for trench works, steel, scaffolding material, site holding, packaging material, etc. shall be collected and separated on-site from other waste sources for reuse, for use as fill, or for sale. • If not removed off site, solid waste or construction debris shall be disposed of only at sites identified and approved by the Construction Supervision Consultant and local authority and included in the solid waste plan. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas, such as in areas of natural habitat or in watercourses.
Construction material storage	• Construction material need to be safely stored in the approved area in consultation with communities and local authorities. • Keep stockpile of aggregate materials covered to avoid suspension or dispersal of fine soil particles during windy and rainy days or disturbance from stray animals
Effects of construction of temporary vehicle access track	• careful supervision of earthworks to ensure minimal damage to farmland and vegetation, • reuse of surplus spoil, distribution to users in or near the subproject area, or disposal at a site approved by the PAFO / DAFO.
Effects of temporary worker populations	• consultation with local people on acceptable areas for siting of facilities, • installation of suitable toilets such as pit latrines and grey water drainage facilities such as soakage pits. • arrangements for collection of solid waste, • assignment of responsibility for worker and local peoples' welfare to a senior member of the Contractor's staff. • Employ local people as workers during construction
Safety hazards to workers and local people	• Allocation of responsibility for site safety to the Contractor's site supervisors staff, who will ensure that all reasonable safety measures, such as use of safety clothing and equipment and placing of hazard warnings are taken.
Impacts from Operation	
Effects of intensified agricultural production	• instruction in purchase and use of pesticides, • promotion of the informed use of mineral fertilizers, • promotion of the concept of integrated pest management, and • emphatic discouragement of the use of persistent pesticides and introduce IPM instead.

Potential Negative Impacts	Mitigating Measures
Obstruction of water flows in the canals from sediment or other deposits	• Support to water user groups so that users discourage or prevent any placing of material or solid waste in the canals.
Extraction of water during the dry season	• Monitoring of river flows and extraction levels, ensuring that an adequate riparian flow is maintained.
Collapse of canals	• Routine and periodic maintenance, according to a well-designed and adequately resourced maintenance program
Leaching of nutrients	• Promotion of sustainable irrigated agriculture and soil management methods
Occurrence of water related diseases	• promoting improved operation and maintenance of the irrigation scheme and road through water user groups • raising awareness on hazards posed by poor sanitation, water logging and use of untreated irrigation water for drinking.
Water logging of soils	• Regulation of water application to avoid over-watering. • Installation and maintenance of adequate drainage system. • Use of lined canals or pipes to prevent seepage. • Accurate calculation of delivery of irrigation requirements.

2. ECOP for Storage facilities

Potential Negative Impacts	Mitigating Measures
Pre-Construction Stage	
Safety Hazards to workers and local people, and effects of temporary worker populations in the area	• Before construction, the contractor carry out consultations with local government and community and with traffic police. • Significant increases in number of vehicle trips must be covered in a construction plan previously approved. Routing, especially of heavy vehicles, needs to take into account sensitive sites such as schools, hospitals, and markets.
Impacts from Construction	
Dust generation/ Air pollution	• The Contractor implement dust control measures to ensure that the generation of dust is minimized and is not perceived as a nuisance by local residents, maintain a safe working environment, such as: - water dusty roads and construction sites; - covering of material stockpiles; - Material loads covered and secured during transportation to prevent the scattering of soil, sand, materials, or dust; - Exposed soil and material stockpiles shall be protected against wind erosion.
Noise and vibration	• All vehicles must have appropriate quality to avoid exceeding noise emission from poorly maintained machines. • Plan activities in consultation with communicates so that noisiest activities are under taken during periods that will result in least disturbance

Potential Negative Impacts	**Mitigating Measures**
Solid waste	• At all places of work, the Contractor shall provide litter bins, containers and refuse collection facilities. • Solid waste may be temporarily stored on site in a designated area approved by the Construction Supervision Consultant and relevant local authorities prior to collection and disposal. • Waste storage containers shall be covered, tip-proof, weatherproof and scavenger proof. • No burning, on-site burying or dumping of solid waste shall occur. • Recyclable materials such as wooden plates for trench works, steel, scaffolding material, site holding, packaging material, etc. shall be collected and separated on-site from other waste sources for reuse, for use as fill, or for sale. • If not removed off site, solid waste or construction debris shall be disposed of only at sites identified and approved by the Construction Supervision Consultant and included in the solid waste plan. Under no circumstances shall the contractor dispose of any material in environmentally sensitive areas, such as in areas of natural habitat or in watercourses.
	•

Disruption pf vegetative cover and ecological resources	• Areas to be cleared should be minimized as much as possible.
	• The Contractor shall remove topsoil from all areas where topsoil will be impacted on by rehabilitation activities, including temporary activities such as storage and stockpiling, etc.; the stripped topsoil shall be stockpiled in areas agreed with the Construction Supervision Consultant for later use in re-vegetation and shall be adequately protected.
	  • The application of chemicals for vegetation clearing is not permitted.
	  • Prohibit cutting of any tree unless explicitly authorized in the vegetation clearing plan.
	• When needed, erect temporary protective fencing to efficiently protect the preserved trees before commencement of any works within the site.
	• The Contractor shall ensure that no hunting, trapping shooting, poisoning of fauna takes place.

Safety hazards to workers and local people	• Allocation of responsibility for site safety to the Contractor's site supervisors staff, who will ensure that all reasonable safety measures, such as use of safety clothing, gloves, dust masks, hard hats, boots and goggles and placing of hazard warnings are taken.
Impacts from Operation	
Traffic management	• Significant increases in number of vehicle access and exit to the facility. Routing, especially of heavy vehicles, needs to take into account sensitive sites such as schools, hospitals, and markets. • Employing safe traffic control measures, including road/rivers/canal signs and flag persons to warn of dangerous conditions. • Limit vehicle transport speed during access and exit to facility.
Workers and public safety	• Training workers on occupational safety regulations and provide sufficient protective clothing, dust masks, ear plug for workers in accordance with applicable Lao laws.

3. ECOP for Packaging facility and processing

Potential Negative Impacts	Mitigating Measures
Construction	
Disruption of vegetative cover and ecological resources	• Areas to be cleared should be minimized as much as possible. • The Contractor shall remove topsoil from all areas where topsoil will be impacted on by rehabilitation activities, including temporary activities such as storage and stockpiling, etc.; the stripped topsoil shall be stockpiled in areas agreed with the Construction Supervision Consultant for later use in re-vegetation and shall be adequately protected. • Prohibit cutting of any tree unless explicitly authorized in the vegetation clearing plan. • When needed, erect temporary protective fencing to efficiently protect the preserved trees before commencement of any works within the site.
Building	• Avoid use of asbestos cement tiles as roofing • Tiled floors are preferred for easier cleaning and more hygienic • Include sanitary facilities such as toilets and basins for hand-washing
Cold room	• Using low GWP regrigerant
Operation	
Increase vegetable wastes	• Recycle use of agriculture waste through composting technique and train farmers on how to prepare and apply those wastes for improving soil fertility • recycle as feed for livestock-raising and/or decomposed
Wastewater	• Waste management should be adequately streamlined to prevent the release of effluent into the environment (storage pond, simple treatment unit is applicable)
Safety products	• Training workers on occupational safety regulations and provide sufficient protective clothing for workers in accordance with applicable Lao laws. • Provide personal protective gear for workers as necessary (gloves, dust masks, hard hats, boots, goggles)

4. ECOP for Rice Mill

Potential Negative Impacts	Mitigating Measures
Construction	
Disruption of vegetative cover and ecological resources	• Areas to be cleared should be minimized as much as possible. • The Contractor shall remove topsoil from all areas where topsoil will be impacted on by rehabilitation activities, including temporary activities such as storage and stockpiling, etc.; the stripped topsoil shall be stockpiled in areas agreed with the Construction Supervision Consultant for later use in re-vegetation and shall be adequately protected. • Prohibit cutting of any tree unless explicitly authorized in the vegetation clearing plan. • When needed, erect temporary protective fencing to efficiently protect the preserved trees before commencement of any works within the site.

Potential Negative Impacts	**Mitigating Measures**
Building	• Avoid use of asbestos cement tiles as roofing • Tiled floors are preferred for easier cleaning and more hygienic Include sanitary facilities such as toilets and basins for hand-washing
Operation	
Rice husk	• Potentially prepared as fertilizer for soil improvement
Dust and Noise	• Operation machineries should be confined to normal 8 am to 5 pm working hour. • Training workers on occupational safety regulations and provide sufficient protective clothing and mask for workers in accordance with applicable Lao laws. • larger mill need to install bag house • Use dust and noise control method such as close operation system in concrete building, fences and fast growing trees as a noise and dust barriers
Traffic management	• Significant increases in number of vehicle access and exit to the facility. • Limit vehicle transport speed during access and exit to facility
Safety	• Provide personal protective gear for workers as necessary (gloves, dust masks, hard hats, boots, goggles)

5. ECOP - Physical Cultural Resources (specifically chance find)

Subproject issues	Mitigation measure	Remarks
Chance find Physical Cultural resources	Immediate reporting to the World Bank Group and the relevant Government departments. In case of potential damage to chance finds, stop work in the area immediately and proceed in line with the relevant national laws and WB OP 4.11.	See details on procedures listed in Annex 4.

ANNEX 7: TERMS OF REFERENCE – PANEL OF EXPERTS

Project background

1. The proposed Laos Agriculture Commercialization Project (LACP) seeks to enhance the competitiveness and sustainability of Lao PDR's agriculture sector through technical and financial support to increase in agricultural productivity and commercialization in selected strategic value chains. The project would focus on: (i) geographical areas with high agricultural development potentials; (ii) farming systems with high potential for commercialization (i.e. paddy, maize, vegetables); (iii) promotion of good agricultural practices and climate smart agricultural technologies and farming system diversification to enhance food and nutritional security; (iv) building capacity for farmers' organizations, agribusinesses, public and private service providers; and (v) building on and developing synergies with other government/donor programs.
2. Lending Instrument: The proposed Project would have a total cost of USD 29.3 million and would be supported by the World Bank through an Investment Project Financing (IPF) in the form of an IDA Credit for USD 25.0 million equivalent.

3. Project Costs and Financing: The table below presents the total costs and indicated IDA financing for the project. In addition to the proposed IDA credit, the government would provide an estimated USD 0.5 million in counterpart financing for the project, while farmers, farmer groups and agribusiness entities would provide an estimated USD 5.6 million associated with their matching grants.

4. The Project Development Objective (PDO) is to increase commercialization of selected value chains in the project areas. The LACP is comprised of the following three components: (1) Improved Agriculture Efficiency and Sustainability; (2) Enhanced Agriculture Commercialization; and (3) Project Management.
5. Component A: Improved Agriculture Efficiency and Sustainability (est. US$ 18.7 million, of which International Development Association (IDA) would finance around US$ 16.7 million). This component would support: (a) Adopting good varieties and quality seeds, (b) Promoting good agriculture practices, (c) Providing critical infrastructure, and (d) Strengthening public services delivery.

6. Under component (A3): Providing Critical Infrastructure (est. US$ 6.1 million, of which IDA would finance around US$ 5.6 million). The main objective of this subcomponent is to improve critical public infrastructure to support farmers in development of commercial agriculture. The project will finance new construction of missing infrastructure and rehabilitation of existing ones (mainly irrigation schemes) to improve their operations and efficiency. The project will also support PAFOs and Department of Irrigation (DOI) of MAF to provide training in new irrigation models aiming at reducing operating costs and improving water productivity through establishment and strengthening of water user groups to effectively operate and maintain existing and the newly built infrastructure supported by the project.

7. Under this component, the project intends to rehabilitate 71 existing irrigation schemes. Among those schemes, 5 systems feature earthen dam and reservoirs. The dimensions of the dams vary from site to site, and in particular the dam crest height is comprised between 13 m and 28 m. The nominal storage capacity of the reservoirs is comprised between 2.2 and 28 million cubic meters. Below is the list and main characteristics of the 5 irrigation reservoirs:

Table: Indicative list of reservoir irrigation systems

	Province	District	Reservoir Name	Dam Height	Dam crest length	Storage capacity (million cu.m)
1.	Vientiane	Thoulakhom	Nam Phot	18 m.	2,101 m.	16.0
2.	Sayabouly	Sayabouly	Nam Tien	28 m.	628 m.	28.0
3.		Sieng Hone	Nam Mao	21 m.	180 m.	8.3
4.		Sayabouly	Houay Khen	20 m.	150 m.	2.23
5.	Bolikhamxay	Borikhan	Nam Kap	13 m.	220 m.	4.34

Rationale

8. The dam and reservoir dimensions indicate that all 5 reservoirs headwork classify as Large Dams as per the World Bank Operational Manual OP 4.37 for Safety of Dams. The project interventions do not intend to do any repair or change on the irrigation reservoir headwork themselves. However, the reservoirs are expected to be used as the main source of irrigation water supply to the target command cropping areas. The proposed interventions focus on increasing water management efficiency in the distribution network. The rehabilitation works will consist in upgrading existing earthen canals to concrete lined canals or U-shape brick masonry canals. It is expected that the repairs in those 5 irrigation systems will not occur before the third year of project implementation to provide time to comply with Dam safety requirements and due diligence.

9. To comply with Dam Safety requirements and due diligence, the present Terms of Reference intend to define the composition, qualification and tasks of the Panel of Expert including (i) inspect and evaluate the safety status of the existing dam, its appurtenances, and its performance history; (ii) review and evaluate the owner's operation and maintenance procedures; and (iii) provide a written report of findings and recommendations for any remedial work or safety-related measures necessary to upgrade the existing dam to an acceptable standard of safety.

Qualifications and Scope of Work

10. The Engineering Panel of Expert will be composed of three senior specialists as follows: (i) A Civil Engineer specializing in earthen dam safety aspects (ii) Hydrologist and (iii) Irrigation Specialist

11. **The Civil Engineer** will have a Master or PhD degree in civil engineering or related field of expertise. He/She will have at least 15 years' experience in operation and maintenance and safety measures of earthen dams. The tasks assigned to the Civil Engineer will be as follow:

- Review existing documentation: design, environmental impact assessment, inspection report, irrigation O&M monitoring report, etc.

- Conduct detailed on-site inspection of the 5 pre-identified potential dam sites under component A3 of the project as described in the table above. The inspection will use best practices and standards
- Produce a detailed assessment report for each of the 5 dams, presenting evidence based conclusion on the Dam Safety status
- Provide recommendations for any remedial work or safety related measures necessary to upgrade the existing dam to an acceptable standard of safety
- Contribute to the Panel of Expert report presenting conclusions of the assessment for the 5 dams

12. **The Hydrologist** will have a Master or PhD degree in hydrology or related field of expertise. He/She will have at least 15 years' experience in hydrology studies, feasibility studies of reservoir, water balance studies as well as integrated river basin management with watershed management considerations. The tasks assigned to the Hydrology will be as follow:

- Review existing documentation: design, environmental impact assessment, inspection report, irrigation O&M monitoring report, etc.
- Conduct an assessment of the watershed and river catchment upstream of the dam, identifying potential hydrological risks
- Carry out a water balance assessment of the reservoir to identify potential hydraulic risks and issues in management modalities of each of the 5 dam
- Produce a detailed assessment report for each of the 5 dams, presenting evidence based conclusion on the hydrology status of the dams and their upstream river catchment
- Provide recommendations for any remedial work or safety related measures necessary to upgrade the existing dam to an acceptable standard of safety
- Contribute to the Panel of Expert report presenting conclusions of the assessment for the 5 dams systems

13. **The irrigation specialist** will have a Master or PhD degree in irrigation or related field of expertise. He/She will have at least 15 years' experience in irrigation survey and design, irrigation standard and best practices, operation and maintenance of gravity irrigation schemes and in particular of reservoir irrigation schemes. The tasks assigned to the irrigation Specialist will be to:

- Review existing documentation: design, environmental impact assessment, inspection report, irrigation O&M monitoring report, etc.
- Conduct an assessment of the irrigation infrastructures downstream of the dam, identifying potential risks at the main water intake and spillway, distribution network and association structures
- Carry out an assessment of the current irrigation O&M management modalities by Water Users Groups and Irrigation Agencies staff assigned at each of the 5 dams
- Produce a detailed assessment report for each of the 5 dams, presenting evidence based conclusion on the irrigation operation and maintenance status of the dams and their downstream irrigation infrastructures
- Provide recommendations for any remedial work or safety related measures necessary to upgrade the existing dam to an acceptable standard of safety

- Contribute to the Panel of Expert report presenting conclusions of the assessment for the 5 dams systems

Panel of Expert Reporting

14. The Panel will prepare a single mission report combining inputs from the three specialists. The report will include details regarding all activities carried out as well as reviewed documentation and meetings held during the mission in country. The report will include (i) a description of the assessments conducted and the methodology and protocols used; (ii) the conclusions as well as the recommendations of the panel; (iii) recommendations for any remedial work or safety related measures necessary to upgrade the existing dam to an acceptable standard of safety. Annexes will include the proposed management procedures as well as the inspection and reporting format. The report will provide the details of the on-the-job trainings provided to the relevant stakeholders during the assignment.

15. The draft panel report will be submitted to the Project Executing Agency and the World Bank no later than 15 days after the end of the mission in country. Comments will be made on the draft report within one month of the date of submittal. A revised version of the report will be prepared by the Panel to address comments. The final report will be submitted no later than 15 days after comments have been officially addressed to the Panel. The Project will arrange for translation of the relevant sections of the report as deemed necessary. The EA will then assign responsibility to the involved Department within MAF, including Department of Planning and Finance (DoPF) and Department of Irrigation (DoI) in charge of technical aspects.

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Mobilization of the Panel of Expert

16. The PoE will be mobilized in the first half of 2018 for a single assignment. It is expected that the project will allocate financial resources to bear the costs of the mobilization of the Panel of Experts.

17. The Ministry of Agriculture and Forestry (the project executing agency) will assist in organizing the in-country mission and arranging the assessment and consultations at each of the 5 dam sites.

18. During the Dam Safety inspection mission, the PoE will work in close coordination with representatives from MAF and its concerned departments: Department of Planning and Finance as well as Department of Irrigation. The MAF representatives will ensure that all relevant stakeholders at local level are mobilized for each of the 5 dam sites to be reviewed and inspected by the PoE. Those stakeholders include: Provincial Agriculture and Forestry Department, District Agriculture and Forestry Offices, Water Users Groups in charge of the daily Operation and Maintenance of the irrigation infrastructures.

ANNEX 8 DAM SAFETY RELATED PROCEDURES

Overall

1. As per OP 4.37 Dam Safety policy – Large dam is distinguished from the small dam with the following criteria:

(i) Small dams are normally less than 15 meters in height. This category includes, for example, farm ponds, local silt retention dams, and low embankment tanks;

(ii) Large dams are 15 meters or more in height. Dams that are between 10 and 15 meters in height are treated as large dams if they present special design complexities--for example, an unusually large flood-handling requirement, location in a zone of high seismicity, foundations that are complex and difficult to prepare, or retention of toxic materials. Dams under 10 meters in height are treated as large dams if they are expected to become large dams during the operation of the facility or if one of the following three conditions are met: a) reservoir capacity greater than 3 million m3; b) crest length greater than 500 m; or iii) spillway capacity greater than 2,000 m3/s.

2. Large dam will be handled under OP 4.37 (Dam safety), while small dams will be handled under OP 4.01. For small dams, generic dam safety measures designed by qualified engineers are usually adequate. For large dams, the Bank requires reviews by independent panel of experts.

3. As the sub-project activities, do not include a new dam but will rely on the performance of an existing dam, irrigation canal that may directly draw water from a reservoir controlled by the existing dam, irrigation system that will depend on the storage and operation of an existing dam for their supply of water and could not function if the dam failed. The Bank requires that the borrower arrange for one or more independent dam specialists to (a) inspect and evaluate the safety status of the existing dam, its appurtenances, and its performance history; (b) review and evaluate the owner's operation and maintenance procedures; and (c) provide a written report of findings and recommendations for any remedial work or safety-related measures necessary to upgrade the existing dam to an acceptable standard of safety. MAF has prepared TOR of PoE in Annex 7. The result of the dam inspection and findings and recommendations for remedial work or safety-related measures necessary to upgrade the existing dam to an acceptable standard of safety will be reviewed by the Bank. The dam inspection need to be reviewed during implementation phase and prior to the implementation of the sub-projects downstream of large dams. This is to ensure that the failure of the existing dam will not cause extensive damage to or failure of the Bank-funded activities.

4. The detailed investigation, design studies and supervision will be undertaken by a competent consulting firm if remedial measures are required to address dam safety risks. The TOR to hire the consulting firm will be reviewed by the Bank. The Construction supervision and Quality Assurance (CSQA) Plan, an Instrumentation Plan, an O&M Plan and an Emergency Preparedness Plan (EPP) need to be prepared and implemented by the detailed design consulting firm. MAF will take responsible to ensure that the results of the detailed investigation and design, CSQA plan,

Instrumentation Plan, O&M Plan and Emergency Preparedness Plan (EPP)will be reviewed by an international dam specialist and the Bank.

5. Construction Supervision and Quality assurance (CSQA) Plan-The CSQA Plan covers the organization, staffing levels, procedures, equipment and qualifications for supervision of the construction of remedial works on existing dams and ensures that the dam safety related elements of the design are sufficiently addressed during construction. The Plan for each of large dams will be prepared by the detailed design consultant during project implementation and will be submitted to the Bank for review before the detailed design is completed.

6. Instrumentation Plan- The Instrumentation Plan indicates the required monitoring instruments, including existing ones and newly procured ones, to monitor and record dam behavior and related hydro meteorological, structural, and seismic factors. The Plan also covers the types, numbers, layout, and specifications of instruments as well as reading frequency and thresholds for triggering warning for each type of equipment. The Plan for each of large dams will be prepared by the detailed design consultant during project implementation and will be submitted to the Bank and one or two independent dam specialists for review before the detailed design is completed.

7. Operation & Maintenance (O&M) Plan- The O&M Plan covers the organizational structure, staffing, technical expertise, and training required; equipment and facilities needed to operate and maintain the dam: O&M procedures, and arrangements for funding O&M activities, including regular surveillance, monitoring, long-term maintenance and safety inspections. The O&M Plan for each of large dams will be prepared by the detailed design consultant during project implementation and will be submitted to the Bank and an international dam specialist for review before the detailed design is completed.

8. Emergency Preparedness Plan (EPP) - The EPP specifies the roles and responsibilities of relevant parties when dam failure is considered imminent, or when expected operational flow release threatens downstream life, property, or economic conditions that depend on river flow levels. It includes the following items: clear statements on the responsibilities for dam operations decision making and for the related emergency communications; maps outlining inundation levels for various emergency conditions; flood warning system characteristics; and procedures for evacuating threatened areas and mobilizing emergency forces and equipment. Inundation and flood hazard maps should indicate the dam break wave arrival time and duration of inundation, based on dam break modelling and simulation of dam break wave propagation in the downstream areas. Flood damage estimates and potential loss of life should be developed based on the above results. The EPP for each of large dams will be prepared by the detailed design consultant during project implementation and will be submitted to the Bank and an international dam specialist for review before the detailed design consultancy is completed.