

POLICY BRIEF 1

Kerosene subsidies in India: The status quo, challenges and the emerging path to reform.

This Policy Brief examines the current system of kerosene subsidies in India, the key issues facing this system and the implications of kerosene subsidies for the dissemination of clean, alternative off-grid solar lighting solutions. It is one of a series of three policy briefs examining the links between the use of kerosene fuel and off-grid solar applications for lighting in rural India.

1. AN OVERVIEW OF THE KEROSENE SUBSIDY SYSTEM

Kerosene consumption is high in India, accounting for 15 percent of global consumption. Subsidised kerosene sold through the public distribution system (PDS) remains a primary source of lighting for many rural households and, to a lesser extent, cooking for urban and peri-urban households. Kerosene subsidies impose a burden on the government's finances, in FY 2014-15 total kerosene subsidies amounted to INR 24,799 crore representing 34.2 per cent of total fuel subsidies (MoPNG, 2015b). Despite widespread use, kerosene subsidies have been at the centre of energy policy debates for many years due to the intrinsic problems with kerosene use itself and the inefficiencies in kerosene distribution, which are both examined in detail below.

Key Facts on Subsidised Kerosene

- India consumes high amounts of kerosene, nearly 15% of the global kerosene consumption
- 43 per cent of rural households use kerosene as their primary lighting source (Census 2011)
- 0.7 per cent of these households who use kerosene as a primary cooking fuel (Census 2011)

Kerosene Subsidy Distribution

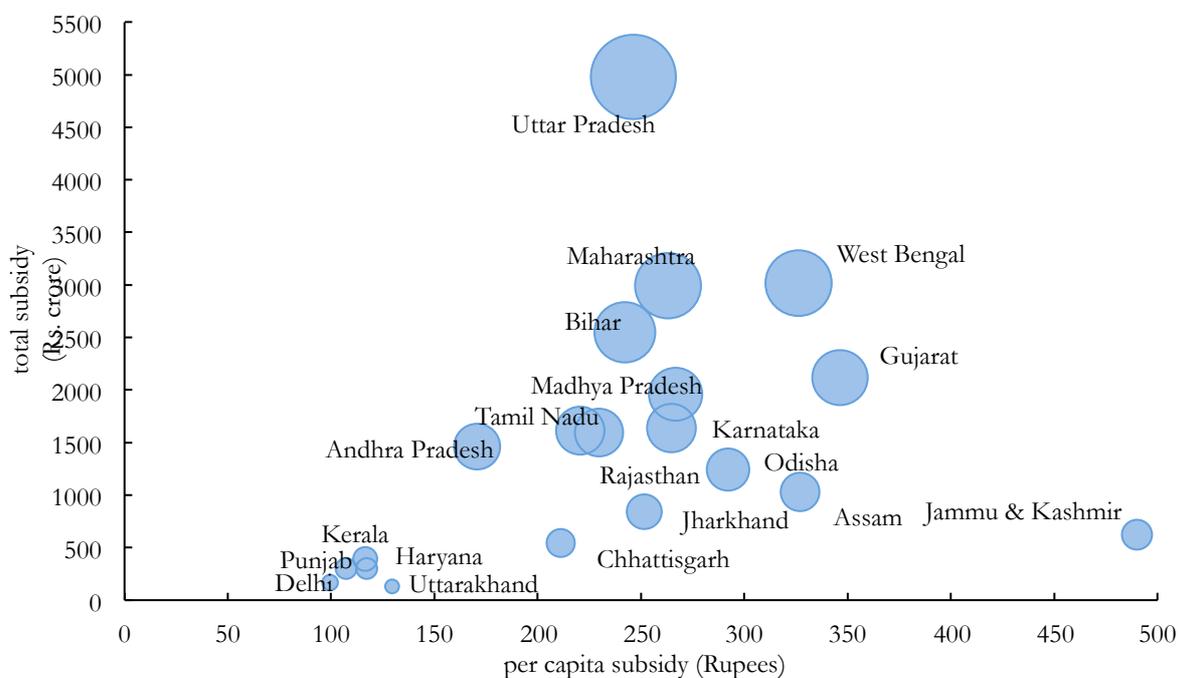
Kerosene is allocated to states based on a range of criteria by the Ministry of Petroleum and Natural Gas (MoPNG) and is released on a quarterly basis. To control the expenditure on kerosene subsidies, the central government began reducing the allocation¹ of kerosene to

different states under the PDS scheme. With progress in electrification in rural India, the consumption of kerosene by households has itself naturally fallen².

The kerosene distributed to states is then further distributed through a nationwide system of predominantly third-party run Fair Price Shops (FPS) (administered at the state level) through which the central and state governments distribute subsidized food, kerosene and other commodities on the basis of household ration card allocations.

A vast amount of PDS kerosene is lost to leakage. Across rural and urban populations, the bottom 20 per cent of households use similar proportions of total PDS kerosene allocations, with lighting being the predominant use of kerosene in rural India and cooking in urban areas. *While kerosene subsidies are designed to protect the poorest, subsidies are largely ineffective as a social protection mechanism.*

Figure 1: Total and per capita kerosene subsidy by state (2013-14)



In 2013-14, per capita kerosene subsidies were slightly higher for most states and Union Territories (UT) in comparison to the previous financial year, reflecting in part the administrative redistribution of total kerosene subsidy expenditure (with states such as Tamil Nadu and Maharashtra seeing significant reduction in total kerosene allocations). Other remotely located regions with lower household electrification rates continue to receive large shares of total kerosene subsidies³.

The government has announced several initiatives aimed at reducing expenditure on kerosene subsidies. As discussed, in line with encouraging electrification rates in rural India, the government plans to reduce kerosene allocation to villages that have been categorized as ‘electrified’. According to the Central Electricity Authority (CEA), 97.5 per cent of all villages are deemed electrified (CEA, 2016). However, a village is deemed electrified if only 10 per

cent of the households in the village have an electricity connection. Indeed, this does not take into consideration the quality and duration of electricity supply (especially in evening hours), which determine the reliance of households on kerosene for their lighting needs. Analysis by CEEW suggests that half of the electrified households across six states surveyed receive electricity supply for three hours or less in the evening (CEEW, 2015).

Another initiative by the Government in this direction is to change kerosene subsidy delivery from in-kind subsidies (i.e., sale of low cost fuel) to cash transfers to consumers for kerosene purchase, in the context of market pricing of kerosene by PDS distributors. This planned 'direct benefit transfer' approach mimics a similar program for delivery of LPG subsidies the (DBTL or PAHAL program), which has become the world's largest cash transfer. These schemes aim to reduce leakage by removing retail dual pricing of fuels and thereby the incentive for divergence. The government has launched the scheme in 40 districts across 9 states since 1 April 2016 (Business Standard, 2016). The costs and benefits of these cash transfer systems will be discussed in detail in Policy Brief 3.

Key Challenges in PDS Distribution

- Lost to leakage: Approximately 45 per cent of PDS kerosene ends up in the black market
- Inefficient Targeting: The bottom 20 per cent of households get only 14 per cent of the allocated kerosene share in rural India
- Most of the kerosene is received by the non-beneficiaries:
 - In rural India, half of the subsidized kerosene goes to the bottom 60 per cent of the rural population, with a large share also accruing to middle-income households (i.e., income deciles 4–6).
 - In urban India: the bottom 40 per cent of the population consumes about 57 per cent of allocated PDS kerosene
- Reduction in allocation of kerosene increases hardships for households which are not yet electrified or that receive electricity supply for only 3 to 4 hours a day

2. IMPACTS OF A DEEPLY FLAWED KEROSENE SUBSIDY SYSTEM

Kerosene subsidies are expensive and very often wasteful. Much of the subsidised fuel does not actually reach the intended consumers but is illegally diverted; many consumers who are eligible to consume subsidised fuel are unable to access the fuel; and the consumption of kerosene is associated with negative health and safety impacts.

Understanding Leakage and divergence

PDS kerosene leakages¹ occur as a result of a number of factors, but these are most often the result of corruption within the supply chain and especially related to the price incentive to use subsidised kerosene to adulterate diesel for self consumption or reselling in the market at a higher price. *Kerosene divergence directly impacts public finances. In 2011-12⁴,*

¹Leakages in the PDS system can be defined as the difference between the supply by the central agencies to the states and union territories (also called off-take) and the demand by households (or consumption by households) (Gulati & Saini, 2015, p. 4).

leakages approximately cost INR 8,370 crore (US\$ 1.2 billion), a tremendous waste of public finances that could have been used elsewhere. If divergence is not checked, then states⁵ will continue to lose precious public finances.

As discussed, a direct benefits transfer program for kerosene will be piloted in 40 districts in India with the aim of reducing leakage and divergence within the PDS kerosene system. Although largely successful for LPG, it is difficult to assess the likely effectiveness of this initiative; a prospect which is complicated by the antiquated and dispersed nature of the PDS system itself.

Access to Kerosene

Eligible households are not always able to access their allocated PDS kerosene for several reasons – they may not have BPL (Below the Poverty Line) ration cards, or even if they possess a ration card they have been denied access to it by the FPS (Fair Price Shops) because of shortages and restrictions on availability. In these cases, households are forced to purchase kerosene on the black market. Reducing the allocation of PDS kerosene risks reducing supply and forcing more consumers to consume black market fuels. Black market kerosene consumption is not captured by NSS surveys so the extent of eligible consumers relying on the black market is not currently reflected in official statistics.

When households purchase kerosene at higher prices from the black market (non-PDS) it *impacts their household budget*. The use of and dependence on black market kerosene, varies significantly across states. According to National Sample Survey (NSS) data, a very high proportion of rural households consume non-PDS kerosene in the north-east states such as Manipur (61 per cent of households), Assam (50 per cent), Nagaland (39 per cent), as well as Jharkhand (54 per cent) and Bihar (39 per cent). About 12 per cent of households in India depend entirely on non-PDS kerosene (CEEW, 2016).

Even when consumers are able to access kerosene it may come at a high cost in terms of time (GSI, 2010). Consumers may have to travel long distances on a monthly basis to FPS shops in rural areas, spend significant periods queuing, and risk missing out altogether if kerosene supplies are exhausted. FPS owners have been found to exploit rent seeking opportunities, between 2011 to 2013, 92 cases of irregularities – diversion of PDS kerosene for black marketing, leakages, adulteration etc. lead to the cancellation of licenses of kerosene dealers (GSI, 2013).

Aside from the deep flaws in the PDS kerosene subsidy system, kerosene use itself has widely documented negative externalities for the health, opportunities and lifestyle of users, as well as for the environment. These negative impacts will be discussed in more detail in Policy Brief 2.

Key Impacts of Kerosene Subsidy

- Kerosene leakage causes loss to public finances that could have benefited the poor
- Poor households budgets are impacted when they purchase non-PDS (black market) kerosene
- Households have to bear hardships and time loss to collect kerosene from the FPS
- Kerosene causes respiratory illnesses among women and children who use kerosene for cooking

3. ALTERNATIVES TO KEROSENE: SOLAR OFF-GRID SOLUTIONS

Given the serious negative externalities and wastefulness involved in kerosene subsidization, there is an urgent need for forward-looking policies that helps to spur a transition from the use of kerosene in both lighting and cooking (Morris et al 2006, CEEW 2015). In terms of lighting, solar lanterns and solar home systems exist as clean, increasingly affordable alternatives to kerosene. Solar lights not only illuminate homes, they improve educational opportunities, health, savings, welfare and safety, while entailing large environmental benefits. At the same time, a flourishing off-grid solar sector creates rural jobs and enterprises (Solar Aid, 2015).

The following part of this brief sets out a series of cost comparisons between the use of subsidised kerosene and a range of small solar technologies.

Although household consumption is sometimes higher, monthly allocations of PDS kerosene is 3 liters per household, with the rest of monthly household demand obtained from the black market at higher prices. Evidence suggests that that households using the entry level lanterns with six hour lighting capacity save 2 litres of kerosene consumption per month. On the other hand, households using mid- and high-end lantern technologies with 9 hour lighting capacity save 3 litres of kerosene consumption per month (CEEW, 2016).

There are options of how solar lanterns can be financed to make them more accessible and affordable for those households keen on shifting from kerosene to solar based lighting. Such a financing solution could involve an EMI (equated monthly instalment) with banks or other financial institutions providing the appropriate support.

Detailed cost calculations (available in the annexure) reveal that at the current level of kerosene subsidies, household expenditure on entry-level solar lighting system is only marginally lower than that on kerosene. If kerosene subsidies are removed and households shift from kerosene to entry-level solar products, households save INR 760 over 1.5 years (approximately USD 12) (or 150 per cent of the capital cost of an entry-level lantern). For both mid-level and high-level systems, expenditure is significantly greater than on kerosene over the two-year life of the systems in the case where kerosene subsidies are maintained. For mid-level systems, even if kerosene subsidies are halved, households make either very small savings over the life of the product by switching to solar, or incur additional

expenditure of INR 294 (USD 25) in the case where investments in these solar applications are financed.

In the case where kerosene subsidies are removed, households with mid-level systems make significant savings by switching to solar over two years. For high-level systems, the economics are more problematic for solar. In all kerosene subsidy scenarios, households with high-level systems incur additional expenditure resulting from their investment in solar compared with the use of kerosene, except when kerosene subsidies are zero and systems are paid for upfront, in which case they make a small saving. Given current levels of kerosene subsidies, households incur additional expenditure of INR 1688 (USD 27) over two years when systems are financed and INR 1248 (USD 20) when systems are paid for upfront, which respectively equate to 140 per cent and 110 per cent on top of expected kerosene expenditure over two years.

Key Facts on Solar Off Grid Solutions

- The government needs to provide alternative options like solar off grid lighting products at affordable prices for the households which are unable to tap the benefits of electrification and DBT-Kerosene.
- The continuation of kerosene subsidies reduces the competitiveness of solar off grid solutions and discourage households from switching fuels
- When comparing household expenditure on lighting, if kerosene subsidies are removed, households spend slightly more on subsidised kerosene than on entry level solar lanterns
- Hence providing cost assistance for poor households to access entry level solar products can help them save money on lighting expenditure
- Both mid-level and high level solar lighting systems have higher expenditure when compared to expenditure on subsidised kerosene
- Households can be encouraged to switch away from kerosene lighting to solar based systems by re-directing kerosene subsidies towards financing entry level solar products

4. CONCLUSIONS AND THE PATH TO REFORM

The analysis above demonstrates a clear linkage between kerosene subsidy reform and the cost competitiveness of off-grid solar alternatives. Kerosene subsidy reform is crucial to stimulate a large-scale transition toward solar lighting in rural India that replaces kerosene use. There is much that governments at the central and state levels can do to promote this process of reform. This includes:

Improving Kerosene Distribution

45% of the kerosene is lost to the black market, the central government has plans to continuously decrease allocation of kerosene to various states. The central government also believes by not checking leakages the product's effectiveness as a strategic tool to reduce poverty is lost. It also reduces the government's finances that could have been used for other social welfare schemes. Therefore, the central government is continuing with its policy to

gradually decrease the size of kerosene subsidies through continued year-on-year reductions of PDS kerosene allocations to states.

To reduce leakages, the central government is moving towards direct benefits transfer for most welfare schemes. By effectively implementing a direct benefit transfer program for kerosene, while being aware of the risk of beneficiary exclusion of this payments model, the government can improve the effectiveness of kerosene subsidy distribution so as to reduce leakage and divergence. Legislators from different state governments can assist by piloting the direct benefits transfer scheme in their respective constituencies.

Improving Targeting of Kerosene Subsidies

The Economic Survey 2015-16 estimates that nearly 50% of the kerosene is consumed by the well off. Hence there is an urgent need to improve targeting of kerosene subsidies so they reach the poorest households.

Some state governments have experimented with eligibility criteria (for e.g. those who do not have LPG connections or are BPL (below poverty line) households etc.) to restrict beneficiaries of kerosene subsidies. By restricting kerosene subsidies to poor households, the real beneficiaries can be reached.

Encouraging Cities to Reduce Kerosene Consumption

State governments can help residents of cities from migrating away from kerosene consumption for cooking. Initiatives to replace kerosene use for cooking with LPG, through Kerosene Free programs have been successful in Delhi and Chandigarh. Reducing the reliance of certain households on kerosene for cooking implies that the government can undertake kerosene subsidy reform without the risk of depriving these households of cooking fuel.

Gradual Pricing Reform

Similar to the diesel pricing reform, that increased one rupee every month, undertaking gradual price increases, if necessary, can make the marginal cost offering of solar application more attractive. Despite rising incomes in rural areas of India, PDS kerosene prices have decreased in real terms since the end of the Automatic Pricing Mechanism era, making price reform possible and, indeed, overdue.

However, kerosene subsidy reform is an intrinsically difficult process. In the absence of affordable and widely available lighting alternatives, rapid kerosene subsidy reform risks depriving the poorest households in India of an important social benefit. Further, the political economy challenges of kerosene subsidy reform are significant. There are considerable vested interests in the maintenance of kerosene subsidies, including the kerosene dealer and fair price shop lobby, which are large and powerful. Kerosene subsidy reform is therefore likely to be a difficult and drawn out process.

Encouraging Solar Off Grid Solutions

Kerosene subsidy reform is impeded by the current lack of affordable, widely available off-grid solar lighting alternatives (while kerosene subsidies themselves constrain solar market

development). In tandem with efforts towards kerosene subsidy reform, government policy should increasingly focus on tackling the barriers to greater off-grid solar penetration, and in particular the financial and cost barriers that exist. The other policy briefs in this series will examine this issue in detail, setting out a suite of innovative policy solutions that can be implemented to this end.

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ANNEXURE

¹From fiscal year (FY) 2009/10 onwards, total PDS allocation has fallen significantly with annual decline of 7.9 per cent, 14 per cent, 9 per cent and 1.28 per cent in 2011-12, 2012-13, 2013-14 and 2014-15 respectively (Clarke, 2014) (MoPNG, 2015c).

²Total kerosene consumption has fallen from 10.2 million metric tonnes in FY 2003/04 to 8.97 million metric tons in FY 2014/15 (MoPNG, 2015c).

³For example, Sikkim in the northeast remained the highest per capita, per annum recipient of kerosene subsidies (INR 770), followed by the islands of Lakshadweep (INR 660) and Andaman and Nicobar (INR 559). Among major states, Jammu and Kashmir, with low household electrification rates, remained the largest recipient (INR 498), followed by Gujarat (INR 371), West Bengal (INR 351) and Assam (INR 350). Reflecting its continued phase-out of kerosene supply, Delhi remained the lowest per capita recipient (INR 23), followed by Punjab (INR 106), Haryana (INR 117) and Kerala (INR 120) (Clarke, 2014).

⁴The national average for PDS kerosene leakage is estimated to be 45 per cent based on data from 2011-12 (Gupta, 2014). The Indian Government's Economic Survey also estimates that 41 per cent of the PDS kerosene was lost to leakages in 2011-12 (GoI, 2015, p. 54).

⁵Leakage rates are highest in the north-eastern states. For example, leakage in Nagaland is estimated to be 97 per cent of all subsidised kerosene, 84 per cent in Manipur, 80 per cent in Sikkim, 76 per cent in Arunachal Pradesh, and 70 per cent in Meghalaya. In terms of volume, the PDS leakages are the largest in states which have the largest allocations. By volume the greatest leakage is in Uttar Pradesh, West Bengal, Gujarat and Maharashtra. It is not clear that reducing PDS kerosene allocations to states will reduce leakage. Indeed, it is quite possible that if similar volumes continue to be diverted as allocations decrease then the rate of leakage may actually increase.

Cost comparison assumptions

In the most recent financial year, PDS kerosene retailed at a fixed price of INR 16 (US\$ 0.23) per litre² relative to an average total cost of INR 35 (US\$ 0.51)³, representing a subsidy of INR 19 (US\$ 0.28) per litre (or approximately 54.2 per cent of total cost).

To assess the economic viability of solar lighting products, three solar lantern types are (entry-level, mid-level and high-level) are assessed⁴. An entry level product has 25 lumens, a lifetime of 1.5 years, and provides six hours of lighting per day with cost of INR 500 (US\$ 7.2). A mid-segment product has 120 lumens, a lifetime of 2 years, and provides nine hours of light per day, with cost of INR 1,800 (US\$26). The high segment product has 160 lumens, rate of 12 per cent per annum (CEEW, 2016). It should be noted that the product lifetimes described above are conservative estimates (often lanterns last longer than 1.5 or

²Based on the current price in November – December 2015 in most states.

³Mean of the median values of NSS and CEEW data.

⁴Information on entry-level, mid-level and high-level products is available at <https://www.greenlightplanet.com/shop/pro-all-night/>

two years respectively) and that the phone-charging capacity of high-level products is a significant source of additional value for households with this technology. In any case, the analysis below compares the cash outflows on kerosene (1.5 years of kerosene consumption for entry level product and 2 years for mid and high level product) to that for each solar alternative, respectively.

Considering total the kerosene consumption of rural and urban households for lighting, and after taking into account leakage, the Indian Government annually spends INR 17,500 crore (US\$2.55billion) to provide subsidised lighting in India (calculated based on MoPNG, 2015c). This equates to the market price for 350 million, 97 million or 73 million entry level, mid-level, and high level lighting systems respectively. However, if no leakage is considered, the government annually expenditure is INR 9,611 crore (US\$1.4billion), which equals the market value of 192 million, 53 million and 40 million entry level, mid-level, and high-level solar lighting systems respectively.

Cost comparisons across three technologies

With this in mind, three kerosene subsidy scenarios are examined in the cost comparisons below:

- Fullsubsidy: the existing level of subsidised kerosene allocation to household is maintained (3 litre allocation);
- Fifty per centsubsidy: subsidised kerosene allocations are reduced by half (1.5 litre allocation);
- Zero subsidy: households pay market price for kerosene.

Further, for mid-level and high-level lanterns, two financing options are examined:

- Without Equated Monthly Instalment (EMI): upfront costs are borne directly by the households;
- With EMI: upfront costs are financed over two periods from banks/financial institutions at 12 per cent interest per annum.

Based on these inputs, the equivalent household expenditure on kerosene is calculated (given different subsidization scenarios) in comparison to expenditure on entry-level, mid-level and high-end solar lantern products (with different financing options) over the life of these products, and the net savings from switching to solar over the life of the product is computed. Given the short periods involved, discount rates are not applied to future expenditure and savings streams, however it should be noted that poor households have relatively high discount rates on streams of future savings. The results of these cost comparisons are striking.

Table 1: Kerosene vs. entry-level lantern expenditure (1.5 years) (INR)

	Full Subsidy	50% Subsidy	Zero Subsidy
Kerosene expenditure	576	747	1260
Solar expenditure	500	500	500
Net savings	76	247	760

Table 2: Kerosene vs. mid-level lantern expenditure (2 years)(INR)

	Full Subsidy		50% Subsidy		Zero Subsidy	
	EMI	No EMI	EMI	No EMI	EMI	No EMI
Kerosene expenditure	1152	1152	1836	1836	2520	2520
Solar expenditure	2130	1800	2130	1800	2130	1800
Net savings	(978)	(648)	(294)	36	390	720

Table 3: Kerosene vs. high-level lantern expenditure (2 years) (INR)

	Full Subsidy		50% Subsidy		Zero Subsidy	
	EMI	No EMI	EMI	No EMI	EMI	No EMI
Kerosene expenditure	1152	1152	1836	1836	2520	2520
Solar expenditure	2840	2400	2840	2400	2840	2400
Net savings	(1688)	(1248)	(1004)	(564)	(320)	120



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Head Office

111 Lombard Avenue, Suite 325, Winnipeg, Manitoba, Canada R3B 0T4
Tel: +1 (204) 958-7700 | Fax: +1 (204) 958-7710 | Website: www.iisd.org



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Climate Parliament

21, The Cliff
Brighton
East Sussex
BN2 5RF
United Kingdom
info@climateparl.net