

What Has the Pradhan Mantri Ujjwala Yojana Achieved So Far?

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The central government's flagship programme to provide free liquefied petroleum gas connections has been in operation for two years, providing more than 3.5 crore free LPG connections to poor women. This much-needed scheme is a major step to reduce indoor air pollution, drudgery faced by women, and one that promises to extend LPG access. However, little is known about the progress of the scheme. Has it led to sustained use of clean fuels among poor households? There is need for more information about the scheme in the public domain for a comprehensive evaluation and mid-course correction.

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The Pradhan Mantri Ujjwala Yojana (PMUY) was launched in 2016 to distribute five crore liquefied petroleum gas (LPG) connections to poor women "free of cost" by March 2019. As of early April 2018 more than 3.5 crore connections were provided under the scheme. Encouraged by the rapid release of connections, the central government revised the target and scope of the scheme to eight crore connections by March 2020. Under the scheme, the union government bears the connection cost of ₹1,600 per connection, and each household pays about ₹1,500 for the stove and the first LPG cylinder.

The announcement of PMUY and the recent increase of its target, marks a significant shift in the government's approach to providing access to clean cooking fuels. For the first time, it chose to aggressively pursue providing modern cooking fuels to all Indian households. This is an important step since household air pollution (HAP) arising from combustion of solid fuels for cooking is a major contributor to four of the top five causes of mortality and morbidity in India, and HAP is also a significant contributor to outdoor air pollution (IHME 2017; ICMR, PHFI, and IHME 2017; IIT Bombay, HEI and IHME 2018). Recent research suggests that providing clean cooking fuels to all can be a highly cost-effective health intervention (Smith and Sagar 2014; Prayas 2018). In addition, collection and use of solid fuels for cooking increases the drudgery and adversely impacts time-use by women (Desai and Vanneman 2016; Desai et al 2010). The scheme also aims at addressing these issues (PIB 2016b).¹

The LPG sector has seen a wave of schemes over the last few years targeted at various objectives such as eliminating spurious consumers, effective subsidy

targeting and delivery through schemes such as PAHAL and the Give-it-up campaign.² While there have been some issues such as differing claims on the actual saving from schemes like PAHAL (CAG 2016), it is generally accepted that these have helped reduce leakages in the LPG delivery system. These reform measures and relatively lower crude oil prices provide an opportunity for the concerted connection drive to translate to sustained adoption of LPG for many.

It has been about two years since the launch of PMUY, and it is a good time to assess the programme and try to identify necessary course corrections, if any, to ensure that the programme's objectives are met. This is also important because the programme involves a public investment of over ₹12,000 crore³ and it is necessary to ensure that this investment realises its social objectives.

Assessing PMUY

There are two levels at which PMUY can be assessed: the first is against the stated objective of disbursing connections, while the second is against the intended objective of tackling the adverse health effects of using traditional solid fuels.

On the first parameter, Table 1 shows the status of LPG connections in the country when PMUY was launched. Given that 1.6 crore LPG connections were released to below poverty line (BPL) households under various state government schemes till April 2016, it is evident that PMUY's target of five crore connections to poor households in three years is very ambitious, and a major step to increase LPG connection coverage among poor households.

Table 1: Status of LPG Connections in the Country as on 1 April 2016

Parameter	Total	Urban	Rural
Number of registered LPG connections in crore	20	–	–
Number of active LPG connections in crore	17	10	7
Percentage of households with active LPG connections	62	118	36
Number of BPL households covered under schemes sponsored by state governments and OMC CSR funds in crore	1.6	–	–

OMC=oil marketing company, CSR=corporate social responsibility.

Source: Lok Sabha (2016b); PPAC (2016a).

In this regard, PMUY has broadly been on track. Over 70% of the target of five crore connections have been disbursed in about two-thirds of the intended time. In fact, almost 60% of the new LPG domestic connections given across the country in 2016–17 were PMUY connections (PPAC 2017a). This encouraging start to the programme has prompted the government to increase the target to provide three crore additional connections over an additional year.

However, there have also been some concerns raised around identifying the beneficiaries under the scheme using the Socio-Economic Caste Census (SECC).⁴ This includes concerns around errors in the SECC data and pressures from the oil-marketing companies (OMCs) to meet and exceed targets resulting in dilution of beneficiary identification processes (FLDI 2016a, 2016b).

While Aadhaar-based “know-your-consumer” steps and bank account details of consumers are necessary to prevent spurious connections and LPG diversion, they can be another barrier for poor households as highlighted by studies (Parikh et al 2016). Some steps have been initiated to coordinate Aadhaar applications with PMUY applications (MoPNG 2017a). Nevertheless, significant efforts and time would be needed to extend connections to poor households in Uttar Pradesh, Bihar, Rajasthan and some North East states, which have Aadhaar coverage lower than 88%, LPG coverage as a primary fuel less than the national average, and also relatively more socio-economically deprived households in rural areas (UIDAI 2018; MoRD nd).

Notwithstanding such concerns, it is fair to conclude that the objective of providing connections to poor households is broadly being achieved. However, the real social objective of a scheme such as PMUY can only be achieved if households not only get LPG connections but use it for most, preferably all, of their cooking needs on a sustained basis. Converting connections to sustained use requires overcoming a few barriers such as affordability, reliability, accountability, and viability (Dabadge et al 2016).

A programme such as PMUY is also perhaps the largest ever social programme

undertaken by the OMCs. This is challenging for them, but also presents them an opportunity to significantly deepen their LPG market. To be able to assess these dimensions of the programme, it is necessary to have access to fairly rich data in the public domain. It is here that it becomes challenging to assess the effectiveness of PMUY.

Information Gaps

PMUY connection data is provided only at a state level and no district-wise disaggregation is available. In contrast, other government schemes such as the Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY)⁵ and Pradhan Mantri Awas Yojana⁶ (PMAY) provide information about the progress of the respective schemes at the district and village level. Progress is regularly tracked for the various programmes under the household electrification scheme and infrastructure development schemes such as DDUGJY, Saubhagya, and Integrated Power Development Scheme using local representatives and updated on the respective portals (MoP 2015, 2016). This makes it easier to assess the progress of these schemes and provide feedback to improve the programmes.

The most important datapoint to understand whether PMUY beneficiary households are using LPG regularly is the rate of LPG consumption by such households. Such data is not reported on a regular basis for all states. The only information available for the rate of consumption for PMUY households is an average estimate for consumption for one year from the date of release of the connection. The average estimate for the country, released by the Ministry of Petroleum and Natural Gas (MoPNG) is 4.32 (14.2 kg) cylinders in the first year of adoption (Lok Sabha 2018). Estimates for states with a rate of consumption higher than the average were also provided. However, it is not clear from this estimate whether households consistently use the fuel after adoption. An estimate of number of refills from PMUY connections for every year, and not just the first year of adoption, would have been a more appropriate datapoint to analyse LPG use by PMUY households. The information

should also be provided in a disaggregated manner (state, district, block) to help address barriers to adoption.

Indeed, even at the national level (that is, going beyond just PMUY beneficiaries), LPG consumption data is only disaggregated to the state level, but is not available along the crucial axis of urban and rural households. Since over 85% of rural households used biomass, coal or kerosene (in comparison to about 25% of urban households) as their primary cooking fuel according to the 2011 Census, it is clear that this problem is primarily rural in nature and therefore, a rural–urban breakdown of overall LPG consumption and that of PMUY households is critical to understanding progress in uptake of modern cooking fuels.

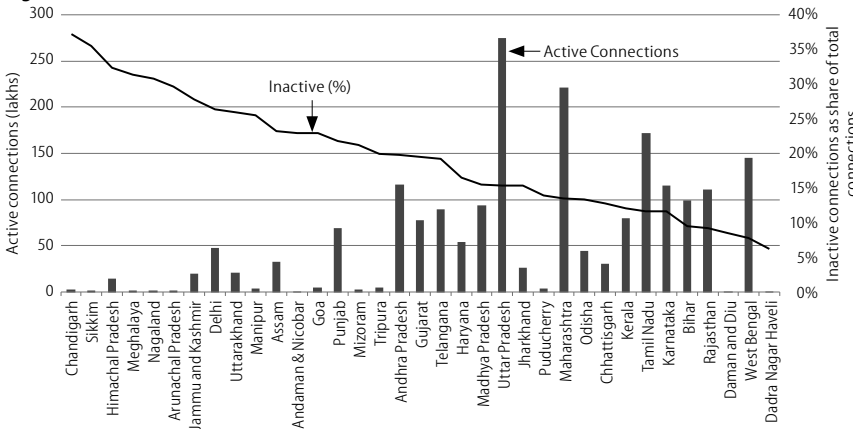
Other relevant information, such as service quality related information (average time taken for providing connections, average time for refills, proportion of consumers receiving home delivery services, instances of underweight cylinders reported by distributors and consumers, number of complaints received, complaints addressed, nature of the complaints, etc) and safety-related information (inspections conducted, accidents reported, fatalities, compensation/insurance claims settled, etc) are also not publicly available. This information should be collated and made available for each distributor by the OMCs with aggregated reports at the state, district, and block level for each type of distributor.

Considering that PMUY is a bold, new initiative, it is to be expected that there would be some learning along the way and a need for course correction. Availability of detailed data about PMUY would enable such a course correction. In the absence of such information, PMUY can only be assessed based on indirect indicators and scattered data available from various sources. This is attempted in the next section, though the findings can only be seen as indicative rather than firm, given the indirect methods used in the analysis.

Unrealistic Coverage

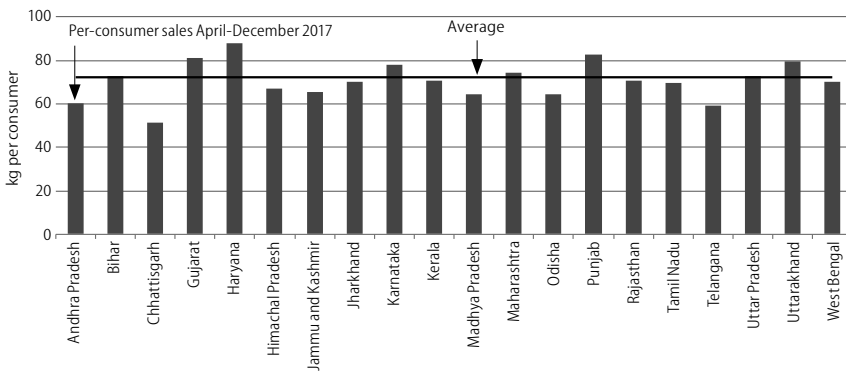
A connection-focused approach has resulted in a few interesting anomalies. According to data submitted in Parliament,

Figure 1: Statewise Variations for Inactive Connections



Source: PPAC (2017a).

Figure 2: Average LPG Sales per Active Domestic Consumer, April–December 2017



Source: PPAC (2018).

“active” LPG connections in urban India in November 2015 (a few months before the commencement of PMUY) were already more than the number of urban households in India (Lok Sabha 2016a). While connection coverage of a little over 100% may be understandable as peri-urban LPG distributors may also be catering to some rural consumers, coverage of over 150% for urban areas in states such as Himachal Pradesh, Punjab, Rajasthan and Uttar Pradesh indicates that connection levels were already very high even before PMUY commenced.⁸ Even at the state level, recent connection data indicates that it has exceeded 100% coverage in states such as Punjab, Haryana, Kerala, and Telangana (PPAC 2018). These data suggest that connections do not necessarily indicate that households are moving away from using solid fuels for cooking, but that the connections are possibly being used for other purposes.

Moreover, under PMUY, the union government has the ambitious target of disbursing three crore connections in

2018–19 itself (MoPNG 2018). Although the net of beneficiaries has been widened to include more households, such a move might only lead to a rush in achieving connection targets. This raises questions about the effectiveness of a purely connection-focused approach.

An interesting aspect of the LPG sector is also that there are a significant number of consumers who are registered but not “active.” As of April 2016, when PMUY was launched, there were already 3.55 crore “inactive” connections in the country (PPAC 2017a). This had increased to 3.58 crore by April 2017 and 3.82 crore by January 2018 (PPAC 2017a, 2018). The number of inactive connections is comparable to the total number of PMUY connections released and accounts for 15% of the total registered connections in the country. The number of inactive connections also shows wide variations across states (Figure 1). It varies from a high of about 35% in an urban area such as Chandigarh to a low of around 6% in West Bengal. There is no obvious pattern

to the number of inactive connections that is evident and this is perhaps something that needs to be understood better.

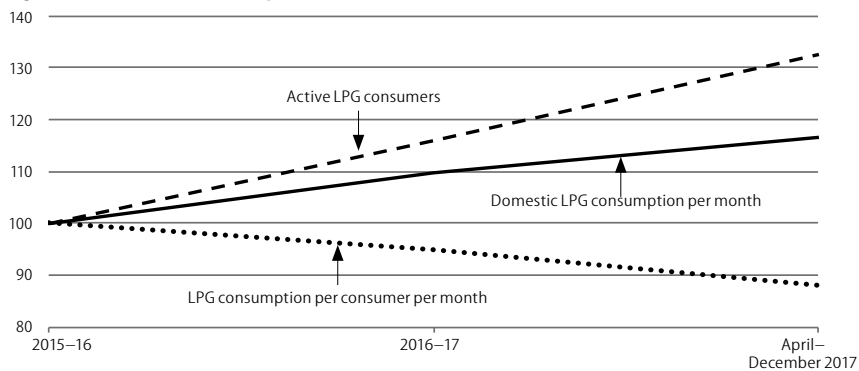
Anomalous LPG Consumption

The possibility of a rapid increase in connections leading to diversion is partially reinforced by an analysis of LPG consumption data per consumer across different states for April to December 2017 (Figure 2). Some of the potentially anomalous points that emerge are that per-consumer sales in Uttar Pradesh (73 kg) are higher than the all-India average (72 kg); per-consumer sales in Bihar (73 kg) are higher than states such as Telangana (59 kg), Andhra Pradesh (60 kg), and Himachal Pradesh (67 kg) and per-consumer sales in Rajasthan are similar to Tamil Nadu (70 kg). In contrast, according to the Census of 2011, Andhra Pradesh, Himachal Pradesh, and Tamil Nadu are states that had a higher proportion of primary LPG users in total households while Uttar Pradesh, Bihar, and Rajasthan had lower LPG users in total households. Given the disparity in economic development, and hence affordability of LPG, across Indian states, the aforementioned seems to indicate diversion of LPG. These numbers are also at odds with the results of a study commissioned by the Petroleum Planning and Analysis Cell (PPAC), which showed that around 90% of households without LPG connections that were surveyed in many districts of Bihar, Uttar Pradesh, and Rajasthan cited the high refill price of LPG as a barrier to using it (CRISIL 2016).

However, it should be acknowledged the annual⁹ per-consumer consumption in Bihar (117 kg), which was higher than the national average (106 kg) a few years ago (Lok Sabha 2016b), is now comparable to the national average, perhaps due to initiatives such as PAHAL.

Design and Affordability

Various surveys indicate that the share of total registered LPG consumers who use LPG as their primary cooking fuel is about 60%¹⁰ (IPS and ICF 2017; PPAC 2016a); a percentage largely unchanged since 2011. This shows that many consumers who could afford to pay for an LPG connection also could not transition

Figure 3: Trends in LPG Consumption (2015–16 = 100)

Source: PPAC (2016a, 2017a, 2018).

to being primary LPG users. High upfront costs and high refill costs are both cited as the reasons for not using LPG by roughly 85% of households surveyed in CRISIL (2016).

Under PMUY, beneficiaries have the option of getting the cooking stove and first LPG cylinder from the OMCs via the LPG distributor on an interest-free equated monthly instalment (EMI) basis (PIB 2016a). The EMIs are expected to be recovered from subsidies on future cylinder refills. This leads to a structural problem. Since stove and associated expenses cost around ₹1,500 and the subsidy per refill is in the range of around ₹200 to ₹300, it would take five to seven refills for the loan to be repaid. During this period, beneficiaries are expected to pay the full unsubsidised price of the refill. Since PMUY beneficiaries would typically be poor households, they would find it extremely difficult to come back for refills if they have to buy LPG at unsubsidised prices five to seven times. Assuming a PMUY consumer avails 4.32 refills in the first year, this implies a payment of ₹2,500 to ₹3,000 for the period. A BPL consumer using 30 units to 50 units of electricity per month pays about half this amount to meet their basic electricity needs in any state in India. Perhaps, this is the reason why OMCs have recently decided not to collect EMIs for the first six refills (Bhaskar 2018), though it seems this would, at best, only postpone the problem rather than address it.

Reports indicate that about 65%–70% of PMUY beneficiaries have availed the EMI option (Bhaskar 2018; Sharma 2017) but it is not clear if these consumers manage to pay the loan amount and sustain

the use of LPG. This is a crucial parameter to track and it would affect the sustainability of the programme.

Trends in Consumption

Since the launch of PMUY, overall domestic LPG consumption in the country has shown an upward trend. The average monthly domestic LPG sales increased from 1.4 million tonnes (MT) in 2015–16, to 1.6 MT in 2016–17 and 1.7 MT during the period April–December 2017 (PPAC 2016a, 2017a, 2018). However, the number of active LPG connections has gone up much faster during the same period due to the rapid disbursement of connections under PMUY. As a result, the per-consumer consumption of LPG has reduced over time from 9.1 kg per month in 2015–16 to 8 kg per month in 2017. This is illustrated in Figure 3.

This suggests that LPG consumption of newer consumers—who are primarily PMUY beneficiaries—is lower than what it was earlier, and that newer PMUY connections may not be translating to consistent use, even to the extent of earlier connections. This may be aggravated by a steady increase in the price of even subsidised LPG, which grew by 12% between April and December 2017 (MoPNG 2017b; PPAC 2017b).

The national average LPG consumption per consumer was about 7.3 cylinders per year in 2015–16, as against a normative expectation of about 12 cylinders if it were used for all cooking,¹¹ indicating that LPG was meeting only about 60% to 80% of the normative cooking needs even before PMUY. Official estimates indicate that PMUY beneficiaries consume only 35% to 50% of even the normative

estimate. This is another indicator that PMUY consumers are perhaps consuming much less LPG than other Indian LPG consumers, pointing to issues of affordability and reliability of service.

In addition to these indirect indicators of PMUY consumers not shifting to sustained use of LPG, there have been various field-visit-based media reports that indicate that refill adoption is low among PMUY beneficiaries (Pandey et al 2017; Malhotra 2017; Kishore 2017; Jha 2017). Thus, in spite of the official figure of about 80% of PMUY beneficiaries opting for at least one refill (Lok Sabha 2018), it appears that the number of refills are far from sufficient to meet the cooking needs of the household.

LPG Distribution

The LPG distributor is the customer's link to the LPG supply chain. Thus, unless the distributor is able to function effectively and is held accountable for their services, the ambitious programme to supply LPG to a large number of unserved or underserved households is unlikely to fructify. Lessons from the electricity sector can be valuable in ensuring mid-course correction. Concerted drives to increase access to electricity across the globe relied on financially viable and healthy utilities (Barnes 2007).

The PPAC-commissioned study had identified that the distance to the LPG distributor and long waiting time to get a refill are barriers to adoption of LPG (CRISIL 2016), further underscoring the importance of the location and accountability of the distributor. The LPG distribution guidelines, introduced after the survey, now mandate all distributors, except the “durgam kshetra” distributors, to home deliver LPG cylinders (MoPNG 2016). It would be useful to conduct a survey now to see how well this is implemented in rural and remote areas.

LPG distributors are currently classified as “shehri” (urban), “rurban” (rural–urban), “gramin” (rural) or durgam kshetra, with the criteria for opening a distributorship gradually weakening from shehri to rurban to gramin to durgam kshetra. In addition, there are some distributors classified under the erstwhile Rajiv Gandhi Gramin LPG Vitaran Yojana

(RGGLVY). While some rural distributors, who are located in urban areas may also supply rural consumers, it is expected that most rural consumers would be serviced by one of the other kinds of distributors. While there are about eight distributors per lakh households in urban areas, it seems there are only 6.5 distributors per lakh households in rural areas (SCPNG 2018), in spite of the fact that the LPG distributorship guidelines require fewer consumers per distributor for rural, gramian and durgam kshetra distributors (MOPNG 2016).

The number of distributors has not kept pace with the increasing number of active LPG consumers as connections are disbursed under PMUY. Between April 2016 and January 2018, the total number of distributors in the country went up by 9%, while the total number of active LPG consumers shot up by 31% (PPAC 2016a, 2018). The discrepancy between increase in the number of distributors and consumers is much worse in some states. For example, in Bihar and Chhattisgarh, the total number of distributors went up by only 5% and 18% respectively while the number of consumers increased by 84% and 91% respectively.¹² It is unlikely that distributors would be able to service consumers effectively in this situation, and points to a need to increase the number of LPG distributors rapidly in rural areas.

While it is necessary to increase the number of distributors, a couple of other points also need to be kept in mind. First, the distribution business needs to be viable to ensure that distributors are interested in serving their clients and are not tempted to use other means, such as diversion, to remain viable. Given the lower density of consumers in rural areas and resultant increased costs in delivering services to them, and potentially lower consumption of such consumers, it is not clear whether the distribution business remains viable in rural areas. An independent study in this matter is desirable to explore strategies to ensure that rural distribution is a viable proposition.

Supply, Service, and Safety

Given the increase in connections, especially to BPL households, safety has been a major concern. The likelihood of accidents

has increased not only because of the lack of amenities in beneficiary households but also because of lack of awareness. The MOPNG has taken cognisance of this fact and has recently launched the LPG panchayat programme to increase awareness about safety-related issues (PTI 2017). However, a lot more needs to be done in order to avoid accidents, including regular inspections and adherence to safety procedures. Compliance to such procedures should be monitored by the OMCs and also reported for every distributor. Data related to accidents, loss of life and property and the action taken should also be reported publicly.

In addition to safety, monitoring supply and service quality is also paramount. Though the LPG Marketing Discipline Guidelines stipulate actions and penalties to ensure compliance to procedures and practices specified by the OMCs, there are no published reports of compliance to this. Anecdotal evidence suggests that current mechanisms may not be sufficient to ensure accountability of distributors and OMCs to consumers (Pandey et al 2017). Some performance indicators can be regularly collected and reported on a disaggregated basis to ensure accountability such as the average time taken to get connections, average time to obtain refill, and other key parameters.

There is also a need for a well-defined and fair multi-tiered consumer grievance redressal mechanism, consumer awareness programmes about the existence of such a mechanism, and publicly available information about consumer grievances raised and addressed by type (for example, overcharging, issues with home delivery services, etc) on a disaggregated basis. These are some ingredients that can help increase accountability of distributors and OMCs.

Conclusions

PMUY is a bold new initiative that aspires to fundamentally address one of the pressing energy-access, health and gender challenges in the country. The broad picture that emerges is that while the programme has been successful in introducing a sense of urgency into the transition to modern cooking fuels and disbursing connections, it has been less

successful in introducing a sustained change. Indicative evidence suggests that this is because of issues around affordability and reliability of LPG supply. A major concern is the absence of publicly available data about the programme, its progress, and impact. Lack of availability of such information results in reliance on anecdotal reports to assess the programme. In light of this analysis, we suggest the following changes to the PMUY programme in particular and the LPG sector in general.

Publishing more information: The MOPNG should publish more information about the PMUY programme and the LPG sector at regular and frequent intervals (say quarterly) disaggregated along various dimensions such as by state/district/block, by distributor type, by PMUY/non-PMUY consumers, rural-urban and by subsidised/non-subsidised consumer type. Examples of the kind of data that should get published include consumption of LPG by households, details of expenditure on the programme, the number of PMUY consumers who availed of the EMI facility and the status of repayment of those loans, statistics on key performance indicators, especially for distributors and OMCs, aggregate information about LPG consumer complaints and their status/resolution, and data about accidents involving LPG categorised by their severity. The data along with analysis reports using the data should be published online, with the PMUY portal being the obvious choice. In addition, apps can be provided to easily access this information as in the case of other government programmes. The data should also be available as a time-series to enable analysis of trends over time.

Periodic studies: It would be good to conduct an independent study periodically (say, every three years) to understand ground realities regarding the adoption of LPG (and, more broadly, modern cooking fuels) as a primary cooking option. Such a study can be commissioned by the PPAC. This would help recalibrate the programme by understanding consumer preferences, problems, barriers, affordability issues, service issues, etc.

The study can also try to estimate the changes in air pollution levels in homes and resultant health benefits. Regular monitoring of PMUY and publishing of information has also been recommended by the corresponding Parliamentary Standing Committee (SCPNG 2018).

Fuel pricing: Studies as recommended above can help inform policy decisions, particularly around the pricing of fuel, as that is likely to be a critical barrier to sustained modern fuel adoption in the near to medium term. Various options may be considered such as telescopic pricing, cross-subsidies, smaller gas cylinders, prepaid coupons, targeted subsidies, etc, which may ease cash flow and/or make LPG more affordable. This is also an urgent need as more than 50% of the MoPNG budget is allocated for Direct Benefit Transfer of LPG or DBTL. For PMUY consumers on EMI, loan repayments can also be rationalised so that some benefits of subsidy per refill can be realised. Insights can also be gained from state-specific initiatives to alleviate the financial burden on poor consumers, such as the ones initiated by Chhattisgarh and Jharkhand (Sharma 2017).

LPG distribution: The success of the programme also hinges on the distributors as they are tasked with implementing all modalities of the scheme: right from identification of beneficiaries to organising camps for LPG use and safety. However, they form the weakest link in the LPG supply chain. Currently, this segment of the supply chain is totally controlled by, and accountable to only the OMCs. Instead, distributors and OMCs should be made accountable to the government and citizens at large. The possibility of an independent regulator, whose responsibilities include consumer service, pricing, planning, etc, can also be considered. Simultaneously, challenges faced by distributors—including the current business model and its viability—need to be understood and addressed. A first step towards such a reform could be to commission a detailed, independent study of the LPG distribution ecosystem and accountability and publish it, with a view to

initiating discussions on addressing this critical issue. More immediately, there is a need to rapidly increase the number of rural distributorships to enhance the reach of LPG to rural consumers.

Safety, supply, and service: There is a need to bring greater consumer accountability of the distribution segment by instituting appropriate standards of performance for services and multi-tier grievance handling systems and processes to increase accountability, and publishing annual reports on grievances addressed in a disaggregated manner. One such process could be to have annual public hearings for supply and service quality at the block or district level. In addition, incentives and penalties linked to performance and service quality indicators can be provided to distributors to improve quality of service.

A connection focused approach without adequate provisions to ensure affordability, availability, and accountability will not result in a corresponding increase in consistent use of LPG among poor households. We believe that incorporating suggestions as given above would help social investment programmes such as PMUY to achieve the desired objective of not only disbursing connections but making the LPG sector a real contributor to overcoming this deep-rooted challenge affecting energy access, health, and gender disparity.

NOTES

- 1 See the official website of PMUY at <http://www.pmujiwalayojana.com/about.html> (viewed on 3 April 2018).
- 2 See <http://petroleum.nic.in/marketing/schemes/lpg-schemes> (viewed on 3 April 2018) for a list of LPG-related schemes.
- 3 This accounts for about 7% to 10% of the overall budget outlay for the Ministry of Petroleum and Natural Gas (SCPNG 2018: 8–10).
- 4 Beneficiaries under PMUY are identified based on whether their name appears in the SECC database of “deprived” households. These are households who meet certain deprivation criteria as stipulated by the SECC.
- 5 DDUJGY portal and the GARV dashboard provide information on key performance indicators up to the village level. For more information see: <http://www.ddugjy.gov.in/mis/portal/index.jsp> and <http://garv.gov.in/dashboard> (viewed on 9 April 2018).
- 6 Physical progress for PMAY is also reported till the panchayat level. For more information, please see: <http://rthereporting.nic.in/netiay/PhysicalProgressReport/Panchayatwiseincopletesanction.aspx> (viewed on 9 April 2018).

- 7 That is, connections that have had some activity in the preceding few months. We refer to connections that are not active as inactive.
- 8 Many states did have state-level subsidised connected disbursement programmes before PMUY. However, Punjab, Rajasthan, and Uttar Pradesh were not among them.
- 9 As against the earlier figures which are for the nine-month period from April to December.
- 10 This is an indicative number because of possible discrepancies between survey-based estimates and PPAC connection data. This number also includes PNG users, but they are negligible compared to LPG users and are mainly present in urban areas. There were only 31.6 lakh domestic PNG connections in the country at the end of 2015–16 (PPAC 2016b). The number of households is as reported in the LPG profiles published by PPAC.
- 11 Assumptions for the estimation: per capita useful cooking energy required: 947 MJ/year; LPG stove efficiency: 55%; average family size: 4.5.
- 12 Thus, the consumers per distributor increased from 6,500 to almost 11,500 in Bihar, while the same increased from less than 5,500 to more than 8,500 in Chhattisgarh.

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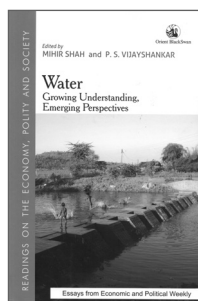
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Water: Growing Understanding, Emerging Perspectives

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For decades after independence, Indian planning ignored the need for sustainability and equity in water resource development and management. There was just one way forward, that of harnessing the bounty in our rivers and below the ground. It was only in the 1990s that serious questions began to be raised on our understanding and approach to rivers.

This collection of essays, all previously published in the *Economic and Political Weekly* between 1990 and 2014, reflects the multi-dimensional, multi-disciplinary character of water and spans hydrogeology, sociology, economics, political science, geography, history, meteorology, statistics, public policy, energy and ecology.

The essays are arranged thematically and chronologically: Water Resource Development and Management, Historical Perspectives, Social and Political Dimensions, Economic Concerns, and Water Policy.

With detailing of the huge diversity of concerns and points of departure, *Water: Growing Understanding, Emerging Perspectives* will be invaluable to students and scholars of sociology, economics, political science, geography, ecology and public policy.

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