

Proposal Submission Form

"Take urgent action to combat climate change and its impacts -
achieving SDG 13"

General Information

Proposal title: Solar LED Lamp Project in a rural community in Rukum District of Nepal

Proposal acronym:

LED	Light Emitting Diode
CFUG	Community Forest Users Groups
CO ₂	Carbon Dioxide
DFO	District Forest Office
SDG	Sustainable Development Goals
DDO	District Development Office
DSCO	District Soil Conservation Office
DEO	District Energy Office
VDC	Village Development Committee

Duration: 12 months

Short summary:

Burning of "Fatwood", local name "Jharro", for lighting houses in remote areas in Mid-hills and Himalayan regions of Nepal where there is no access to electricity grid is threatening the pine forest (The Kathmandu Post, 2015). The per capita Carbon dioxide (CO₂) emission from just burning of "Jharro" is significantly higher in these areas. The continuous burning of "Jharro" has not only impacted the forest health but is also detrimental to the health (vision and respiration) of women and children who primarily use "Jharro" lamp in kitchen and study room (Bhusal, Zahnd, Eloholma, & Halonen, 2007). Meanwhile, the forest degradation is triggering nature- and climate-related disasters such as landslide and soil erosion in these regions. With the main objective of reducing household CO₂ emission, the project is designed to help local people in one of the Community Forest Users Groups (CFUGs) in Rukum district of Nepal to transition from use of high CO₂ emitting "Jharro" lamp to low CO₂ emitting (apparently green technology) Solar Light Emitting Diode (LED) Lamps. As a pilot project, it benefits 300 households including around 1380 people with Solar LED lamp sets and the primary beneficiaries are women and children. The project aims to reduce household CO₂ emission by 255 tonnes per year by reducing the extraction and burning of "Jharro". The project, upon successful execution, can be easily replicated to other CFUGs in the same regions where the problem is similar and contribute to reduction in national CO₂ emission. It also addresses the targets of the UN's Sustainable Development Goals (SDGs); SDG 7 and SDG 13 (United Nations, 2020).

Administrative data

Name of applicant: Manoj Pariyar

Project Area: Rukum District, Nepal



Figure 1: Map of Rukum district, Nepal

Source: (Jhumlawang Village Foundation, n.d.)



Figure 1: Jharro Extraction



Figure 3: Jharro lamp

Source: (Bhusal et al., 2007)

Ethical issues

The project needs to conduct survey for the collection of household data which includes demographic information (age, gender, ethnicity, marital status, income, education, and employment status) of family members. The data is collected with the help of community representatives (most preferably a member from CFUG committee) and preserved in the project office for the purpose of the project only.

Outline of proposal

1. Excellence & impact

1.1 Objectives & concept

The objective of the project is to support the energy transition from traditional burning of "Fatwood" of pine tree, locally called "Jharro", to (LED) Lamps in a CFUG in Rukum District of Nepal which is deprived of electricity, starting from August 1st, 2021 to July 31st, 2022.

Burning of resinous wood, commonly called "Fatwood" and locally named "Jharro", extracted from the bottom portion of heartwood of trunk of a pine tree is a traditional way of lighting houses in Nepal (Bhusal et al., 2007; MMForge, n.d.). As a matter of fact, the continuation of this practice has raised a serious problem in pine forests in far western Mid Hills and Himalayan regions of Nepal and the local people have no other option as these areas are far from the outreach of electricity grids (The Kathmandu Post, 2015). This practice is not only impacting the health of forest and people but is also contributing to national and global CO₂ emission.

The project is designed on the concept of "mutual benefits" where, on one hand, the forest dependent local people for lighting their house will receive free sets of Solar LED lamps and get rid of burning smoky "Jharro" lamp and, on the other hand, they will completely stop extraction of fatwood, preserve forest, and help reduce CO2 emission. Therefore, the main target of this project is to assist the local people in transitioning from high CO2 emission lighting source i.e., "Jharro" Lamps to a low CO2 emission lighting source i.e., Solar LED Lamps, while preserving the forest. The project also aims to achieve secondary benefits to the local people such as reduction in health problems related to vision and respiration due to smoky indoor environment, reduction in workload for collecting fatwood, and reduction in disasters like landslides and soil erosion due to forest degradation. The main task of the project is to distribute the sets of Solar LED Lamps to each household in a CFUG in Rukum district of Nepal as prioritized in coordination with the District Forest Office (DFO), Rukum. Thus, the primary beneficiaries will be the households who are members in the CFUG. Specially, women and children are expected to be highly impacted as they are more involved in cooking, reading, and wood collection activities.

The project specifically attempts to address the targets of United Nations' SDGs; SDG 7 "Ensure access to affordable, reliable, sustainable and modern energy for all" and SDG 13 "Take urgent action to combat climate change and its impacts". Under SDG 7, the project will ensure the access of renewable and affordable solar energy to light the house in one CFUG and under SDG 13, the project will help strengthen the resilience and adaptive capacity of local people against natural and climate related hazards like soil erosion and landslide by protecting the forest (United Nations, 2020).

Logical framework of the project:

	Summary of project	Indicators & means of verification	Risks / barriers / mitigation measures
Goal	To support the energy transition from traditional burning of "Fatwood" of pine tree, locally called "Jharro", to Solar (LED) Lamps in a CFUG in Rukum District of Nepal which is deprived of electricity, starting from August 1st, 2021 to July 31st, 2022.		<ul style="list-style-type: none"> Geographical challenge for transportation of delicate solar sets due to lack of good transport system. Seasonal applicability of solar appliances
Outcomes	<ul style="list-style-type: none"> Conservation of pine forest and reduction in CO2 emission. Reduction in forest dependency of local people for the source of light. Reduction in health problems (vision and respiratory) due to burning of pine wood in each house. Decrease in workload of local people (specially women and children) who spend time in collection of fatwoods. Reduction in nature- and climate-induced disasters like landslides and soil erosion. 		

Outputs	<ul style="list-style-type: none"> • 300 Solar LED Lamp sets are installed in each household which are deprived of electricity in a CFUG in Rukum District. • 5 skilled manpower are generated for proper installation, operation, and maintenance of solar sets. • Household survey data report is produced (1 document). • Forest inventory data report is produced (3 documents). 	<ul style="list-style-type: none"> • Project report • Minutes/Records of solar sets handover • Minutes/Record of training program. • Data entry field books 	
Activities	<ul style="list-style-type: none"> • District level coordination meeting with District Development Office (DDO), DFO, District Soil Conservation Office (DSCO), and District Energy Office (DEO) • Stakeholders' meeting including DDO, DFO, DSCO, DEO, Village Development Committee (VDC), CFUG, and representatives from youth clubs, women's groups, and others. • Preliminary household survey for data collection • 3 forest inventories (1 at the beginning, 1 at the middle, and 1 at the end of project) to check the status of trees/forest. • 1 Training is provided to 5 members of CFUG for proper installation, operation, and maintenance of the solar appliances. • Distribution of 300 Solar sets with the lead of CFUG committee. • Monitoring of households in monthly basis for feedbacks collection and maintenance if needed. 	<ul style="list-style-type: none"> • Project Report • Minutes/Records/Bookkeeping of CFUG • Data entry field books • Project Monitoring and Evaluation (M&E) Report 	

1.2 Ambition & Impact

13 % of global population did not have excess to electricity in 2016 that equals to 940 million people (Ritchie, 2019). The figure reached 1.2 billion by 2017 which covered roughly 16 % of the global population (Nick Routley, 2019). However, it was 860 million and 770 million in 2018 and 2019 respectively but it is expected to increase again from 2020 (IEA, 2019). The bitter fact is that these countries who have the least access to the electricity lie in underdeveloped and developing regions of the world - the Sub-Saharan Africa and South Asia, and the alternative sources of fuel for them are biomass and fossil fuels (Nick Routley, 2019; Ritchie, 2019).

In remote parts of Nepal where there is no electricity grid available, people are still dependent on burning of resinous pine wood for lighting their house (The Kathmandu Post, 2015). According to the research conducted in Helsinki University of Technology, the daily household consumption of "Jharro" lamp is 1.35 kg considering an average daily need of lighting house as 5 hours and per hour consumption of "Jharro" lamp as 0.27 kg. Therefore, the annual household consumption comes out to be 492.75 kg (Bhusal et al., 2007). Generally, 1 kg of wood contains 450 to 500 grams of Carbon and 1 kg of Carbon can produce 3.67 kg of CO₂.

So, on complete combustion, 1 kg of wood can produce 1.725 kg of CO₂ assuming 475 grams as an average carbon content in 1 kg of wood. Therefore, daily consumption of "Jharro" produces 2.33 kg of CO₂ per household and annual consumption produces 850 kg of CO₂ per household (Bhusal et al., 2007; Kaltimber, 2017). As per the above calculation, the per capita CO₂ emission only from "Jharro" is 185 kg whereas the per capita CO₂ emission from overall sources in Nepal is 290 kg (Worldometer, 2016). The figure clearly indicates the need for energy transition towards a low emission source and technology in the project area.

As a best possible solution, PV Solar LED Lamps are proved to be highly luminous-efficient and cost-effective technology as compared to "Jharro" lamps because of its considerably high life expectancy – about 25 years of life cycle (Bhusal et al., 2007).



Figure 4: Solar LED Lamp sets



Figure 5: Child studying under Solar LED Lamp

Source: <https://www.indiamart.com/proddetail/solar-home-lights-14620908155.html>

Source: (Shrestha, n.d.)

Table: Comparison of PV Solar LED Lamp and "Jharro" Lamp (derived from (Bhusal et al., 2007)):

	Jharro	PV Solar LED Lamp
Power (in Watt (W))	2167	0.73
Luminous Flux (lumen (lm))	88	11
Luminous efficacy (lm/W)	0.04	15
Cost per (in kilolumen-hour (klmh))	Rs 307	Rs 15
Annual cost	Rs 49,250	Rs 2,408

The ambition of the project is to provide 300 households of a CFUG with PV Solar LED Lamp sets and reduce household CO₂ emission from burning of "Jharro" by 255 tonnes per year. As mentioned earlier, the direct impacts of the project will be reduction in deforestation due to "Jharro" extraction, improvement in health (vision and respiration) of family members, especially women and children and reduction in workload for collection of "Jharro". The indirect impacts will be reduction in nature- and climate-related disasters like landslides and soil erosion in long run.

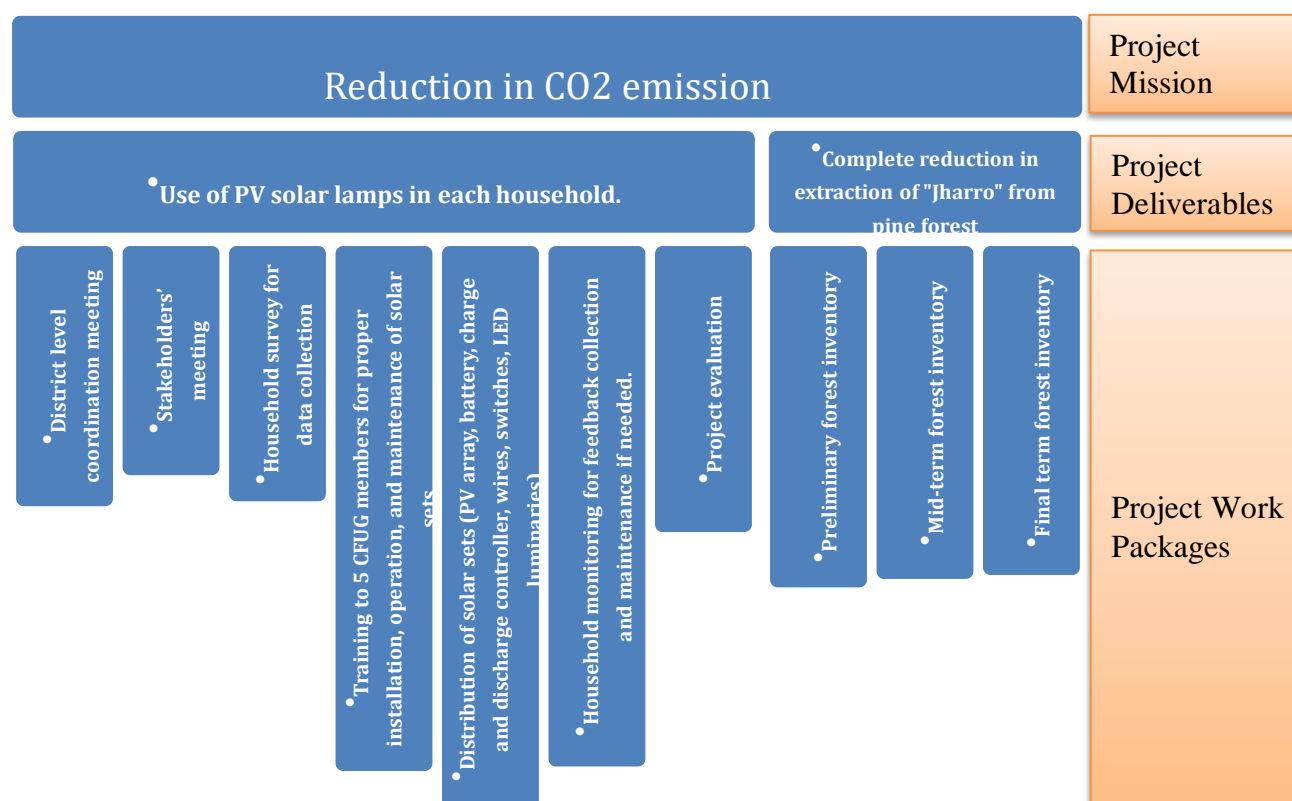
The project is a pilot project run under coordination and support from district level government agencies and stakeholders so the project result will be endorsed and validated by them and disseminated to other districts through government channels. A copy of project report will be provided to relevant district development offices where the problem is similar. There is high scope of replicating the project in other places because

the extraction of “Jharro” is a common problem in most CFUGs in Mid-hills and Himalayan regions in Far-West Nepal. Meanwhile, the major barriers to such projects are geographical challenges for transportation of delicate solar sets, and seasonal applicability of solar lamp sets.

2. Implementation

2.1 Work plan — Work packages, deliverables, and milestones

The mission of the project is to reduce CO₂ emission from burning of “Jharro” and the project is designed to produce particularly two deliverables. They are (1) Use of PV solar lamps in each household and (2) Complete reduction in extraction of “Jharro” from pine forest. The overall workplan of the project follows the following chart:



The individual activities within each work packages are listed as below:

S.N.	Project Work packages	List of Activities
1	District level coordination meeting	<ul style="list-style-type: none"> Finalizing date, time, and place for coordination meeting Drafting, finalizing, and sending invitation letters to district level government agencies like DDC, DFO, DSCO, and DEO Briefing about the project Collection of comments and suggestions
2	Stakeholders' meeting	<ul style="list-style-type: none"> Finalizing date, time, and place for coordination meeting Drafting, finalizing, and sending invitation letters to district level government agencies like DDC, DFO, DSCO, and DEO and VDC, CFUG, Youth clubs, Women's groups, and others.

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		<ul style="list-style-type: none"> Prioritizing the most needy forest group from participatory discourse Deciding the name of beneficiary CFUG
3	Household survey for data collection	<ul style="list-style-type: none"> Assigning staffs for collection of household data Collection of demographic data (including number of family members, sex ratio, age, number of children, etc.) Data entry and compilation in software (Microsoft Excel).
4	Training to 5 CFUG members for proper installation, operation, and maintenance of solar sets	<ul style="list-style-type: none"> Selection of 5 members from CFUG meeting for receiving training. Preparation for training materials Providing knowledge about different parts of solar set Demo class for installation, operation, and maintenance of solar sets Certification from Trainer, Government official and Project staff.
5	Distribution of solar sets (PV array, battery, charge and discharge controller, wires, switches, LED luminaries)	<ul style="list-style-type: none"> Purchase of PV solar sets Finalizing date, time, and place for solar sets distribution Preparing the list of beneficiary households Handover of solar sets and preparing receipts.
6	Household monitoring for feedback collection and maintenance if needed.	<ul style="list-style-type: none"> Selecting members for monitoring committee Observing the condition of solar sets (in use or not in use) Collecting feedback from households about the functioning of solar sets Preparing and finalizing report
7	Project evaluation	<ul style="list-style-type: none"> Compiling and analyzing monthly and mid-term reports Compiling and analyzing feedback and comments Evaluation of deliverables
8	Preliminary forest inventory	<ul style="list-style-type: none"> Consultation with DFO staffs and CFUG committee Selection of staffs for field inventory Planning on paper to conduct inventory (For example, setting transect paths, preparing field equipment, inventory book, etc.) Recording and compilation of field data
9	Mid-term forest inventory	<ul style="list-style-type: none"> Recording and compilation of field data Cross-comparison with preliminary forest inventory data
10	Final term forest inventory	<ul style="list-style-type: none"> Recording and compilation of field data Cross-comparison with preliminary forest inventory and mid-term inventory data Final report preparation and finalizing

The Gantt chart for the project work packages is as follows:

S.N.	Project Work packages	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	Jun	July
1	District level coordination meeting												
2	Stakeholders' meeting												

3	Household survey for data collection												
4	Training to 5 CFUG members for proper installation, operation, and maintenance of solar sets												
5	Distribution of solar sets (PV array, battery, charge and discharge controller, wires, switches, LED luminaries)												
6	Household monitoring for feedback collection and maintenance if needed.												
7	Project evaluation												
8	Preliminary forest inventory												
9	Mid-term forest inventory												
10	Final term forest inventory												

Note: Details on milestone/deadlines for individual project activities are listed in the Annex.

2.2 Indicative budget

The following table indicates an estimated budget for each activity described in the logical framework including materials cost, transportation cost, communication cost, service charges, and other logistics.

S.N.	Activities	Unit	Quantity	Participants	Unit cost (NRs)	Travel cost (NRs)	Foods (NRs)	Communication (NRs)	Total Budget (NRs)
1	District level coordination meeting with DDO, DFO, DSCO, and DEO	Event	1	20		100	100		4000
2	Stakeholders' meeting including DDO, DFO, DSCO, DEO, VDC, CFUG, and representatives from youth clubs, women's groups, and others.	Event	1	40		100	100		8000
3	Preliminary household survey for data collection	Event	1	2		0	500	500	2000

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4	3 forest inventories (1 at the beginning, 1 at the middle, and 1 at the end of project) to check the status of trees.	Events	3	5		100	500	500	16500
5	1 Training is provided to 5 members of CFUG for proper installation, operation, and maintenance of the solar appliances.			5		0	500	200	3500
6	Purchase of Solar Sets (PV array, battery, charge and discharge controller, wires, switches, LED luminaries)	Sets	300		1600				480000
7	Transportation of Solar Sets to the Project area	Trips	4		10000				40000
8	Cost of Installation	Houses	300		500				150000
9	Distribution of 300 Solar sets with the lead of CFUG committee.	Event	1					1000	1000
10	Monitoring of households in monthly basis for feedbacks and maintenance if needed.	Events	8	5		100	500	500	44000
11	Stationery for project office	LS							30000
12	Communication cost for project office	LS							30000
13	Office rent	LS							50000
14	Miscellaneous	LS							50000
Grand total (in NRs)									909000
Grand total (in US Dollar) (exchange rate: 1 US Dollar = 117 NRs)									7769.00

In words: Seven Thousand, Seven Hundred, and Sixty-nine US dollar.

Note: LS stands for Lumpsum

References:

- Bhusal, P., Zahnd, A., Eloholma, M., & Halonen, L. (2007). Replacing fuel based lighting with light emitting diodes in developing countries: Energy and lighting in rural Nepali homes. *LEUKOS - Journal of Illuminating Engineering Society of North America*, 3(4), 277–291.
<https://doi.org/10.1582/LEUKOS.2007.03.04.003>
- IEA. (2019). Access to electricity – SDG7: Data and Projections – Analysis - IEA. In *International Energy Agency*. Retrieved from <https://www.iea.org/reports/sdg7-data-and-projections/access-to-electricity>
- Jhumlawang Village Foundation. (n.d.). Jhumlawang Village Foundation is a Nepal-based community, diaspora and volunteer-driven Non-Governmental Organisation (NGO). Retrieved March 10, 2021, from <http://www.jvf-nepal.org/about-jvf.html>
- Kaltimber. (2017). How much CO2 is stored in 1 kg of wood? — Kaltimber. Retrieved March 4, 2021, from Kaltimber website: <https://www.kaltimber.com/blog/2017/6/19/how-much-co2-is-stored-in-1-kg-of-wood>
- MMForge. (n.d.). Finding Fatwood : 5 Steps - Instructables. Retrieved March 7, 2021, from Instructables Outside website: <https://www.instructables.com/Finding-Fatwood/>
- Nick Routley. (2019). *Mapped: The 1.2 Billion People Without Access to Electricity-Visual Capitalist*. Retrieved from <https://www.visualcapitalist.com/mapped-billion-people-without-access-to-electricity/>
- Ritchie, H. (2019). Access to Energy - Our World in Data. Retrieved March 4, 2021, from OurWorldInData.org. website: <https://ourworldindata.org/energy-access#access-to-electricity>
- Shrestha, P. K. (n.d.). *Photos from A Clean Solar Alternative to Kerosene Lamps, Nepal - GlobalGiving*. Retrieved from <https://www.globalgiving.org/projects/alternative-energy-for-nepal/reports/?pageNo=2>
- The Kathmandu Post. (2015). Resin extraction threatens pine forests in Far West. *Kathmandupost.Com*. Retrieved from <https://kathmandupost.com/national/2015/03/08/resin-extraction-threatens-pine-forests-in-far-west>
- United Nations. (2020). THE 17 GOALS | Sustainable Development. Retrieved March 7, 2021, from United Nations Department of Economic and Social Affairs website: <https://sdgs.un.org/goals>
- Worldometer. (2016). Nepal CO2 Emissions - Worldometer. Retrieved March 4, 2021, from worldometers.info website: <https://www.worldometers.info/co2-emissions/nepal-co2-emissions/>
- Annex: Details on milestone/deadlines for individual project activities (not included in the project because of maximum page limit)