

MILLION SOLAR URJA LAMP (SoUL) PROGRAM

Right to Clean Light

www.millionsoul.iitb.ac.in

An Initiative of
Indian Institute of
Technology Bombay



Sponsored by
Ministry of New and
Renewable Energy,
Government of India



**“Education is the most powerful weapon
which you can use to change the world.”**

– Nelson Mandela

... the Million Solar Urja Lamp (SoUL) Program aims to
contribute towards improving education

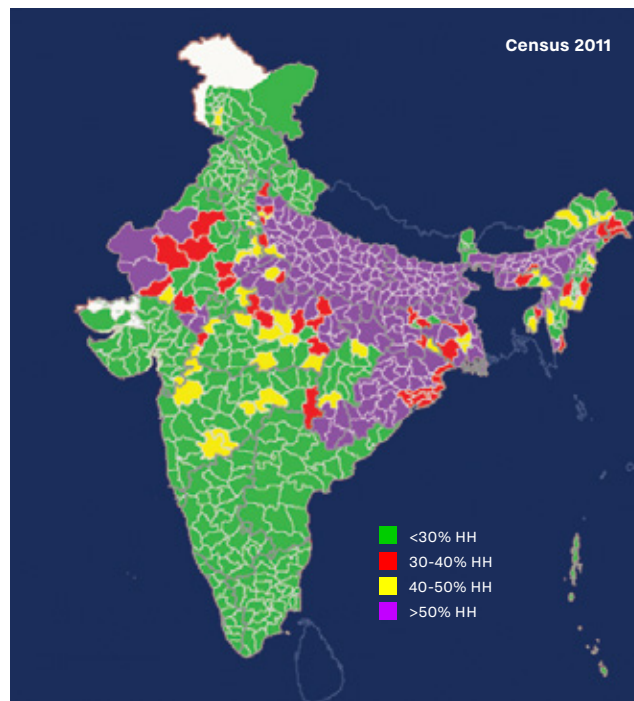
RIGHT

to clean light for every
school going child

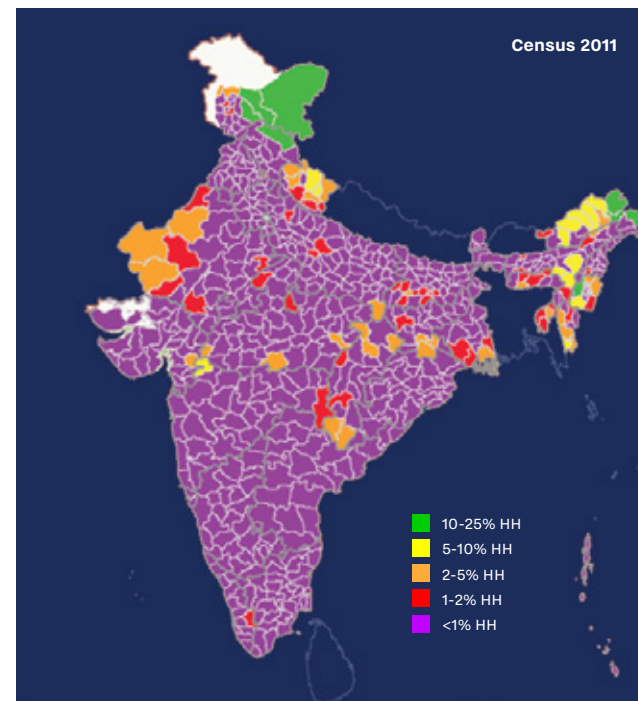


SOURCE OF LIGHT IN RURAL INDIA: KEROSENE

- **78 million households** (~300 million people) in rural India use kerosene as their main source for lighting (Census 2011)
- Grid electricity cannot provide immediate solution for lighting to all
- Solar lamp can replace kerosene lamp, but solar products penetration so far has been **only 1% across India** (Census 2011)



Percentage of Rural Households (HH) using Kerosene as main source of lighting



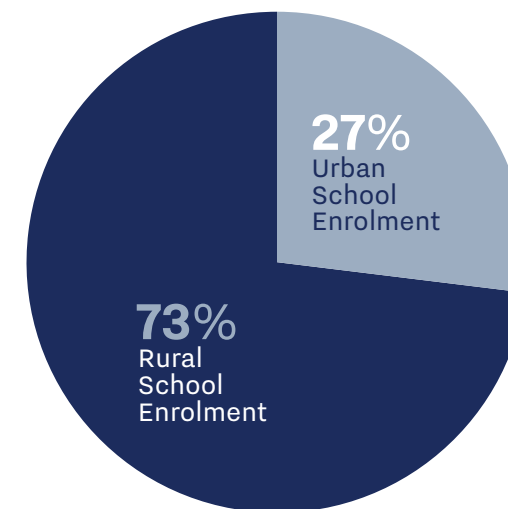
Percentage of Rural Households (HH) using Solar Energy as main source of lighting

Students should not wait for supply of conventional electricity

- After 68 years of independence, the per capita annual electricity consumption in India is about **1010 kWh** (Central Electricity Authority) in 2014-15 as against the **3064.5 kWh** consumption of the world in 2012 (World Bank)

Relying on conventional electricity alone to **bring light to students' life** for study will require:

- Huge resources of fossil fuels
- A large investment, and
- A very **long time**



A school going child **CAN-NOT** and **SHOULD-NOT** wait indefinitely for light for study purposes

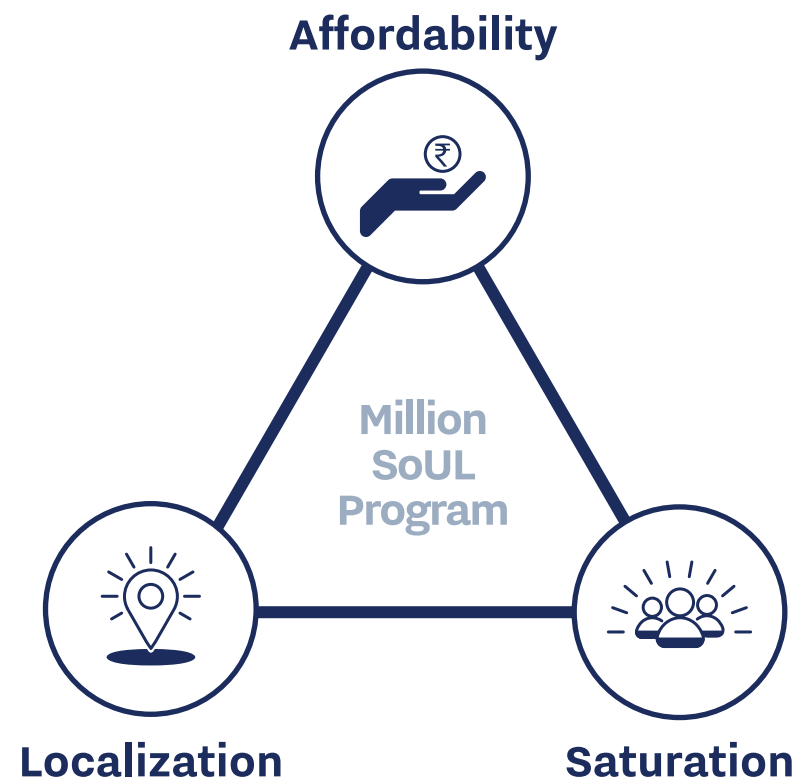
THE MILLION SOLAR URJA LAMP (SoUL) PROGRAM

An Initiative of IIT Bombay (2014-16)

SCALE and
SPEED using
LOCAL skills

The **Million SoUL Program** guarantees clean light to school going children in rural India in the **fastest possible way and in a cost-effective manner.**

The Program is designed on the principles of **Localization, Saturation** and **Affordability.**



OBJECTIVES *of the Million SoUL Program*



- Provide **10,00,000 Solar Urja Lamps (SoUL)** to as many students in rural areas to increase their hours of study
- Involve local people in lamp assembly, distribution and repair activities
- Generate sustainable employment in rural areas
- Develop local capabilities for sale, repair and maintenance of solar products
- Create a sustainable, large scale SoUL program model
- Seed rural solar markets for accessibility and availability of solar products

SoUL A Study Light Solution

The light level required for study purposes is 150 Lux.

A kerosene lamp provides merely 15 Lux of light.

A solar powered 0.5 Watt LED lamp can provide the required light level (150 Lux) for study.

Did you know?

To study 4 hours a day for 365 days, a child requires only 0.73 unit of electricity in a year!

The electricity consumption of the lamp in a year is less than that of running a refrigerator for a day!

Appropriate Technical Solution

- **Panel:** 1.0 Wp
- **LED Wattage:** 0.5 Watt
- **Battery:** 1.2x2V 1200 mA NiMH Or LFP (LiFePO4) 3.2 V, 1000 mAh
- When fully charged, SoUL delivers 150 Lux at over 12" height, with a backup of about 8 hours on half intensity and 5 hours on full intensity mode



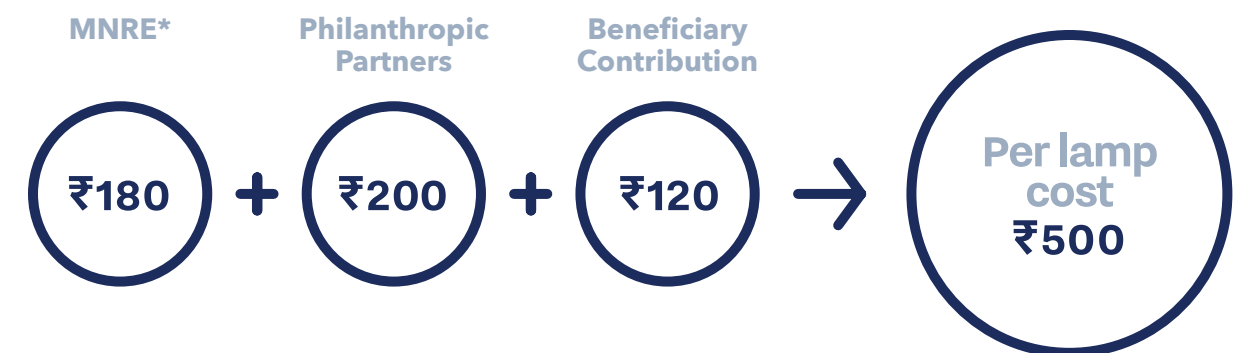
AFFORDABILITY of the SoUL



The main target being remote rural households, affordability is critical in reaching maximum number of students.

The subsidized beneficiary contribution towards the SoUL is **₹120** — The price is based on the per-day average labor wage of the National Rural Employment Guarantee Act in the most backward states (2012).

This makes solar lamp affordable to all.



The total cost of a lamp includes the cost of components, assembly, manpower, logistics, campaigning, along with repair and maintenance.

*MNRE-Ministry of New and Renewable Energy, Government of India

LOCALIZATION of Solar Lamp Program

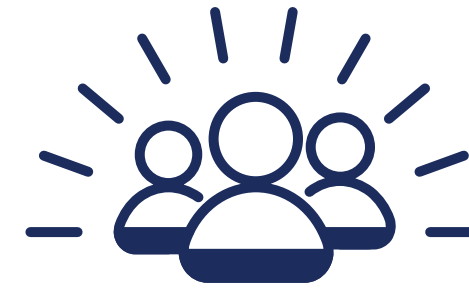


- Equips local people with the knowledge and skills of assembly, distribution, repair and maintenance of the SoUL
- Enables local livelihood generation and efficient after-sales service
- Fosters confidence in solar technology and seeds solar market for better availability of and accessibility to solar products
- Approx. **2,72,356 man-days** of employment and ₹9,13,00,000 were invested in rural economy through the program over a period of two years

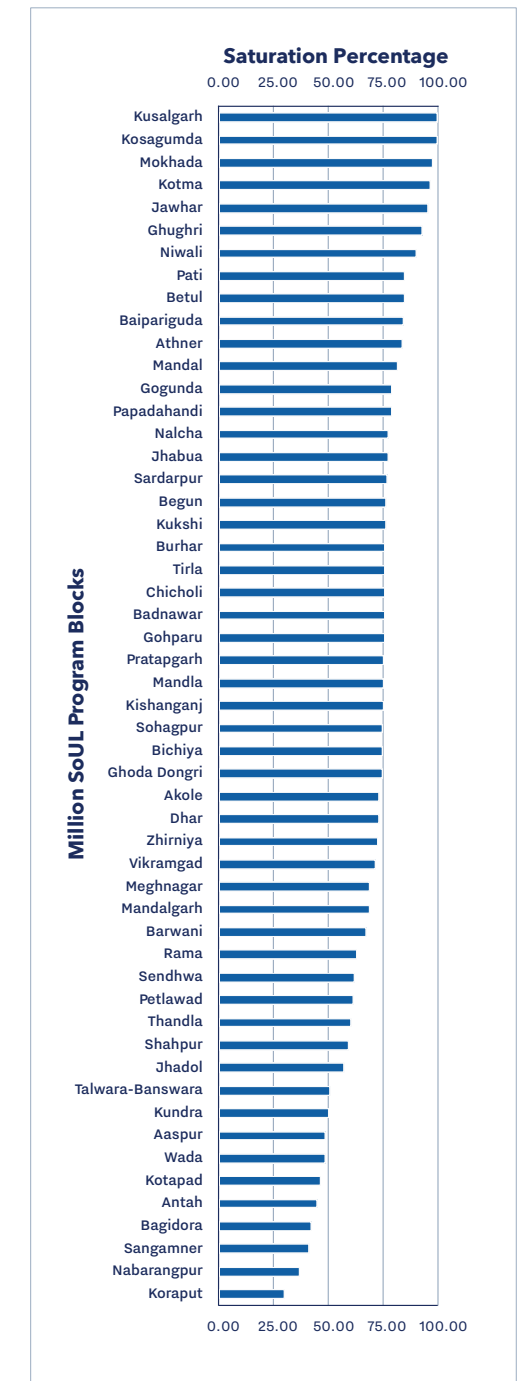
State	Manpower Trained
Maharashtra	223
Madhya Pradesh	679
Rajasthan	347
Orissa	160
Total	1409



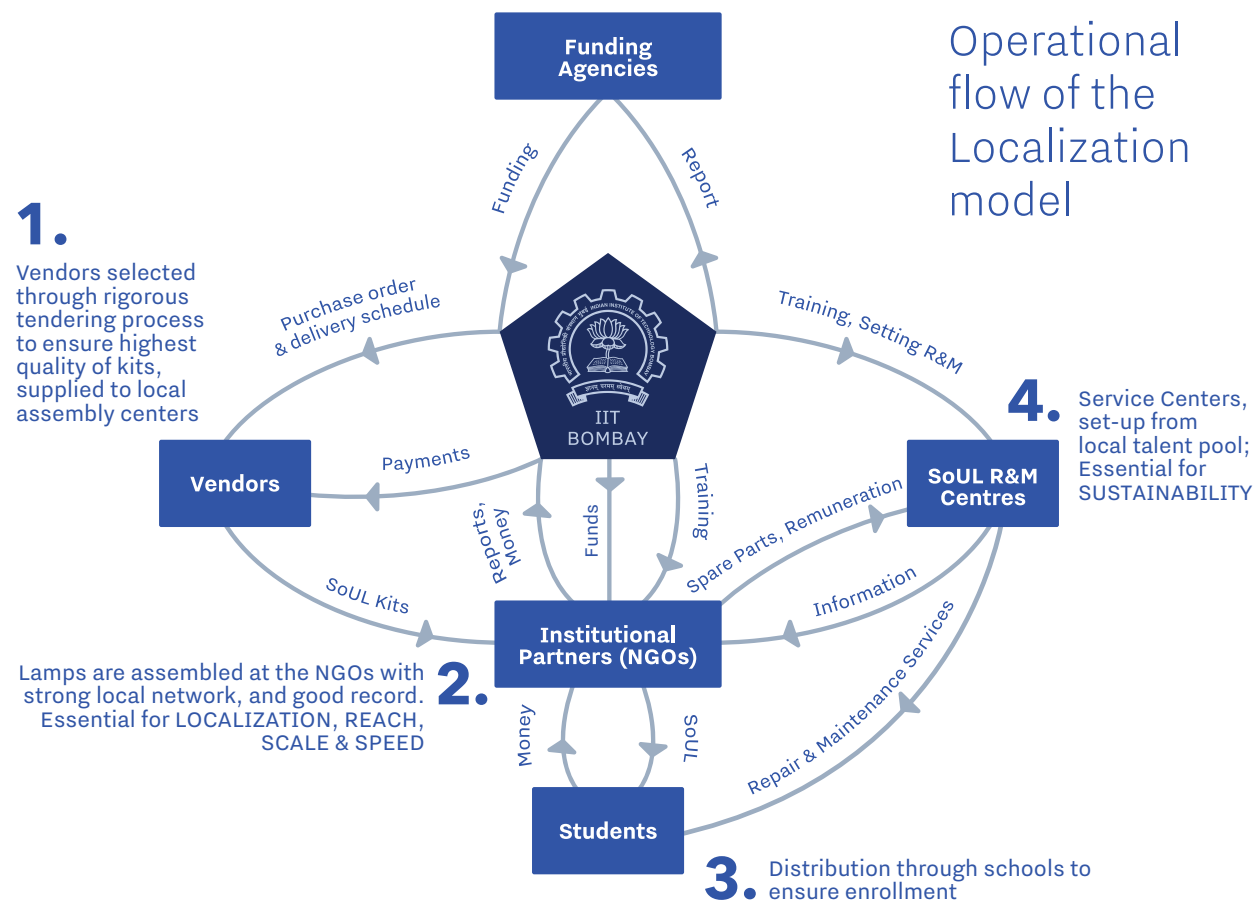
SATURATION in the Million SoUL Program



- Development block is used as the basic unit of intervention to reach maximum number of rural school going students in a concentrated manner
- Target beneficiaries are 75% of the total school enrollment from classes 5th to 12th
- Local NGO partners chosen by IIT-B develop appropriate saturation plan for speedy implementation by recruiting local people as assemblers & distributors
- Provides more efficient logistics and management of the program



PARTNERS in the Endeavor



Funding Agencies	Institutional Partners	Vendors
- Ministry of New and Renewable Energy (MNRE) - Government of Madhya Pradesh - Sir Dorabji Tata Trust (SDTT) - Idea Cellular - Larsen & Turbo (L&T) - Tata Motors	- Aga Khan Rural Support Programme (AKRSP) - Ashagram Trust - BAIF Research Development Foundation (BAIF) - Centre for Advanced Research and Development (CARD) - Foundation for Ecological Security (FES) - Gramin Vikas Trust (GVT) - Harsha Trust - Sahjeevan Samiti - Watershed Organization Trust (WOTR)	- Gautam Solar Pvt. Ltd. - Sirius Solar Energy Systems Pvt. Ltd. - TATA Power Solar Systems Ltd. - Thrive Solar Energy Pvt. Ltd.

TRAINING Knowledge & Skill Transfer



Assembler Training

- Basics of solar technology
- Assembling the solar lamp
- Conducting quality checks (Component Testing & Final Testing)



Repair Centre Training

- Repairing of Lamps (Testing and replacing parts)
- Spare parts management



Distributor Training

- Methods of campaigning (SoUL display posters, pamphlets & banner)
- Distribution methods
- Basic information collection about beneficiary students



Management Training

- Management of inventory, assembly and distribution center
- Planning, execution and monitoring of activities
- Reporting and communication

Comprehensive training helps effective planning, implementation and monitoring of operations

LOCAL LEVEL REPAIRS

- SoUL Repair Centers (SRC) are local level institutions established to provide effective after-sales service
- Cluster approach was adopted, with one SRC catering to approximately 10-15 villages & **3000 lamps**
- Each SRC provides free repair services within the warranty period & earns **₹2750 per month** for these services
- SRCs can serve as local access points for consumers & distribution points for vendors of **new solar products**

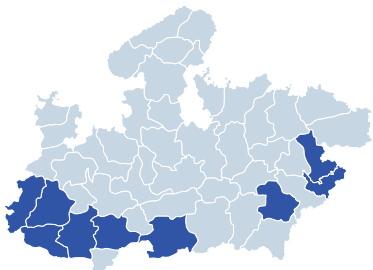
State	SoUL Repair Centres (SRCs)
Maharashtra	60
Madhya Pradesh	185
Rajasthan	89
Orissa	36
Total	370



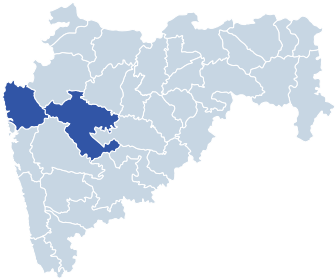
PROGRAM OUTREACH

Million SoUL Program is present in select **23 districts of the four states** of Madhya Pradesh, Rajasthan, Maharashtra and Odisha.

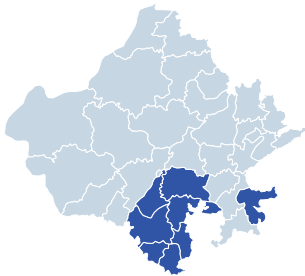
76% of the total blocks covered under the program are **tribal blocks**.



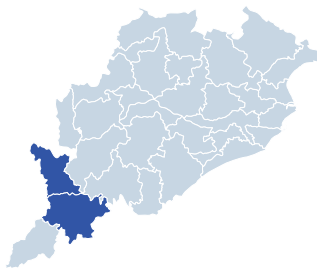
Madhya Pradesh



Maharashtra



Rajasthan



Odisha

	Implementation period Feb 2014-Feb 2015	Implementation period Oct 2015-Feb 2016	Total
Beneficiary students covered	7,35,000	2,65,000	10,00,000
Number of blocks with SoUL presence	72	25	97
Number of villages with SoUL presence	7900	3000	10,900
Local people trained	1040	369	1409
Repair centers established	260	110	370
Assembly & Distribution Centers	36	18	54

Currently, **29 blocks** have achieved **more than 75% saturation**

PEOPLE SPEAK



Student

“Earlier I used to study with the kerosene wick lamp which had low luminosity and caused eye and nose irritation due to the smoke. Now, with SoUL I am studying for longer hours & there is a significant improvement in my marks.”

Ajay Kale, a 10th standard student from Ahmednagar, Maharashtra



Assembler & Repair Center Manager

“I have worked as an assembler and earned ₹15,000, which helped me in my 12th Class studies. Now, I am also working as a SRC manager, earning ₹2,750 per month. I am thankful to the program for making me financially independent.”

Chanda Kishan Powar, a differently abled woman from Barwani, Madhya Pradesh



Distributor & Repair Center Manager

“Only because of the earnings I make by working as a SRC manager, I am able to pursue final year degree of Bachelor of Arts. I feel proud to provide services to the students even in the Naxalite affected villages.”

Trinath Mundagudia, Koraput district, Odisha

Headmaster

“...there is noticeable improvement in the secondary state certification (SSC) exam results with 84% students passing in 2014-15 compared to only 38% in 2013-14.”

Excerpts from **a letter by Rajendra Singh Sisodiya**, the headmaster of Sharda Bal Vidhya Mandir U.P.S. Semlopur, Pratapgarh, Rajasthan **while highlighting the importance of SoUL**



Partner NGO

“The Million SoUL Program has enabled us to work in the domain of education and renewable energy for the first time and also allowed us to expand our reach to all villages in the implementation blocks. This has resulted in increased recognition of CARD in the region”.

Anil Punj, Project In-charge, CARD (Centre for Advanced Research and Development)

RESEARCH METHODOLOGY

Comprehensive mixed methods used to assess the impact of the program on various aspects and also to make **mid-course corrections**.

Category of Sample	No. of Households covered
Treatment	12,000
Control	1,200
Total Sample Households	13,200

Quantitative method: A household level survey was conducted in 20 representative blocks. The same household was surveyed twice: the first round was conducted soon after SoULs were distributed, and the second round was conducted 5-6 months after the first round.

- Treatment sample (households that have purchased SoUL) was 1.2% of the total beneficiaries, and control sample (households that have not purchased SoUL) was 10% of the treatment sample.
- Sample criteria: Stratified purposive random sampling based on the percentage of Scheduled Tribes (STs), Scheduled Castes (SCs) and electrification status of a sub-district as per Census 2011
- Additional pre- and post-implementation surveys are planned in select blocks.
- Statistical software STATA & two sample t-test applied for analysis.

Qualitative method: Included Focus Group Discussions (FGDs) and personal interviews.

- 17 FGDs (~1000 participants) and 60 personal interviews were conducted.

RESEARCH OUTCOME

- ° Poor & marginalized sections of society (Scheduled Caste and Scheduled Tribes) were extensively covered in the survey (>69% of the households surveyed)
- ° **94% sample** households reported using kerosene for lighting purpose, while 48% used kerosene exclusively for lighting
- ° Results from two-sample mean **t-test** (between treatment and control samples) shows that
 1. mean monthly kerosene purchased for lighting, and
 2. mean monthly expenditures incurred on kerosene consumed for lighting are statistically significant at **99% confidence levels**
- ° **~1,80,000 liters of kerosene per month is saved** in 7,35,000 SoUL recipient households compared to households that do not have SoUL
- ° 22.88% & 37.34% of students in control sample depend on 'only kerosene based devices' & 'only electricity' for their studies respectively, whereas **no such dependency is seen in students from treatment sample**
- ° Evidence from qualitative study shows that there is an increase in the study hours with teachers from many schools across four states confirming that there is an **improvement in the performance of students** and higher likelihood to submit their homework
- ° Extensive literature survey on benefits of solar lighting revealed numerous benefits such as **safety from fire accidents, improved health and environment, better education and quality of life**, which could not be corroborated in the surveys due to methodological and time limitations



Other uses
of SoUL



RIGHT TO CLEAN LIGHT - *The Way Forward*

‘Right to Education’ is the basic right of every child.
‘Right To Clean Light’ Supports ‘Right To Education’.

As per Census 2011,

- ° **There are 2022 Blocks** with more than **50%** households using kerosene as their main source of lighting
- ° **There are 1464 Blocks** with more than **25%** tribal population
- ° There are **76 million students enrolled in 2900 blocks** that fall under the above criteria

These students should not wait for grid connection, but must be provided clean light for study in the fastest possible way.

Towards this end, IIT Bombay is creating **Open Source Hardware** and **training material** for large scale implementation.





Million SoUL Program

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