LPG Growth in India: A revolution towards clean cooking energy access

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Based on the most recent census data from 2011, it was found that approximately 28.5% of households relied on LPG as their primary cooking fuel source [1]. The census also revealed that a significant segment of the population, particularly those in rural areas and of lower economic status, continued to depend on solid fuels such as wood, crop residues, cow dung, or coal for their cooking needs. The use of these polluting fuels contributes to household air pollution (HAP), which is a significant risk factor for chronic respiratory diseases, cardiovascular issues, diarrheal diseases, and other infections in the country. A traditional chulha, which is an open fire cook stove commonly used in India and fuelled by solid biomass, emits smoke equivalent to the harm caused by about 400 cigarettes per hour[2]. This smoke contains many hazardous substances such as particulates matter (PM), black carbon (BC), carbon monoxide (CO), nitrous oxides, sulphur oxides (more with coal), formaldehyde, and polycyclic organic carcinogens like benzo[a]pyrene [3]. According to the World Health Organization (WHO), an estimated 3.2 million people worldwide died prematurely in 2020 due to illnesses attributed to the smoke generated from the burning of solid biomass for cooking [4]. Recognizing the severity of this issue, the Government of India implemented a comprehensive long-term strategy to promote the adoption of LPG, particularly among underprivileged sections of society. The action plan of the government of India has several lessons for the international community to achieve the sustainable development goal (SDG) of universal energy access. The article aims to elaborates some of these in the following paras. The article is structured as follows. We begin with describing the LPG initiatives, that were implemented by the government. The next section discusses, in brief the impact of the said initiatives. Next section evaluates the effectiveness of these initiatives in expanding the LPG coverage across the country, particularly among the deprived section of the society. The last section concludes with the lessons that may be implemented by various countries to expand the clean energy coverage.

The initiatives of the government of India to expand the clean cooking fuel coverage across the country began with the "Lakshya" project.

The "Project Lakshya - EMPOWERING CONSUMERS: Transparent Supply Chain and Efficient Subsidy Administration" was initiated with a dual purpose. Firstly, it aimed to enhance the transparency and efficiency of the LPG supply chain, making it more customer-centric. Secondly, it sought to optimize the management of LPG subsidies, ensuring that these subsidies reached those individuals who genuinely required them.

1. LPG Initiatives of the Government of India

Broadly, the initiatives of the Government of India in LPG segment can be divided into three categories, though some of them overlap with each other.

1.1 Consumer empowering initiatives

When, back in 2012 end, the government started considering to push LPG expansion, the subsidized price of LPG for domestic use was less than the half of the market cost of LPG. There was lack of visibility of the supply chain of subsidized cylinders to the consumers or civil society partners. The lack of visibility of LPG consumption data in public domain and the presence of dual pricing (subsidized price and the significantly higher market price of LPG) led to proliferation of illegal secondary market of LPG in which the domestic subsidized LPG was getting diverted for commercial usage instead of household cooking. Such diversions were conducted by sourcing LPG through multiple connections and from the unused quota of subsidized cylinders of genuine Consumers.

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In the fiscal year 2013-14, the total subsidy burden due to LPG exceeded $7.6 billion, accounting for approximately 32% of the overall fuel subsidy expenditure ($ 23.4 bn) by the Indian government [5]. Hence, it was imperative to infuse transparency in the LPG supply chain to achieve twin objectives of reduction in diversion and improving consumer services. This necessity gave rise to the concept of a portal, initially named the "Transparency Portal," which aimed to provide LPG consumers with convenient access to various services. Subsequently, this portal evolved into the website www.mylpg.in. The website not only served as an effective tool for empowering LPG consumers by allowing them to track their entitlement to LPG cylinders, access various LPG services from the comfort of their homes, evaluate the performance of their distributors, file complaints, and flexibility to change distributors if needed, but it also provided comprehensive information about the supply chain to enhance transparency and reduce diversions. Additionally, it became a powerful mechanism to conduct social audits of LPG consumption. In essence, the need for a portal arose to shift the balance of power in favor of consumers. Following the launch of the portal, a star rating system for LPG distributors was introduced on the platform (Table 1). This system allowed any LPG consumer to assess the service levels of LPG distributors nationwide in terms of their supply to consumers.

No. of Star	Delivery period	Category
5 Star	85% delivery in < = 2 days	Excellent
4 Star	85% delivery in < = 4 days	Good
3 Star	85% delivery in < = 6 days	Average
2 Star	85% delivery in < = 8 days	Below Average
1 Star	15% delivery in > 8 days	Poor

Table 1: Criteria for Star Rating of LPG Distributors [6]

The introduction of delivery performance visibility on the portal had a significant impact on LPG distributors, motivating them to enhance their services.

Once the Star rating system was successfully implemented on the web portal, the decision was made to introduce the LPG portability system. LPG portability offers dissatisfied customers the option to switch to a distributor of their choice within a cluster of distributors from Indian Oil, HPC, and BPC. This customer-centric approach encourages distributors to maintain a high level of service quality, as they are aware that customers have the flexibility to change distributors. To avail of this feature, customers need to submit their application through the portal, which automatically initiates the transfer process, even without the consent of their current distributor. Subsequently, the customer can complete the necessary documentation at the new distributorship within the specified time frame. This process eliminates the need for customers to physically approach their current distributor with a transfer request, making it a more convenient and hassle-free experience.

Obtaining an LPG connection in the country was often a time-consuming and cumbersome process. It involved several steps: first, locating the nearest distributor, then obtaining an application form from the distributor, filling it out, and submitting it along with proof of address and identity. Customers had to endure waiting in a queue until their turn came, after which they were required to visit the distributor's shop to make the necessary payment and acquire the equipment. Unfortunately, this process was also plagued by harassment from distributors and other relevant entities, resulting in a long list of waitlisted consumers eagerly awaiting their LPG connections. To address the issue, the ministry introduced the

"Sahaj" program, an online application process for obtaining LPG connections. "Sahaj" introduced the "e-SV" (electronic subscription voucher) system, initially launched on a pilot basis in May 2015. This innovative scheme (Figure 1) allows customers to register and make online payments for LPG connections, all from the convenience of their own homes, without the need to physically visit the LPG distributorship. Once the online registration is complete and intercompany de-duplication is carried out, an "e-SV" is emailed to the customer, indicating the number of cylinders and pressure regulators lent to the customer against their security deposit. Sahaj also offers online payment options for booking refills and settling bills, streamlining the entire process [7].

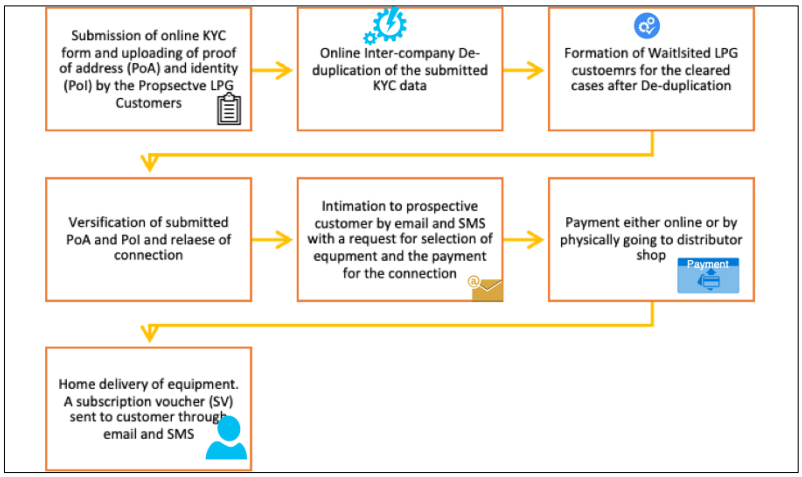

Figure 1: Process Flow for Online Application for LPG Connection (Source: Author)

These technological has helped LPG consumers to avail the services online, eliminating the need for visiting the distributor. As per the data available on website, over the last three years, the percentage of digital transactions in LPG has increased significantly from 4.1 % to 46.6% in April 2023[8].

While the government introduced Sahaj scheme to enable the people in the country to get permanent LPG connection seamlessly, it also realized that a certain percentage of population in the country is mobile and therefore does not require permanent LPG connections. The segment also included the poor mobile populations such as migrant daily wage labourers who were not able to purchase higher quantity of LPG at a time. To enable such segment to have LPG access without hassle, the government introduced the Free Trade LPG (FTL) scheme. Under the scheme, the government permitted oil marketing companies to sell 5 kg LPG cylinder at non-subsidized price through company owned retail outlets. One has to give only proof of identity at the time of first sale [9].

1.2 LPG Subsidy Management

At the time of launching of Project “Lakshya”, the government through three oil marketing companies namely IOC, BPC and HPC provided subsidized LPG connections to domestic consumers. Each household of the country was eligible to have only one subsidized LPG connection. The restriction of one connection was primarily due to government’s commitment to provide subsidized LPG to everyone and to prevent the misuse of LPG meant for household consumption on account of significant difference between subsidized price and market price of LPG. Notably, these subsidies were provided without consideration for the income level of the

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household. Thus the provision of universal subsidy placed a substantial financial burden on the government, necessitating a comprehensive strategy for subsidy management.

The first step in this process was the implementation of a "Capping" scheme that limited the quantity of subsidized LPG provided to each connection holder. Initially, households were restricted to receiving only six 14.2 kg LPG cylinders per year (though this limit was later revised to 12). Subsequently, efforts were made to identify unauthorized "ghost" and multiple LPG connections in the country, which were in violation of the rules of one household – one subsidized connection. The existence of such unauthorized connections was primarily a result of the significant price disparity between subsidized and non-subsidized LPG, leading to the diversion of LPG intended for domestic use into the commercial market. The process of identifying and eliminating these unauthorized connections was referred to as "de-duplication." In this extensive process, data from all domestic LPG connections in India (which numbered around 150 million at the time) provided by Oil Marketing Companies (IOCL, HPCL & BPCL) was compiled and de-duplicated. Subsequently, a suspect report detailing fake and multiple connections was generated for each state, along with a count of inter and intra OMC connections. This complex task was made possible with the assistance of the National Informatics Centre (NIC), which developed a sophisticated algorithm for both textual (name matching) and demographic deduplication (address matching). Later on, when Direct Benefit Transfer scheme was introduced, the Aadhaar Number (a unique number issued by UIDAI to every person in the country) was also used for de-duplication. As a result of de-duplication exercise, around 41 million fake/ multiple/ghost LPG connections have been blocked [10(p17)].

One notable challenge of differential pricing in the market was the potential for lower-priced LPG to be diverted into the non-subsidized commercial market. In response, the government of India implemented "PAHAL,"[10] a cash transfer scheme that not only introduced uniform LPG pricing but also eliminated intermediaries between the government and consumers, thus minimizing subsidy leakage. PAHAL has been recognized as the largest direct cash transfer scheme in the world [11] (figure 2).

Figure 2: Certificate issued by Guinness World Records [10(p10)]

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PAHAL, combined with another government scheme called "JAN DHAN," designed to ensure financial inclusion by promoting universal access to bank accounts, guarantees that the benefits of LPG subsidies reach impoverished households directly. As of April 1, 2023, more than 290 million LPG consumers have enrolled in the scheme and over INR 1,42,926 Crore has been transferred into their bank accounts [12]. The successful implementation of de-duplication and the PAHAL scheme has resulted in savings of approximately INR 25,869 crore over a three-year period from 2014-15 to 2016-17 [13(p76)].

The entire subsidy management initiative of the government of India is depicted in the Figure 3.

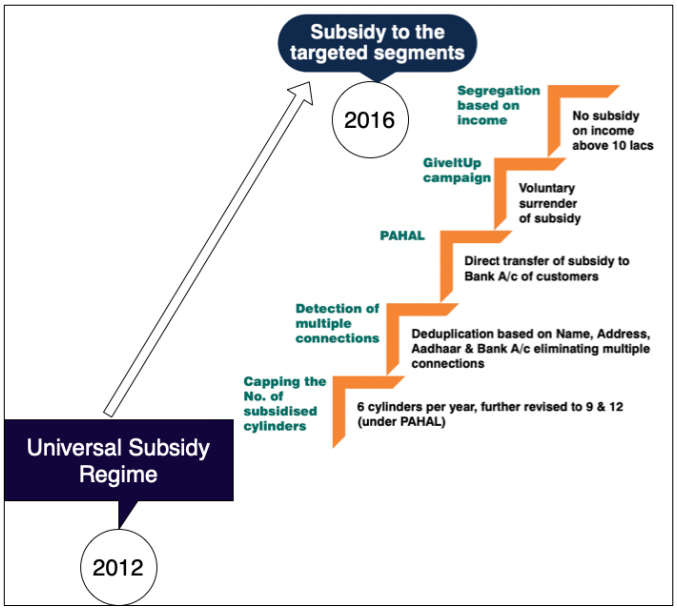

Figure3: Subsidy Management Initiative of the Government of India[9(p7)]

1.3 Clean Fuel Access Initiatives

The universal application of LPG subsidy has a regressive nature, primarily benefiting the wealthier income groups rather than the poor. In response to this issue, the Government initiated the "Give It Up" campaign, urging affluent LPG consumers to voluntarily relinquish their LPG subsidy. This innovative campaign elicited a substantial response, with nearly 11 million middle and upper-class LPG consumers choosing to forgo their subsidies [14].

With the growing adoption of Aadhaar in the country, the government, in early 2016, found a means to link subsidies with income. In light of the success of the "Give It Up" campaign, the government made the decision to exclude individuals with an annual income of Rs. 10 lakhs or more from the subsidy. However, due to the lack of a comprehensive income tax system, this restriction is currently enacted on a voluntary basis.

The "Give It Up" scheme not only raised awareness about the adverse effects of using solid fuels for cooking but also fostered a sense of responsibility among the public regarding the importance of extending LPG access to the underprivileged. While this initiative was ground breaking and valuable, it could not fulfill the immense demand for additional LPG connections. Recognizing the need to provide

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clean fuel access to impoverished households, therefore, the government introduced the "UJJWALA" program [15]. "UJJWALA" directly covers the upfront costs, which often act as barriers for many households. It offers free LPG connections, which include the costs of cylinders, regulators, hoses, and related equipment, making LPG accessible to economically disadvantaged sections of society, particularly BPL families.

Initially, the government aimed to extend the scheme to 50 million households by 2019, allocating a budget of over Rs. 8,000 crores (1.2 billion USD). In response to the overwhelming demand for the program, the government in 2018 decided to increase the "UJJWALA" target to 80 million households from deprived section of society, with an additional budgetary allocation of Rs. 4,800 crores (720 million USD). This expansion aimed to ensure that no eligible beneficiaries were excluded from the scheme [16].

Recognizing the need for addressing the household air pollution issue and the importance of Ujjwala in that regard, the Government launched "Ujjwala 2.0" in August 2021 to provide an additional 10 million LPG connections to adult women from economically disadvantaged households. In addition, new PMUY beneficiaries received their first refill and stove also free of cost. The target was subsequently revised to 16 million LPG connections. Later, with the growing demand, the government sanctioned an additional 7.5 million deposit-free connections under the existing "Ujjwala 2.0" guidelines [17].

With the implementation of Ujjwala and later version Ujjwala 2.0, the scheme stands as one of the world's most extensive clean energy access programs.

To make LPG more affordable to PMUY consumers and ensure continued usage, the Government introduced a targeted subsidy of Rs.200 per 14.2 kg cylinder for up to 12 refills per year in May 2022, which was later revised to Rs.300. The subsidy is directly credited to the bank accounts of eligible beneficiaries [18].

2. Current Status of Clean Fuel Coverage

Due to various policy initiative of the government of India, there has been tremendous growth in LPG expansion throughout the country including the deprived section of society. There were 31.4 crore active LPG consumers in the country as of March 2023 as against the 14.52 crore in April 2014. The LPG Coverage has increased to 99.8 %. Thus, almost every household of the country has access to LPG [19]. The LPG consumption in the country has rose to 29.3 MMT in 2022-23 [15] from 16 MMT in 2013-14 [20].

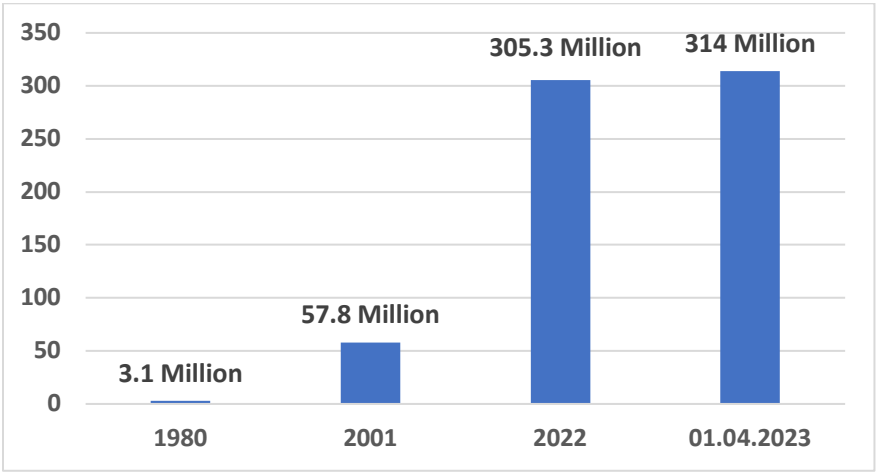

Figure 4: Growth of LPG Connections in India [21(p5)]

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3. Evaluation of LPG Initiatives of the Government of India

The lack of an integrated policy framework has historically hindered the effectiveness of government initiatives in achieving the objective of universal energy access. When policies are crafted with a keen understanding of the specific needs of the target population, they tend to yield better results. The Indian government recognized this crucial aspect while implementing the nationwide LPG expansion plan.

The government acknowledged that the expansion of LPG was primarily aimed at addressing the critical issue of indoor air pollution. Consequently, the government was committed to ensuring LPG access for the entire population, with a particular focus on marginalized and underserved segments of society. This recognition prompted the government to take decisive policy actions to overcome the barriers to LPG expansion among the population. There are three major barriers to LPG expansion among the deprived section of society: Affordability, Availability, and Awareness. Let's delve into the barriers encountered and the corresponding actions taken by the government to address them:

3.1 The issue of Affordability and the response

Affordability remains a critical concern, particularly for the significant portion of the population living below the poverty line. According to the latest official poverty estimates for 2011-12, there were approximately 269.78 million individuals below the poverty line, constituting around 55.77 million households, which accounted for roughly 21.9% of all households in the country [22(p7)]. For these households, the affordability of LPG posed a significant barrier due to the substantial initial capital investment required to acquire the necessary equipment and the ongoing expenses related to fuel purchases. Motivating poor households to shift to LPG is more challenging because these poor households are spending very little on solid biomass fuel in many parts of the country. Further, trends in NSSO expenditure survey since 1993-94 indicate that on an average, every household in the country spends around 7-9% of monthly expenditure on meeting its cooking and lighting requirement. Therefore, any expenditure beyond this spending limit discourages the poor households from adopting the cleaner fuel sources. For instance, an analysis conducted by Tripathi & Sagar (2020) found that to encourage the poorest households to consistently use LPG, the price of domestic LPG cylinders in India should be maintained at around Rs. 350, a point referred to as the "willingness to purchase" [23]. However, the data of Domestic LPG non subsprices shows that the prices of LPG for last 10 years have been higher than the willingness to purchase price. (Figure 5)

Figure 5: Price of Domestic LPG in India, (Based on Data from Indane site [24])

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The UJJWALA initiative not only covered the initial purchase of equipment but also extended LPG subsidies to promote the sustained use of LPG. Initially, these subsidies were provided universally, benefiting a broad range of recipients. However, in a subsequent phase, the subsidy structure was refined by linking it to income levels, thereby targeting and benefiting only those individuals who genuinely required the subsidy. This strategic shift ensured that the subsidy resources were allocated more effectively to support the economically disadvantaged sections of the population.

While there has been a noticeable improvement in sustained LPG usage, as indicated by data from the NFHS-5 surveys, the results for certain states like Bihar and West Bengal reveal that only a meager 37.8% and 40.2% of households are using clean fuel for cooking (Figure 6). These statistics highlight a significant disparity between LPG coverage and the ongoing adoption of clean fuel. Consequently, this compels us to consider additional policy measures to bridge this gap. Even though LPG has been made accessible to economically disadvantaged households, the data from NFHS-5 underscores the challenges in ensuring its continued use. This is likely the rationale behind the government's decision to provide the first refill to PMUY beneficiaries free of charge under UJJWALA-2. This policy adjustment aims to further encourage the sustained use of LPG among beneficiaries of the UJJWALA scheme, helping to bridge the existing gap between accessibility and utilization.

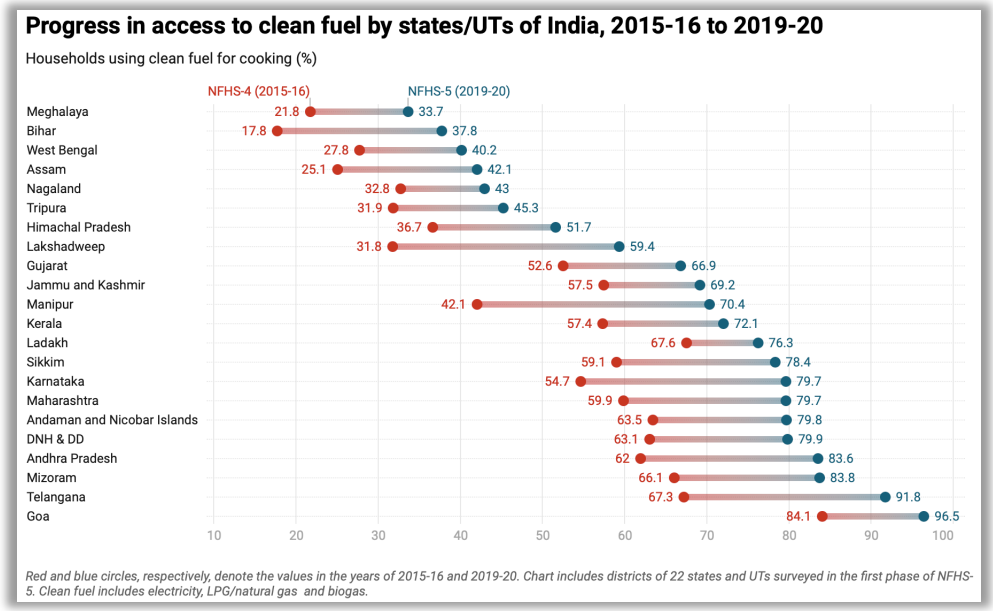

Figure 6: Access to Clean Fuel in India [25]

3.2 Ensuring the Availability of LPG

India is facing a challenge as it currently experiences a deficit in LPG supply. The government's proactive efforts to expand the role of LPG in the country's energy mix will inevitably lead to a significant rise in India's dependency on LPG imports. This escalating demand for LPG, coupled with a slower-than-anticipated increase in domestic production, has emerged as a critical concern for the nation, particularly in the context of strengthening energy security and promoting sustainable development.

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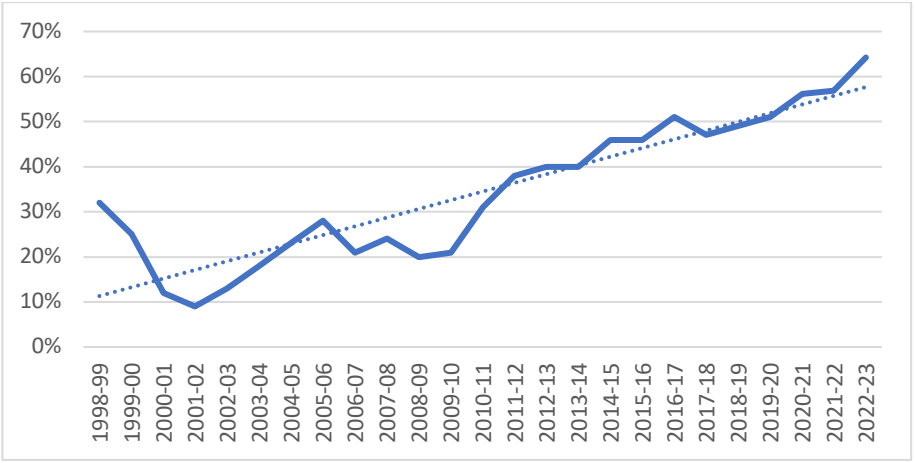

Figure 7: India's LPG Import Dependency, (Data extracted from PPAC web site [26]).

Over the years, India's reliance on LPG imports has steadily increased (Figure 7). This growing import dependency underscores the need for strategic planning and actions to address this challenge while simultaneously working towards achieving universal clean fuel access across the country. Further, fluctuation on price of LPG in international market and high import dependency create uncertainty in fixing the price of LPG closer to willingness to purchase price. To address the issue of availability, the government has adopted a multi-pronged approach: Increasing the domestic production, promoting energy efficiency in LPG appliances, expanding the city gas distribution network to promoting primary natural gas consumption in urban areas so as to increase the LPG availability in remote and rural areas, and augmentation of the LPG handling infrastructure which includes, LPG distributor network, import handling infrastructure at ports, capacity augmentation/ new LPG pipelines, increase in bottling capacities across the country, and increase in LPG equipment such as cylinders, LPG stoves etc.

Over the years, the government has taken a number of policy actions to expand the distributor network across the country.

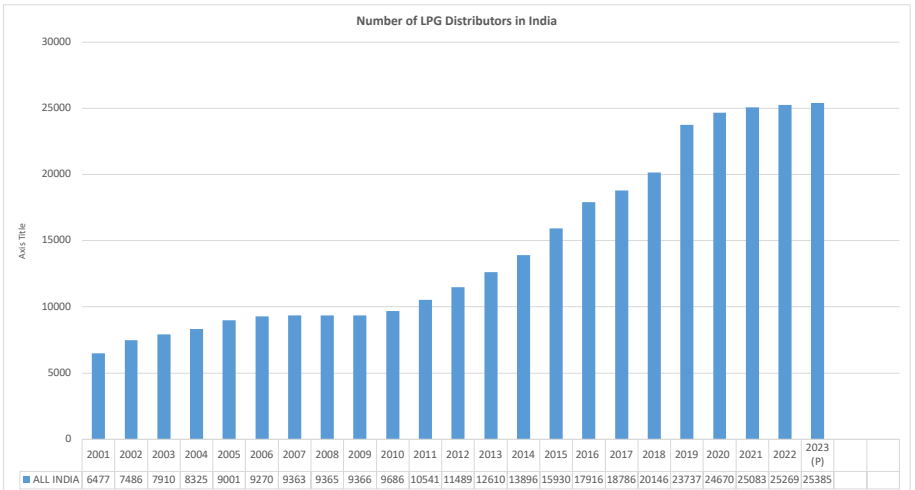

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Figure 8: LPG Distributors in India, Source: (data from PPAC website [27])

Over the past two decades, the number of LPG distributors has grown nearly fourfold. This significant expansion of LPG distributorships has played a crucial role in ensuring that LPG is readily available at the doorstep of every household across the country (Figure 8).

The LPG infrastructure has also seen significant growth in recent years. The LPG bottling capacity, which stood at 13.525 MMTPA in 2014, has notably increased to approximately 22.225 MMTPA in 2023 [15]. Furthermore, the LPG tankage at bottling plants, a critical component for ensuring uninterrupted operations at full capacity, has expanded, providing an All-India figure of 6 days' coverage. When considering LPG tankage at all sources combined, it ranges from 9 days to 23 days of coverage, with an All-India average of 14 days' coverage [19(p8)]. These developments underscore the commitment to strengthening the LPG infrastructure to meet the increasing demand and ensure a reliable supply of this vital energy source.

3.2.1 Increasing energy efficiency to improve LPG availability in country

To meet the growing demand of LPG another approach involves the adoption of fuel conservation and energy efficiency measures and creating awareness about fuel saving tips for users. One significant measure, in this regard is improving the thermal efficiency – through technological innovation and intervention – of LPG stoves. There are mainly two policy initiatives, the government has undertaken to increase the thermal efficiency of LPG stoves:

a) BIS Certification of LPG stoves

The government through IS 4246:2002 has specified the construction, operation, safety requirements and tests for household gas stoves with metallic bodies intended for use with LPG at 2.942kN/m² gas inlet pressure [28]. The standard includes the water boiling testing procedure to evaluate the thermal efficiency. It also specified the minimum thermal efficiency of 68 % for LPG stoves for obtaining the BIS certification [28].

b) Standard and Labelling Program of LPG stoves

Bureau of Energy Efficiency under Ministry of Power implemented a standards and labelling program for LPG stoves. The approved Star Rating plan of the S&L Program is as under (Table 2).

Star Rating	Thermal Efficiency (As per IS:4246 latest)
1 Star	>= 68% to < 72%
2 Star	>= 72% to < 75%
3 Star	>= 75% to < 78%
4 Star	>= 78% to < 81%
5 Star	>= 81%

Table 2: Star Rating Scheme of LPG Stoves [29]

It is noteworthy that the Indian standard for thermal efficiency of gas stoves ranks among the highest globally, with a minimum efficiency specification of 68%. In comparison, the Chinese standard (GB 16410) sets the minimum efficiency at 50% [30(p3)], while European standards require a minimum thermal efficiency of 58% [31(p5)]. India's stringent standards underscore its commitment to promoting energy-efficient LPG stoves.

3.3 Creating Awareness about the need and ways of clean energy access

In a survey encompassing six Indian states and conducted collaboratively by Columbia University, the Council for Energy, Environment and Water (CEEW), and

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the Sustainable Energy Foundation (Shakti), a notable barrier to accessing clean household energy emerged - a lack of awareness and insufficient information regarding the positive health benefits associated with clean fuels like LPG [32]. To address this challenge, the UJJWALA initiative has played a pivotal role in raising awareness about the health advantages of using clean fuels. The government, in partnership with NGOs, Oil Marketing Companies (OMCs), and local authorities, has launched several awareness campaigns in this regard.

Furthermore, the government's commitment to enhancing LPG accessibility extends to safety considerations, as LPG is a combustible product. In light of this, a multilingual LPG Emergency Helpline was officially dedicated to the nation on January 1, 2016, by the Minister of State (Independent Charge) for the Ministry of Petroleum and Natural Gas. This helpline operates 24/7, with two 12-hour shifts, and is readily available to handle emergency LPG leakage complaints. The call centre utilizes a web-based application for logging, monitoring call logs, and updating contact details for mechanics and field officers [12]. Additionally, LPG Panchayats have been organized with the primary aim of educating LPG consumers, especially beneficiaries of the Pradhan Mantri Ujjwala Yojana (PMUY), about the benefits and safe usage of LPG [33]. These measures underscore the government's dedication to promoting the safe and informed use of LPG while emphasizing its health benefits.

3.4 Mission mode approach to LPG Growth

When one observes the policy process of the Government of India concerning LPG expansion, it becomes evident that a long-term and mission-oriented approach has been adopted to attain universal energy access. This approach is visually represented in the following diagram (Figure 9). The government adopted a two-pronged approach: subsidy management initiatives such as 'Lakshya', 'PAHAL' and 'Give it Up' to reduce the fiscal subsidy burden on the government and the consumer empowering initiatives such as star rating of distributors and LPG portability to provide the reliable LPG services by bringing competition in LPG distribution system. As the years passed, the government's strategy aimed at moving towards a targeted subsidy mechanism from universal subsidy approach. This strategic shift aims to ensure universal LPG access by providing LPG to the deprived sections of society through the 'Ujjwala' scheme.

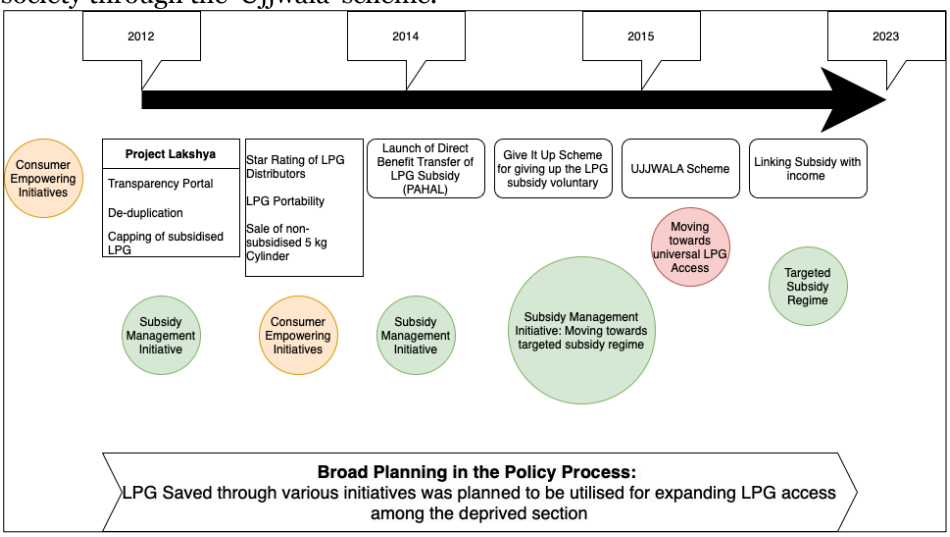

Figure 9: India's LPG Policy Reforms (Source: Author)

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The above planning necessitates a collaborative effort involving numerous agencies. To facilitate this, a project management structure was established to execute schemes like PAHAL and PMUY. This project management structure comprises three tiers, as illustrated below (Figure 10). At the apex level, the scheme was monitored by the Prime Minister office. Next level of scheme implementation was at the Ministry of Petroleum and Natural Gas. The minister in-charge, assisted by the ministry's secretary spearheaded the scheme's implementation. The proactive approach adopted at the apex levels ensured that the LPG customers did not face inconvenience during the scheme implementations and their grievances were redressed in time. For day to day implementation of the schemes, the government has set up a three tier project management structures: national level committee formulated the implementation strategies , state level units oversaw the implementation within each state and the district level scheme monitoring mechanism to deal with the ground level scheme implementation conditions. The project management structure of the government ensured that every stakeholder felt accountable for the successful implementation of the scheme and actively participated in the process.

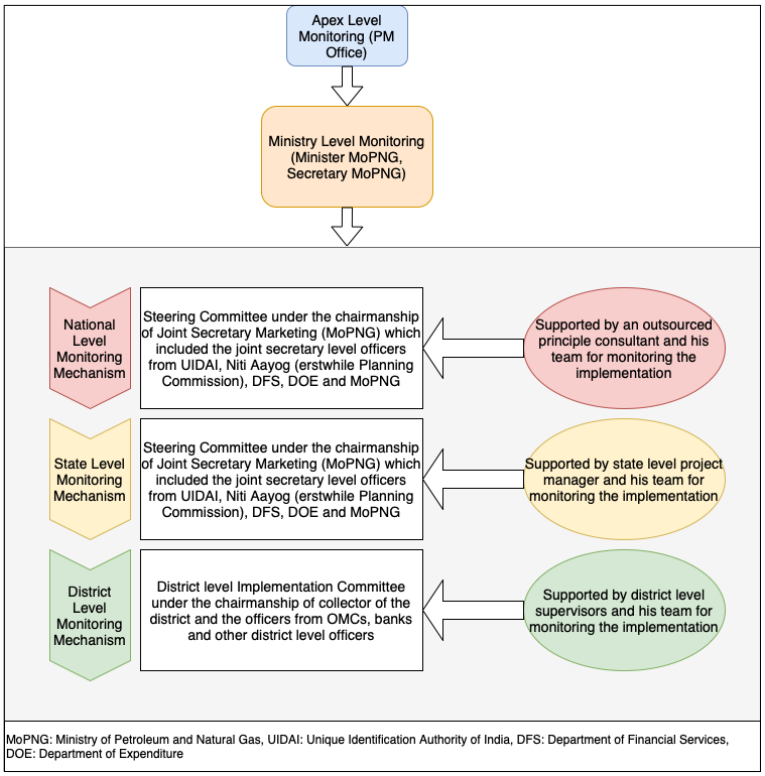

Figure 10: Project Management Structure (Source: Author)

3.5 Technology played an important role in the policy process

In the process of planning LPG expansion, the government recognized the potential of information technology to address the twin challenges of inadequate consumer services and diversion of LPG. This opportunity emerged from the existing IT-enabled sales operations of LPG, which had not yet been harnessed to tackle these issues.

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The first step was to extend visibility of the supply chain information that was so far internally available to the Oil Marketing Companies (OMCs). 'Transparency Portal', enabled the same by providing the basic data comprising of consumers name, address and consumption details including subsidy availed for each consumer. In the subsequent phase, when expanding the portal's scope, LPG consumers were actively involved in co-creating various features to enhance service delivery. This exercise involved focus group discussions with customers and distributors in all major towns. The effort was very well received by the consumers spanning different parts of the country and suggestions poured in for creation of a dream portal. This resulted in conversion of portal as 'MyLPG.in' – a name that was chosen by way of a public naming contest. The portal was a fully consumer empowering portal, has standardized look and feel across the three Government run Oil Marketing Companies IOCL, BPCL and HPCL engaged in LPG distribution. It has brought much needed uniformity in provision of services to consumers irrespective of the OMC. The portal helps the government to introduce the scheme of LPG portability, grievance redressal, booking and tracking of LPG delivery and performance of the distributors.

Use of technology helps the government to improve the LPG services across the country. The power of engagement of LPG consumer has changed vis a vis the LPG distributor as now the consumer has the power to see the rating of his distributor, rate him on various parameters and change the distributor. This has induced competition in a hitherto monopoly market. The portal also became a rich source of information for NGOs / social activist for social audit of LPG supply chain as it provides LPG consumption data for every LPG customer, delivery performance of each of the LPG distributors and also the list of suspect multiple LPG connections etc.

When the DBTL scheme was to be launched, the country had more than 160 million LPG customers, covering more than half of the country"s population, served by more than 13000 distributors from three oil marketing companies. More than 3 million LPG cylinders were being supplied daily all over country. The portal became one of the key enablers to launch PAHAL (DBTL).

The basis of implementing the PAHAL scheme was technology. By using the technology, a system was setup across the country for transfer of LPG subsidy electronically to the bank account of LPG consumers as shown in the flow diagram (Figure 11).

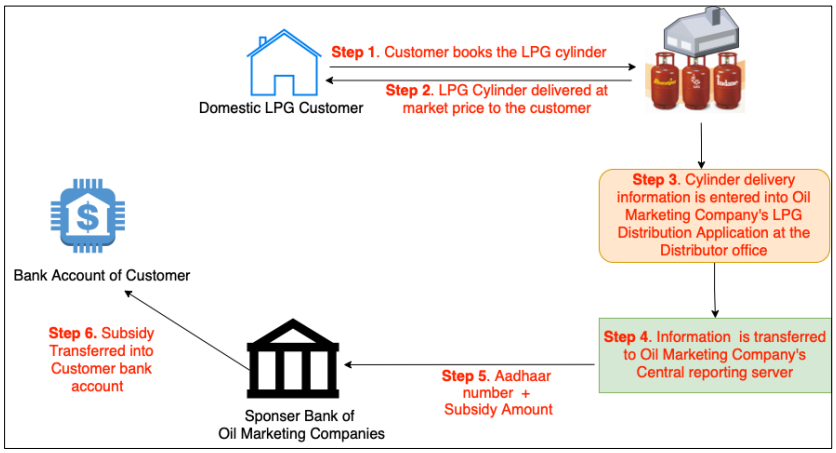

Figure 11: Process for Direct Transfer of LPG Subsidy (Source: Author)

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Besides the use of technology for subsidy transfer, a Project Management Information System (PMIS) was also developed on the backbone of the portal for monitoring progress of PAHAL (DBTL). This application was accessible to various stakeholders including Ministry of Petroleum and Natural Gas, OMCs, Lead District Managers of the banks, LPG Distributors and other identified agencies to view/update their respective information. The PMIS application provided a platform for different stakeholders such as officers from MoPNG, OMCs and to enter and update PAHAL (DBTL) related information including the scheme compliant status of LPG customers, the payment of LPG subsidy and monitor the scheme progress vis-à-vis the planned ones. The effective monitoring by use of technology has been a very important factor for the success of PAHAL scheme. The insights gained from this experience were also applied to monitor the progress of other significant government schemes, namely "GiveItUp" and "UJJWALA."

4. Conclusion: Lesson for international community from the LPG Story of India

More than 2.3 billion people lack access to clean cooking fuel, relying instead on solid biomass, kerosene or coal as their primary cooking fuel. Household air pollution, mostly from cooking smoke, is linked to around 3.7 million premature deaths a year [34].

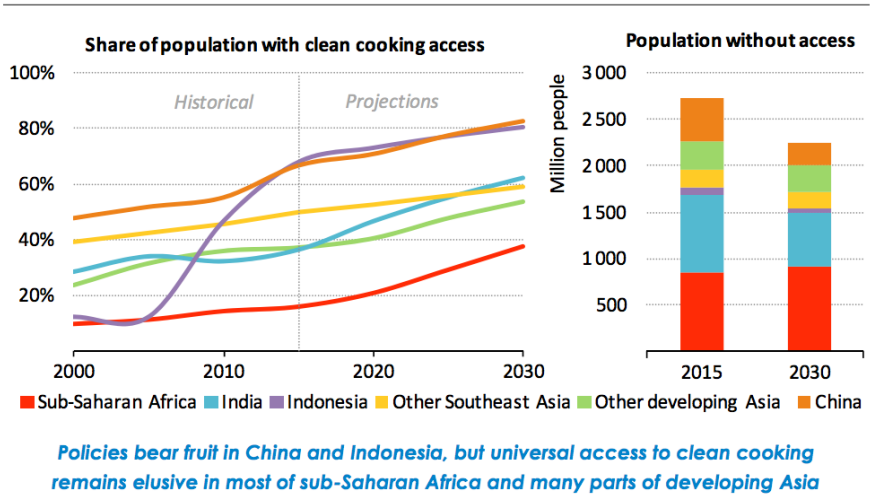

Figure 12: Clean cooking Energy Access at Global Level [35]

While a significant percentage of the population has gained access to clean cooking energy over time, the absolute number of people lacking access to clean cooking fuel, particularly in Asia and sub-Saharan Africa, has not decreased (see Figure 12). Consequently, these regions find themselves trapped in an energy-deprivation cycle, and the United Nations' Sustainable Development Goal (SDG) of achieving universal access to clean energy for all remains far from realization.

India's clean cooking fuel access program is unparalleled, with no other country implementing such a massive initiative. The lessons drawn from India's LPG growth story provide invaluable insights for the international community as they strive to progress towards universal clean energy access. These lessons may also aid other countries in developing their programs with a similar objective

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A. Involvement of leadership

During the implementation of PAHAL, GiveItUp and UJJWALA programs, the leadership at the central government was involved at every step: from policy formulation to program implementation and the monitoring. The scheme was regularly reviewed by the Prime Minister and monitored almost on daily basis by the Minister in charge of the Ministry of Petroleum and Natural Gas. This high-level involvement prompted senior bureaucrats at the national, state, and district levels, as well as top management in Oil Marketing companies and the banking sector, to personally monitor program implementation. Frequent review meetings were conducted at the Chief Secretary level in states and at the collector level in districts. The Minister himself conducted video conferences with collectors from at least 70 districts. A three-tier project management structure, as illustrated above, facilitated coordination among different stakeholders and enabled prompt problem-solving during program implementation. Many innovative approaches were employed for implementation of the programs. For instance, during the PAHAL rollout, each top-level executive, including Minister, adopted responsibility for monitoring progress in one district across the country.

B. Adaptive Management of the programs

The government, during the program implementation, actively monitored the challenges faced by various stakeholders and made necessary adjustments to address them. For instance, when the DBTL scheme was initially rolled out, there were issues related to the transfer of subsidies into consumers' bank accounts due to the non-linking of Aadhaar numbers with account details. Recognizing the difficulties encountered by customers, the DBTL scheme was temporarily suspended, and a committee was formed to investigate the challenges impacting the scheme's implementation, particularly the exclusion of LPG consumers without Aadhaar numbers. Among the committee's recommendations, one key suggestion was to allow customers to enroll in the scheme even if they didn't possess an Aadhaar number. Furthermore, the PAHAL enrollment forms and methods were simplified to expedite the nationwide adoption of the scheme.

C. Effectively leveraging the Technology

The LPG growth story clearly demonstrates the effective utilization of technology, not only for program implementation but also for monitoring. MyLPG.in was employed for LPG consumers, providing them with a user-friendly platform for accessing services and information. The Aadhaar technology, which aimed to provide a unique Aadhaar (UID) number to every resident of the country, facilitated online authentication and identification of beneficiaries for subsidy transfers. The Aadhaar Payment Bridge System, in conjunction with the Core Banking System, streamlined the electronic transfer of funds to beneficiaries' bank accounts. De-duplication exercises were conducted to eliminate multiple and fake LPG connections, resulting in a cleaner, digitized LPG consumer database. All of these technological innovations contributed in successful implementation of the UJJWALA, PAHAL and other consumer empowering initiatives and demonstrated the usefulness of technology in program implementation.

D. Effective use of channel partners

Throughout the implementation of LPG programs, LPG distributors played a pivotal and indispensable role. These distributors possessed an intimate knowledge of every LPG consumer associated with their service areas, making them instrumental in reaching out to and encouraging consumers to participate in the schemes. The distributors exhibited remarkable responsiveness in swiftly

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executing directives and guidelines issued periodically to ensure effective program implementation. The presence of these channel partners, distributed across every region of the country, and their synchronized efforts were paramount to the overall success of these programs.

E. Demand orientation to policy making

One of the major factors that makes the policy ineffective in achieving its objective is the supply focused approach, the policy makers adopt. A supply-oriented approach to policymaking, emphasizes the government's role in providing solutions and services based on its own assessment of what is needed. In case of policies focussed on providing energy access, this supply focused approach results in duplicity of efforts in policy making, sub-optimal utilization of resources and uneven distribution of energy access across various regions in the country leading to loss of govt exchequer. In case of LPG expansion by the government, the policy approach was more demand focused. While developing the program for LPG expansion, policymakers' approach focused on understanding and responding to the needs, preferences, and demands of the public. It involves considering the input and feedback from households, businesses, or other stakeholders when designing and implementing policies. This approach recognized that effective policies should be responsive to the concerns and desires of the people they affect and this has been an important factor in success of LPG programs in India.

F. Targeted Subsidy Approach

Providing a universal subsidy to all has the drawback of diminishing the subsidy rate, as the total subsidy amount is dispersed among a vast number of beneficiaries. Furthermore, the resultant reduced subsidy rates exhibit a regressive nature, rendering LPG unaffordable for the impoverished, while predominantly benefiting the affluent. Recognizing this issue, the government opted to transition from a universal subsidy approach to a targeted mechanism.

Nevertheless, this shift from a universal subsidy regime to a targeted one carries the risk of eliciting negative sentiments among the public. There is a concern that individuals may perceive the subsidy as an entitlement, making the transition to a targeted regime a delicate process that requires careful consideration and planning. The Indian Government's approach in this matter is commendable, as it takes into account various factors such as socio-political conditions, administrative challenges, the government's financial standing, and the potential impact of such a policy on the economically disadvantaged in their access to LPG, a clean source of cooking energy.

G. Need for an Integrated planning approach

When one look at the energy ladder for cooking (figure 13), one finds that there are several cooking fuel options such as LPG, Natural Gas and Electricity, which can address the issue of universal clean cooking energy access.

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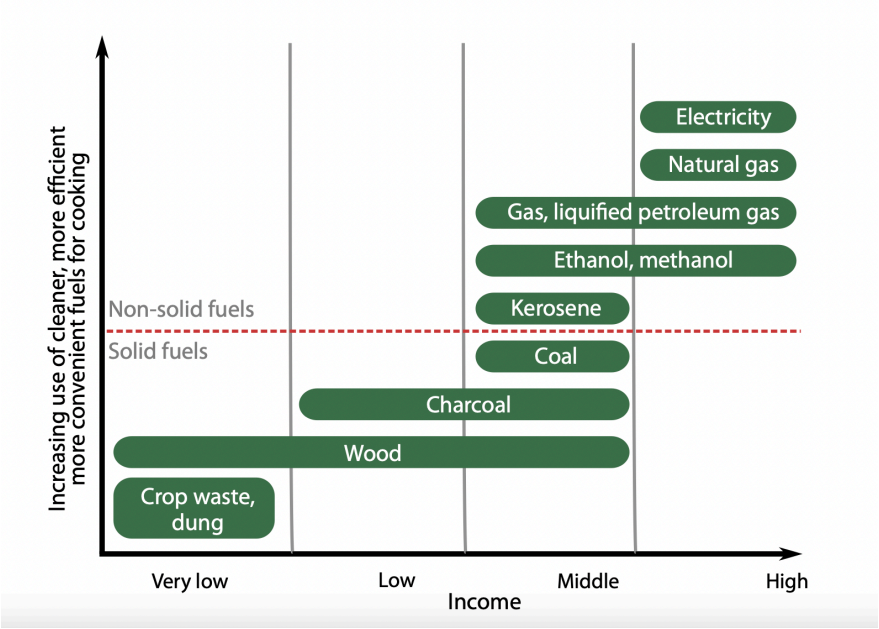

Figure 13: Energy Ladder [36]

In various countries, it may so happen that these clean fuel cooking options may be administered by different entities. Thus, in absence of a coordinated approach to ensuring universal clean energy access for cooking, each entity would be framing the policies keeping the in consideration the fuel it is administering. The process would then result in duplicity of efforts, sub-optimal utilization of resources and uneven distribution of energy access across the various regions. Therefore, it is important that all the stakeholder entities in universal clean energy access program synergize their effort for the program success.

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