



# Project Information Document (PID)

Appraisal Stage | Date Prepared/Updated: 08-May-2019 | Report No: PIDA26487

**BASIC INFORMATION****A. Basic Project Data**

Country Lao People's Democratic Republic	Project ID P169538	Project Name Lao PDR Clean Cook Stove Initiative	Parent Project ID (if any)
Region EAST ASIA AND PACIFIC	Estimated Appraisal Date 06-May-2019	Estimated Board Date 17-Jun-2019	Practice Area (Lead) Energy & Extractives
Financing Instrument Investment Project Financing	Borrower(s) Ministry of Finance	Implementing Agency The Ministry of Energy and Mines (MEM)	

## Proposed Development Objective(s)

Generate environment and gender benefits for target households through a switch to clean energy efficient gasifier cookstoves using biomass pellets across selected provinces.

## Components

Preparedness Activities and Capacity Building of IREP on carbon finance  
 Technical Assistance for project management and implementation  
 Carbon Emission Reduction Program

**PROJECT FINANCING DATA (US\$, Millions)****SUMMARY**

<b>Total Project Cost</b>	6.44
<b>Total Financing</b>	6.44
<b>of which IBRD/IDA</b>	0.00
<b>Financing Gap</b>	0.00

**DETAILS****Non-World Bank Group Financing**

Trust Funds	6.44
Carbon Initiative for Development	5.58
Energy Sector Management Assistance Program	0.86



Environmental and Social Risk Classification

Moderate

Decision

The review did authorize the team to appraise and negotiate

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## A. Country Context

- Economic growth in Lao PDR, while rapid, has not been all inclusive and the individual household economic situation remains volatile with people moving in and out of poverty and inequality widening.** Lao PDR has experienced consistent growth and rapid expansion of the economy in the last decade. With gross national income (GNI) increasing from US\$320 in 2002 to \$2,270 in 2017, Lao PDR for the first time met the criteria for Least Developed Country (LDC) graduation in 2018.<sup>1</sup> In the last decade, the country has experienced an average annual Gross Domestic Product (GDP) growth rate of around eight percent and GDP per capita growth at six percent, which makes it the second fastest growing economy in the East Asia and Pacific (EAP) region<sup>2</sup> and the 13<sup>th</sup> fastest growing economy globally.<sup>3</sup> Though the percentage of people living below the national poverty line declined from 34 percent to 23 percent between 2002 and 2012,<sup>4</sup> the poverty reduction elasticity of Lao PDR's growth has been relatively low. For every percent of GDP growth, poverty in Lao PDR has declined only 0.4 percent, compared to 1.2 percent on Cambodia and 1.0 percent in Vietnam.<sup>5</sup> Furthermore, while the overall rate of poverty is declining, a significant number of households continue to shift in and out of poverty. According to a survey of the same households conducted at 5-year intervals between 2003 and 2013, more than half the poor in both 2008 and 2013 were previously non-poor.<sup>6</sup> Not surprisingly, the Gini coefficient has also increased from 32.5 to 36.2 in the same time period, reflecting lower gains for the bottom 40 percent than for the rest of the population.
- High poverty rates and reliance on natural resources makes Lao PDR vulnerable to climate change.** Historical damage data indicates that annual expected losses range between 3.3 percent and 4.1 percent of GDP with the associated average annual fiscal cost equaling approximately 2.3 percent of government expenditures.<sup>7</sup> Around 1.9 million rural people, or 46 percent of rural population—often children and women—are estimated to be at risk of food insecurity caused by drought.<sup>8</sup> Climate change is affecting existing dams and Lao power generation capacity; the minimum annual value of hydroelectricity generation revenue at risk is an estimated US\$283 million.<sup>9</sup> Climate change projections include further increases in temperature and increased intensity and frequency of extreme events, including increased rainfall and flooding risks during wet season which will exacerbate local shocks and hit the lowest income bracket in Lao PDR. Associated agriculture shocks and health shocks are the main drivers of household vulnerability<sup>10</sup> with health shocks particularly concentrated among the rural poor.<sup>11</sup> Overall, agricultural households are twice as likely as other households to fall back into poverty due to sudden exposures in shocks from price fluctuations, loss of land, and adverse weather. Additionally, health shocks in Lao PDR often lead to high income losses due to high medical costs. As a result, they are often dealt with through dis-saving, borrowing, asset sales, an early harvest, pawning of possessions, and the delaying of plans.<sup>12</sup>
- Lao PDR has started to narrow its gender disparities but continue to lag behind many other countries.** Women spend over three times more time than men on unpaid domestic and child care work, according to survey data from 83 countries. Women thus carry the heaviest burden of energy poverty and time poverty. In 2015, Lao PDR ranked 106th among 188 countries on the UNDP's composite measure of gender inequality.<sup>13</sup> Women in Lao PDR spend seven hours a day on productive tasks and child care, compared to 5.7 hours spent by men.

## B. Sectoral and Institutional Context

- Most of Lao PDR's energy mix is made up of renewable energy sources, which cover 80 percent of energy demand.** The country lacks access to conventional energy sources like oil and natural gas, and has some reserve of coal, but has capitalized on its abundant access to renewable energy resources such as hydropower, biomass, wind and solar energy.<sup>14</sup> The hydropower industry has played a particularly important role in raising the economic status of Lao PDR and ensuring increased electrification rates at 93 percent.<sup>15</sup> In 1993 the government opened the power sector



to foreign investment, which significantly benefitted the hydropower industry. From 1993 until 2017 installed hydropower capacity increased from 206MW to 7,082MW.<sup>16</sup> Today the electricity sector is the country’s third largest export earner. With a theoretical potential of 26.5GW, Lao PDR is among the richest countries in South East Asia in terms of hydropower.<sup>17</sup>

- 5. **Given wide-spread traditional cookstove use, the residential sector is the largest energy consumer in Lao PDR accounting for nearly half of the country’s energy consumption.**<sup>18</sup> About 91 percent of the population continue to use solid biomass for cooking and heating purposes,<sup>19</sup> with fuelwood (67 percent) and charcoal (24 percent) being the predominant sources of fuel.<sup>20</sup> Nationally, a family on average consumes as much as five kilograms (kg) a day of fuelwood for cooking, which amounts to almost two tons per year. Families using charcoal, use about 1.86kg of charcoal per day in rural areas and 2.33kg of charcoal per day in urban areas; however, it takes as much as 6-10kg<sup>21</sup> of wood to produce one kg of charcoal making it a much larger culprit in terms of emissions and rapid deforestation.

Figure 1. Energy Consumption in Lao PDR

Fuel consumption by sector

Fuel consumption by

<sup>1</sup> World Bank Data. GNI per capita, Atlas Method. Available at <https://data.worldbank.org/indicator/ny.gnp.pcap.cd?page=1>. Accessed April 17, 2019.

<sup>2</sup> World Bank. 2016. Green Growth Development Policy Financing Program Document.

<sup>3</sup> World Bank. 2017. Lao PDR Systematic Country Diagnostic: Priorities for Ending Poverty and Boosting Shared Prosperity. <https://openknowledge.worldbank.org/handle/10986/26377>.

<sup>4</sup> World Bank Country Data. Available at <http://data.worldbank.org/country/lao-pdr>. Accessed March 24, 2017.

<sup>5</sup> World Bank. 2016. Lao PDR Country Partnership Strategy.

<sup>6</sup> World Bank. 2015. Lao PDR Poverty Policy Note: Drivers of Poverty Reduction in Lao PDR.

<http://documents.worldbank.org/curated/en/590861467722637341/pdf/101567-REPLACENENT-PUBLIC-Lao-PDR-Poverty-Policy-Notes-Drivers-of-Poverty-Reduction-in-Lao-PDR.pdf>.

<sup>7</sup> World Bank. 2017. Lao PDR Systematic Country Diagnostic: Priorities for Ending Poverty and Boosting Shared Prosperity. <https://openknowledge.worldbank.org/handle/10986/26377>.

<sup>8</sup> Ibid.

<sup>9</sup> USAID. (2014). Climate Change in the Lower Mekong Basin: An Analysis of Economic Values at Risk.

<sup>10</sup> World Bank. 2015. Lao PDR Poverty Policy Note: Drivers of Poverty Reduction in Lao PDR.

<http://documents.worldbank.org/curated/en/590861467722637341/pdf/101567-REPLACENENT-PUBLIC-Lao-PDR-Poverty-Policy-Notes-Drivers-of-Poverty-Reduction-in-Lao-PDR.pdf>.

<sup>11</sup> World Bank. 2010. Policy Research Working Paper: Are Health Shocks Different? Evidence from a Multi-Shock Survey in Laos. <http://hdl.handle.net/10986/3825>.

<sup>12</sup> Ibid.

<sup>13</sup> UNDP. 2016. Human Development Report, Table 5, Gender Inequality Index. <http://hdr.undp.org/en/composite/GII>.

<sup>14</sup> Government of Lao PDR. 2011. Renewable Energy Development Strategy. <http://www.eepmekong.org/index.php/resources/country-reports/laos/57-laos-06/file>.

<sup>15</sup> Lao Statistics Bureau. 2017. Lao PDR Social Indicator Survey. [https://www.lsb.gov.la/wp-content/uploads/2018/10/Lao-Social-Indicator-Survey-Lsis-II-2017\\_EN.pdf](https://www.lsb.gov.la/wp-content/uploads/2018/10/Lao-Social-Indicator-Survey-Lsis-II-2017_EN.pdf).

<sup>16</sup> Asian Development Bank. 2013. Lao PDR Energy Assessment. <https://www.adb.org/documents/lao-people-s-democratic-republic-energy-sector-assessment-strategy-and-road-map-2013>.

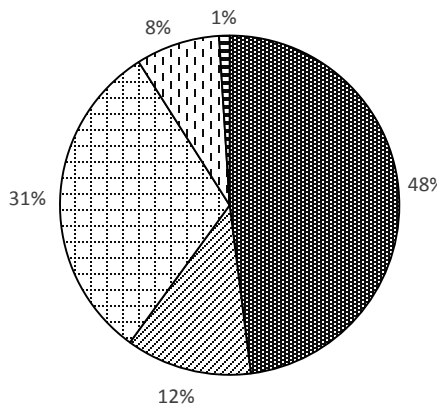
<sup>17</sup> International Hydropower Association. <https://www.hydropower.org/country-profiles/laos>. Accessed April 17, 2019.

<sup>18</sup> Ministry of Energy and Mines, PPT presentation, Energy Policy Training Program, Course Period in Japan, June/July 2015. <https://eneken.ieej.or.jp/data/6233.pdf>.

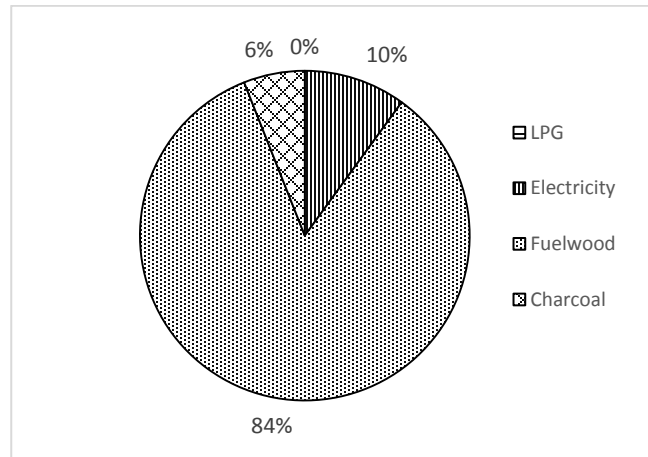
<sup>19</sup> The rest use LPG or electricity. (Lao PDR. 2015. Population Census, <https://www.lsb.gov.la/pdf/PHC-ENG-FNAL-WEB.pdf>).

<sup>20</sup> Lao Statistics Bureau. 2015. Lao PDR Population Census. <https://www.lsb.gov.la/pdf/PHC-ENG-FNAL-WEB.pdf>.

<sup>21</sup> Sepp, S. 2014. Multiple-Household Fuel Use – a balanced choice between firewood, charcoal and LPG [https://energypedia.info/wiki/File:2014-03\\_Multiple\\_Household\\_Cooking\\_Fuels\\_GIZ\\_HERA\\_eng.pdf](https://energypedia.info/wiki/File:2014-03_Multiple_Household_Cooking_Fuels_GIZ_HERA_eng.pdf).



Source: Ministry of Energy and Mines, 2015<sup>22</sup>



Source: Lao PDR Population Survey, 2015<sup>23</sup>

- Despite the steady rise in electricity service coverage, the transition to electricity for residential cooking energy has been very slow.** This has been caused by a variety of factors. The relatively high price of both electricity and retail costs of imported Liquid Petroleum Gas (LPG) comparatively to charcoal, have been determining factors in the continued use of charcoal for household cooking and heating needs.<sup>24</sup> Charcoal is a primary fuel source in the cooking sector due to its easy availability, ample quantity, ease of the local cooking style. The Lao PDR menu is largely grill-based, which gives it a specific smoky flavor. Switching to electric stoves will ultimately change the taste of food and apart from the price, this is also a reason for the low uptake of cooking with electricity and LPG.
- The consistent use of solid biomass for cooking causes serious impacts outside the energy sector.** In 2017, Household Air Pollution (HAP) was the third leading health risk factor for premature deaths in Lao PDR<sup>25</sup> causing 3.5 percent of GDP in lost productivity annually.<sup>26</sup> The full range of diseases caused by HAP all ranged among the top-ten reasons for death and premature death in Lao PDR.<sup>27</sup> Since women are the primary cooks in most Laotian households (98 percent), they disproportionately carry the greatest burden of disease. However, the entire household is affected by HAP from cooking, in households where cooking is done inside (about 88.5 percent nationwide).<sup>28</sup> Locally, traditional cookstoves are also associated with ambient air pollution causing about 10 percent of local ambient air pollution.<sup>29</sup>

<sup>22</sup> Ministry of Energy and Mines, PPT presentation, Energy Policy Training Program, Course Period in Japan, June/July 2015. <https://eneken.iej.or.jp/data/6233.pdf>.

<sup>23</sup> Lao Statistics Bureau. 2015. Lao PDR Population Census. <https://www.lsb.gov.la/pdf/PHC-ENG-FNAL-WEB.pdf>.

<sup>24</sup> World Bank. 2013. Pathways to Cleaner Household Cooking in Lao PDR. An Intervention Strategy. <http://www.esmap.org/node/70752>.

<sup>25</sup> Institute for Health Metrics and Evaluation (IHME). 2017. Global Burden of Disease Study. Visualization of data. <https://vizhub.healthdata.org/gbd-compare>.

<sup>26</sup> World Bank. 2017. Project Appraisal Document. Lao PDR Health Government Nutrition Development Program.

<sup>27</sup> Institute for Health Metrics and Evaluation (IHME). 2017. Global Burden of Disease Study. Visualization of data. <https://vizhub.healthdata.org/gbd-compare>.

<sup>28</sup> Lao Statistics Bureau. 2017. Lao PDR Social Indicator Survey. [https://www.lsb.gov.la/wp-content/uploads/2018/10/Lao-Social-Indicator-Survey-Lsis-II-2017\\_EN.pdf](https://www.lsb.gov.la/wp-content/uploads/2018/10/Lao-Social-Indicator-Survey-Lsis-II-2017_EN.pdf).

<sup>29</sup> Varying from 0% (five regions) to 10% (East Asia including China), 26% (South Asia including India) and 37% (in southern Sub-Saharan Africa). Global averages have been fairly stable but marked changes have been seen in many regions – substantial reductions in East Asia, but substantial increases in South Asia and sub-Saharan Africa. (Source: Kirk R Smith, Nigel Bruce et al; *Millions Dead: How Do We Know and What Does It Mean? Methods Used in the Comparative Risk Assessment of Household Air Pollution*. American Review of Public Health, 2014, 35: 185-206.)



8. **Switching from charcoal to a cleaner and more efficient source of fuel in Lao PDR would allow for lower GHG emissions, reduction in energy intensity from the residential sector, and improved health.** Although, charcoal is a more efficient heating agent than wood, charcoal consumption will result in more CO<sub>2</sub> emissions than fuelwood at each household level and it emits Carbon Monoxide (CO), SO<sub>2</sub>, NO<sub>2</sub> and Particulate Matter (PM<sub>2.5</sub>), all of which can cause significant health and environmental issues. In 2017, Household Air Pollution (HAP) was the third leading health risk factor for premature deaths in Lao PDR. Charcoal use tends to create an illusion of improved HAP, as current charcoal stoves do not produce much smoke. However, charcoal still emits PM<sub>2.5</sub> and CO at much higher levels than recommended by the World Health Organization (WHO)<sup>30</sup>, thus continuing to cause significant HAP in Lao RDR households (see paragraph 16). The use of charcoal as a cooking fuel is rapidly increasing in Lao PDR – from a low of six percent in 2012 to 24 percent in 2015. With the economic expansion and migration to cities, charcoal use is likely to become more widespread, which can pose significant complications for Lao PDR’s inclusive green growth development agenda.
9. **The energy sector institutional framework is well-defined.** The Ministry of Energy and Mines (MEM) is the focal point for overall energy policy. Under MEM, the Institute for Renewable Energy Promotion (IREP) is the main body responsible for the promotion of renewable energy and energy efficiency in Lao PDR. Its mandate is to promote and manage technical aspects within the organizational system of MEM and assist MEM in the implementation of the country’s Renewable Energy Development Strategy (REDS). IREP has worked closely with the World Bank since 2012 to lay a foundation that can spur cleaner cooking solutions that are energy efficient and lower energy intensity.
10. **The World Bank has been engaged in the cookstove sector in Lao PDR since 2012, working closely with IREP.** The project builds on the findings from the previous Lao PDR cookstove initiative activity, which saw the implementation of a pilot in Savannakhet province during 2014/15 in 72 households to inform the development of the results-based finance (RBF) scheme and a methodology for measuring exposure to household air pollution.<sup>31</sup> In addition, the project builds on technical assistance provided to the Government of Lao PDR on improving the cookstove sector under the Lao PDR Health Governance Nutrition Development Program (HGNDP). Under the HGNDP, the World Bank also guided the World Food Program (WFP) and the Lao PDR Government’s Poverty Reduction Fund (PRF) with the roll-out of 200 forced-draft gasifier cookstoves in the North of Lao PDR to pilot. The engagement with PRF will potentially continue work under PRFIII Additional Financing. In addition, the project will also support the development of a cookstove component under the Lao PDR Watershed L3 project.

### C. Proposed Development Objective(s)

#### Development Objective(s) (From PAD)

Generate environment and gender benefits for target households through a switch to clean, energy-efficient gasifier cookstoves using biomass pellets across selected provinces.

#### Key Results

11. **The PDO Level Results.** The expected key results from the project intervention will be:

- a) Lowered Greenhouse Gas (GHG) emissions due to a switch to pellets and gasifier cookstoves.

<sup>30</sup> Emit  $\leq 0.42$  g/min of CO and  $\leq 2$  mg/min of PM<sub>2.5</sub>. (Source: WHO. 2006. Guidelines on Indoor Air pollution.

<http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/policy/who-guidelines-for-indoor-air-quality>).

<sup>31</sup> Gold Standard, 2017. *Methodology to Estimate and Verify Averted Mortality and Disability Adjusted Life Years (ADALYs) from Cleaner Household Air*. <https://www.goldstandard.org/sites/default/files/documents/401.3-adalys-cleaner-household-air.pdf>.



- b) Reduced acute health symptoms associated with household air pollution (HAP) from cooking.
- c) Reduced time burden from cooking and cleaning for women.

#### D. Project Description

12. **The project will distribute 50,000 forced draft gasifier cookstoves across eight to eleven districts<sup>32</sup> in three provinces: Vientiane Capital, Savannakhet Province, and Champasack Province** (Table 1). These three areas are urban to peri-urban areas. They were chosen in collaboration with IREP at MEM based on their high charcoal consumption, carbon emission reduction potential, and the characteristics of the charcoal market. The main criteria for household identification are: (1) household must be willing to pay for the stove, (2) the households’ source of fuel has to be charcoal, (3) the household must commit to use the stove 80 percent of the time for cooking and heating, and (4) the household must agree to the rigorous monitoring during the project implementation period. A list of 2000 households willing to be first-movers in purchasing the stove have already been pre-identified. This was done through a scoping exercise to prepare for a gender-focused impact evaluation funded by the East Asia and Pacific Gender Innovation Lab (EAPGIL).

**Table 1. Project Characteristics**

Project Location	Vientiane Capital	Savannakhet	Champasack
Population <sup>a</sup>	820,940	969,697	694,023
Charcoal use % <sup>a</sup>	45.4%	41.2%	60.6%
Traditional stoves replaced	26,000	12,000	12,000
No. of HH <sup>a</sup>	166,333	157,767	121,865
No. of HH using charcoal <sup>a</sup>	75,506	65,014	75,014
Charcoal usage per HH/year (tons) <sup>b</sup>	0.90	0.74	0.74
Price of charcoal (US\$/kg) <sup>b</sup>	0.2	0.2	0.2
Penetration rate (calculated)	34.4%	18.5%	15.9%

*Sources:* a. 4<sup>th</sup> Population and Housing Census, 2015; b. Ministry of Energy and Mines, 2019.

13. **In line with the Government of Lao PDR’s plan to lower charcoal consumption, the project is designed to target charcoal users in urban to peri-urban areas.** MEM has requested assistance from the World Bank to help lower charcoal use and spur a transformation in the residential cooking sector. Urban areas are good market entry points for ensuring future replication. Urban areas pay for their fuel for cooking, hence making the transition from charcoal to pellets more comprehensive. The MEM has also requested an emphasis on urban intervention first as it believes that urban trends affect what

<sup>32</sup> Current districts selected are Vientiane Capital (7 Districts): Sikhottabong, Chanthabouly, Xaysettha, Sisattanak, Naxaithong, Xaythany, Hadxaifong; Savannakhet (2 District): Kaysone Phomvihane, Outhoumphone; Champasack (2 District): Pakse, and Champasak.





happens in rural areas: cookstoves adopted in urban areas become aspirational products for rural areas. In addition, World Bank research<sup>33</sup> has assessed that necessary conditions for successful early adoption of cookstoves are more likely to hold in urban areas, including:

Easy access to training on how to use the cookstove.

Access to fuel.

Provision of repair facilities.

Reliance on purchased fuel (charcoal) as opposed to collected firewood.

Finally, female-owned businesses are also more prevalent in urban areas, thereby making it a better entry-point for the potential development of economic opportunities for women.

14. **The forced-draft gasifier cookstove will be distributed through a leasing scheme at a maximum of US\$45 per cookstove.** The price has been determined based on discussions with the government of Lao PDR in addition to information gathered on willingness-to-pay from the WFP/PRF pilots and a World Bank field trial in Savannakhet in 2014/15 where forced draft gasifier stoves were distributed to 72 households. In addition, the price tag is established based on Lao PDRs Household Final Consumption Expenditure per capita which is US\$1171 or about US\$98 on average a month, and it is benchmarked against the cost of similar appliances that households in urban and peri-urban areas; such as a refrigerator (US\$160-800) or a luxury item like a TV (US\$150-1200).<sup>34</sup>

15. **Each household provided with a force-draft gasifier cookstove is expected to reduce CO<sub>2</sub> emissions by 3.1 ton per year assuming one forced draft gasifier cookstove will replace one existing charcoal cookstove.** The project will generate a total of 558,648 Emission Reductions (ERs) assuming 75 percent stove usage. A 2-year roll-out plan has been considered given the time horizon needed for clean and efficient cookstove market development. The project was cleared for Emission Reductions Purchase Agreement (ERPA) negotiations by the donors of a World Bank Carbon Fund in July 2018 and will proceed with negotiations upon project effectiveness.

Table 2. Emission Reductions 2019-2025

	2019	2020	2021	2022	2023	2024	2025	Total
Stove distribution	16,000	34,000	0					
Annual ER generation (tCO <sub>2</sub> )	0	18,544	76,495	115,902	115,902	115,902	115,902	<b>558,648</b>
Cumulative ER generation (tCO <sub>2</sub> )	0	18,544	95,040	210,942	326,844	442,746	558,648	

Note: Calculated based on the UNFCCC methodology AMS-II.G. ver. 10 – Energy efficiency measures in thermal applications of non-renewable biomass.

16. **The project employs five innovative design measures:**

a) Technology change. The technology to be used will be a certified<sup>35</sup> forced-draft gasifier

<sup>33</sup> World Bank. 2019. Uganda Clean Cooking Behavioral Diagnostic. <https://openknowledge.worldbank.org/handle/10986/31283>.

<sup>34</sup> Appliance ownership in Lao PDR: Fridge (59.1% overall; 82.9% in urban areas, 50.4% in rural); Cell phone (86.2% overall; 94.7% in urban; 83.4% in rural); TV (77.3% overall; 91.5% in urban; 73.4% in rural); Electric fan: (67.3% overall; 88.4% urban; 60.2% rural). From 2015 population census.

<sup>35</sup> Cookstoves must be certified at an ISO verified cookstove laboratory using the harmonized protocols. (see International Organization for Standardization. <https://www.iso.org/standard/66519.html>).



cookstove that conform to a minimum of tier 5 on CO and PM 2.5 to meet WHO guidelines on HAP, and minimum tier 4 on thermal efficiency, safety, and durability according to the Voluntary Performance Targets set by the International Organization for Standardization (ISO). The forced draft gasifier cookstove decreases emissions by 99 percent, thereby emitting little or no GHG, PM<sub>2.5</sub>, black carbon, and CO. While similar technology has been implemented elsewhere with some success, it will be the first time that a project will aim to distribute the technology at such a large scale with the aim to transform the local cookstove market. The cookstove manufacturer will be chosen through competitive bidding, but currently there are only very few certified forced-draft gasifier cookstoves available.<sup>36</sup>

- b) Fuel change. The introduction of the forced-draft gasifier cookstove will also require the introduction of a new fuel source. The forced-draft gasifier cookstove uses no charcoal and burns most efficiently using pellets, which can be produced from a variety of biomass including wood chippings, rice husk, coconut husk etc. At present, there is no pelletization business in Lao PDR, however a market analysis and experience from the previous WFP and PRF pilots, shows that pellets can be imported at a price that is competitive with charcoal. Current assessments show the most optimal pellets come from Indonesia; though pellets are also available in neighboring countries (Myanmar, Vietnam, Thailand). The pellets from Indonesia are 100 percent FSC (Forestry Stewardship Certified) wood, which burns with more efficiency than pellets produced from other biomass. Testing results carried out in Myanmar, for example, showed 20 percent higher efficiency of wood pellets (from Indonesia) compared with 100 percent rice husk pellets from Myanmar. Overall, 30 – 40 percent more pellets are needed if using rice husk pellets, the power is too low on the small chamber, and lighting the pellets take longer.

Bringing in pellets from Indonesia has been done effortlessly by the WFP for their pilots in the North of Lao PDR. Pellets can be transported in through the First and the Second Thai–Lao Friendship Bridge over the Mekong connects Mukdahan Province in Thailand with Savannakhet in Lao PDR as well as to Vientiane capital. This will bring pellets straight into the project area in Savannakhet and from there the Implementing Entity (as described in section 22.c) will be able to set up distribution routes to neighboring Champasak. There are no import restrictions as both countries are members of the Association of Southeast Asian Nations (ASEAN). To ensure social and environmental safeguards are met, imported pellets will need to meet strict certification standards to ensure that the biomass used for the pellets is sustainably sourced and labor conditions at pellet-producing plants are satisfactory to World Bank standards. In addition, all transportation of pellets must be done by transport companies that abide by national and international rules on safe and sustainable transportation. A sustainable supply of pellets is not only important during, but also following project implementation to ensure continued sustainability, this is discussed in the section III on sustainability.

- c) Private sector company to lead implementation and adopt the project risk. A private sector firm with experience in climate finance and the Clean Development Mechanism (CDM)

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<sup>36</sup> The Mimi Moto 2.0 and the ACE-1.



process will be hired by MEM to be the Implementing Entity of the project activities.<sup>37</sup> Since there is no up-front financing on this project, the Implementing Entity is asked to secure the financing. In addition, they are fully responsible for the achievement of the carbon emission reductions. This transfers the full risk, economic and project design risk, onto the private firm, which may make it difficult to attract firms. However, the project is designed with incentives to attract qualified firms including the promise of the carbon finance transferred to the Implementing Entity and the opportunity to be the first private sector company to enter the pellet market. To ensure that the firm delivers on the carbon finance, a sub-ERPA will be signed between the firm and MEM, which will specify the carbon emission schedule as well as ensure that a percentage of the carbon finance payment will be transferred from MEM to the firm after emission reductions have been verified and certified. The private sector will be the first mover in the cleaner cookstoves sector in the country.

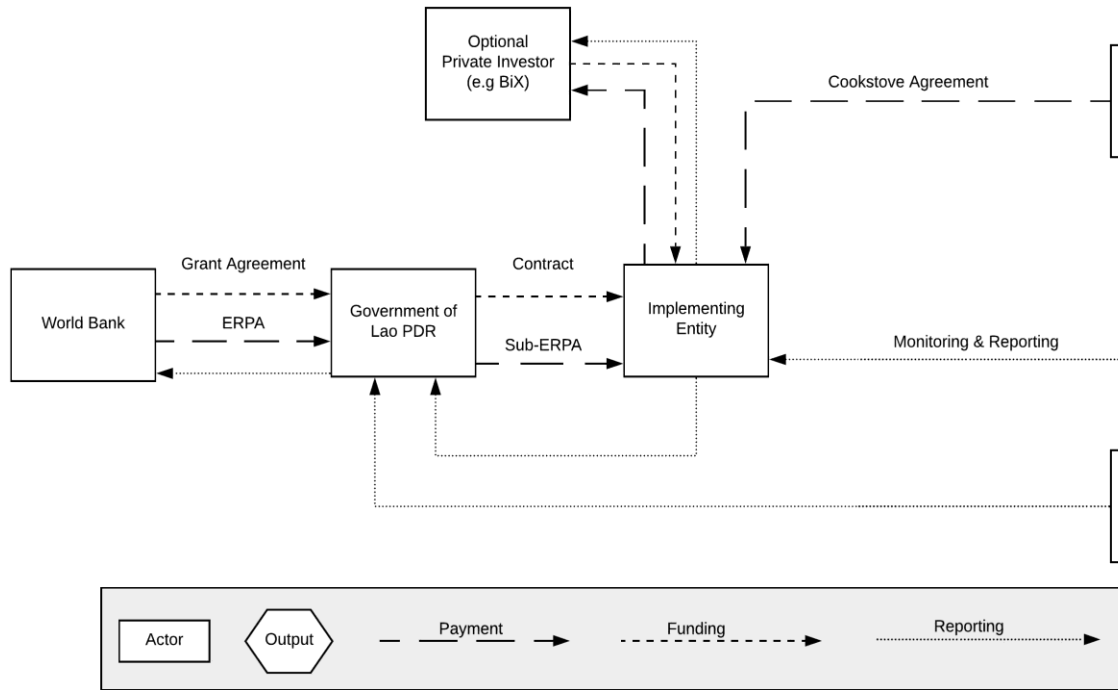
- d) Results-based financing (RBF). The project is being implemented as a results-based finance (RBF) Public-Private Partnership (PPP) project that links public support to the achievement of demonstrated benefits, which in turn mobilizes private sector investments. This model is what helps bring the price down to an affordable level thereby allowing a larger fraction of the Lao PDR population access to a technology that would have otherwise been outside their scope of affordability. From the manufacturer, a forced-draft gasifier stove costs about US\$100. Due to the payments from the carbon finance, the project will reach a stove price point that meets the willingness-to-pay of the average household (maximum \$45). It will also promote the establishment of a market where sales can flourish in the long-term, thereby improving the energy efficiency in the cooking sector and lowering GHG emissions.
- e) Community Approach. The project design engages a community approach that targets selected districts in the three provinces. This will be done through the involvement of various stakeholder, primarily, village chiefs, District Departments of the Ministry of Energy and Mines (DDEM) and the Provincial Departments of the Ministry of Energy and Mines (PDEM) as IREP's stakeholder engagement plan. Through this approach, the new technology is likely to gain more popularity if a larger proportion of people within the targeted districts gain access to the forced-draft gasifier and its benefits can thus travel easier by word-of-mouth. It will also be easier to distribute pellets in these target areas, and the approach may have a larger impact on lowering ambient air pollution as the forced draft gasifier will have a more local impact when distributed in clusters rather than if it is dispersed at random across the provinces.

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<sup>37</sup> The TORs for the Implementing Entity is already under preparation by the PMU at MEM/IREP. They are scheduled to be released on May 20, 2019.



*Figure 2. Implementation arrangements and financial flow of the RBF model*



Legal Operational Policies

	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Areas OP 7.60	No

Summary of Assessment of Environmental and Social Risks and Impacts

The environmental risk is classified as moderate and the social risk as low with an overall risk rating as moderate. The potential social risks and impacts relate to the procurement, distribution, storage and safe use of stoves and pellets. It is expected that stove and pellets will be imported with the pellets likely sourced from Indonesia through sustainable procurement. The stoves will be supplied from a certified supplier. Community health and safety risks from pellets and stoves, while they exist, are minimal. Potential for risks related to labour and working conditions are covered either through sustainable procurement or through putting in place labour management procedures to address any gaps between national requirements and those of the World Bank.

The procurement, storage and distribution of 50,000 stoves, together with pellets to be used with the stoves, are not expected to require land acquisition, conversion of land nor restrict access to land or other resources.

An impact evaluation, which will be a key component of the project, has been designed such that it informs on



inclusion based on socio-demographics and which in turn informs project design. The study can also inform accessible and inclusive strategies for engaging interested and affected stakeholders.

The project has the potential to benefit individual people, particularly females, and households that will have access to the clean cook stove and pellets. This will include ethnic groups' households as well as vulnerable groups. Benefits include better health outcomes for the households that benefit from the project and better gender outcomes including that of health and time savings. There is also potential for increased awareness on health from information campaigns targeted at communities in the project area.

From the nature and scale of project's activities, the project will not pose any footprint and/or negative impact on local environment, instead will provide positive impact by carbon emission reduction and promote human health by reducing the use of traditional cookstove. However, some concern in relation to the road safety during the transportation and storage of cookstoves and pellets before they are distributed, and management of hazardous waste generated from used battery and solar panel. The IREP will make sure (1) the cookstoves and pellets are produced from sustainable source, (2) transportation and storage plan is developed and implemented, and (3) waste management plan is developed and implemented satisfied to the WB. The timeline for development and implementation of these instrument was discussed and provided in the Environmental and Social Commitment Plan (ESCP).

**Note:** To view the Environmental and Social Risks and Impacts, please refer to the Appraisal Stage ESRS Document.

## E. Implementation

### Institutional and Implementation Arrangements

17. **The Government counterpart on the project is the Ministry of Energy and Mines (MEM).** The MEM will be responsible for overall project management. This will include signing an Emissions Reduction Purchase Agreement (ERPA) with a World Bank carbon fund, for the sale and transfer of Certified Emission Reductions (CERs) as well as a Sub-ERPA with the Implementing Entity. The overall project activities are imbedded in the Institute of Renewable Energy Promotion (IREP), which is under MEM. The IREP has established a Project Management Unit (PMU) that will be the central coordinating entity from the government side responsible for overall oversight of the project. This includes hiring the Implementing Entity, coordinating the target provinces and districts as well as line ministries relevant to project implementation, providing oversight on the carbon finance process including the CDM registration, and developing and managing a sound financial management system. The PMU consists of a team of government staff as well as consultants.
18. **The Implementing Entity will be a private firm hired by the PMU at IREP and will be responsible for the technical implementation of the project.** The firm will be proficient in the carbon finance process, hold country and regional experience, and have the capacity to put people on the ground in Lao PDR. The Implementing Entity will be responsible for the procurement of the forced draft gasifier cookstoves and associated pellet supply, and as such must take the risk on the up-front investment of the cookstoves. This is achieved either through (1) a committed private sector investor such as BIX



(Base of the Pyramid Impact eXchange) Capital<sup>38</sup>, which have expressed willingness to invest, or (2) through their own investment to maximize their Return on Investment (ROI). The Implementing Entity will also be responsible for the achievement of the carbon emission reductions and will sign a Sub-ERPA with MEM to ensure that monitoring and reporting on the emission reductions is carried out according to CDM MRV standards and procedures. The Sub-ERPA also ensures the transfer of the carbon finance payment flows from MEM to the Implementing Entity upon achievement of CERs to cover their initial investment of the cookstoves. ANNEX 1 includes a detailed overview of the implementation arrangements as well as the responsibilities of the agencies and organizations involved.

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<sup>38</sup> BIX Capital, established in 2003, provides medium-term working capital debt to companies in the value chain to provide households in developing countries with essential products (such as improved cookstoves). Its financing uniquely uses future income of carbon credits and other forms of pre-committed impact-based cashflows as security.



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**APPROVAL**

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