

# Fuel Subsidy Reform and Green Taxes: Can Digital Technologies Improve State Capacity and Effectiveness?

**Alan Gelb and Anit Mukherjee**

## Abstract

Reforming inefficient and inequitable energy subsidies continues to be an important priority for policymakers as does instituting “green taxes” to reduce carbon emissions. Simply increasing energy prices will have adverse impact on poorer consumers, who may spend substantial budget shares on energy and energy-intensive products even though the rich typically appropriate more of the price subsidy. Equitable pricing reforms therefore need to be accompanied by programs to transfer compensation: depending on the situation, this can be targeted or universal. Successful reforms require measures to raise awareness of the subsidies and the problems they cause, effective dissemination of the reform to the population, and rapid feedback loops to facilitate mid-course corrections. Digital technology, including for unique identification and payments, as well as general communications, can help build government capacity to undertake such reforms and respond to changes in fuel markets. The paper outlines the use of digital technology, drawing on four country cases. The technology is only a mechanism; it does not, in itself, create the political drive and constituency to push reform forward. However, it can be employed in a number of ways to increase the prospects for successful and sustainable reform.

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## Contents

1. Introduction .....	1
2. Why subsidies—and sometimes reforms? .....	4
2.1 Why subsidies? .....	4
2.2 Why reforms? .....	5
2.3 Subsidy reform in the context of climate change: towards a global consensus for carbon pricing and ‘green taxes’ .....	7
3. Components of reform .....	9
4. Country cases: Contribution of digital technology in fuel subsidy reform .....	12
4.1 Bolivia: capability without reform .....	12
4.2 Nigeria: reform effort without capability? .....	16
4.3 Iran: building on capacity to reform .....	19
4.4 India: the reform of the LPG system .....	23
5. Conclusion .....	29
References .....	32

# 1. Introduction

Reforming inefficient and inequitable energy subsidies continues to be an important priority for policymakers as does instituting “green taxes” to reduce carbon emissions. In 2015, fossil fuel subsidies, defined as fuel consumption times the gap between existing and efficient prices (including environmental costs), touched \$4.7 trillion, nearly 6.3 percent of global GDP (Coady et.al. 2019). Underpricing of local air pollution constitutes half of this amount, and accounting for global warming contributes another quarter of the total subsidy. IMF also estimates that efficient fossil fuel pricing in 2015 through the introduction of “green taxes”, for example, would have lowered global carbon emissions by 28 percent while increasing government revenues by 3.8 percent at the same time.

These aggregate numbers point to the scale of the challenge faced by governments as they embark on a process of rationalization, reallocation and redistribution of energy subsidies, including to encourage clean, renewable energy. But a single number for energy subsidies, significant as it might be, does not fully reflect the complexity of the politics, policies and programs that determine the allocation and distribution of energy subsidies for individual countries, as well as the global aggregates. Global priorities and realities within countries often diverge making it difficult to forge a consensus on a set of policy measures that would guide the process of reforms.

At the country level, energy subsidy reform is complex, not least because of the distributional implications. These are recognized in Target 12c of the Sustainable Development Goals:

Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities.

Designing, communicating, coordinating and implementing a reform agenda that enables governments to move towards efficient pricing<sup>1</sup> with equity requires political will, administrative acumen and technical capacity, including the feedback mechanisms to enable the calibration of measures through unexpected shocks. What may be politically feasible may not be possible to administer effectively. Conversely, reforms that are both desirable and within the capacity of the state to implement often need to deal with both political and popular opposition. Policymakers need to strike a delicate balance between competing priorities and mitigating actions that will enable them to move to a solution that is both more efficient and more equitable.

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<sup>1</sup> The term “efficient prices” is used to indicate prices that take into account the externalities generated by consumption of a commodity. Efficient prices will tend to exceed market prices for commodities with negative externalities and to fall below them when externalities are positive.

There is already a large literature on the need to reform energy subsidies and the design and implementation of programs to address them, including many country-level cases.<sup>2</sup> This paper therefore has no need to overview the entire area. Our objective is more focused: *to consider how countries can incorporate digital technology, notably the combination of digital ID and payments, including through mobile technology, to help reform their energy subsidies.* In particular, we focus on the role of digitalization in the design of mechanisms to improve both the efficiency and equity of budgetary or economic subsidies, and how it can help to mitigate some of the more difficult problems associated with moving to market pricing for fuels, especially petroleum and natural gas.<sup>3</sup> We build on recent experience to address the roles that new digital platforms can play in improving state capacity to design policies, implement programs and mitigate the impact of the reforms, especially on the poor. These considerations apply similarly to carbon pricing reforms that give rise to the need to impose “green fuel taxes”, which will be more or less quantitatively significant depending on the level of carbon taxes.

Digital technologies, broadly defined, have become ubiquitous across the world and almost all governments are adopting them at a rapid pace. Digital transformation can help countries to consider a wider array of policies than would have been possible to implement otherwise. In the case of fuel subsidies, digitalization of public expenditure management, including payments, can improve budget reporting and forecasts and increase transparency on the use of public resources (Cangiano, Gelb and Godwin-Gruen 2017). Digital communication tools can help governments to raise awareness of subsidies, to explain the need for reform, to build coalitions of support, to nudge consumer behavior and to monitor implementation. On the policy side, there can be huge gains from individualizing subsidies—shifting from distorting and inequitable price subsidies to direct transfers to individual beneficiaries—including by leveraging digital and mobile financial services that are growing at a rapid pace around the world. This approach is central to reforms that aim to conform to the aspiration of SDG Target 12c.

The transformation, from “traditional” to “digital” governance, can be conceptualized as an expansion of the “policy-possibility frontier (PPF2)”, a frontier setting out the best feasible set of trade-offs between the three broad objectives of efficiency, equity, and sustainability. The analogy is with the production-possibility frontier (PPF) is widely used in supply-side economic analysis to delineate the tradeoffs, at the margin, between providing various goods. Along the lines of the PPF, we can think of innovation as both shifting the best-practice PPF2 frontier outwards and enabling a government to move to an efficiency-equity-sustainability combination that is closer to the frontier.

Digitalization can help to expand the PPF2 frontier in several ways. For example, inefficient subsidies can be rationalized across different types of fuel with the use of a common digital

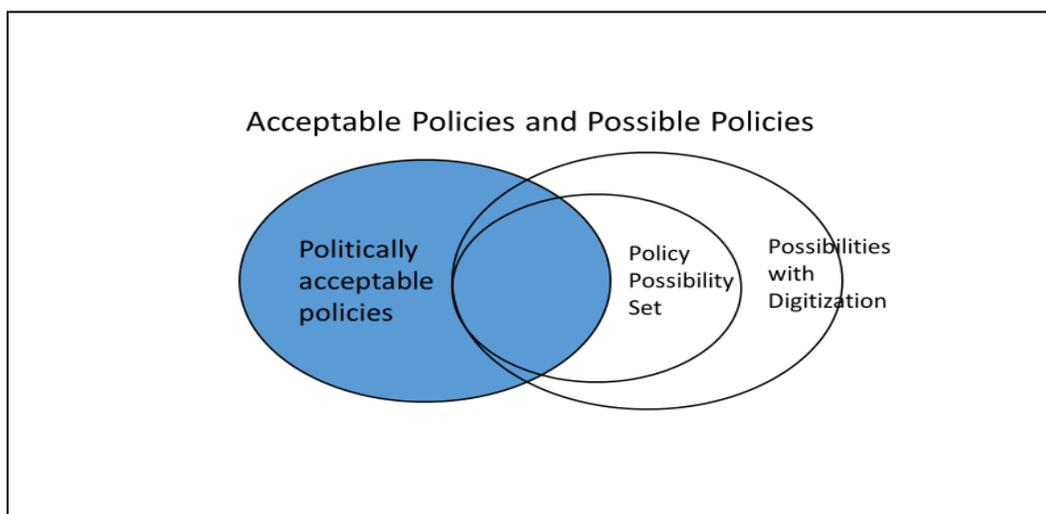
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<sup>2</sup> See for example, Clements, Coady, Fabrizio, Gupta and Alleyne (2013), Vagliasindi (2013), Inchauste and Victor (2017), Flochel and Goptu (2017) and Rentschler (2018)

<sup>3</sup> The term “economic subsidies” is used to describe subsidies generated by holding down prices to less than market levels that do not necessarily flow through the budget. These are common, particularly in fuel producing countries which mandate the domestic sale of fuels at less than border prices.

ID system—as in India, where the use of Aadhaar enables kerosene subsidies to be phased out for households receiving an LPG subsidy. Reforms can seek to increase the developmental impact of individualizing fuel subsidies by targeting them to women and using payments to drive financial inclusion, as one step on the long road towards economic parity with men. Of course, there is no guarantee that the *possibility* of more effective programs will *actually* result in improvements; there are many cases where the introduction of new technology with the potential to improve public administration has led to waste and inefficiency rather than progress (Dener, Watkins and Dorotinsky 2011, Gelb and Diofasi 2018).

**Figure 1: Digitalization and expansion of policy options**



More generally, even if they expand the “policy possibility frontier” for governments, new technologies might do little to induce reforms. As depicted in Figure 1, there may be little overlap between the set of policies made newly possible by technology and the set of policies supported by political and social priorities. Bolivia, the first country in the spectrum considered here, appears to have ample capacity to shift from price subsidies towards more equitable and efficient individualized direct transfers or dividend payments, but currently lacks the political and social drive to do so. Nigeria has a long record of attempting to reform fuel price subsidies but (among other limitations) has lacked the capacity to offer credible compensation. We argue that its recent “price modulation” reforms, undertaken in response to extreme fiscal pressure caused by low fuel export prices, are not likely to be sustainable if, and when, world energy prices recover. Iran, the third country in the spectrum, leveraged a strong civil registration and identification system as well as capacity in its banking system to implement a major reform. It did not necessarily use the latest in digital technology but did employ digital communications in a number of ways. India’s continuing reform of its household LPG subsidies demonstrates a multifaceted use of digital systems to move towards market pricing of cooking fuel through a voucher-type direct cash transfer mechanism, in a process that could be of interest to many other countries.

Moving towards digital programs raises a number of potential hurdles for governments. One is to ensure that the digital applications are inclusive. Even though the coverage of digital ID and financial systems is expanding rapidly, in many countries they still fall short of reaching the poorest. In some countries, many poor people will need to acquire more capacity to work effectively with such systems (Microsave 2017). Another challenge is to protect personal data and privacy with the transition towards digital societies and economies. The number of developing countries with data protection laws has been increasing, so that some 120 countries had such a framework in place by 2017, but many developing countries do not have data privacy laws and some others with laws lack the capacity to enforce them (Greenleaf 2017). This paper will not go further into such cautions, but it is important to flag them at the outset.

The rest of the paper is organized as follows. Section 2 summarizes the different motivations for countries to provide fuel subsidies and the rationale for reforms. Section 3 sets out a conceptual framework for the analysis and stages of a typical reform. Using these stages, Section 4 explores the potential or actual contribution of new digital platforms in the four countries. Section 5 concludes with a summary of lessons learnt and provides recommendations for effectively using digital systems for energy subsidy reforms going forward.

## **2. Why subsidies—and sometimes reforms?**

### **2.1 Why subsidies?**

Part of the complexity in the design of reforms reflects the multiple reasons that lead countries to subsidize energy. They may be offered to sustain producing sectors with political clout or to favor consumers more, or less, selectively. One interesting analysis of such factors at work is by Wheeler (2008), who investigates the forces influencing US congressional voting on proposed legislation to curb carbon emissions. At state level, he finds that both high dependence on the fossil fuel industry and low income are significant determinants of opposition to carbon taxes or quotas. Wheeler notes that carbon taxes are seen, by those opposing them, as elite efforts to impose a regressive tax on poorer members of society as well as detrimental to producing industries. The same rejection of carbon taxes as “elitist” policies of the rich inflicted on the struggling poorer classes has characterized the violent “Yellow Vest” protests that paralyzed Paris in late 2018.<sup>4</sup>

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<sup>4</sup> As reported by the Associated Press: *Macron, like French presidents before him, made environmental and energy decisions without explaining to the public how important they are and how their lives will change. He's also seen as the “president of the rich” — his first fiscal decision as president was scrapping a wealth tax. So hiking taxes on gasoline and diesel was seen as especially unfair to the working classes in the provinces who need cars to get to work and whose incomes have stagnated for years.* December 6, 2018. <https://www.apnews.com/8b9d12d3605b4f6fa989c5377393d547>

Figure 2: Gilet Jaune (Yellow Vest) protest in France, December 2018<sup>5</sup>



Source: Wikimedia Commons (CC BY 4.0)

Price subsidies may be provided to advance certain socio-economic and environmental priorities when no better alternatives exist. For example, India subsidizes cooking gas to improve women’s health and reduce reliance on firewood; other countries support on- or off-grid electricity for poor rural households, including to improve lighting to help children complete homework assignments. In these cases, when the particular energy source is seen as a “merit good”, it is not sufficient to simply replace a price subsidy with a general income transfer; some form of consumption incentive must be offered, perhaps through vouchers for lifeline consumption, up to a specified level. The size and distribution of the subsidy can then be controlled in a similar way as for a general cash transfer compensation.

## 2.2 Why reforms?

Given that fuel subsidies distort market prices, are often inequitable and impose a significant burden on government budgets, the literature on energy subsidies highlights several factors that can motivate reforms.

**First, to reduce allocative efficiency losses.** As is well documented, fuel price subsidies create distortions that lead to over-use, with accompanying adverse economic and environmental externalities. While demand elasticities may be low in the short run, they increase substantially over time, as older plant and vehicles can be replaced with more fuel-

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<sup>5</sup> [https://en.wikipedia.org/wiki/Yellow\\_vests\\_movement#/media/File:2018-12-01\\_14-37-38\\_manif-GJ-Belfort.jpg](https://en.wikipedia.org/wiki/Yellow_vests_movement#/media/File:2018-12-01_14-37-38_manif-GJ-Belfort.jpg)

efficient investments and as higher prices induce technology advances (see for example, Hossinger et al 2017).

**Second, to improve equity.** Price subsidies are typically mostly appropriated by richer groups who have higher levels of direct and indirect energy consumption. They are therefore regressive, supporting inequitable distribution of benefits across the population. At the same time, the direct and indirect dependence on fuels can be high in relative terms for the poorer segments of society. They may not own automobiles but may be dependent on diesel-fueled transport; they are also likely to use kerosene and other oil derivatives for cooking. As shown by the Bolivia case (below), even if the rich use far more energy per head, the weight of energy-intensive sectors in total consumption can be higher for the poor than for the rich. As noted by Inchauste and Lustig (2017), increasing consumption taxes will lower disposable income for the poor without a guarantee that they will benefit from any public services that might be funded. Especially in poor countries, there are few alternatives to the use of direct transfers to compensate for the reduction of subsidies or for higher indirect taxes.

**Third, to reduce leakages and increase transparency.** Subsidy systems are often opaque and complex, partly because opacity is in the interest of those benefiting from them. Complex subsidy systems give rise to a substantial bureaucracy with a powerful vested interest in maintaining the *status quo*. The implementation of Nigeria's fuel subsidies, for example, has itself resulted in massive losses due to diversion and corruption. Not all of the cost of the subsidies corresponds to gains by energy consumers. Reducing opacity requires that any alternative compensation mechanism be simpler and more transparent, with little bureaucratic discretion to allocate the subsidy to special interest groups (Atansah et.al., 2017).

**Fourth, for strategic reasons.** The threat of looming resource scarcity could provide a motive to reform, but in practice the prospect of reserve depletion has not usually been major reform driver. However, reforms to decrease the fuel-intensity of the economy sometimes been encouraged for strategic reasons—to reduce dependence on imports and improve self-sufficiency. Thus, the US Congress first established fuel economy standards (CAFE) in 1975, in response to the 1973 Arab oil embargo which threatened supplies. Faced with international sanctions, Iran's recent subsidy reforms were largely motivated by the need to improve energy efficiency.

**Fifth, in response to macroeconomic and fiscal pressure to reduce fuel subsidies.** A multi country review carried out by the IMF found that out of 21 country experiences of energy subsidy reform, 11 had an ongoing IMF-supported program during the reform episode and that in 10 of these countries this included conditionality on energy subsidy reforms. (Clements et.al.,2013).<sup>6</sup> Reforms are not always, or only, driven by macroeconomic pressures but they are frequently a major factor in pushing countries to reduce or eliminate subsidies. The stronger are such pressures, the higher will be the priority on eliminating

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<sup>6</sup> Conditionality on subsidy reform is fairly common in IMF programs. A survey of 212 programs in 106 countries by Gupta, Schena, and Yousefi (2018) finds such conditionality in 40 cases.

diversion and leakage. At the same time, there will be less fiscal space to offer compensatory measures to cushion the effect of higher prices on the population at large, increasing the premium on effective targeting.

Fiscal pressures evolve over the resource cycle depending on whether countries are energy importers or exporters. For energy importing countries, the rationale for raising domestic prices is stronger when international energy prices are high or rising in order to keep budgetary subsidies at an acceptable level. For energy exporters, the pressure to raise domestic prices can be higher when world prices are low or falling, due to budgetary pressure on the revenue side because of lower energy taxes. Policymakers in both sets of countries therefore face the difficult task of mitigating energy price shocks in the face of fiscal constraints with a limited set of instruments at their disposal and make reforms durable.

### **2.3 Subsidy reform in the context of climate change: towards a global consensus for carbon pricing and 'green taxes'**

Reducing fossil fuel consumption is at the heart of the solution to combat greenhouse gas emissions that causes global warming. As well as moving away from budgetary or (as in the case of energy exporters) economic price subsidies, fossil fuel pricing reforms can include the implementation of 'green taxes' in order to reduce carbon emissions and encourage a shift towards clean and renewable sources of energy. As noted in the 2016 Carbon Pricing Watch Report, there is as yet no uniform carbon pricing policy across countries, but a large number do price carbon emissions. As of May 1, 2016, 162 intended contributions to reducing emissions, representing 190 parties, had been submitted to the UNFCCC. Of these, more than 90 included proposals for emission trading systems, carbon taxes, and other carbon pricing initiatives.

The Report documents a wide range of CO<sub>2</sub> tax rates, with a few being very high and most at modest levels. Seventy-five percent of the covered emissions were at prices under \$10 per ton but quite a number exceeded this level by a substantial margin. At the same time, the UN Global Compact called for a minimum rate of \$100 per ton by 2020 to be on track for a temperature pathway of not more than 1.5–2.0 degrees of warming. Studies have suggested a wide range of tax rates and tax trajectories, with initial taxes increasing from around \$10 per ton to as much as \$100 per ton in the case of the modeling of the Carbon Tax Center.<sup>7</sup> In considering the distributional impact of green taxes and how to compensate for them, it is therefore reasonable to think about a potential carbon tax range of \$10 - \$100 per ton with a base scenario of around \$20.<sup>8</sup>

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<sup>7</sup> <https://www.carbontax.org/blog/2008/10/18/a-question-of-balance-finding-the-optimal-carbon-tax-rate/>

<sup>8</sup> The impact also depends, of course, on the share of emissions covered by a carbon tax regime. This can vary considerably; for the example of Canada, following the implementation of the carbon tax federal backstop on April 1, 2019, coverage in the provinces will range from a low of 47 per cent in Prince Edward Island to a high of 90 per cent in New Brunswick (Dobson, Winter and Boyd 2019).

Resources for the Future estimates that a tax of \$20 per ton adds about \$0.20 per gallon to gasoline prices (somewhat less than 10% of recent US retail prices) and \$1.00 per 1000 cubic feet for natural gas<sup>9</sup>. These increases are modest relative to the observed differences in fuel prices across countries and variations over time. A carbon tax at the upper end of the range would involve a tax of \$1.00 per gallon but even this falls well within the range of historically observed price variation. Prices for West Texas Crude, for example, peaked at \$122 per barrel in 1980, crashed as low as \$18 per barrel in 1998 then skyrocketed as high as \$160 per barrel in mid-2008, just before the global financial crisis. Across countries, on September 17, 2018, petrol prices ranged from a low of \$0.01 per liter in Venezuela to a high of \$2.17 in Hong Kong, with Norway and Iceland only a little lower. Natural gas prices vary a great deal too, being far lower in North America, which currently has a surplus of gas, than in Asia which has a deficit. The percentage increase in fuel prices resulting from any given level of green taxes will therefore vary a great deal across countries and over time, depending on the prevailing price of fuels.

Proposals to compensate consumers for higher fuel prices have outlined a number of possibilities. For the US, for example, Metcalfe (2007) and other studies have advocated using carbon tax revenues to reduce payroll taxes. A tax of \$17 per ton for the US is estimated to provide enough resources to eliminate the payroll tax on the first \$3,660 earned by each worker and would enable an average 11% reduction in payroll taxes, with greater percentage reductions for the lowest-paid workers. Such an approach could be considered for higher-income countries, but in low income countries payroll taxes are only levied on employees in formal sector occupations (and in some cases, only on public employees); these tend not to be among the poorer cohorts of society. As noted previously, uncompensated carbon taxes would involve a further levy on the monetary earnings of lower-income groups, even if most of the cost would be borne by higher-income deciles who spend more on fuels and fuel-intensive services. Direct financial transfers offer the only feasible way to insulate poor consumers from the impact of green taxes.

How large might such transfers be, and how do they compare with the “oil to cash” payments that have been advocated for fuel exporting countries? We can take the example of Bolivia which provides substantial fiscal and economic fuel subsidies to its citizens. Laserna (2018) estimates that domestic oil and gas prices are set at around 50% of border price levels and that the average implied subsidy per Bolivian household from this difference would be around \$300.<sup>10</sup> Adding a “green tax” of \$20 per ton of CO<sub>2</sub> to the world price to get an “efficient” reference price would increase the necessary compensation by around \$17 per head, to around \$360 for an average household. For an energy exporter like Bolivia, the effect of a green tax at this level would therefore not be too large relative to the average energy subsidy already received by the population.

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<sup>9</sup> <http://www.rff.org/blog/2017/calculating-various-fuel-prices-under-carbon-tax>

<sup>10</sup> This makes the simplifying assumption that the subsidy is divided among households, with none allocated to help firms adjust to the new price levels.

To offer other (rough) estimates, fossil fuels represent around 40% of total energy consumption for lower-income Sub-Saharan Africa. This is equivalent to around 70 gallons per head per year; green taxes of 20 cents per gallon would then amount to a uniform cost increase of \$14 per person per year, somewhat less than for Bolivia. Applying this cost increase to Tanzania, it would come to around \$70 per year for an average family. This is about the same as the level of compensation provided by the basic unconditional tranche of the TASAF PSSN program, although total transfers under this program can be considerably higher. A similar calculation for India suggests an average green tax cost increase of \$12.50 per head.<sup>11</sup> This level of compensation would be modest relative to central budgetary spending on India's large and complex system of social benefits and subsidies, which amounts to around \$60 per person.

The level of compensation required to return the proceeds of green taxes to people uniformly across all income groups is therefore not negligible. However, unless the carbon tax is raised to very high levels, is well within the range of social transfers already seen in many lower and middle-income countries. For modest carbon tax rates, the levels of compensation may not be sufficient to warrant introducing a separate compensation scheme, so that it might be more feasible to graft additional financing onto existing programs. For high carbon taxes and "oil to cash" reforms in producing countries that maintain deep price subsidies, the situation is different. The implied levels of uniform compensation are large enough to warrant a distinct "dividend" program, especially if the intention is to aim for uniform compensation than to build on existing targeted programs (Moss, Lambert and Majerowicz 2015).

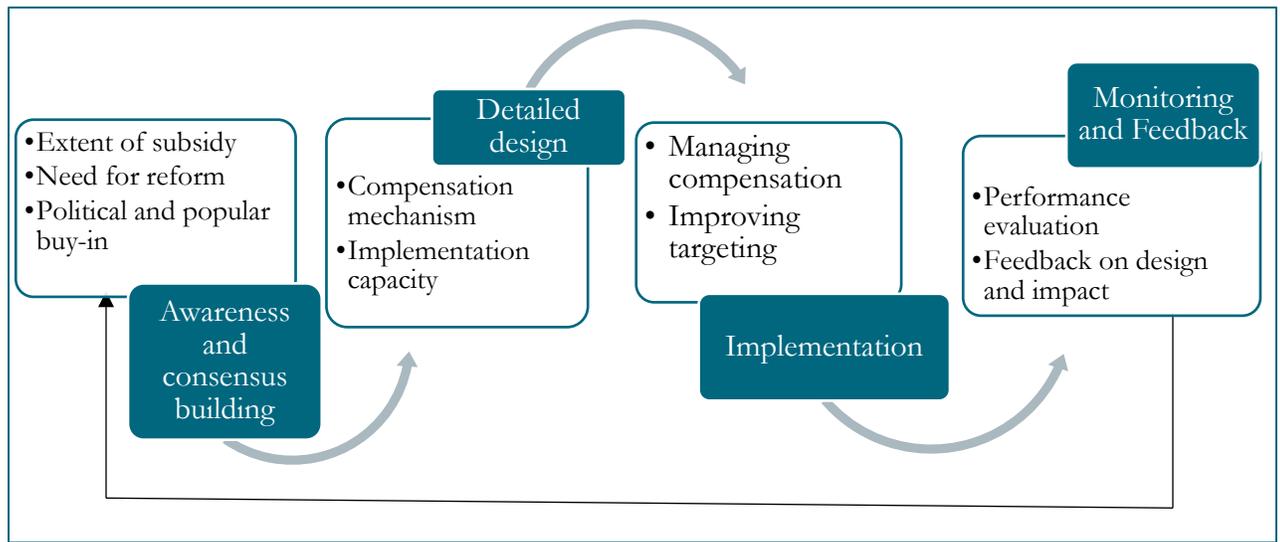
### **3. Components of reform**

Consistent with SDG12, the general pattern of reform will seek to shift from price subsidies towards individualized compensation, with degree of targeting depending on country conditions. While some studies introduce a complex representation of reform (Rentschler 2017), we break down the process into four components as represented in Figure 1. They are not strictly sequential since the reform process will involve some focus on all elements at any time and a constantly shifting emphasis between them.

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<sup>11</sup> Based on typical energy consumption levels: see <https://www.enerdata.net/publications/executive-briefing/world-energy-expenditures.html>

**Figure 3: Conceptual Framework for fuel subsidy reform**



***Raising awareness and building a consensus on subsidies and the need to reform them.*** At the initial stage, the formulation of a reform agenda is usually a technocratic process where experts are convened to recommend policies to address identified problems. Since subsidies are not always transparent, this early stage requires building an evidence base on their level, their allocation, the direct and indirect cost to the exchequer, and their impact, including on the distribution of public expenditure. Expert recommendations then need to be marketed to create buy-in from the political establishment and to be communicated effectively to the people—often difficult steps in the reform process.

Effective communication on the need for reform and its prospective impact can help mitigate both the political risk and the popular opposition that are common to almost all fuel subsidy reform initiatives. This is a key lesson emerging from the meta-analysis of country case studies (Clements et.al., 2013). Informational reforms—interventions intended to improve the state of information about subsidies designed with the popular perception in mind—can expand the political operating space and improve the probability of a successful reform agenda (Inchauste and Victor, 2017). Publicly available information can be used to compare domestic policies in a global context, thereby raising awareness of the magnitude of subsidies (or ‘subsidy salience’) and the consequences of inaction. Increased transparency of the magnitude of the subsidies and their socio-economic and environmental consequences (fuel shortages, inflationary pressures, pollution etc.) is necessary to build consensus and secure buy in from key stakeholders in the reform process, and to neutralize, or preferably win over, the beneficiaries of the current system.

***Designing components, including the envisaged compensation mechanism as an integral part of the reform process.*** This includes details of the scope of the reform, its management and accountability mechanisms, its speed and sequencing, and keeping in mind the capacity required to implement it at scale. These plans will often confront the weight of previously failed reform efforts; in many countries, there will be public memory of previous episodes of subsidy reform and their social and economic impact. Past experiences of

administrative mismanagement and personal hardship shape peoples' perception of the government's capacity to fulfill current promises. This places a premium on simplicity, even though it may be necessary to fine-tune the model over time.

The need for simplicity and credibility bears on the question of whether compensation should be through individual or socialized benefits. Political decisionmakers often justify subsidy reforms as necessary to improve fiscal management and promise improvements in infrastructure and social services, such as roads, public transport, education and health. But especially if capacity and governance is weak, such promises may not have much credibility in the eyes of the population. In contrast, a reform program based on individualizing the subsidy regime by instituting private payments directly to beneficiaries can be more transparent and inclusive by design and can also facilitate a clear accountability structure because transfers to well-identified beneficiaries are relatively easy to track. To the extent to which the transfer mechanisms also help progress towards other, easily-monitorable, goals—such as financial inclusion or more equitable compensation—they can help build the credibility of the reform.

***Targeting compensation and managing the distribution of benefits.*** In the real world, this extends beyond households to encompass energy-intensive sectors and enterprises that will need assistance to restructure in response to higher energy costs, or else to cushion closure. Around one third of the fiscal resources released by Iran's energy price reforms was dedicated to this purpose. On the household side, countries that are able to leverage broad, well-functioning, social protection systems benefit from having an essential building block in place, as do countries where there is already a high level of financial inclusion or the capacity to leverage payments to further roll out financial infrastructure. Countries have adopted different approaches towards targeting, with some, including both Iran and India, as discussed below, initially imposing weak, if any, restrictions on accessing compensation but later shifting towards tighter targeting. Targeting involves tradeoffs, between cost (including that of the targeting mechanism itself) and broad acceptability, and also transparency, unless the criteria for beneficiary selection are easily evident.

***Monitoring and tracking the program and its impact to ensure that problems in implementation are identified early.*** Centralizing information in a “war room” can help policymakers to undertake mid-course correction if needed, through tweaking or even redesigning the program in response to unexpected outcomes or shocks. Tracking implementation is a capacity intensive process, especially if the performance metrics involve collection and analysis of extensive datasets both at the administrative and individual levels. Moreover, demonstrating impact requires tracking process and outcome indicators, as well as budgetary savings and beneficiary perception of the reforms. Given increased popular awareness and scrutiny, the onus will be on the government to use data more effectively to maintain and increase support for the reform.

***Ensuring sustainability of the reforms.*** The success of any reform agenda relies on its sustainability. Reforms are often sequential rather than a one-off process; governments need to be flexible in terms of the transfer as well as its targeting mechanisms. This is particularly true for fuel, where volatile international markets make it difficult to manage subsidies within

a predictable fiscal envelope. Moving from generalized price subsidies towards individualized compensation and the use of digital systems offers governments more degrees of freedom to manage the distribution of any subsidy or compensation. Moreover, effective use of digital technology and communications provides an opportunity to implement “soft targeting” through moral suasion (or “nudges”), encouraging recipients to self-select out of the subsidy and increasing the probability that the reform process would be sustainable in the medium and long run.

## **4. Country cases: Contribution of digital technology in fuel subsidy reform**

Can digital technology contribute towards government’s capacity to implement reforms and so expand the Policy-Possibility Frontier? Will this be reflected in better policies? We consider these questions in the context of a spectrum of four countries, Bolivia, Nigeria, Iran and India. This spectrum of countries shows that having digital ID and payments is neither necessary nor sufficient for reform, but that they can be useful when other conditions are in place. We consider each of the cases in detail below.

### **4.1 Bolivia: capability without reform<sup>12</sup>**

#### **4.1.1 Country and reform context**

Bolivia, a landlocked South American country of 11 million people, has considerable oil reserves and very large natural gas reserves; it was an exporter of natural gas as early as the 1970s. As in many other energy producers, domestic fuel consumption is heavily subsidized. Prices are determined by political decisions guided by a nationalistic ethos that natural resources are collectively owned, and that the dividends from their extraction are the birthright of its citizens. Historically, this goal has been achieved by setting domestic prices at around half the level of FOB international prices; the fuel subsidies arise as a consequence of this price differential.

Over the last two decades, with rising fuel consumption Bolivia has become a net importer of gasoline, so that volatile world prices cause subsidies to pose a challenge for prudent fiscal management. Due to low domestic natural gas prices, demand has increased there too, from direct household use as well as from sectors, such as power, that use natural gas as an input. Bolivia has foregone potential export earnings and fiscal revenues, distributing the dividend from natural gas to its citizens through a universal and untargeted price subsidy. This, added to revenue foregone from the sale of domestic oil at border prices plus the budgetary subsidies on imported oil, constitutes a formidable energy subsidy. It was estimated at almost \$2.9 billion in 2013, very large for an economy of only \$31 billion. Another consequence has been the neglect of other, sustainable, sources of electricity, in particular hydro-power.

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<sup>12</sup> This section relies heavily on Laserna (2018).

Figure 4: Protests against natural gas exports in Bolivia, 2003



Bolivia has made efforts to rein in the subsidies. Following the global crisis and collapse of world energy prices, the government attempted to increase the price of gasoline by 73 percent in December 2010. The objective was to limit subsidies that had reached 10.5 percent of GDP in 2008.<sup>13</sup> Protests erupted across the country, forcing the government to quickly back down and restore the status quo. There has not been a reform episode since then, and the issue is no longer on the political agenda.

Bolivia does have experience of using fuel taxes to fund direct transfers. Taxes levied on the consumption of fuel support social safety net programs such as Renta Dignidad, an old age pension scheme, whose origins dates back to the 1997 Bonosol program. In 2016, \$422 million was distributed to 1.3 million beneficiaries through this program, which now covers all citizens older than 60 years of age. The scope of social transfers has been further expanded through new programs for pregnant mothers and school children, and these programs are also funded through fuel taxes. Recent evidence suggests that this aspect of Bolivia's redistributive policy has been pro-poor, resulting in a reduction of both poverty and inequality over the last decade and a half (Vargas and Garriga, 2015).

To implement these programs, Bolivia has been able to build on good capacity to identify its people, on widespread access to digital communications, and on a moderate level of financial inclusion. Biometric identification was introduced in a successful drive to register voters for the 2009 elections; this saw a major expansion in the rolls, with 5.2 million people enrolling to form the basis for a population register, including many in isolated communities. The coverage of the biometric national ID system is now almost universal for those above 18 years, the legal voting age in the country, and this is used to identify those receiving transfers.

Per the World Bank's FINDEX 2017 report, 54 percent of Bolivia's population age 15 and above have a financial account. This is about average for South American countries, where

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<sup>13</sup> President Evo Morales described them as "bleeding subsidies"

financial inclusion is relatively low compared to other regions at the similar levels of per capita GDP, but Bolivia is one of the stronger performers as it is among the poorer countries in the region.

Mobile coverage is extensive—over 90 percent of households have mobile phones, and mobile payment points are used to distribute Renta Dignidad transfers. In exceptional situations, custom disbursement arrangements prevail such as disbursement operated by the military in some very remote areas. This identification and payments architecture could readily be used to help to further reform fuel subsidies, but such initiatives have not been forthcoming since 2010. We can consider the potential for using Bolivia’s ID, communications and payments capacity to further individualize and reform subsidies.

#### **4.1.2 Awareness and consensus building**

Bolivia’s case shows that while digital identification and payment systems can be used as a tool to reform fuel subsidies, they are not necessarily the binding constraint. As in many other countries, the primary constraint is political. If fuel subsidies are equally divided among households, each is estimated to receive \$300 annually<sup>14</sup>. Based on consumption patterns, the distribution of the subsidy is highly unequal—families in the poorest decile received \$189 while those in the highest decile get nearly five times as much (\$971). Since most of the subsidy is not reflected in the budget, there is little public recognition of its magnitude and distribution, or of the potential value of reform to improve both efficiency and equity. As for other fuel exporters, high global energy prices reduce the pressure on government to undertake unpopular reforms. However, the long run consequences of Bolivia’s subsidy due to demand growth, the regressive nature of its distribution, and the volatility of international energy prices, suggests that reform needs to be high on the policy agenda.

A first step could therefore be to increase awareness of subsidies, or subsidy salience, among Bolivians. Prices posted for energy and for energy-intensive services such as transport—which factors large in Bolivia’s sparser regions—could be complemented with information on their subsidy component. India has done this, for example, in the marketing of subsidized fertilizers to raise awareness among farmers—the first stage in promoting a dialog on the over-use of fertilizers (Giri et al 2017) and for consumers purchasing LPG (below). Digital communications, including social media, could also be used to disseminate information and generate consensus in favor of the reforms.

#### **4.1.3 Reform design and compensatory transfer**

Bolivia’s populist philosophy, that everyone should share in the benefit of its natural resources, has been reflected in a policy of socialization—the oil and gas sectors were nationalized in 2006-- but without much detailed consideration of the distribution of benefits, which are at present provided largely through the subsidies. A prospective reform design therefore needs to address the issue of equity, especially if macroeconomic pressures

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<sup>14</sup> These estimate abstracts from the share of fuel subsidies that accrue to producers and that are not passed on, in some form, to domestic consumers. For more details, see Laserna 2018.

to reduce subsidies were to result in across-the-board increases in the administered prices of fuels. Implementing a credible compensatory mechanism should be relatively straightforward, drawing on Bolivia's largely successful system of social transfers. Per estimates quoted above, each family receives \$300 on average annually in fuel subsidies. If this amount were transferred uniformly, the poorest four deciles would receive more than the amount needed to cover the higher cost of energy.

Digitalization opens up further possibilities to calibrate the level of transfers and improve the efficiency of the targeting mechanism. Equity could be enhanced by assigning, say, half of the average subsidy as a universal transfer, while the remaining share is distributed to those below the poverty line (40 percent of the population in 2016).<sup>15</sup> Another approach could be to encourage higher-income groups to self-select out of the subsidy. As shown by the examples of Iran and India (below), this could be encouraged by effective communications and outreach initiative using both traditional and digital channels.

#### **4.1.4 Implementation**

As already noted, Bolivia already operates large scale social transfer systems that pay directly to beneficiaries—the elderly, expectant mothers and school children. In 2016, over 11 million transactions were performed to deliver Renta Dignidad alone. Beneficiaries were given the option of receiving it monthly, quarterly or annually, in electronic form that can be cashed-out at banks or at agents of mobile money providers. While data on the efficiency of the transfer mechanism or the ease of withdrawal is not readily available, Bolivia's delivery systems are of particular interest because of the challenge of its geography, with many remote communities.

#### **4.1.5 Monitoring and feedback**

One of the most important contributions of digital technologies to fuel subsidy reforms is its role in monitoring implementation and providing feedback to policymakers in almost real-time. With careful design of the transfer mechanism, it is possible to track uptake of subsidy at the individual level, including through leveraging existing delivery channels such as topping up payments for Renta Dignidad. Delivery data can be monitored against census and satellite-based population data to help identify difficult-to-reach populations and target services to them, ensuring access and increasing the reach of the subsidy transfer program as a whole. Another key factor is the continuous feedback made possible by digital systems, to help make mid-course corrections. This would be important in case Bolivia decides to individualize energy subsidies because of the need to be able to adjust to macroeconomic factors and world energy markets.

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<sup>15</sup> <https://data.worldbank.org/country/bolivia>

## 4.2 Nigeria: reform effort without capability?<sup>16</sup>

### 4.2.1 Country and reform context

Nigeria, the most populous country in Africa with a population of nearly 200 million, is a member of Organization of Petroleum Exporting Countries (OPEC). Although Nigeria contains 28.5 percent of Africa's crude oil reserves and produces 26 percent of the continent's oil, investments in domestic refining have lagged so that over 80 percent of gasoline had to be imported in 2011. In recent years Nigeria has come under severe fiscal stress as a result of declining global crude oil prices and political instability in the Niger delta, the main oil-producing area of the country. Volatile global prices, for both fuel exports and imports, create significant macroeconomic instability, including in the management of fuel subsidies, and present an ongoing challenge for a government with limited revenue-raising capacity.

Nigeria's fuel subsidy system is unusual for an energy exporter since it relies on fiscal revenues from exported crude oil to subsidize imports of refined products. The budgetary burden of the fuel subsidy regime reflects the government's pricing formula for gasoline, as mandated by the Nigerian Petroleum Products Pricing Regulatory Agency (PPPRA). The federal government sets a fixed pump price for gasoline and then pays the difference between this and PPPRA's open market price, which depends on the prices of global crude and refined petroleum imports. This price gap is the mechanism through which subsidies are provided. Corruption and malfeasance in the non-transparent administration of the subsidy program have often resulted in additional fiscal costs.

The fuel subsidy amounted to a record 4.1 percent of GDP in December 2011 and has generally remained above 3.5 percent of GDP until its recent decline. Its distribution has been inequitable, with the richest 20 percent of households receiving double the benefit of the bottom 20 percent (Soile and Mu, 2015). The problems are compounded by deadweight losses to the economy, including the smuggling of fuel out of the country, the undermining of the domestic refining industry, and opportunities for corruption in oil import contracts. Reform efforts have been sporadic and mostly ineffective, largely focused on changing the gasoline pricing formula without any effort to undertake structural reforms. In January 2012 the government announced the complete removal of subsidies in order to address the precarious state of public finances and the ballooning subsidy bill. Overnight, the price of gasoline more than doubled from \$0.46 to \$0.87 per liter, catching most Nigerians by surprise. This move was followed by two weeks of often violent protests, forcing the government to reinstate the subsidies though at a lower level.

To boost the popularity of the reforms, the government instituted the Subsidy Reinvestment and Empowerment Program (SURE-P) to increase budget allocations to social sectors, including through programs for maternal and child health, public works, vocational training and other initiatives. However, SURE-P did not offer transparent monetary compensation

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<sup>16</sup> This section is largely based on Onyekwena (2019)

for higher fuel charges. It suffered from a lack of credibility, and perceptions of corruption and mismanagement similar to those that reflected the problems with the fuel subsidy regime and with public spending in general. It was discontinued by the Buhari government as soon as it took office in May 2015, on a strong program of anti-corruption.

With the fall in global oil prices and under extreme fiscal pressure, in January 2016 the government shifted from price subsidies to ‘price modulation.’ This aims to eliminate price subsidies through periodic adjustment of domestic prices to reflect the cost of imported gasoline. Although not fully a market pricing mechanism, the program has had some initial support and success, helped by low global energy prices that both reduce the need for subsidies and constrain the ability for government to fund them. However, its long-term sustainability and effectiveness in reducing subsidies is yet to be seen.<sup>17</sup>

The state of Nigeria’s digital infrastructure reflects its lack of effective governance in other spheres. The country has struggled to roll out a national ID system under the auspices of the National Identity Management Commission (NIMC) set up by an Act of Parliament in 2007. Coverage is only about 10 percent, a problem compounded by the fact that it is one of over a dozen un-connected ID credentials used to access public and private services.<sup>18</sup> While mobile phone penetration has improved significantly and now stands at 83 percent, only 40 percent of Nigerians have access to an account in any financial institution. The lack of robust identification and payments capacity limits the scope for designing a credible direct transfer mechanism, especially in the context of weak governance systems and widespread popular perception of corruption and inefficiency.

#### **4.2.2 Awareness and consensus building**

Nigeria’s fuel subsidies have been the subject of intense political and popular debate for several decades. What sets the 2012 reform effort apart was the suddenness with which the price decontrol policy was implemented and the ‘searing anger’ that led to popular protests fueled by the spread of digital communications, especially mobile phones.<sup>19</sup> The “Occupy Nigeria” protests following the removal of fuel subsidy were largely organized by text messages and social media posts, eventually leading to a rollback of the reforms (Chilwa 2015).

Prominent public figures played an important role building consensus against the reforms through social media posts, especially Facebook and Twitter accounts followed by millions of Nigerians. YouTube videos spread virally through the internet making ‘OccupyNigeria’ a global movement.<sup>20</sup> As depicted in Figure 5, digital media also provided channels for venting frustration against the general dysfunction and corruption of the government, its inability to

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<sup>17</sup> There are already signs of a reversal in the 2019 budget  
<https://www.sunnewsonline.com/2019-budget-shocker-nigerians-query-fg-over-n305bn-fuel-subsidy-provision/>

<sup>18</sup> <http://documents.worldbank.org/curated/en/156111493234231522/pdf/114628-WP-68p-TheStateofIdentificationSystemsInAfricaASynthesisofIDDAssessments-PUBLIC.pdf>

<sup>19</sup> <https://www.cnn.com/2012/01/03/world/africa/nigeria-fuel-protest/index.html>

<sup>20</sup> <https://www.youtube.com/watch?v=Bqbd0xJXTk>

provide basic necessities such as roads, electricity, healthcare and education, with strong calls for mass protest movement against the reforms (Egbunike, 2015). Indeed, if the effect of higher fuel prices is simply to channel resources to a government that lacks spending accountability, it is not clear that reform is in the best interests of the population.

**Figure 5: Keyword analysis of Occupy Nigeria protests in social media and newspapers**

	Social Media								Newspapers					
	Blogs		Nairaland		Tweet		Facebook		Punch		Guardian		Tribune	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Dictatorship	9	4.1	0	0.0	9	1.1	2	1.7	12	2.3	12	2.5	26	6.3
Corruption	22	10.1	16	8.3	35	4.3	8	6.8	42	8.1	49	10.0	23	5.5
Excess Spending	15	6.9	9	4.7	23	2.8	9	7.6	27	5.2	32	6.6	4	1.0
Oppression	17	7.8	18	9.3	52	6.4	6	5.1	59	11.3	48	9.8	39	9.4
Poverty	29	13.3	10	5.2	16	2.0	16	13.6	50	9.6	64	13.1	59	14.2
Insensitivity	30	13.8	9	4.7	16	2.0	6	5.1	46	8.8	62	12.7	49	11.8
Foreign Influence	8	3.7	6	3.1	10	1.2	6	5.1	9	1.7	9	1.8	6	1.4
Opposition Party	6	2.8	0	0.0	1	0.1	1	0.8	20	3.8	8	1.6	19	4.6
Mass Movement	39	17.9	91	47.2	445	54.4	35	29.7	223	42.9	174	35.7	175	42.2
Generation Transfer	22	10.1	12	6.2	154	18.8	10	8.5	17	3.3	18	3.7	11	2.7
Revolution	12	5.5	8	4.1	10	1.2	1	0.8	11	2.1	7	1.4	3	0.7
Unity	9	4.1	14	7.3	47	5.7	18	15.3	4	0.8	5	1.0	1	0.2
Total	218	100.0	193	100.0	818	100.0	118	100.0	520	100.0	488	100.0	415	100.0

Source: Egbunike, 2015

The power of digital and social media was taken seriously by the Buhari government as it moved towards the policy of price modulation when it assumed charge in mid-2015, in the face of severe fiscal stress due to lower oil revenues. Opposition to the removal of fuel subsidy was muted, in part due to greater awareness and information on the extent of the fiscal crisis. The government used social and digital media to communicate the need to raise prices to check corruption in public expenditure on subsidies, something that was accepted as credible by the general population. This helped build a broad-based coalition that supported the reform—at least for a period—and mitigated the likelihood of a political and popular backlash against it (Atansah et.al., 2017).

#### 4.2.3 Reform design and compensatory transfer

Reforms focusing on eliminating price subsidies without a credible compensation mechanism to mitigate the impact are less likely to achieve their objectives. Nigeria's case illustrates the problems with the socialization of benefits of fuel subsidies - linking collective goods such as roads, health and education to a subsidy reform agenda—when there is low credibility in the capacity of state to deliver on its promises.

The Subsidy Reinvestment and Empowerment Program (SURE-P) was intended to reallocate part of the savings from ending the subsidy to improve maternal and child health

services, urban mass transit, vocational training, and public works for unemployed youth and women. Around \$1.2 billion was allocated to SURE-P annually between 2012 to 2014, most of it coming from fiscal savings generated by the price increase of fuel (Atansah et.al. 2017). However, the program suffered from a perception of widespread corruption and inefficiency with no tangible improvement in social services as promised by the government. For this reason, there were no significant protests when the new government of President Buhari terminated SURE-P after taking office in May 2015, focusing instead on the need to address corruption and inefficiency in the allocation and distribution of subsidies. However, given Nigeria's fragmented ID system, low financial inclusion and penetration of mobile money services, it is unlikely that any system of compensatory direct benefit transfer can be corruption-free and effective. Developing such capacity should be a policy goal; it can be done if there is strong political will and vision, as the examples of Iran and India show. Nigeria's experience of distributing digital fertilizer vouchers through mobile phones offers a possible precedent.

#### **4.2.4 Implementation**

In contrast to the widespread protests that accompanied the January 2012 reforms, it is noteworthy that the policy of price modulation did not generate much political and popular opposition. As noted, the government put significant effort into implementation and communication; in addition, there was more transparency on fiscal costs and a fragmented opposition. The fact that falling international prices enabled the initial price adjustment to be downwards may have changed peoples' perception of the reforms, providing the government with greater political space to maneuver.

Judging from past experience, however, there is little reason to believe that the price modulation policy will be sustained if world prices rise again and so relax the fiscal constraint. Nigeria has not yet evolved an effective compensation mechanism, and by late 2018 there were signs that increasing world energy prices could signal a return of the subsidies. There is an urgent need to lock in the gains from the reform and move towards a credible compensation mechanism that would make the sharing of dividends from Nigeria's energy resources more efficient, effective and equitable.<sup>21 22</sup>

### **4.3 Iran: building on capacity to reform**

#### **4.3.1 Country and reform context**

Iran, the largest country in the Middle East with a population of 80 million, is an important exporter of energy and a member of OPEC. With one-eighth of the world's proven reserves,

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<sup>21</sup> <https://www.cgdev.org/blog/nigeria-lifts-fuel-subsidies-misses-chance-follow-india-future>

<sup>22</sup> Nigeria has experimented with the replacement of price subsidies with direct transfers in more limited programs, including for fertilizers. This program was implemented through agricultural associations, with e-vouchers sent to farmers through mobile phones which also served to identify the farmers. The vouchers could be redeemed by the fertilizer distributors to cover the difference between procurement and sale price. Research is on-going on the effectiveness of this initiative (CSEA forthcoming).

it accounted for over 11 percent of OPEC's total production and 4.7 percent of the global supply of crude oil. Iran's large oil industry and its dependence on exports as the primary source of government's revenue poses a significant challenge for fiscal management, particularly in the context of sanctions as have been imposed by the United States and the EU.

Fuel subsidies have been in place for nearly four decades and have proved politically difficult to remove. By the late 2000s, Iran had the highest rates of energy subsidy in the world; they were both inefficient and iniquitous. Domestic prices were 10 percent of the global market price, leading to large-scale smuggling across international borders and to high levels of vehicular emissions, making cities like Teheran one of the most polluted urban centers in the world. The top income quintile captured nearly 65 percent of the total benefits compared to only 8 percent accruing to those at the bottom, a level of inequality higher than for fuel subsidies in most other countries. At the same time, the basis for the government's support was largely drawn from the poorer and more conservative parts of the population, with less coming from the richer, urbanized, elite. A more equitable distribution of energy rents was therefore an attractive way to motivate the reform.

The dysfunction of the fuel subsidy regime, fiscal strain from international sanctions and the collapse of energy prices in the aftermath of the global financial crisis of 2008 eventually forced the government to undertake reforms in 2010, although related data analysis had been ongoing for several years before. Iran was the first country to institute a system of 'Oil-to-Cash' transfers at a national scale, moving to individualize the subsidy into households' bank accounts. In the process, the government was able to leverage Iran's strong civil registration system to identify beneficiaries and capacity in the banking system to expand financial access to make the transition to the new system relatively smooth and effective.

Digitization played an important role in the implementation of the reforms, especially in the banking sector. Banks upgraded their payments infrastructure and collectively opened 16 million new accounts to enable all eligible households to access their transfers. While the use of the mobile network for payments was not as significant, banks expanded their ATM network to include many rural regions which did not previously have access to convenient cash out points. As the reforms progressed, the government used digital and social media to encourage richer people to give up their subsidy, thereby improving targeting and equity. It also undertook mid-course corrections following timely feedback received in the early stages of implementation. Iran's reform experience, therefore, points to the importance of leveraging existing strengths (civil registration, for example) in the design of reforms and upgrading the capacity of the government, including through digitization.

#### **4.3.2 Awareness and consensus building**

Iran's advantage as a crude oil exporter has been undermined by geo-political factors over the past decades. Political mobilization has played a key role in increasing the population's awareness of the difficulties faced by the country due to an adverse international environment. Even so, opposition to fuel subsidy reforms could have been substantial. The government took on board lessons from the Green Movement protests in 2009 that had

been fueled by digital media platforms such as YouTube and Facebook, with the objective of better managing public opinion on the reform agenda.<sup>23</sup>

The “oil-to-cash” reforms of 2010 were an attempt to radically overhaul the subsidy mechanism, lessen the burgeoning import bill and improve energy efficiency at the same time. To create the policy space for such a wide-ranging reform, the government paid great attention to communication. It initiated a broad public relations campaign promoting the reform program using both traditional and digital channels - newspapers, radio and television as well as websites and social media. Special public seminars and meetings by the president and senior government officials were also disseminated extensively. Political awareness, mass communication and targeted messaging—including on the need for greater equity—were effective to build a consensus on the reform agenda, with significantly less opposition compared to earlier efforts at reforming fuel subsidies in the country.

#### **4.3.3 Reform design and compensatory transfers**

The 2010 reforms marked a significant change from the business-as-usual approach to fuel subsidies. However, the groundwork was laid in 2007 when Iran put in place a gasoline rationing plan to reduce the country’s dependence on refined petroleum imports. Each private vehicle was allocated 100 liters of petrol per month at the subsidized price (10 cents per liter), while any consumption over and above that was at the market rate which was four times as much. The quota was administered through electronic “smart cards” that were distributed to each beneficiary. While the system suffered from some administrative problems such as the slow distribution of the smartcards, the government achieved its objective of reducing gasoline consumption by nearly 16 million liters per day, saving around \$4 billion in import revenue in two years until the new system was put in place.<sup>24</sup> It also demonstrated the capacity of the state to use digital technology in reform design and to monitor compliance at an individual level, lessons that were put to good use in 2010.

The digital framework had to be expanded significantly for the “oil-to-cash” reforms to be successful. The core of the reform was the compensation mechanism where every family was provided with a fixed monthly transfer to cover the cost of the increase in gasoline prices. For this to happen, beneficiaries had to be registered into the new system, their identity verified, regular payments made to their bank accounts and steps taken to make it convenient for people to withdraw the subsidy. To ensure credibility of the reform process, the challenge Iran faced was two-fold: systems for onboarding beneficiaries had to be inclusive by design, and the transfer of payments had to be made regularly with the option of cashing out the subsidy on demand.

Assessments of the reforms suggest that the government was successful on both counts, thereby sustaining political and popular support for the program. Delinking the transfer from consumption allowed an easier process than one requiring the subsidy to be linked to use—a single bank transfer from the exchequer to the beneficiary without needing

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<sup>23</sup> <https://www.youtube.com/watch?v=fqHhLy6KOMo>

<sup>24</sup> [https://en.wikipedia.org/wiki/2007\\_Gasoline\\_Rationing\\_Plan\\_in\\_Iran](https://en.wikipedia.org/wiki/2007_Gasoline_Rationing_Plan_in_Iran)

information on how much fuel had been consumed. The massive scale of the transfer program provided an incentive for the banking sector to upgrade its physical and digital infrastructure, a development that could potentially generate further economy-wide benefits in the long run.

Although the intention had always been to target compensation towards the poorer segments of society, at the start of the reform, Iran lacked the capacity to do so and the compensation program was therefore universal. Over time, however, targeting mechanisms were progressively brought in. Initially this was through self-targeting on a voluntary basis, with richer households encouraged to forego their subsidy, and then through more top-down targeting. This use of an initially voluntary mechanism was not unlike the process outlined for India, below.

#### **4.3.4 Implementation**

Even with the best design and compensation mechanisms in place, the success of any reform program depends crucially on its implementation. Leveraging a strong civil registration system with nearly universal birth and death registration, the onboarding process could be based on self-enrolment with entries checked for duplicates using unique identification numbers. The government did not institute late penalties for registration, so reducing the chances of exclusion. Despite the fact that less than 10 percent of households had internet access in 2010, the option of on-line registration was provided, alongside more traditional methods.

The government also initiated a media campaign to explain the registration process and encourage people to apply (Atashbar 2012). On the compensation side, instead of using regional and local governmental networks, the decision to use bank accounts to disburse the cash transfers increased efficiency, eliminating time lags and possibilities of corruption in the funds transfer process. It also increased competition in the banking system and incentivized banks to upgrade to handle the cash transfers and recruit customers to receive transfers. An expansion of ATMs in the rural areas allowed rural residents easier access to cash-out the transfers as needed, bringing modern services to previously neglected regions.

To further boost the credibility of the reform, the government distributed transfers well in advance of actual price increases; people could see them in their account balances but not access them until prices were raised. Given the magnitude of the price shock (approximately 10 times the prevailing price), this was an important element in heading off mass protests.

#### **4.3.5 Monitoring and feedback**

Rapid feedback loops are increasingly feasible with digital technology, and Iran's reforms included a strong monitoring and feedback mechanism. The reform legislation authorized the government to establish a new Subsidy Targeting Organization (STO) to ensure efficient and centralized management of the implementation and to provide periodic reports to the parliament. Transparent reporting on the progress of implementation of the reform and the use of fiscal savings increased public confidence in the outcome of the reform and helped maintain the government's credibility at the same time.

Feedback from beneficiaries is critical to the success of any subsidy reform agenda, especially when it involves necessities such as gasoline. In the early phase of reform, the government engaged a feedback loop to hear citizens' problems and to undertake mid-course correction. It maintained a website<sup>25</sup> to enable households to verify whether they had received their transfers, thereby using digital means to help monitor this critical element of the reform. It also set up telephone hotlines for questions about the program, providing a human option for those who might have difficulty negotiating the digital system (Guillaume and et al. 2011).

Iran's fuel subsidy reforms therefore combined administrative monitoring with beneficiary feedback and a grievance redressal mechanism that provided choice to the beneficiary to use digital or human modes of communication. It offers important lessons for other countries.

## **4.4 India: the reform of the LPG system**

### **4.4.1 Country and reform context**

India, the second most populous country in the world, is heavily reliant on imports to meet the energy needs of its 1.25 billion inhabitants. With over 80 percent of domestic hydrocarbon demand met by imports, volatile international energy prices pose significant challenges for policymakers caught between the need to limit macroeconomic imbalances and at the same time to shield consumers from the impact of external price shocks. Reflecting the movement in global prices, India's estimated fuel subsidy bill increased from 0.6 percent of GDP in 2004 to nearly 2 percent when international oil prices hit their peak in 2008.

Management of fuel subsidies in India has been problematic for many years. Government-owned companies have a near-monopoly on the importation and refining of crude oil and the marketing of petroleum products, including motor spirits, kerosene and LPG cooking gas. This gives it unfettered powers to allocate subsidies in ways that often create inefficiency in the system. Moreover, political and bureaucratic discretion results in deadweight losses and creates opportunities for corruption, especially when there is an excess demand for fuels, which—given marketing arrangements—has often been the case.

In June 2010, after decades of administered pricing, the government announced full decontrol of petrol prices, giving the (public) oil marketing companies the task of setting pump prices of petrol aligned to the global price of crude oil. It also announced a phased decontrol of diesel prices but initially kept kerosene and LPG cooking gas out of the ambit. From 2013 onwards, major reforms have been carried out in the way LPG gas is subsidized. Instead of a price subsidy on each cylinder of cooking gas for household use, an amount equivalent to the subsidy is transferred directly to the consumer's bank account, up to a ceiling of 12 cylinders per beneficiary household per year. Unlike Iran, the transfer is contingent on consumption, effectively making it a voucher system administered through a

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<sup>25</sup> [www.refahi.ir](http://www.refahi.ir)

direct benefit transfer mechanism. The reason for the difference is that LPG is seen as a merit good in India, providing a clean cooking fuel that reduces the health burden of women who otherwise would need to use the far dirtier alternatives of kerosene or biomass. To the extent that access to subsidized LPG reduces deforestation and the time demands of gathering fuel (also largely a cost born by women), its merit good status is further reinforced.

India's experience confirms that subsidy reform is not always a smooth, linear, process. The direct benefit transfer (DBT) of LPG faced uncertainty regarding its design and implementation and was suspended in January 2014, just before the national elections. The new government that took power in May 2014 revived, changed, and significantly expanded the program. The re-designed DBT program, known as PaHaL, was launched nationwide in January 2015. It is now the world's largest cash transfer program covering over 226 million beneficiary households. An ancillary program, known as Ujjwala, has significantly expanded access to clean cooking gas for rural households, issuing over 56 million new LPG connections in two years starting in May 2015. The fiscal savings generated by PaHaL helped to subsidize the Ujjwala beneficiaries, who were mostly poor rural women most in need of the support.

The LPG reforms have leveraged digital technology in several ways, using India's digital governance infrastructure underpinned by the 'JAM trinity'—(i) the Jan Dhan program, the government's financial inclusion mission to increase access to bank accounts; (ii) the biometric ID Aadhaar; and (iii) mobile phones. JAM has been rolled out rapidly across India. From mid-2015 onwards, the Jan Dhan program has opened nearly 311 million bank accounts, helping India achieve 80 percent coverage of those older than 15 years by 2017 compared to only 53 percent in 2014. Following a nationwide rollout in 2011, the Aadhaar program has registered 1.2 billion individuals on its biometric database, achieving almost universal coverage in just over five years. Finally, mobile phone (SIM) subscriptions increased from 17 per 100 inhabitants in 2007 to 85 in 2016, achieving almost universal access within a decade. The falling cost of data-enabled value-added services is providing an opportunity to integrate mobile services into the overall digital governance framework, especially for government-to-people (G2P) payments and subsidies. All these digital elements have been critical for the LPG subsidy reform process, as explained below.

#### **4.4.2 Awareness and consensus building**

Fuel prices and subsidies have always been high on the political agenda in India and a subject of intense debate, both in the parliament and outside. Before the decontrol of petrol prices in 2010, successive governments were faced with the challenge of raising awareness and building consensus on the need to raise energy prices in response to global price movements.

As in many other countries, household fuel subsidies have been perceived by people as an entitlement even though the macroeconomic consequences were detrimental in the long run. At the same time, the inconvenience created by the subsidy system for consumers was also evident, especially for LPG cooking gas. The gap between the subsidized price for household consumption and the market rate for commercial use gave rise to a thriving black market in diverted cylinders. With few dealer incentives to service them, households could

be left waiting for refills for extended periods. Shortages in LPG supply increased demand for subsidized kerosene supplied exclusively by the government through the public distribution system (PDS) shops. As with LPG, kerosene distribution was inefficient and inequitable, with a significant proportion of the supply diverted to the black market as well.

While there was general awareness that LPG was subsidized, beneficiaries were not fully aware of the extent of subsidies that they were receiving. The government thought that, once the amount of subsidy was known, people would prefer to receive a transfer in cash through a credible compensation mechanism and pay the market price for LPG if the other deadweight losses to the system (corruption, cylinder shortages, black marketing) could be addressed. Such a reform would shift the LPG subsidies to an individualized benefit. The government would also have greater capacity to calibrate the transfer based on international energy prices and its fiscal capacity to carry the burden of subsidy, without jeopardizing macroeconomic stability.

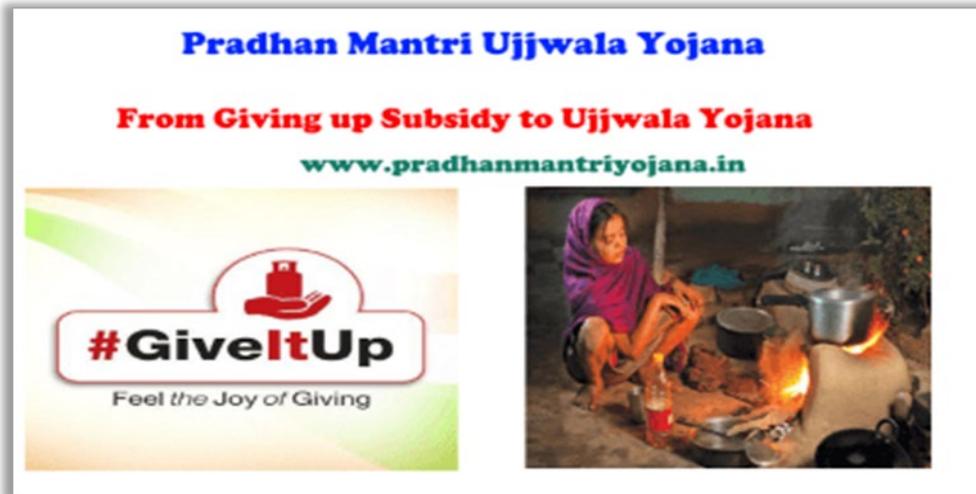
The initial phase of the reform, starting in January 2013, suffered from a lack of clarity in terms of its objectives, design and implementation. In contrast, the redesigned program, PaHaL, was preceded by an extensive communications campaign extolling the benefits of the direct transfer.<sup>26</sup> The campaign made use of all forms of digital channels—government websites, mobile text messages and most importantly, social media such as Facebook and Twitter. This dissemination strategy reached a significant proportion of beneficiaries at relatively low cost given that LPG was—at the start—used primarily by urban households who are more digitally connected than poor rural ones.

Building on the individualization of compensation, PaHaL developed an innovative sequence of steps to target the subsidy to poorer households. The first phase involved self-targeting via the “GiveItUp” initiative. Appealing to the more affluent section of the population, the government launched a campaign, including through text messages and social media, urging them to voluntarily give up their subsidy in the national interest. In return, their names would be included on a ‘Scroll of Honor’ on the PaHaL website, providing public recognition and linking them with the name of a poor rural family whose participation in Ujjwala had been funded by their sacrifice. The program was deemed a success, with over 10.6 million beneficiaries renouncing their subsidy and contributing significantly to the overall savings from PaHaL.

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<sup>26</sup> The rough translation is: “Get your money and save public money”

Figure 6: Digital ‘nudge’ for GiveItUp campaign, India



The second stage was to eliminate the subsidy for all households who had declared sufficient income to submit a tax return. Some of these had already given up their subsidy; the others were terminated from the benefit rolls on the grounds that “your neighbors have given up the subsidy voluntarily so how can you defend keeping it?”. This proceeded smoothly, without opposition. The third phase of targeting has required all households benefiting from the scheme to sign a legally binding affidavit declaring that the combined income of the household falls below the income threshold for the program. As subsidies are extended to poorer consumers, the steady winnowing-out of the better-off continues.

The LPG reform thus demonstrates how digital technology and communications can be used strategically, to target different audiences and to “nudge” beneficiaries towards decisions in ways that would not have been possible without individualizing the subsidy.

#### 4.4.3 Reform design and compensatory transfer

The LPG reform involved a two-pronged approach. First, it was necessary to clean up the existing list of household LPG customers through the removal of duplicate connections and non-existent beneficiaries. Though not a complete solution, this would help to reduce the diversion of subsidized LPG cylinders from domestic to commercial use. Second, the reform eliminated the dual pricing mechanism by setting a market price for all LPG consumers. Households pay the same price as commercial establishments but receive the subsidy directly to their bank accounts upon delivery of the cylinder. The number of subsidized cylinders is capped at 12 per connection per year with households paying the market price for additional use.

Use of digital technology has been integral to both these processes. The existing consumer databases held by the three public sector oil marketing companies had to be moved into one common platform, with each verified consumer issued a unique LPG ID. While the initial design mandated the submission of Aadhaar to obtain the LPG ID number, not all consumers had the Aadhaar initially, so that the program was made more flexible, giving

them multiple options to verify their identity and proof of address. As the coverage of biometric ID increased, beneficiaries were encouraged to link their LPG ID with their Aadhaar numbers remotely through a web portal or through the network of LPG distributors, whichever was more convenient. This made the onboarding and linking process more inclusive, taking into account the relatively low levels of digital literacy especially among women (Mittal, Gelb and Mukherjee, 2017).

As in the case of Iran, the credibility of the compensation mechanism is an important determinant for success in moving from universal to individual subsidy transfer system. The compensation mechanism also should be designed to make the transition smooth, without any income shock to the beneficiaries. Linking the LPG ID to the beneficiary bank account is an important part of the process. Expansion of electronic banking facilities, the opening of new accounts through the financial inclusion (Jan Dhan) campaign and linking bank accounts with Aadhaar significantly enhanced the capacity of the government to design an efficient compensation mechanism for PaHaL.

PaHaL has also been one of the early adopters of the Aadhaar Payment Bridge (APB) and the Aadhaar-enabled Payment System (AePS), the digital payment mechanisms created to transfer benefits to beneficiaries who have linked their LPG ID and bank accounts with Aadhaar. As the linkage of Aadhaars with LPG ID's and bank accounts increased, new beneficiaries could be added to the program through APB and AePS with low transactions cost to the system. This further encouraged the government to expand the scope of PaHaL and to launch the ambitious Ujjwala program distributing LPG connections to poor rural women from mid-2016. A survey of 600 households in Rajasthan confirms that the rollout of DBT mechanisms has been central in increasing financial inclusion, especially for women (Gelb, Mukherjee and Navis 2018). All beneficiaries had at least one bank account and most were transacting on it themselves (though sometimes accompanied by men). Prior to the rollout of the program, two thirds had not owned a financial account.

#### **4.4.4 Implementation**

Another lesson from PaHal is to deploy appropriate technology depending on the problem that needs to be addressed. Since Aadhaar coverage was not initially high, the initial cleaning of beneficiary lists was undertaken on the basis of an algorithmic matching of names and addresses. While less precise than unique biometric ID, biographical matching can be quite effective and is used by many applications, both with and without a biometric component.<sup>27</sup> The genuine beneficiaries were issued a unique LPG ID number, for which Aadhaar was not mandatory. Over time, however, Aadhaar numbers were collected for a majority of beneficiaries and linked to their LPG ID as noted above. This allowed Aadhaar to be used to authenticate new beneficiaries as the government started to expand access to clean cooking fuel for the hitherto underserved rural areas of the country.

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<sup>27</sup> For example the ELISE algorithms of WCC which are used in many applications including for border control [file:///C:/Users/age/b/Downloads/WP\\_WCC\\_MCNM03\\_Multi-Cultural-Name-Matching-03.pdf](file:///C:/Users/age/b/Downloads/WP_WCC_MCNM03_Multi-Cultural-Name-Matching-03.pdf)

With digital technology, beneficiaries could order refills remotely and check the status of delivery using their LPG ID number on mobiles, through a dedicated web portal. This was made possible due to the digitization of the entire LPG supply chain, a reform that was implemented at the same time as DBT was introduced in early 2013. Digitization improved coordination of the demand and supply sides, resulting in greater efficiency of the entire system. Beneficiary surveys show overwhelming support for the new system, with the advantages of reduced diversion and prompt cylinder delivery far outweighing any potential inconvenience of receiving the subsidy in a bank account (Gelb, Mukherjee and Navis 2018).

28

Digitization also played an important role in establishing the credibility of the compensation mechanism. Mobile phones served as a channel to inform beneficiaries, especially to confirm that benefits had been transferred to their bank accounts. Although mobile financial services are not as prevalent in India as in other countries such as Kenya and Bangladesh, the provision of such information strengthened trust in the government's ability to deliver as promised. As mobile transactions become more prevalent, including through the UPI, the digital architecture is expected to provide beneficiaries with greater choices vis-à-vis their use of the transfer beyond cashing it out.

Finally, as the use of Aadhaar as an identifier has been extended across all benefit programs, as authorized by the Supreme Court ruling of late 2018, it has become easier to further rationalize energy subsidies by linking different beneficiary databases. This has enabled the government to remove the allocation of subsidized kerosene from those receiving the PaHaL subsidy, further reducing diversion and leakage and generating fiscal savings in the process. PaHaL's implementation therefore demonstrates the possibility of better targeting through a comprehensive digital framework and improving both equity and efficiency of public subsidies in the long run.

#### **4.4.5 Monitoring and feedback**

PaHaL's success can be attributed in large part on its use of digital technology in monitoring the implementation of the program. It uses almost real-time data to track performance and fix targets, building on a rapid feedback loop addressing challenges and resolving problems earlier rather than later. A common "data view" dashboard has been developed on an integrated web portal so that the same information can be disseminated throughout the chain of command, increasing transparency and accountability for performance. The availability of full daily data through the MIS has made it possible to monitor trends and set appropriate targets, giving program managers essential tools needed to achieve the goals of the reform.

The integrated MIS portal allows different views and reports for different officers depending upon their function in the scheme. It can generate reports for various managerial purposes

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<sup>28</sup> These results, for Rajasthan, mirror the results of surveys commissioned by the Ministry of Petroleum (Mittal et al 2017). Especially for poorer beneficiaries, however, the Rajasthan survey finds that the need to pay upfront for part of the connection charge and the initial cylinder is a concern.

and respond to program management needs. All India's 640 districts and the district level departments receive daily progress on enrolment, cash transfer rates, and error rates. These reports highlighted progress made and the shortfall with respect to targets; they help to identify hotspots, discuss solutions, and improve performance. Customers can change dealers; they can also rate their performance, helping to bring more competition into cylinder distribution.

For a reform program of this magnitude, it is not possible to anticipate all possible challenges, especially in a country as diverse as India. Design and implementation mechanisms must provide flexibility for midcourse corrections from the feedback received. Digitization played a key role in this process, significantly reducing the lag in the dissemination of information of the targets achieved and the public response to the program. For example, while initially only those consumers who had an Aadhaar number were allowed to enroll in the program, the design was quickly modified to allow enrolment even without it on the basis of feedback received from the ground. Similarly, consumers were given the option of being "cash transfer compliant" both with and without Aadhaar, providing them flexibility and reducing the risk of exclusion. To do that, however, the digital architecture underpinning the program had to be responsive to changes in the design and implementation, without disruption and inconvenience to the beneficiaries.

A further benefit of PaHaL is the increased flexibility it offers help manage subsidy outlays when world LPG prices change. The effect of price increases can be offset by reducing the subsidy cap from its current level of 12 towards the national average consumption of 6.8 cylinders per year (poor consumers generally use only 3-4 cylinders per year) or by further tightening targeting to focus on the poor, as well as by passing on the price increase to all consumers. Looking forward, as the list of beneficiaries gets progressively linked to their Aadhaar numbers and these are linked to bank accounts and to other benefit rolls, this will generate large volumes of transactions data that can be used for better targeting and enforcement. The digital reforms and PaHaL does not solve the political problem of reducing subsidies if needed but it offers a wider array of options to approach the problem in ways that differentiate the impact across groups of consumers.

The key lesson from PaHaL is that changing from a universal price subsidy to an individualized direct benefit transfer is a complex matter, but that it can be managed effectively by leveraging digital technology in a way that is appropriate, adequate and adaptable. Digitization expands the possibilities for governments to undertake innovative policy actions to address the challenges of fuel subsidies, strengthening credibility in its ability to deliver on its promises.

## **5. Conclusion**

Digital ID and payments systems have been used in many other countries and contexts to deliver social transfers and other G2P payments. This paper has focused on the case of reforming fuel subsidies and energy pricing to increase efficiency, equity and the sustainability of development. It therefore addresses Target 12c of the SDGs—reforming

energy subsidies—but this can be seen as encompassing quite a wide agenda of development objectives, especially with the inclusion of “green taxes” as a particular case.

ID and payments systems are mechanisms rather than objectives, and digitization only serves to make them more effective and inclusive. Such tools do not necessarily drive policy even if they expand the Policy-Possibility Frontier. They are also not a substitute for government commitment to reform; but rather a way of supplementing and leveraging capacity to improve policy outcomes. From experience in many areas, there is ample evidence that technology is not, in itself, the answer to deep-seated policy or governance challenges. However, with these caveats, the spectrum of countries in this study suggests how much more difficult reforms are when government lacks certain basic capabilities—to raise awareness and communicate the need for reform; to individualize and pay subsidies through a credible and transparent transfer mechanism rather than providing them indiscriminately through controlled prices; as well as to gather and analyze data on the progress of reform, facilitating mid-course adjustments and corrections. Shifting from price subsidies to individualized compensation also increases the range of flexibility to deal with unanticipated shocks, such as the fiscal consequences of an increase in world fuel prices.

The four countries covered in this paper illustrate many of these conclusions. Bolivia offers an example of a country that both maintains large fuel price subsidies and has the capacity to implement reforms to shift towards less distorting and more equitable direct transfers. However, at a political level and across society, the awareness and motivation to implement such reforms is lacking, even though the principle of “energy dividends to Bolivians” is highly compatible with the political and social philosophy of the government. Nigeria has a long record of attempting to reform fuel price subsidies, most clearly when impelled by severe fiscal and macroeconomic constraints. However, it has lacked the capacity to offer credible mechanisms to cushion the impact of higher prices, particularly on the poor. Its recent achievement in shifting from subsidies to “price moderation” under intense fiscal pressure is therefore not likely to be sustainable if oil prices increase. Iran implemented a major change in its fuel subsidy mechanism, shifting from heavy price subsidies towards direct transfers. It was able to draw on a strong civil registration and identification system to help identify beneficiaries, as well as on capacity in its banking system to deliver compensation, showing that it is not always essential to rely on the latest in digital technologies, but the program did use digital communications in important ways. India’s continuing reform of its household LPG subsidy system demonstrates a multifaceted use of digital systems—to communicate the program, to reform the subsidy mechanism towards individualized voucher-type payments subject to a cap on cylinders, and also to induce self-targeting of beneficiaries—in ways that could be of interest to many other countries. Under the new approach, India also has more degrees of freedom to respond to an increase in world LPG prices.

Our review points to three key areas where policymakers can use digital technologies to successfully implement complex fuel subsidy reforms. First, governments need to control the narrative, raise awareness, proactively engage with citizens and build coalitions of support, including through digital media to mitigate the political risk of the reforms. Digital and social media can, of course, also help to mobilize citizens against reforms but they

should ideally be an integral part of communications strategy, highlighting the need for action, and laying out goals and targets, and contributing to accountability.

Second, spread of digital technologies have made it possible to transition from general price subsidies to more efficient and equitable direct transfers or vouchers. While relatively few countries have implemented this at scale, many have G2P payments, such as social pensions, maternal and child benefits, student bursaries etc. that are transferred through digital means. These can serve as a backbone for direct payments of fuel subsidies to individuals. Beneficiary lists based on unique digital IDs can eliminate duplicate and false entries, help to target the poor and the economically vulnerable sections of the population, and generate fiscal savings for the government in the process. Moving to individualized transfers also offers more options to deal with fiscal stresses associated with subsidies or compensation programs.

Third, digital mechanisms produce large volume of high-frequency data that can be used to monitor the implementation of the reform program. This can be supplemented by beneficiary feedback that would enable governments to identify bottlenecks, re-design policies and address grievances in almost real time. A digitally enabled, well-functioning feedback and grievance redressal system improves credibility and trust in the government, which in turn reduces the political risk of popular backlash against the reform.

Country experience also indicates areas of complementarity between the objectives of fuel subsidy reform (greater efficiency and equity, reduced carbon emissions) and other possible goals of development policy, such as encouraging financial inclusion and improving the health status of women. These are enhanced by leveraging the overall digital governance framework. Subsidies can be rationalized across different fuels and programs by using a common identifier for beneficiaries; technology can also help to empower beneficiaries (public feedback on dealers) and “nudge” consumers to forego subsidies in ways that help to diffuse potentially violent responses to targeting. These experiences provide useful inputs for other countries as they seek approaches towards reforming price subsidy systems in ways compatible with SDG target 12c.

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