Sustainable Cooking Fuels

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Agenda

Introduction

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Clean Cooking Fuels

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Safety measures in using LPG, PNG etc.

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Types of Cooking Fuels

Fuel is a combustible substance that mostly consists of carbon. On proper burning in the presence of air, Fuel releases a considerable amount of energy in the form of heat and light. There are different classifications of fuels, like natural and artificial fuels. Fuels produce an immense amount of energy, which is economically used for various domestic and industrial purposes.

Types of Fuel

Fuel can be classified into two types: Natural or Primary fuel (Ex. coal, wood, crude oil, natural gas, etc.), and Artificial or Secondary fuel (Ex. kerosene, charcoal, petrol, water gas. etc.)
Another basis of fuel classification is on the state in which they exist, i.e., solid, liquid, and gas. Fuels have some unique properties, such as ignition temperature and calorific value. Based on these properties, we can decide the use of fuels in various aspects of our life.

Based on the State of Aggregation

All matter in the universe is divided into solid, liquid, and gas states. Thus, fuels are classified based on the state in which it is available. This classification does not consider primary and secondary fuels.
1. **Solid Fuel** – All the fuels that exist in a solid-state are known as solid fuels. Example: Coal, Bituminous, Anthracite, Peat, Wood, Coke, Charcoal, etc.

2. **Liquid Fuel** – All the fuels that exist in the liquid state are known as liquid fuels. Example: Diesel, Petrol, Kerosene, Crude oil.

3. **Gaseous Fuel** – All the fuels that exist in the gaseous state are known as gaseous fuels. Example: Natural gas, Biogas, Water gas, etc.

Gaseous fuels are derived from different sources.

-Natural gas: Natural gas occurs near coal and petroleum deposits. They mainly contain methane gas along with other components. They have high calorific value. Natural gas is liquified to form compressed Natural Gas (CNG).

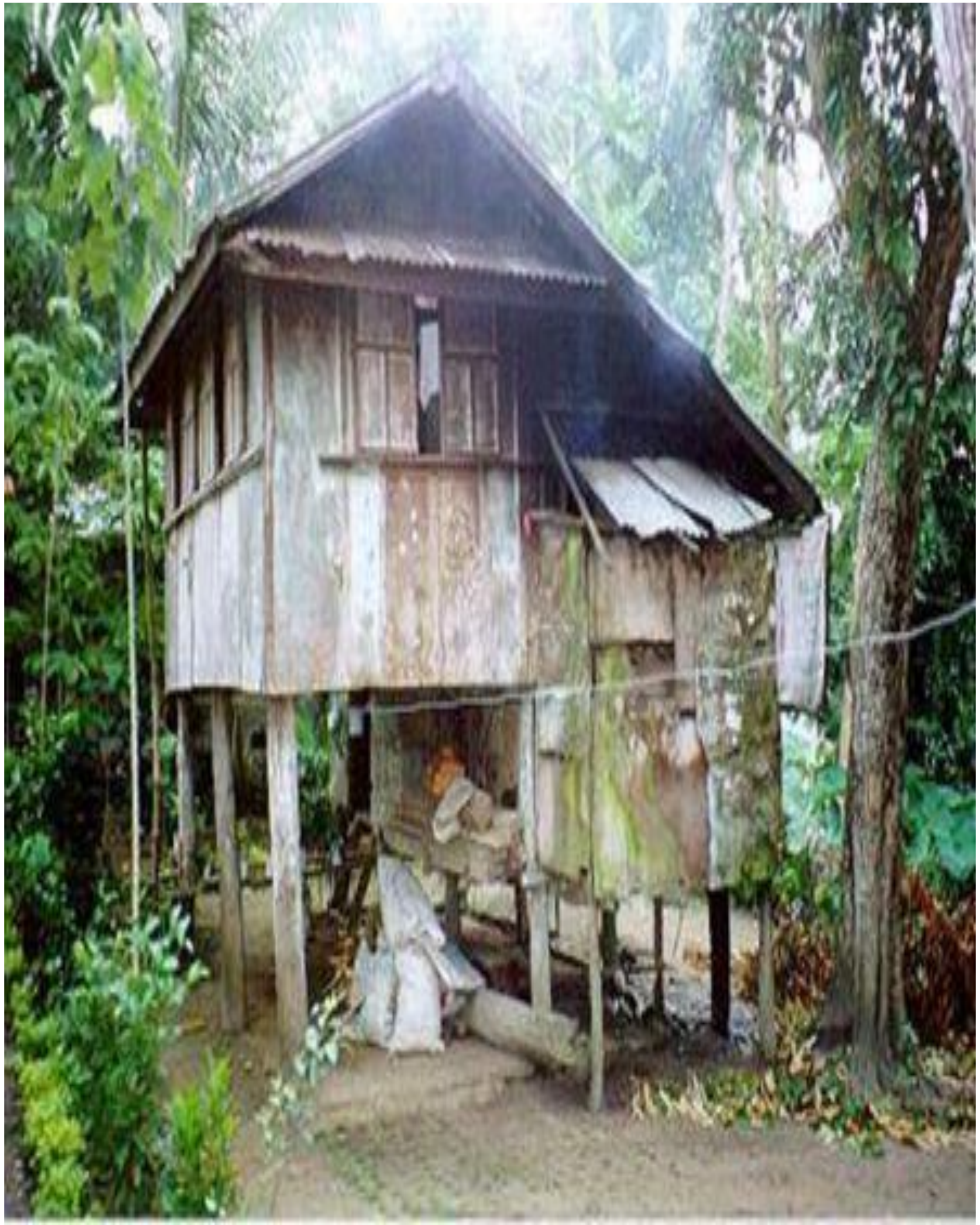
-Gaseous fuels are obtained from other processes: Biomass and waste produce biogas from fermentation, LPG (Liquified Petroleum Gas) is obtained from various petroleum refining processes and many more.

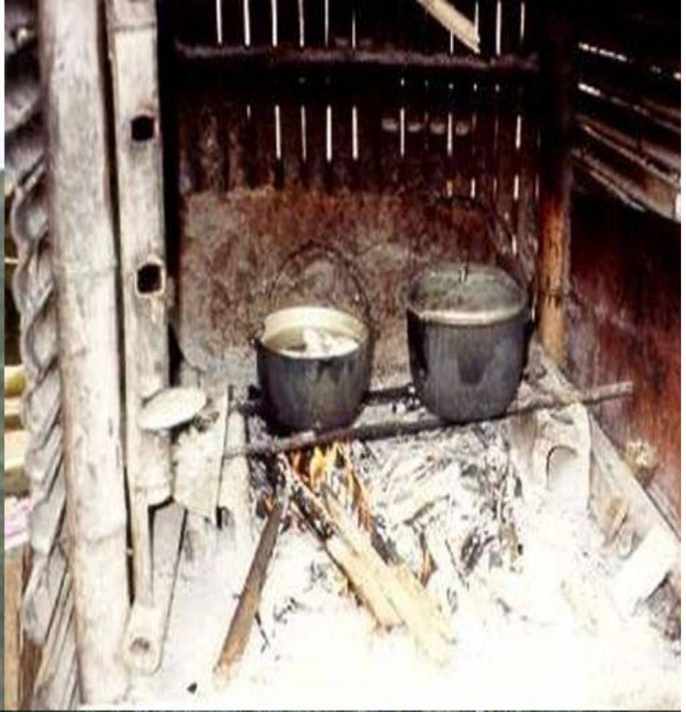
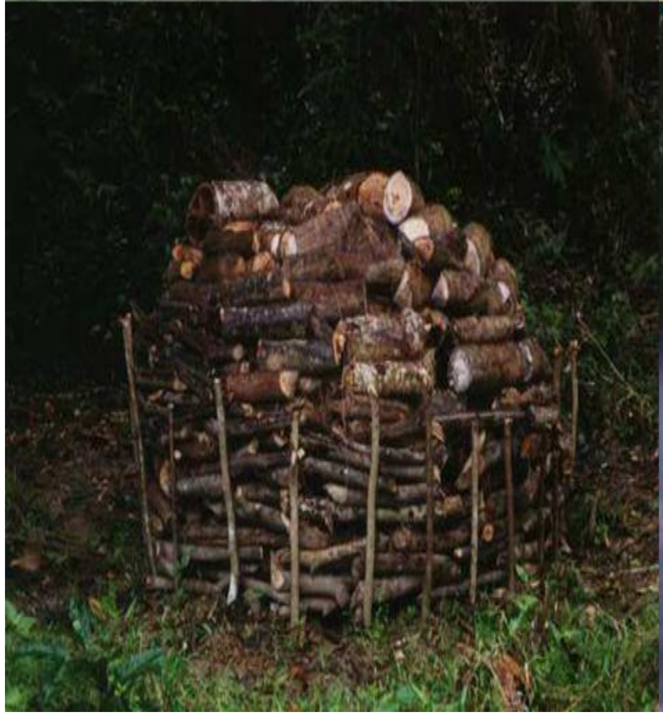
Why is Sustainable Household Cooking Important

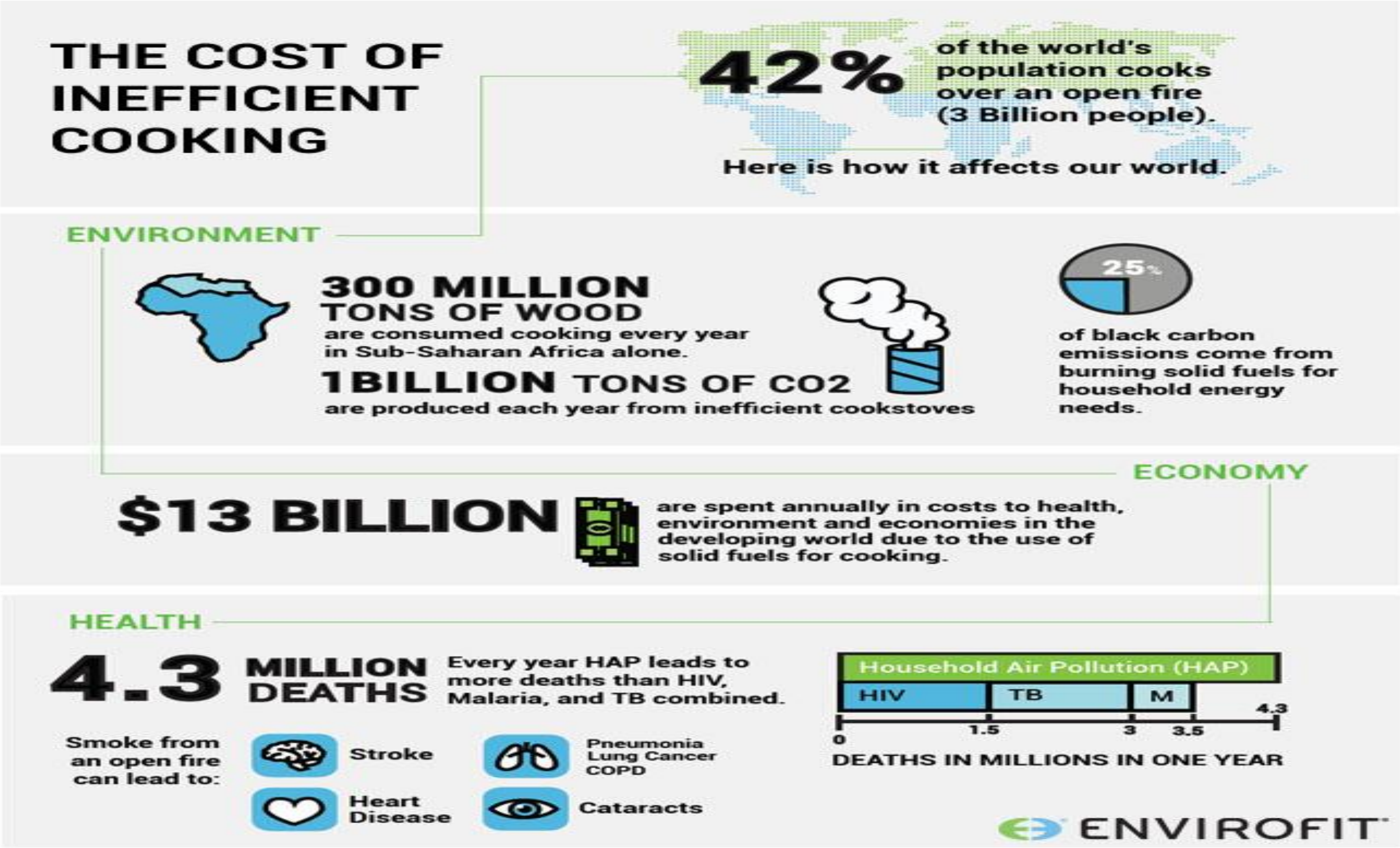
- **Financial** : Purchasing LPG typically costs Rs. 14500/yr, importing fossil fuels is a major drain on developing economies
- **Women's labour**: women can spend more than 200 days per year gathering fuelwood
- **Household air quality**: women and children are the most vulnerable to respiratory and eye infections from inefficient combustion
- **Landscape ecology**: reducing fuelwood use protects watersheds and biodiversity

How are rural people cooking and eating ?

- Traditional diet is centered around Roti, Rice, dal, vegetables and meat.
- Typically boiling foods in aluminum pots over a biomass stove and grilling fish / meat over charcoal.
- Tend to have multiple cooking devices for convenience and for the various foods they like preparing
- LPG/PNG is preferred as a quick cooking method especially early in the morning





THE COST OF INEFFICIENT COOKING
42% of the world's population cooks over an open fire (3 Billion people).
Here is how it affects our world.
ENVIRONMENT
300 MILLION TONS OF WOOD
are consumed cooking every year in Sub-Saharan Africa alone.
1BILLION TONS OF CO2
are produced each year from inefficient cookstoves
25%
of black carbon emissions come from burning solid fuels for household energy needs.
ECONOMY
$13 BILLION
are spent annually in costs to health, environment and economies in the developing world due to the use of solid fuels for cooking.
HEALTH
4.3 MILLION DEATHS
Every year HAP leads to more deaths than HIV, Malaria, and TB combined.
Household Air Pollution (HAP)
HIV
TB
M
0
1.5
3
3.5
4.3
DEATHS IN MILLIONS IN ONE YEAR
Smoke from an open fire can lead to:
Stroke
Pneumonia
Lung Cancer
COPD
Heart Disease
Cataracts
ENVIROFIT

Energy values:

	LPG	Kerosene	Fuelwood	Charcoal	Rice Hull
Units	kg	lt	kg	kg	kg
Energy content (MJ/unit)	45.5	35	16	28	14.7
Thermal Efficiency (%)	0.6	0.5	0.1025	0.15	0.15
Energy delivered (MJ/unit)	27.3	17.5	1.64	4.2	2.205

Inadequate access to a clean and affordable energy source and large-scale use of solid fuels are the primary reasons behind low quality of life in most of the developing countries. Although the SDG7 (Sustainable development goals) ensures access to affordable, reliable, sustainable and modern energy around three billion people worldwide use solid fuels for cooking purposes. In India, only 49% population have access to clean fuels. About four million people die prematurely due to illness caused by household air pollution that comes from inefficient cooking practices. Exposure to indoor air pollution increases the risk of childhood pneumonia, chronic obstructive pulmonary disease (COPD) in adults, and stroke.

In the recently conducted India Energy Week exhibition the Indian oil has launched **Surya Nutan** which could be the sustainable solution for clean cooking fuel (May 08,2023).

What is clean cooking fuel?

- Clean fuels and technologies are those that attain the fine particulate matter (PM2.5) and carbon monoxide (CO) levels recommended in the WHO global air quality guidelines (2021).
- Modern and clean cooking fuels are fuels with very low levels of polluting emissions when burned. Examples include biogas, LPG, electricity, ethanol, natural gas, and solar power (BLEENS).
- Pellets used in specialised biomass stoves can also be a clean fuel.

What is the need for clean cooking fuel?

- Provides energy access to poor people of the country.
- Reduces health issues and premature deaths.
- Helps India achieve its net zero targets by reducing carbon emissions.
- Boost GDP by reducing the economic burden resulting from the use of unsustainable fuels.

What are the challenges to India's clean cooking transition?

- **Cylinder refill being costly** - Over 50 % of the households that received new LPG cylinders did not choose to refill due to high costs of refill.
- **Cylinder distribution networks** - Lack of access to the cylinder distribution networks especially in rural India.
- **Lack of choice** - The government only promotes LPG cylinder leaving out the alternatives such as electric cooking (e-cooking), especially solar photovoltaic (PV) connected e-cooking.

What are the measures taken for clean cooking fuel?

- **Rajiv Gandhi Gram LPG Vitrak Yojana (RGGLV scheme)** - Was launched in 2009 to provide clean coking fuel.
- **Pradhan Mantri Ujjwala Yojana (PMUY)** - It aimed to replace solid and other biomass-based polluting cooking fuels used in urban and rural households in India with Liquefied Petroleum Gas (LPG).
- Launched in 2016 and replaced the RGGLV scheme.
- **Piped natural gas (PNG)** - The government has been actively promoting PNG, which is a more economically viable fuel than LNG.
- **Go Electric campaign** – It encourages the use of electric vehicles and electric cooking.
- **Energy Efficiency Services Limited** - Working towards better utilization of renewable energy in cooking sector.
- **Surya Nutan** - It is an indigenous, stationary, rechargeable and kitchen-based indoor solar cooking platform.
- Developed by ***Indian Oil Corporation*** and Union Ministry of Petroleum and Natural Gas.
- Works in hybrid mode, using both solar energy as well as an auxiliary energy source.
- **The Energy Sector Management Assistance Programme (ESMAP)** - It announced clean cooking fund for assistance through technical support and investments in developing nations.
- The programme is by World Bank.
- In India, this programme is being developed through the ***Modern Energy Cooking Services programme.***

Out of all the available sources of cooking energies, LPG, Biogas, PNG is found to be the only source of clean fuels.

Factors that affect households' cooking energy choice.

- type of energy preferred by the households which is further divided into four types: (a) firewood and chips,
- (b) dung cake,
- (c) LPG,
- and (d) ‘others fuel.

- The level of education of the household head, source of income, decision-makers of durable goods in the family, and structure of the house.

What are the impacts of unclean fuels?

- The air quality index will further be worsen.
- Cause adverse long-term health impacts.
- Impact GDP due to sickness and loss of productivity.
- Wooden fuel leads to deforestation.

LPG (Liquid Petroleum Gas)

More than 70% of Indian Households Use LPG as Primary Cooking Fuel:

- Most convenient but prohibitively expensive for poor households
- increases fossil energy imports

Cooking has now become a child's play. Thanks to LPG! Liquefied Petroleum Gas or Liquid Petrol Gas is the most preferred gas when it comes to cooking. It is safe, portable, clean and efficient. Way back then people across the world used many possible options like firewood, charcoal, crop residue and kerosene to cook but after the emergence of LPG, it changed the way people used to cook.

Clean cooking fuels (CCF) and technologies into electricity, LPG (Liquid Petroleum Gas), natural gas, biogas, solar, and alcohol-fuel stoves. Despite the United Nation's continuous effort, only 63% of the world population have access to CCF and related technologies (World Health Organization). Still, close to 2.8 billion of the world population lack access to CCF. If the diathesis remains the same, the clean cooking solution will reach only 74% of the world population by 2030.

In India, 49 % people have access to CCF (International Energy Agency). While 688 million people are deprived from CCF access, 681 million still rely on traditional use of biomass (International Energy Agency, 2019). If this trend continues, 580 million of India's population will depend on solid fuels for cooking by 2030. This means that India will not meet the Sustainable Development Goals (SDGs) target by 2030. About 40% Indians will remain exposed to harmful indoor air pollution (IAP) caused by traditional cooking fuels (International Energy Agency, 2017).

Factors Determining Household's Energy Choices

Household's Dimensions

1. **Demographic Factors**
   - ➢ Age of the household head (HH)
   - ➢ Decision-makers in household
   - ➢ Education of HH
   - ➢ Educated female in household
   - ➢ Children in the family
2. **Physical Assets**
   - ➢ Land, Total livestock, Type of home
3. **Income & Expenditure**
   - ➢ Source of income
   - ➢ Monthly expenditure

Energy Dimensions

1. **Accessibility & affordability**
   - ➢ Cost of CCF (LPG) connection
   - ➢ Cost of refilling LPG
   - ➢ Cost of alternative fuels
   - ➢ Time spends in collecting fuels
   - ➢ Procuring distance
2. **Satisfaction in using**
   - ➢ With availability
   - ➢ With cost
   - ➢ With maintenance service
   - ➢ With safety in use

Others Dimensions

1. Taste, preferences, and priorities
2. Externalities and Free rider
3. Awareness
4. Ethnicity

Household energy use status in India

India is one of the most diverse countries with a population of 142.86 crore, the second largest in the world . Close to 68% of the population live in rural areas, and their income largely depends upon agricultural activity. Usually, many parts of India suffer from frequent droughts and floods which affect rural household's income and expenditure. According to the 76th round of the National Sample Survey Office (NSSO), India's monthly per capita expenditure (food and non-food) (MPCE) is close to ₹ 2630 in urban areas and ₹ 1430 in rural areas. Further, monthly expenditure on cooking energy in the urban area is ₹ 175.86, and in rural areas close to ₹ 114 as per the 68th round of NSSO.

Considering the poor use of LPG in rural areas, the government of India has introduced three vital programmes to make it accessible and affordable for low-income families. First, DBTL (direct benefit transfer for LPG) –launched in 2013, initially in 291 districts. Later it is extended throughout the country to provide direct subsidy in beneficiaries' bank account. The objectives of the programme are to remove subsidy diversion and weed out the fake connections. Second, the 'Give it campaign' –this campaign urges middle-class families to abandon their LPG subsidy so that it could be transferred to low-income families.

Since the campaign's launch, about 1.13 crore people have left their subsidies (Pradhan Mantri Ujjwala Yojana, 2020). Third, in the year 2016, *Pradhan Mantri Ujjawala Yojana* (PMUY) was introduced with an aim to provide LPG connection against a female member of a below poverty level (BPL) family. The key objectives of the scheme are to empower women and protect them from the health risks caused by solid fuel use. According to the 76th round of NSSO, 48% of people are using LPG in rural India. While North-East Indians hardly use LPG for cooking, eastern states like Jharkhand (21.5%), West Bengal (24.5%), and Odisha (23.8%) have shallow coverage. However, almost 98% of those households use traditional cooking stoves i.e. *chulha* for cooking. A recent study by Yadav et al. (2021) has shown that fuel stacking persist in the socio-cultural tradition of India.

Classification of fuels used in kitchen?

The different fuels used for cooking are wood, straw/shrub/grass, coal/lignite, animal dung cake, kerosene, biogas, LPG, etc. Among all these, biogas and LPG are least polluting. Both of these burn completely and do not give smoke.

Clean fuels include electricity, liquefied petroleum gas (LPG), natural gas, and biogas.

Ensure access to affordable, reliable, sustainable and modern energy for all:

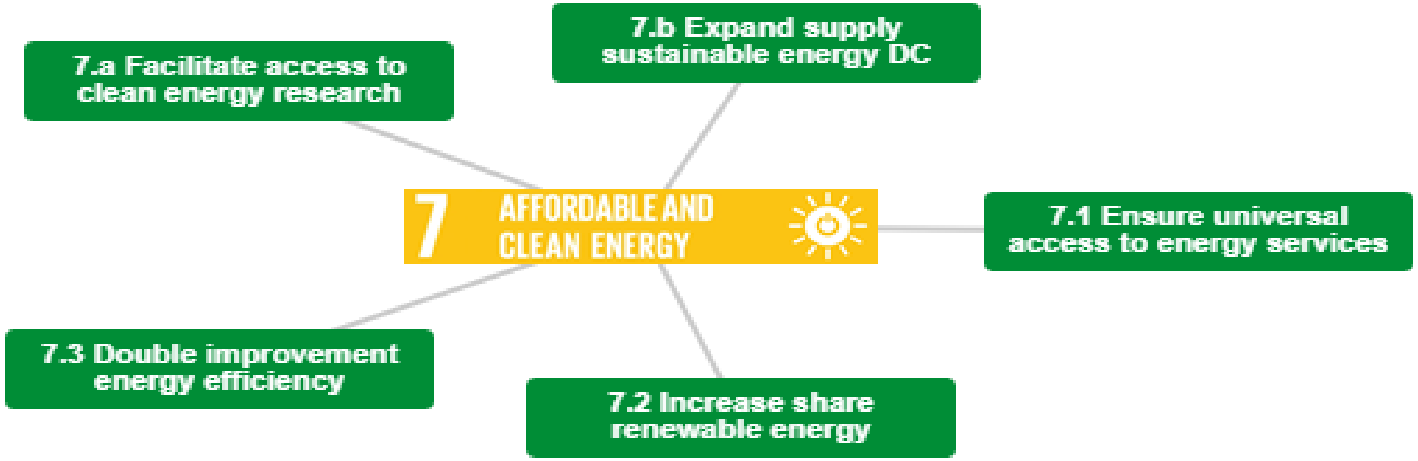
Facts:

- 3 billion people rely on wood, coal, charcoal or animal waste for cooking and heating
- Energy is the dominant contributor to climate change, accounting for around 60 per cent of total global greenhouse gas emissions
- Since 1990, global emissions of CO2 have increased by more than 46 per cent.
- Hydropower is the largest single renewable electricity source today, providing 16% of world electricity at competitive prices. It dominates the electricity mix in several countries, developed, emerging or developing.
- Bioenergy is the single largest renewable energy source today, providing 10% of world primary energy supply.

Targets linked to the environment:

- **Target 7.1:** By 2030, ensure universal access to affordable, reliable and modern energy services
- **Target 7.2:** By 2030, increase substantially the share of renewable energy in the global energy mix
- **Target 7.3:** By 2030, double the global rate of improvement in energy efficiency
- **Target 7.a:** By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology
- **Target 7.b:** By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support


1 NO POVERTY
2 NO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
8 GOOD JOBS AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS


7.a Facilitate access to clean energy research
7.b Expand supply sustainable energy DC
7 AFFORDABLE AND CLEAN ENERGY
7.1 Ensure universal access to energy services
7.3 Double improvement energy efficiency
7.2 Increase share renewable energy


Sustainable Development Goal
Target
Indicator

Biogas

Biogas, a natural gas that is mostly methane, is a valuable source of energy. By turning the organic matter in human, animal, and plant waste into energy, biogas turns waste products into a resource less harmful to the environment and community health than other fuels.

Cooking with sunlight

You can use the sun's heat to cook in solar cookers. Solar cookers require changing your regular cooking habits, and many solar cookers cook more slowly than a fire or a stove. But by using the solar cooker when the sun shines brightly, and

Some cookers can pay for themselves in just a few months because they reduce expenses for charcoal, gas, or firewood. Solar cookers can also be used to disinfect water for drinking.

More than 70% of Indian Households Use LPG as Primary Cooking Fuel:

and 85 per cent have LPG connections, according to an independent study released by the Council on Energy, Environment and Water (CEEW). However, as many as 54 per cent households continue to use traditional solid fuels, either exclusively or by stacking them with LPG. Using traditional solid fuels such as firewood, dung cakes, agriculture residue, charcoal, and kerosene for cooking increases exposure to indoor air pollution for such households. The study also highlighted that LPG coverage and its use as a primary cooking fuel should be particularly improved in the rural areas of Bihar, Jharkhand, Madhya Pradesh, Odisha, and West Bengal.

Prime Minister Narendra Modi launched *Pradhan Mantri Ujjwala Yojana (PMUY) 2.0*, aimed at providing free LPG connections to 1 crore poor and migrant families in the country.

The CEEW study also highlighted that 84 per cent of households that use traditional solid fuels along with LPG cite high cylinder costs as one of their reasons for stacking fuels. This finding is significant in the context of the ongoing surge in LPG prices, which have risen by INR 240 per cylinder (a 40 per cent hike) over the past one year. Lower household incomes during the pandemic and the suspension of LPG subsidies in May 2020 have made LPG unaffordable for a section of the population. Other reasons for fuel stacking include a preference for cooking on traditional *chulhas* (72 per cent of households), the availability of free biomass (59 per cent of households), and the limited availability of LPG refills (46 per cent of households).

Among slum communities, which constitute 17.4 percent of urban Indian households. In India, slums include areas in a town or city that are either formally designated or recognized as 'slum' by public agencies, or consist of a population of at least 300 (about 60–70 households) living in a compact area in poorly built tenements, with inadequate infrastructure and lacking proper sanitation facilities and clean drinking water.

Because traditional fuels are thermally inefficient, a substantial amount of fuel carbon is lost to incomplete combustion, meaning the global warming contribution per meal is high. The use of these traditional fuels causes deterioration of air quality, negatively impacting the local environment and human health, particularly among women and children due to their exposure and close contact with burning fuels. Furthermore, women and children are the ones who usually collect these fuels. By doing so their daily life allows less time for other useful activities such as education. These missed opportunities further limit their livelihood prospects.

Despite all this, few policy options are available to address the issue. The drive to switch to modern fuels is still a long-term option due to many remaining barriers, such as expensive infrastructure, which is unaffordable for most households.

PNG — The future gas energy of India

Natural gas is the cleanest fossil fuels among the available fossil fuels. It is used as a feedstock in the manufacture of fertilizers, plastics and other commercially important organic chemicals as well as used as a fuel for electricity generation, heating purpose in industrial and commercial units.

One of the biggest use of Natural Gas is in cooking in domestic households through pipeline, most commonly known as Piped Natural Gas (PNG).

India is the Asia’s second biggest energy consumer since 2008 and is set to grow faster than that of all major economies in the world. Even, natural gas consumption will grow faster than either oil or coal, expanding at 1.6% a year.

As per the data of Ministry of Petroleum and Natural Gas (MoPNG), in India, the total consumption of Natural Gas is 148.02 MMSCMD (Million Metric Standard Cubic Meter per Day).
At present, India is the 14th largest importer of Natural Gas at 20,530,000,000 (cubic meters) in the world. With the development trajectory of India the demand is expected to rise and so is the import of the Natural Gas. Of the total demand of 148.02 MMSCMD, 14.36 MMSCMD is distributed through City Gas Distribution (CGD) like Indraprastha Gas Limited (IGL) and Mahanagar Gas Limited (MGL), for cooking in domestic households.

At present there are approximately 55 Lakh household consumers in India with 8 lakhs new users being added annually, who are mainly concentrated in the regions of Delhi/NCR and Mumbai. But this consumption demography is expected to rise exponentially with the implementation of Government projects such as Pradhan Mantri Urja Ganga (PMUG). Under this project the PNG line is intended to be expanded to Uttar Pradesh, Bihar, Jharkhand, West Bengal and Odisha by laying 3,384 km Natural Gas pipeline.

Issues involved in PNG

The delivery pressure of PNG gas varies with location. Hence, arbitrarily changing the dimension of the injector jet can lead to leakage of Gas, a serious safety issue. This issue has also been adequately addressed by the BIS standard IS 17153 in which it is clearly mentioned “The size of the Jet in liters per hour of flow of PNG at STP conditions shall be impressed upon it”.

These retrofitted/substandard burners poses safety risks due to flame flashback or incomplete fuel combustion.

Also once changed, the burners cannot be reused for LPG stoves until and unless the injector is changed.

Apart from the national interest, problems gets compounded as the operating consumers are housewives/maids/servants who have comparatively less amount of awareness on the issue.

Sustainable Fuels and Energy Transition

With LPG gas safety tips, our priority is to keep you and your family safe

LPG is used by people all across the globe for various applications in a safe and consistent manner. However, safety always has a scope for improvement. Because we know that your kitchen is always buzzing with activity, with adults cooking and kids sneaking in to grab a bite, we at SUPERGAS have a few **LPG gas safety tips for home**.

When Buying LPG

- Always make sure that you are buying from an authorized franchisee.
- Do not forget to check the company seal and safety cap on the cylinder at the time of delivery.
- Do not accept the cylinder if the seal is broken.
- Please look for the due date of testing, which is marked on the inner side of the cylinder stay plate. The due date is marked by an alphabet representing the quarter (A – March, B – June, C – September, D – December) and year for testing. If the DFT is A-22, it means the cylinder needs to be tested by March 2022.
- Do not accept the cylinder if the due date is over.
- Check for gas leaks by applying soap solution on cylinder joints and Suraksha pipes at the time of putting the new cylinder into use
- Do not use open flame to detect leaks.

When Cooking with LPG

- Keep the doors and windows of your kitchen open for proper ventilation.
- Do not place flammable or plastic items near the flame.
- Never leave your cooking unattended.
- Wear clothes that do not catch fire easily.
- Close the regulator knob to OFF position when cylinder is not in use

LPG Maintenance and storage

- Disconnect LPG regulator and affix safety cap on the cylinder when your gas stove is not in use for long.
- Always store the LPG cylinder in an upright position and away from other combustible and flammable materials.
- As good practice, change the suraksha tubes once a year .
- Always use ISI approved tubes, stoves, regulators and LPG appliances.
- Make sure all parts of your LPG system are in good condition.
- Never tamper with your LPG cylinder.

in case of an Emergency

- Close regulator and burner knobs. Do not panic.
- Open all doors and windows for ventilation.
- Extinguish all flames, lamps, incense sticks and sources of fire.
- Put the safety cap on the cylinder.
- Call your distributor or emergency service for help.
- Do not operate electrical switches and appliances in the room.
- Isolate main electrical supply from outside.
- LPG is heavier than air and it settles on the ground. Use all available ventilation to disperse the gas

GRADES of LPG

- LPG is **graded** on the bases of different mixtures and their **vapor pressure**.

- These fuels are graded according to **vapor pressure** and **temperature** at which **90% to 95% is evaporated**. LPG is produced in many grades. Some of the grades are mentioned below

1) **Predominantly butane**
2) **Butane-Propane mixture (*mainly butane*)**
3) **Butane-Propane mixture (*equal volumes*)**
4) **Less Butane-Propane mixture**
5) **Butane-Propane mixture (*more propane*)**
6) **Predominantly propane**

- **In winter**, the mixes contain **more propane**, while **in summer**, they contain **more butane.**

- **In the United States**, primarily **two grades** of LPG are sold: **commercial propane** and **HD-5.** These specifications are published by the **Gas Processors Association** (GPA)and the **American Society of Testing and Materials** (ASTM).

SPECIFICATIONS

S.NO	Characteristics	Requirement for Commercial	Description
		Butane - Propane Mixture	85
1.	Vapor Pressure at 40 C in kPa gauge Max	1050	D1267
2.	Volatility: Evaporation Temp in C for 95% by Vol. at 760 mm Hg pressure max.	150	D1837
3.	Total volatile Sulphur ppm Max.	2.0	D2784 D3246
4.	Copper Strip corrosion at 38 C for 1 hour	Not worse than No. 1	D1838
5.	Hydrogen Sulphide	Pass	D2420
6.	Free water content	None	Visual

LIQUIFIED PETROLEUM GAS

- MIXTURE OF HYDROCARBONS
  - COMMERCIAL PROPANE
  - COMMERCIAL BUTANE
- MARKETED IN INDIA AS PER
  - BIS 4576 : 1978
- TEST METHODS
- STORAGE
  - PRESSURE VESSEL
  - REFRIGERATED VESSEL
- TYPICAL COMPOSITION
  - MAINLY C3 & C4
  - MINOR TRACES OF C2 & C5
- DEPENDS ON SOURCE
  - REFINERY
  - FRACTIONATORS
- SR GRADE
  - APPROX. NIL UNSATURATED HYDROCARBONS
  - NIL IMPURITIES

PROPERTIES & CHARACTERISTICS

- COLOUR
  - LIQUID PHASE
  - VAPOUR PHASE
- ODOUR
  - FAINT SMELL
  - STENCHING
- DENSITY / SPECIFIC GRAVITY
  - VAPOUR PHASE
  - 1.5 - 2.0 TIMES HEAVY
  - SETTLES AT LOWER LEVELS
- DENSITY / SP. GRAVITY
  - LIQUID PHASE
  - 0.525 TO 0.58 AT 15 DEGREE CENTIGRADE
- VAPOUR PRESSURE
  - TWO PHASE EQUILIBRIUM
  - 16.87 KGF / SQ. CM. AT 65 DEG. CENT.
  - 120 PSI AT 100 DEGREE FOREN.
- VOLATILITY
  - RAPID EVAPORATION - 1: 250

- COEFFICIENT OF VOL. EXPANSION
  - 0.00237 PER DEGREE CENTIGRADE RISE
  - 15-20 KGF / SQ.CM RISE IN PRESSURE PER DEG RISE IN TEMP.
  - FILLING RATIO / ULLAGE

- FLAMMIBILITY
  - LEL: 1.5 % (ALL SAFETY EQUIPMENT LIKE GMS , EXPLOSIMETER ETC.)
  - HEL : 9%

USES

- LPG is popularly **used as a refrigerant**. Since butane and propane are both considered to be energy efficient, LPG serves as a great hydrocarbon.
- LPG is also used as a **chemical feedstock**.
- LPG is also used for **agricultural purposes in drying processes**.
- The other main use of LPG is as **domestic fuel** or what we know as **cooking fuel**.
- LPG is also used in **centralized heating** solutions both for domestic as well as industrial premises
- The **paper industry** as well as the **food processing industry** is also one of the top most industries which rely heavily on LPG.
- It has also a major role in the **plastic industry** and is even used in **making explosives etc.**

Due to Given its widespread use of LPG, it is imperative that we follow certain practices to prevent any untoward incidents. We come across umpteen number of cases where LPG cylinders explode, causing grievous injury and even death. While there have been tremendous improvements when it comes to safety standards, accidents can occur anytime, which is why it is important that we arm ourselves with certain safety tips to prevent them.

Note: Please do not overlook problems like leakages in pipes or cylinders, faulty regulators, wrong way in which the cylinder is stored etc.

Conclusion

Recent announcement by the Ministry of Petroleum and Natural Gas *Energy Transition Task Force* of India of a new target – 25% use of electricity for cooking by 2030.

Both the quantity and quality of energy consumed by a family or individual have emerged as an important parameter for assessing their well-being. While per capita energy consumption is treated as one of the key factors for determining the development level in any society, the lack of access to cleaner fuel for domestic cooking is included among the twelve indicators for measuring multidimensional poverty that identifies people as poor or not poor in the *National Multidimensional Poverty Index(MPI) Baseline Report* brought out by NITI Aayog in September 2021.

The Government of India has initiated programmes and schemes for decarbonisation of the economy and set ambitious targets for renewable energy generation, enhancing energy efficiency, launching GoElectric campaign, and setting up a national carbon market, amongst many others. The Ministry of Petroleum and Natural Gas in the Government of India being aware of the health hazards and climate change set up the *Energy Transition Task Force* to look at the important issue of a transition to affordable and clean energy for all its citizens. The *Energy Transition Task Force* has prepared a detailed report entitled "The Green Shift" focusing on the low carbon transition of India's oil and Gas Sector. The report highlights energy transition issues connected with the oil and gas sector in India, and how will the transition impact other energy-intensive sectors like industry, transport, cooking, etc. As per the report, there are approximately 2.9 billion people without access to clean energy globally, of which about 66 % are in Asia. The efforts being undertaken in this direction are considered not enough as the International Energy Agency's policy scenarios show the world is not on track to achieve universal access to clean fuels and technologies for cooking by 2030.

As regards the Indian energy scenario, the main cooking fuel which is widely used in India is LPG, PNG, coal, Kerosene, Dung Cakes, Firewood, crop residue, and electricity to some extent.

To transition at a rapid pace, Electric cooking needs to be promoted through campaigns. ***Wherever possible at least 50% of the cooking should be done through electricity***.

Clean, Affordable and Sustainable Cooking Energy for India

Possibilities and Realities Beyond LPG

Key Findings

- In terms of economic viability, biogas and PNG emerged as the most attractive option while LPG and pellet-based cook stoves are among the costliest.
- Improved cook stoves need significant technological improvements to reduce emissions to safe levels.
- Traditional biomass has the highest fuel supply assurance, followed by PNG, biogas, LPG and electricity-based solutions.
- LPG and PNG, along with biogas, score high on parameters of cooking convenience due to their improved heat control, higher heat intensities, accommodation to variety of cooking needs etc. Improved cookstoves are deemed as least convenient among these.
- Electricity-based cooking is not considered a large-scale cooking energy alternative due to intermittent power supply, competing needs for electricity, reliance on thermal (coal-based) generation and economics.
- All clean cooking energy technologies are considered better than traditional chulhas, in terms of the global environmental impacts. This is due to avoidance of high emissions of black carbon resulting from incomplete combustion in traditional stoves.

Key Recommendations

• unified approach to provide clean, affordable and sustainable cooking energy to all, giving different technologies their fair share of attention (funds) and adequate direction of interventions.

•Create awareness about the negative impacts of the use of traditional chulhas, in order to generate a bottom-up demand of clean cooking solutions while ensuring their sustained use and a complete transition.

•Promote PNG in urban areas, beginning with densely populated cities, while developing long-term strategies for sourcing the commodity at competitive prices.

•Create an enabling environment to support market-based promotion of biogas as a cooking energy solution and eliminating the technology and management-related challenges through innovative approaches.

•Focus on technology development for improved cookstoves in order to improve emission performance, technology resilience, and cooking convenience.

THANK YOU