Energy safety nets

A literature review

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Key messages

- A broad range of measures could be described as energy safety nets, from general energy subsidies to highly targeted measures for specific social groups. However, the literature on social safety nets often excludes them.
- General energy consumer subsidies are inefficient in reducing energy poverty, but their removal could be damaging for poor people who cannot afford the full cost of modern energy services.
- Social safety nets and cash transfers may not be the answer for energy access objectives. Cash transfers may be used for other expenditure and general social safety nets require time and resources to develop.
- Targeted energy subsidies could be an alternative, though their effectiveness in reducing energy poverty is little understood. There is a need for detailed country case studies, to explore where and how targeted subsidies could reduce energy poverty.

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ACRONYMS and ABBREVIATIONS

ADB	Asian Development Bank
CAS	Comité de Asistencia Social (Social Assistance Committee)
CIS	Commonwealth of Independent States
EBRD	European Development Bank
ESRAF	Energy Subsidy Reform Assessment Framework
GDP	gross domestic product
GSI	Global Subsidies Initiative
IBT	increasing block tariff
IDB	Inter-American Development Bank
IEA	International Energy Agency
IISD	International Institute for Sustainable Development
IMF	International Monetary Fund
kWh	kilowatt hour
LPG	liquified petroleum gas
MENA	Middle East and North Africa
NISER	Nigerian Institute of Social and Economic Research
OECD	Organisation for Economic Cooperation and Development
ODA	official development assistance
UNESCAP	UN Economic and Social Commission for Asia and the Pacific
USA	United States of America
USSR	Union of Soviet Socialist Republics
VDT	volume differentiated tariff

About this paper

This working paper is the first publication from a joint programme of work of CAFOD and ODI that aims to investigate the availability and impact of support for access to modern energy services by very poor and vulnerable people. It follows a preliminary scoping of the evidence on the potential for social assistance measures to enable access to modern energy services. It will be followed by in-depth case study research to learn lessons from experiences to date of the use of social assistance to support access to energy. This research is included in the work programme of Sustainable Energy for All's People Centred Accelerator initiative.

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Executive summary

The principle of 'leave no-one behind' is inherent to the Sustainable Development Goals, including SDG 7 on ensuring access for all to affordable, reliable, sustainable and modern energy services, by 2030. This means that even the poorest and most disadvantaged people should have access to modern energy services. It also means addressing the affordability barrier for very poor people. Consumer subsidies are one way to do this, but they have significant shortcomings. Social assistance mechanisms may be another way, but their effectiveness and impact on the delivery of energy access to poor households is little understood.

To understand how such mechanisms have been used, a literature review was undertaken in August and September 2016 and updated in March 2018. This assessed the evidence available on the experience of using social assistance to enable poor people in developing countries to access modern energy services.

Defining energy safety nets

The World Bank defines social safety nets as 'non-contributory transfers designed to provide regular and predictable support to targeted poor and vulnerable' (World Bank, 2015). Such transfers aim to protect the standard of living of recipients without people requiring a contribution from them. They are also called social assistance.

An 'energy safety net' is defined here as a social assistance mechanism that enables poor and vulnerable people to access and use modern energy services. The literature review identified the use of some form of energy safety net in 62 predominantly middle-income countries, though the term 'energy safety net' is rarely used in the literature.

A broad range of measures, employing a variety of mechanisms, could be described as energy safety nets. For example, an analysis of 13 utilities identified 13 categories of electricity tariff and 45 different subsidies (Komives et al., 2005). The measures used by energy safety nets range from general energy price subsidies to highly targeted measures providing tailored assistance to specific populations. These can be differentiated by type of transfer, duration of application, and approach to targeting. Most energy safety nets would fall into the World Bank's fee waiver category.

The literature on social safety nets usually excludes or overlooks measures related to energy consumption by the poor, including the World Bank's annual *State of Social Safety Nets* report. Although the inventory of social safety nets in the 2018 report lists energy-related fee waiver programmes, which benefit 17.5 million people, the review itself makes no mention of targeted support for energy consumption by the poor.

There may be two reasons for the omission of energy safety nets from analysis of wider social assistance programmes. One reason is the difference in scale. Expenditure on general fuel subsidies in some countries is much greater than social assistance expenditure. The second reason is that social safety nets are intended to support the most important needs of poor and vulnerable people, while the share of their expenditure on energy is perceived to be relatively small.

Energy safety nets in practice

Conventional wisdom is that general fuel subsidies are wasteful and distortionary. However, their removal could disadvantage a significant proportion of the population in developing countries who would be unable to pay the full cost of modern energy services (Komives et al., 2005). To the extent that general fuel subsidies enable poor families to consume the energy that they need, these subsidies might be regarded as a kind of energy safety net, as was the case in Morocco when fuel prices were reformed (Kojima, 2016).

Most energy safety net measures either reduce the price of energy directly or make it easier for recipients to afford the market price. In some cases, support is provided in kind, in the form of fuel, electricity or equipment.

These measures may be permanent or temporary, continuous or seasonal. Examples of one-off energy safety net measures were found in Iran, Tunisia and Jordan, where unconditional cash transfers were provided when general energy subsidies were reformed (Vagliasindi, 2013; Kojima, 2016). One-off measures have also been used to radically change patterns of energy consumption, such as to end the use of kerosene for cooking in Indonesia (Clements et al, 2013). Seasonal safety net measures have been used to support heating costs in winter, including winter fuel payments in some OECD countries and heating subsidies in Romania (Komives et al., 2005; Ruggeri-Laderchi et al., 2013).

Approaches to targeting energy safety nets to poor and vulnerable households include the use of measures based on the quantity of energy consumed, the type of energy, the location of recipients, personal characteristics and means testing. Electricity subsidies are often provided through an increasing block tariff (IBT) structure, which sets a below-cost tariff for consumption up to a specified ceiling (e.g. 50 kWh a month) for all consumers. One multi-country review found IBT tariffs in 70% of the countries covered (Komives et al., 2005). Volume differentiated tariffs (VDT) provide the subsidised tariff only to users who consume less than a threshold (e.g. 50 kWh a month).

The type of energy (e.g. kerosene), location of subsidy recipients (e.g. slums) and provision of subsidy to specified groups of people only (e.g. pensioners, the disabled), have all been used to target energy safety nets. There are few examples of means testing for energy subsidies in the literature. Where this has occurred, such as in Argentina and Chile, it has been as an energy component added to an existing social safety net (Komives et al., 2005).

Insights from the literature

The limited experience of energy safety nets to date, and the wider experience of social safety nets, provide several insights for the contribution of these measures to achieving the goal of universal access to affordable, sustainable and reliable energy services.

- **Energy safety nets can exclude a large proportion of poor households.** For example, energy safety nets for grid-connected electricity do not reach people who remain unconnected.
- **The quantity of energy consumed is not necessarily correlated with income or vulnerability.** Safety net measures that use a physical measure of consumption to target recipients risk inclusion errors if the threshold is set too high, or exclusion errors if it is too low. Households with consumption near to the threshold may be reluctant to join a scheme if a small increase in consumption leads to a large increase in their bill.
- **Categorical targeting works well if the category is well-correlated with poor households.** When social or geographical categories are used to target energy safety net recipients there may be inclusion or exclusion errors. For example, geographical categories can achieve high coverage of the poor, but include non-poor consumers.
- **Cash transfers may not be the answer for energy access.** Poor households may choose to use unconditional cash transfers for other expenditure. This may occur when a lower-cost, lower-quality energy substitute is available.
- **Means testing may target more accurately but can exclude more people.** The share of a total subsidy reaching the poor increases when means testing replaces other forms of targeting or general energy subsidies. However, inappropriate classification or administrative hurdles can result in the exclusion of poor households.
- **Social safety nets are costly to develop and absent in many developing countries.** The construction of a targeting system for social assistance can consume considerable government resources, and typically takes years to build and many more years to refine. Once in operation, their administrative costs may be high.

Despite being near-ubiquitous in some form or other, energy subsidies often fail to reach those most in need of support. Attempts to shift policies from general energy subsidies to targeted energy safety nets in countries that do not have strong social safety nets already in place, are likely to negatively impact the (energy) poverty of the poorest in society.

The literature review highlighted the need for further research to test and ground these insights. In-depth case studies of different country's experiences could help to fill the gap in robust analysis of the impact on poor people of social assistance measures which have been used to enable access to modern energy services. Detailed case studies could also fill the knowledge gap on the use of energy safety nets in low-income countries. The questions that such case studies could address include:

- Can social assistance programmes be used intentionally to support access to modern energy services by very poor households?
- Is social assistance, in the form of cash transfers, an effective way to enable the poorest people in developing countries to access modern energy services?
- Can social assistance programmes be used to improve the targeting of energy consumer subsidies?

1. Introduction

The consumption of energy is closely linked to human development. People who lack access to electricity are disadvantaged in a number of ways: it limits their opportunities to improve their productivity and earn higher incomes, their education and health care, and opportunities to obtain information and knowledge. Yet, in 2016, one person in every eight lived without electricity in their home – almost one billion people. Over 40% of the world's population, 2.9 billion people, depended on solid fuels to cook their food (IEA et al., 2018).

Even if modern energy services are available, their affordability may be a barrier to access for people with very low incomes. For women and men living in extreme poverty, access to adequate, affordable, safe and reliable modern energy services, such as electricity and the use of non-solid fuels for cooking, is essential to escape poverty.

Universal access to affordable, reliable, sustainable and modern energy is one of the Sustainable Development Goals agreed by the United Nations General Assembly in September 2015 (United Nations, 2015). Inherent to these global goals is the principle 'leave no-one behind' which means that even the poorest and most disadvantaged people in the world should have access to modern energy services.

One question for the achievement of this target is how to remove the affordability barrier to energy access for very poor people. Consumer subsidies are one way to do this. Indeed, fuel and electricity subsidies have a long history, though poverty reduction is not the purpose of all energy subsidies. However, consumer subsidies for domestic energy consumption often have serious shortcomings: they can encourage the use of environmentally harmful fossil fuels; they are a disincentive for energy-efficient consumption; they use up scarce public funds; they can affect the financial viability of energy service providers; and they do not always benefit poor and vulnerable groups.

Consumer subsidies, however, can be important to reduce energy costs for people with very low incomes, and their removal can have a negative impact on poor people. Subsidies are also provided to enable low-income people to access other essential services, such as health and education. Such subsidies, which can be part of social safety nets or social assistance programmes, are found in 136 countries (World Bank, 2015).

Social protection has been suggested as a means to enable energy access, and solar lamps have been likened to cash transfers, but evidence about access to modern energy services being provided through social assistance programmes is limited. However, there have been instances of linking the delivery of energy subsidies to social protection programmes, and cash transfers have been used to compensate consumers when fuel subsidies are reformed. How these initiatives have affected access to energy or energy consumption by poor households is not known, and findings from these experiences have yet to be synthesised and analysed to understand the potential for social protection measures to contribute to the promotion of universal access to modern energy services.

This literature review provides a brief overview of what might be called 'energy safety nets', i.e. social assistance measures to support poor households to meet their energy needs and enable them to access modern energy services. The working paper presents a brief discussion of the definition and scope of energy safety nets, highlights known links between social assistance and energy consumption, and the insights that can be drawn from the limited evidence available. The conclusions focus on the key questions that remain to be answered.

2. Methodology

This 2018 report is an update of an unpublished literature review carried out in 2016. The first part of the structured literature review was undertaken in August and September 2016 and the update in March 2018. Relevant literature was identified through internet searches, using Google and Google Scholar and the search engines of specific databases or websites. The key search terms of "energy", "safety nets" and "cash transfers", used in various combinations, were identified through trial and error, after other terms failed to provide relevant results. Table 1 summarises the searches using these key search terms. The structured search was complemented by the identification of further literature, using references found in relevant works identified from the internet search.

Table 1 Features of structured literature search

	Search terms	Result filters/sort	Number of results analysed (total returned)
Google Scholar	"Cash Transfers" AND "Energy" AND "Safety Nets"	Sort by most relevant. 2016-2018 (inclusive) Sort by most relevant	2016: 100 (3040) 2018: 160
World Bank Open Knowledge Repository	Energy Safety Nets "Energy" AND "Safety Nets"	Topic: 'Energy'; sort by most relevant 2016-2018 No sort 2016-2018	2016: 250 (1298) 2018: 100 (160) 2016: 34 (34) 2018: 14 (14)
IMF	"Energy" AND "Safety Nets	Sort by most relevant	2016: 150 (1950) 2018: 50 (262)
GSI/IISD	n/a	Program: Energy; Topic: Subsidies	2018: 29 (140)

There is no register or database of energy-related social assistance like those available for other types of social safety net (e.g. World Bank, 2018; Barrientos et al., 2010; Cirillo and Tebaldi, 2016). However, we identified several reviews of the state of energy subsidies in specific sectors and/or countries (Komives et al., 2005; Kojima, 2016; Ruggeri Laderchi et al., 2013; Ruggeri Laderchi, 2014; Vagliasindi, 2013; Whitley and van der Burg, 2015; NISER, 2016; World Bank, 2015b). These reviews contain some useful information about energy safety nets and this literature review draws heavily on them.

The identification of relevant literature faced several challenges. The biggest of these was the absence of any clear typology for what we have termed "energy safety nets". As discussed below, "safety net" is not commonly used in relation to energy subsidies that target the poorest. In the literature, the fiscal burden of social safety nets is often compared to that of general energy subsidies, particularly for fossil fuels and, to a lesser extent, for utilities. Therefore, searches using the terms "energy" and "safety nets" produced a significant number of false positives, i.e. literature not directly concerned with subsidies that enable access to modern energy sources. Similarly, searches using terms related to subsidising consumers' energy costs generated an enormous quantity of literature focused on general fuel consumption subsidies.

A further limitation of the literature review may arise from the fact that an overwhelming proportion of the literature identified was published by the World Bank Group. A large proportion of the relevant literature identified through searches in Google Scholar was published by the World Bank and International Monetary Fund (IMF), and many of the references in their multi-country analyses reference almost entirely give examples relating to energy subsidies that have been published by the World Bank. This may be because (particularly in the case of developing countries) these institutions are charged with the analysis and aggregation of much of the relevant data (e.g. social safety nets and household surveys).

Moreover, where analysis related to energy safety nets exists, it often relies on data or studies from sources that are not publicly available (see Section 4). Analyses found from other sources like the Global Subsidies Initiative (GSI) tend to corroborate rather than disagree with those produced by the World Bank and IMF, but we are cautious that such a large amount of this analysis has been shaped by work published by relatively few organisations for purposes not directly connected with the focus of this literature review.

Finally, we focus on energy access at the individual household level. Although clearly important, we do not here include measures that support energy use for productive purposes, nor those that compensate individuals for the secondary impacts of increasing energy prices (e.g. the increasing cost of transport, fertilizer and food).

3. Defining energy safety nets

We define energy safety nets as social assistance mechanisms that enable poor and vulnerable people to access and use modern energy services. They include consumer subsidies for energy, if they are targeted at poor and vulnerable households and can be distinguished from general energy subsidies which support energy consumption by the whole population. They also include resource transfers (e.g. cash) intended to enable access to modern energy services. Energy-related or energy-specific safety nets help reduce energy poverty,[1] or prevent people from falling back into energy poverty and can apply to any type of energy source.

The term energy safety net is rarely used in the literature, and there is no consistent typology for targeted energy subsidies. Instances of energy safety nets (by our definition) are often not recognised in the social assistance literature or are labelled in an inconsistent manner in studies that focus on the energy sector. For example, the term 'social fuel' is used in relation to progressive government subsidies for kerosene (Bacon et al., 2010), while discounts on electricity bills may be called 'social tariffs' (Komives et al., 2005). Other terms may specify the type of fuel being supported, such as 'electricity subsidies' (Komives et al., 2009). In the literature, different mechanisms may be gathered under the umbrella terms of 'utility' or 'energy' subsidies (Komives et al., 2005). Perhaps the closest expression to how we define energy safety nets is 'energy-related social assistance programme (ESA)' used by Ruggeri-Laderchi et al. (2013) to describe a means 'to ensure energy affordability to some part of the population', though even this does not explain the full dimensions of energy access that we wish to analyse.[2] Unsurprisingly, this lack of a universal term for energy safety nets hampers analysis across different contexts. The term energy safety nets is used here to distinguish measures designed to address energy poverty from general energy subsidies and social safety nets.

The following sections briefly explain findings from the two disciplines that are most aligned with energy safety nets: social safety nets and energy sector analyses.

Energy in social safety nets: The OECD defines safety nets as 'policies and actions which enhance the capacity of poor people to escape from poverty and better manage risks and shocks' (OECD, 2009). The World Bank defines social safety nets as 'non-contributory transfers designed to provide regular and predictable support to targeted poor and vulnerable people' (World Bank, 2015). A similar concept is social assistance which Arnold et al. (2011: 91) define as 'direct, regular and predictable non-contributory social transfers to eligible households and individuals that raise and smooth incomes to reduce poverty and vulnerability'.

The World Bank's State of Social Safety Nets report series (World Bank, 2015; 2018) identifies four categories of social safety net which could, in principle, apply to targeted support for energy access or energy consumption by the poorest social groups. These are: conditional cash transfers, unconditional cash transfers, (unconditional) in-kind transfers, and fee waivers (see Box 1).

Although energy safety nets appear to fit these definitions, the wider literature on social safety nets usually excludes or overlooks measures to support energy consumption in poor households. When they are included, energy safety nets may be treated inconsistently. For example, the World Bank's 2015 report explicitly excludes general energy subsidies and makes no mention of targeted assistance to support access to, or consumption of, energy services (World Bank, 2015). Conversely, the most recent report (World Bank, 2018) introduces the term 'targeted subsidies' and even lists lifeline electricity tariffs as an example. As summarised in Table 2, the report details energy-related fee waiver programmes benefiting more than almost 17.5 million people in ten formerly communist countries and a measure supporting kerosene consumption in Sri Lanka. Similarly, the 2010 Social Assistance in Developing Countries Database included energy safety net measures in just three countries: Dominican Republic, Indonesia, and Mexico (Barrientos et al., 2010). However, this number is far lower than found in the literature review (see Appendix 1).

1. Energy poverty is defined here as lack of access to affordable, sustainable and reliable modern energy services.
2. For example, as Kojima and Trimble (2016) note: "energy supply supporting access must be adequate in quantity, available when needed, reliable, convenient, affordable, legal, healthy, and safe".

BOX 1
Types of social safety net

Conditional cash transfers: are periodic monetary benefits to poor households that require beneficiaries to comply with specific behavioural requirements to encourage investments in human capital (such as school attendance, immunisations, and health check-ups).

Unconditional cash transfers: provide cash without particular co-responsibilities for beneficiaries; they may spend the cash as they wish.

Unconditional in-kind transfers: allow the distribution of food or other in-kind transfers without any form of conditionality or co-responsibility.

Fee waivers: assist households in meeting the cost for a defined class of services, particularly related to education, health, and housing. Waivers can apply to either partial or discounted fees, as well as to other charges or expenditures.

Source: World Bank, 2015, 2018

The World Bank's social safety net tracking programme is charged with analysing 'social protection and labour systems, policies, and programs [that] help individuals and societies manage risk and volatility and protect from poverty and destitution – through instruments that improve resilience, equity, and opportunity' (World Bank, 2012; Cerruti et al., 2014). However, its global inventory overlooks energy consumer subsidies targeted at poor households. Similarly, the World Bank's Latin American analysis specifically excluded measures that subsidise housing, education, water, food, and energy (Cerruti et al, 2014). A review of social protection in Africa found just three programmes supporting energy (Cirillo and Tebaldi, 2016). In the Asia-Pacific region, UNESCAP reviews of social protection systems call for effort and investments to ensure universal access to energy (UNESCAP, 2017a; 2018). However, neither the UNESCAP Social Protection Toolbox, nor a recent briefing paper by the ADB on how social assistance can help achieve the Sustainable Development Goals (SDGs) mention energy at all (UNESCAP, 2017b; Gassmann and Handayani, 2017).

Table 2 Features of structured literature search

	Benefit	Number of recipients	Year
Albania	Energy benefit	45,833	2014
Belarus	Subsidies for housing and utilities	1,490,000	2011
Bulgaria	Energy benefit	251,876	2013
Georgia	Domestic subsidies	59,741	2013
Kyrgyzstan	Electricity consumption	532,300	2012
Lithuania	Compensation for heating expenses	111,000	2009
Moldova	Heating allowance	547,844	2010
Montenegro	Electricity bill subsidy	20,829	2007
Romania	Heating allowance	3,592,213	2009
Russian Federation	Housing and heating subsidies	9,076,000	2009
Sri Lanka	Kerosene oil stamp	977,463	2007
Ukraine	Housing and utility allowance	1,845,300	2012

Source: World Bank, 2018

Social protection in energy sector analyses

Social protection and what may be considered energy safety nets have often been implicitly analysed in work focusing on the energy sector but are rarely explicitly recognised. For example, the only time that social safety nets are mentioned in the comprehensive review of utility (including electricity) subsidies by Komives et al. (2005), is in the chapter titled 'A typology of consumer energy subsidies'. That this sole reference to safety nets occurs when referring to government assistance to 'help cover electricity and heating fuel charges' is notable because the book itself is about how utility subsidies can best benefit the poor. To confuse matters further, the UK examples of consumer energy subsidies listed by Komives et al. are not included in the OECD's register of social safety nets (OECD, 2016).

Much relevant recent work in the energy sector focuses on the reform of tariffs and prices. The prevailing view is that general consumption subsidies for energy products are wasteful and distortionary. While they may be inefficient and deserve critique, it is important to recognise that general fuel subsidies are also a subsidy for poor energy consumers, and, in this respect, might be regarded as a kind of safety net. As a recent World Bank (2017: 9) report notes: 'Energy subsidies are very expensive ways to benefit the poor, but from the perspective of policy makers, they may be better than no social assistance program at all.'

Despite rhetoric for the need to remove subsidies, general energy subsidies' roles in maintaining energy access are well established. As Komives et al. (2005: 44-45) conclude, 'a sizable percentage of the population in developing countries could face difficulties in paying the full operating, maintenance, and capital costs for water supply and electricity services.' Indeed, it is often made explicit during pre-reform analysis that general subsidies perform as a type of safety net, albeit an inefficient one in terms of government social spending. In Morocco, fuel price reform was delayed specifically because general price subsidies were seen as one of the country's main safety nets (Kojima, 2016). However, their considerable fiscal costs, and a prevailing political desire to remove 'inefficient' fossil fuel subsidies, have recently driven subsidy reform processes which reflect 'the need to move away from price subsidies for liquid fuels to alternative forms of targeted assistance to compensate the poor for the adverse effects of higher fuel prices' (Bacon et al., 2010: 1). At times, the nuanced view that some energy subsidies are beneficial can be overshadowed by the need to remove subsidies. As explained in Box 2, social protection is often at best a secondary goal in the reform process.

Why are energy safety nets overlooked?

These different starting points highlight the inconsistencies in interpretation of safety nets and energy subsidies between different authors and studies. There are several possible explanations for the omission of energy safety nets from wider social safety net analysis. In his analysis of the use of subsidies as social safety nets, Alderman (2002) recognises that energy subsidies can be interpreted as a type of social safety net, as echoed by a recent study by the World Bank (2015b). However, he also highlights that energy subsidies are usually differentiated from other development-related subsidies because of their scale, and that the funds may be targeted, implemented, or directed in different ways to expenditure more generally associated with supporting poor or vulnerable people. For instance, most poor households have generally been assumed to be more vulnerable to changes in food prices than energy prices, given food's typically larger share in the expenditure of poor households (Bacon et al., 2010).[3]

Nevertheless, expenditure on energy by poor households in developing countries often exceeds the 10% share that signifies energy poverty in some OECD countries. Recent survey data from India shows that households reported energy costs reaching 32% of household expenditure, more than the amount spent on food (31%) (Garg et al., 2016). This level can also vary significantly throughout the year: rural households in Eastern Europe and Central Asia reported spending 30%–90% of their income on energy during the winter (World Bank, 2015b).

3. This is not to overlook that changes in energy prices can have significant indirect impacts on food prices, or that energy is required to cook subsidised food.

BOX 2 Energy safety nets and fossil fuel subsidy reform

A significant number of studies on the reform of general, untargeted energy subsidies (covering 15 of the 62 countries with an energy safety net) have tangentially assessed the impact on the poor of either the subsidies in place, or of compensatory measures introduced following price liberalisation. Most reviews of this literature point to the evidence that untargeted consumer subsidies for energy are often highly regressive and a large burden on government budgets. Such studies argue that because only a small portion of the subsidy benefits the poor, they are a poor mechanism for poverty reduction.

'Rationalising' fuel subsidies can be characterised as decreasing the amount of government resources that subsidise the energy costs of those households that are able to bear the burden themselves and are often judged depending on whether they are accepted by the population. Subsidy reform is a worthwhile goal. The presence of any subsidies distorts markets and those for fossil fuels make achieving climate change and sustainable development goals much harder. Moreover, reforming general price subsidies that go to everyone and are fiscally expensive, can potentially free up government resources that can be deployed elsewhere to further national development – including energy access – objectives (Zinecker et al., 2018).

There is therefore some crossover between subsidy reform and energy safety nets. However, the guiding principles of these two strands of work are not usually totally aligned when discussing support for energy access. Energy subsidy reform work focuses on the efficiency of energy subsidies and increasing the proportion of the subsidy that goes to those who deserve it. On the other hand, energy safety nets focus on ensuring the poor have access to modern energy services (i.e. that the coverage and amount of the subsidy is sufficient to alleviate energy poverty). This presents problems when talking about measures to support energy access.

For example, general subsidies are very inefficient but often have good coverage of the poor while cash-transfer schemes may be highly efficient in channelling government resources to the poor, but typically fail to include most poor households. This propensity for the reform process to itself be regressive is, however, recognised explicitly in some work on subsidies (e.g. Toft et al., 2016; Coady et al., 2006; World Bank, 2014). However, the different starting points remain. Energy-related social protection work focuses on answering 'what measures are needed to provide universal access to energy?' while subsidy reform work focuses on 'what measures are required to compensate the poor for the induced change in energy prices?'

The difference in scale, in terms of current government spending and historical impact on household budgets, may explain the exclusion of energy consumer subsidies from wider social safety net analysis. Levels of government spending on general fuel subsidies are often much greater than, and contrasted with, social safety net expenditure. This relationship between the level of public spend on 'energy subsidies' and distributional outcome helps promote the idea that they should be reformed (e.g. Cerutti et al., 2014; Whitley and van der Burg, 2015; World Bank, 2015; Coady et al., 2015).

Final considerations are that there is less data to analyse systematically the resources deployed for targeted energy subsidies than for social safety nets (Cerutti et al., 2014), and definitional problems can prevent more holistic analysis (Kojima, 2016). Relatively simple estimates of the total cost of general fuel subsidies can be approximated using a top-down approach that computes the price gap in a given country as the difference between the cost of energy production and the average consumer price (Coady et al., 2015; Kojima 2016). Some governments provide the overall costs as budget line items. However, these approaches do not capture distribution and a detailed understanding of targeted energy subsidies (energy safety nets) requires data from household surveys (see Section 4).

Increasing appreciation of safety nets in energy reform

Instances of how reform-focused analysis explicitly and implicitly overlooks household energy poverty can be found in the literature. However, key recent publications suggest energy sector analyses may be moving towards more comprehensive analysis of energy safety nets, especially during energy sector reforms. Notable examples include World Bank reports on the impacts of reform processes on affordability in Eastern Europe and Central Asia (Ruggeri Laderchi et al., 2013 and World Bank, 2015b); a summary of policies that can be used to insulate poor households from subsidy reform (World Bank, 2014); a review of the affordability of electricity tariffs in Africa (Kojima and Trimble, 2016) and analysis of the political economy of energy sector reform (World Bank, 2017). Although still on the fringes, studies that seek to understand the gender dimensions of energy access (and implicitly, energy safety nets) have also started to emerge (e.g. Kitson et al., 2016 and World Bank, 2015b). However, these more rigorous treatments of energy access are rare in the reform literature.

The Energy Subsidy Reform Assessment Framework (ESRAF) of the World Bank may promote deeper analysis of energy safety nets in the study of reform processes. As of March 2018, only an overview (Flochel and Gooptu, 2017) and one of ten guidance notes ('Identifying and quantifying energy subsidies') had been published. Three of the proposed guidance notes (see Table 2) appear relevant to energy safety nets. However, as the overview paper states: "Areas only tangentially touched upon in ESRAF include complementary measures to help energy consumers cope with higher prices" (Flochel and Gooptu, 2017: 2).

Table 3 ESRAF Guidance Notes relevant to energy safety nets

Guidance note	Title	Focus
3	Analyzing the Incidence of Price Subsidies and the Impact of Reform on Households	Quantitative analysis. How price subsidies flowing to households are distributed by income and other indicators, and how consumer price subsidy reform may affect households, is determined by household consumption patterns. The note discusses the data and tools available to conduct the analysis.
4	Analyzing the Incidence of Price Subsidies and the Impact of Reform on Households	Qualitative analysis. Asking energy consumers about how they perceive the benefits and dis-benefits of consumer price subsidies and their reforms, and how they may change their behaviour and energy purchase patterns in response to reform, will yield valuable information. As with Note 3, an important criterion is selecting different income groups and those who are considered particularly vulnerable.
5	Assessing the Readiness of Social Safety Nets to Mitigate the Impact of Higher Prices	Where subsidy removal results in price increases, governments need to be able to rely on their social safety net infrastructure to assist vulnerable segments of the population.

Source:Flochel and Gooptu, 2017

4. How do energy safety nets work?

Having considered what constitutes an energy safety net, this section aims to explain how they provide benefits to recipients (delivery mechanisms) and how recipients are identified (targeting mechanisms), using examples from energy safety nets found in the literature. Finally, to illustrate the complexity of real-world energy safety net mechanisms, we provide some examples of how targeting and delivery mechanisms are combined into multiple policy instruments.

Universal access to modern energy services will be achieved through multiple energy services, using different energy sources. Different consumers face different barriers to achieving energy access. Energy safety net measures, therefore, may be introduced to achieve a variety of impacts, in response to a specific event (e.g. a fuel price rise) or with the goal of access to modern energy services. Some measures aim to encourage a population-wide modal shift, while others attempt to compensate the impacts of reforms in the energy sector.

A further dimension to be considered is how long the energy safety net is in place. Measures can be permanent or temporary, though once they are in place, popular opposition to subsidy removal means most are at least semi-permanent (Whitley and van der Burg, 2015; Kojima, 2016). Moreover, there are variations in how often benefits are provided. Transfers may be one-offs, continuous or periodic. Perhaps the biggest question for governments is who the target beneficiaries of the transfers will be.

Delivery mechanisms

Energy safety nets may take the form of a non-earmarked cash transfer, an earmarked cash transfer, or an in-kind benefit. As with wider social safety nets, transfers may be conditional (depending on an action or attribute of the user) or unconditional (available to all). In some cases, the energy safety net may even be designed to promote consumption in certain sectors while preventing leakage to other sectors (e.g. attempts to prevent adulteration of transport fuels with subsidised heating fuels).

Earmarked transfers
Most energy safety nets are monetary in nature and involve beneficiaries receiving cash transfers or discounted rates (fee waivers). When tied to a specific item, the monetary transfer is said to be earmarked[4] and often involves reducing the price of energy directly, though the delivery may be through various mechanisms. For example, approximately 70% of the countries surveyed by Komives et al. (2005) discounted electricity rates for households that consumed low levels of electricity (increasing block tariffs – IBTs). Fuels that are sold as discrete units require a different approach. In Peru, consumers can present a voucher and buy LPG at a discounted price, while in India beneficiaries of the Pratyaksh Hastantarit Laabh (PaHaL) programme pay the market rate and then have the subsidy amount credited to their bank account afterwards (Kojima, 2016). Some energy safety nets might not impact unit price, but still aim to make modern energy services more affordable. For example, consumers in Ukraine can spread their utility payments for periods of high energy consumption over a longer period at zero interest (Kojima, 2016).

Non-earmarked transfers
There is also a strong preference among some practitioners to move towards non-earmarked energy safety nets. Here, a cash amount is transferred to a beneficiary without stipulating how it must be spent, as was the case in the Islamic Republic of Iran following fuel sector reform (Vagliasindi, 2013). An energy component is often combined into social safety nets that aim to tackle broad dimensions of poverty (for example, Bolsa Familia in Brazil or Progresa/ Oportunidades in Mexico, both of which include energy sub-components in the calculation of how much recipient families should receive).

4. In the more general social safety net literature, conditional tends to refer to a benefit that is received if an accompanying action is carried out (e.g. cash transfers are paid to parents if their children attend school or health checks). On the other hand, earmarked benefits are tied to a specific good or service (e.g. reduced-price kerosene or a free quota of staple foods). A considerable body of literature considers many earmarked benefits as conditional because they imply that the user must consume a specific type of energy.

In-kind transfers

In some cases, energy safety nets are in-kind transfers of the fuel itself. Going further than the discounted rates included above, a common example of in-kind fuel transfers is the free electricity allowance for poor households that are offered in the Dominican Republic, China, and many countries in the former USSR (Vagliasindi, 2013; Zhang and Qin, 2015; Ruggeri-Laderchi et al., 2013). Another example is the free gas cylinders given to orphans and vulnerable children in Botswana (Cirillo and Tebaldi, 2016).

There is also a range of in-kind transfers of capital that promote energy access. Some are targeted at shifting consumer behaviour. For example, the Kerosene Reduction Programme in Indonesia and the Pradhan Mantri Ujjwala Yojana programme in India both saw the government distribute the means to use the subsidised LPG cylinders (i.e. the stoves and cylinder fittings) that they were trying to shift consumers towards using (Vagliasindi, 2013; Mittal et al., 2017). In Armenia, the government requested a development cooperation partner to provide grants for installing gas heating and boilers in poor households (Vagliasindi, 2013). A recent trial saw solar lanterns distributed to recipients of the government's social assistance programme in Malawi in an attempt to stimulate their uptake by the wider market (Wood, 2017).

Other schemes endeavour to drive improvements in energy efficiency. For example, many ODA-led initiatives and at least one government scheme have distributed subsidised cleaner biomass cookstoves (Mary Robinson Foundation, 2016). Low-energy light bulbs were distributed in Ghana to cushion the impact of increasing tariffs (Whitley and van der Burg, 2015), and in Turkey to combat electricity theft (Vagliasindi, 2013).

In-kind transfers of capital can also provide recipients with access to more affordable ways to pay for their energy consumption. For example, in Ukraine, a government programme installs heating and electricity meters to allow households in multi-occupancy buildings to better control their consumption and segregate utility bills (Kojima, 2016).

Many energy safety nets are in place to ensure continuing affordability, and others are time-limited to a policy change. The clearest examples are the fee waivers and discounted utility rates that are found in many countries. For fuels sold in discrete units, energy safety nets are often regular and periodic, such as providing support for one subsidised LPG cylinder per month. Non-earmarked cash transfers also tend to be delivered monthly, such as those implemented in the Islamic Republic of Iran mentioned above (Vagliasindi, 2013). Energy safety nets related to heating are often provided only at certain times of the year.

For example, heating subsidies in Romania, the USA, the UK, and France are only provided during winter (Komives et al., 2005; Ruggeri-Laderchi et al., 2013). Focus groups in Europe and Central Asia reported that the delivery of periodic subsidies to cover wood purchases could be better timed to increase the affordability of energy, for example, as a lump sum that allows recipients to bulk buy wood for the coming winter in the summer when prices are lower (World Bank, 2015b).

One-off transfers

Although not strictly safety nets, we have also found a broad range of one-off transfers that promote energy access and protect vulnerable people from short-term energy shocks. One-off transfers that provide the initial access to modern energy services include those mentioned above to encourage a population-wide switch to cleaner cooking fuel in India and Indonesia (Kojima, 2016; Clements et al., 2013) and government payments to subsidise utilities to provide economically unfeasible connections to the electricity grid in Chile (Vagliasindi, 2013).

In many countries, individual or a series of transitionary payments have also been used to cushion the impact of acute changes to fuel prices during energy subsidy reform (World Bank, 2014). For example, when several fuel prices were increased in Tunisia, the government provided a direct cash transfer of approximately $55 to 285,000 families and repeated the transfer again during Ramadan (Kojima, 2016). In Indonesia, a one-off transfer was made to recipients of a former social safety net

(approximately 30% of the population) when new prices were brought in (Fiszbein et al., 2011). In Jordan, general subsidy reform coincided with a cash transfer to low-income government employees, pensioners and households deemed to have low incomes (Vagliasindi, 2013).

In some cases, one-off, in-kind transfers can make modern energy services more affordable. As noted above, the increase in the threshold for lifeline power tariffs in Ghana was accompanied by the free distribution of low-energy light bulbs (Vagliasindi, 2013; Whitley and van der Burg, 2015) and a number of countries have striven to reduce bills by installing electricity or gas meters for low-usage consumers previously on fixed-rate tariffs (Komives et al., 2005).

Targeting mechanisms

The concept of energy safety nets implies the targeting of benefits to poor, disadvantaged or vulnerable households, enabling them to have access to essential energy services. Although there is a range of targeting options, Arnold et al. (2011) point out that 'all targeting methods are imperfect'; Devereux et al. (2015) note there is no 'best' mechanism for targeting social transfers, and the World Bank (2014) notes that 'perfectly' targeted compensatory measures do not exist.

Below, we present the range of different targeting measures in the literature. Although we present the following as distinct approaches to targeting, the fact that several approaches are often deployed together means it is much more appropriate to view the options as a toolbox for the design of energy safety nets. When designing energy safety nets, these tools may be deployed side-by-side (broadening the safety net) or consecutively (narrowing it).

Passive (self) targeting

One alternative to general price subsidies is to only subsidise a quantity of a fuel that is considered a basic necessity. For metered fuels, these are known as lifeline tariffs. An increasing block tariff structure (IBT) is often used for this, under which the tariff increases with each successive block of consumption whereas, for lower consumption blocks (e.g. the first 50 kWh per month), the tariff is below the cost of supply. A recent review of African electricity tariffs found 24 of 39 countries had a lifeline tariff block at 100 kWh or fewer, and 17 of these were IBTs (Masami and Trimble, 2016). During the 2010 reforms of its electricity sector, China instructively labelled the three blocks in the newly proposed IBT as reflecting 'basic', 'normal', and 'high quality' usage (Zhang and Qin, 2015). In cross-subsidisation schemes, the tariff is above-cost for the higher consumption blocks. In Kenya, alongside a lifeline tariff, urban rates are set higher to cross-subsidise rural customers (NISER, 2016).

Governments may also subsidise IBT schemes if the average tariff is below cost recovery levels. Komives et al. (2005), found that electricity tariffs in around 70% of the countries they surveyed were IBTs. Although most commonly used for networked energy supplies, similar schemes operate for fuels that are provided in discrete units. In these cases, a given fuel quota is distributed to households at a subsidised rate according to a rationing system and any further consumption is at the market price. When IBTs provide a subsidy for the first block of electricity consumption to all consumers, they have good coverage of poor consumers connected to the grid but, overall, they do not target the poor well (Komives et al., 2005).

Another form of lifeline tariff is a volume-differentiated tariff (VDT). These are similar to IBTs, but the subsidised tariff is only provided to users who consume less than a cut-off threshold. The VDT approach is self-targeting and based on the premise that low-consumption users are also poor.

Another self-targeting mechanism that can increase the progressivity of subsidies is to subsidise essential or so-called inferior fuels, which are more likely to be used by poor than rich households. Targeting the energy sources used by different income groups has also been used in subsidy reform programmes, which may begin by removing subsidies for fuels that are predominantly used by richer members of society. Subsidies are often first removed from transport fuels, which are typically among the most regressive of the general subsidies, while delaying or preventing increases in lifeline tariffs,

as occurred in Egypt (Kojima, 2016), and Serbia (Ruggeri Laderchi et al., 2013). In Morocco, as general subsidies for gasoline, diesel, and fuel oil have steadily been removed, the government has promised that LPG, which is widely used for cooking, will remain subsidised (Kojima, 2016). Similar attempts to protect the poor in Jordan has seen energy prices on petroleum products reformed as electricity prices remain subsidised (Atamanov et al., 2015).

Active targeting

Adjusting subsidies so that a larger portion of their benefit is received by poor or vulnerable people requires what Komives et al. (2005) term 'administrative selection'. Accurately identifying who should qualify for a given subsidy and delivering it to them is a remarkably difficult undertaking. Much of the decades of work targeting wider social safety nets is applicable here given the crossover between poverty and a lack of energy access. Proxy means tests use several indicators to estimate income and/or a household's energy vulnerability. They may be used before full means testing is invoked to provide sufficient data to target the distribution of scarce government resources to those most in need, depending on their household income or expenditure levels.

A first attempt to identify those in need is often to choose categories of the population that are likely to comprise a significant proportion of households that would experience energy poverty if a subsidy is not provided. One method is to use personal characteristics. In the former Soviet Union, IBTs are often assigned according to the personal status of applicants in the household (e.g. students, pensioners, veterans or refugees) (Komives et al., 2005; Ruggeri Laderchi, 2013). Geographic indicators may also be used. In Colombia, as a proxy for poverty, housing districts were categorised into six strata with households assigned a VDT depending on their district (Komives et al., 2005). In Mexico, the neighbourhood of a household is one of several factors used to decide eligibility for the Oportunidades scheme (and its energy component which included a VDT, Oportunidades-Energéticas) (Komives et al., 2005; 2009). Special IBTs have been provided for slum residents in large cities in Panama, Nicaragua, and Venezuela (Komives et al., 2006). In China, the IBT varies by region to account for summer cooling requirements (Zhang and Qin, 2015).

Targeting poorer households further requires data that can be used to evaluate whether a household is deserving of the subsidy against some set criteria. The wider social safety net literature provides a range of proxy means test variables that have been used to estimate whether a household should receive a benefit. These generally do not require knowledge of the household income, but instead use a number of poverty correlated indicators that may allow assessors to look beyond the categorical targeting mechanisms detailed above. Most proxy means tests do not address energy poverty directly. However, examples that cover aspects of energy access exist in Peru and El Salvador where households qualify for discounted LPG rates if their electricity usage is below a certain threshold (Kojima, 2016; Toft et al., 2016). A similar scheme operates in Thailand, though there the quality of the electricity connection (5 amperes or fewer) is also used alongside usage to determine eligibility (Toft et al., 2016).

Examples of full means testing for energy safety nets are relatively rare in the literature. However, with ever increasing digital solutions, their number is increasing, as is shown by the use of the Aadhar biometric card scheme to identify beneficiaries for the PaHaL LPG subsidy in India (Mittal et al., 2017). Aside from India, means testing has tended to be used when an energy component was added to an existing social safety net that was already means tested. Common in Latin America, examples here include a provincial-level means test in Argentina, and national-level testing in Chile, Brazil, and Mexico among others (Komives et al., 2005; Kojima, 2016).

A range of means tests have also been used in the former USSR, where, rather than specifying an income threshold, many of these means-tested programmes provided subsidies to households whose utility expenditure exceeded a burden limit (a fraction of their total expenditure) (Komives et al., 2005; Ruggeri Laderchi et al., 2013). This approach coincides with the OECD's definition of energy poverty as households spending 10% or more of their income on energy.

BOX 3
Energy safety nets for grid-connected electricity users

- Increasing block tariffs (IBTs), for low-volume consumers with metered connections.
- Volume differentiated tariffs (VDTs), for households consuming less than a specified amount each month.
- Low tariffs for households with low-voltage electricity.
- Geographically differentiated tariffs, for consumers in specified locations.
- Social tariffs, for consumers classified as poor.
- Merit discounts for particular categories of consumer (e.g. pensioners).
- Cash transfers for households whose energy expenditure exceeds a defined limit.
- Reduced connection fees for households classified as poor.
- Reduced connection fees for households choosing a low service level or providing an in-kind contribution for the connection.

Source: Komives et al., 2005

Deploying energy safety nets in practice

A broad range of measures that combine various targeting and delivery mechanisms could be described as energy safety nets (see Box 1). For example, considering just the category of grid-connected electricity users, Komives et al (2005) list 19 possible measures that could be employed: 13 related to tariffs and six related to grid connections. Most of these energy safety net measures would fall within the World Bank's fee waiver category of safety nets (World Bank, 2018).

In addition, in practice many of these measures tend to be deployed together. This meant that when the Komives et al. (2005) analysed real-world utilities in 13 contexts they identified 45 separate support mechanisms. These ranged from general price subsidies to highly targeted measures providing tailored assistance to specific populations. Measures were differentiated by a number of factors, including the type of transfer, the duration of use and the way they are targeted.

The limits of this analysis are that these measures apply to grid-connected electricity only, which is one of the most-documented types of support. Similar support mechanisms can be used to support access to other types of energy (e.g. cooking fuels), while other situations require entirely different approaches. Coverage across energy types varies, though there were some areas (e.g. off-grid electricity) where we found limited instances of energy safety nets in the literature.

5. The effectiveness of energy safety nets

Learning from wider social safety nets

Little published work investigates the effectiveness of energy safety nets for poor households, as defin ed in this paper. However, insights may be drawn from the experience of wider social safety nets, given that energy safety nets are a subset of (and occasionally included in) these programmes. As Whitley and van der Burg (2015: 38) note: 'Strong social protection systems can protect households and individuals against economic hardship, regardless of its origin.' Nonetheless, a generic focus on social assistance often makes it difficult to isolate the energy component and evaluate whether the safety net in question can provide energy access.

Furthermore, it is also worth bearing in mind that social safety nets are not usually significant enough to lift people out of poverty (Devereux et al., 2015).[5] Different needs may be in competition within the social safety net itself. While food- or education-focused social safety nets may have different aims from energy safety nets, it is likely that beneficiary targeting runs along similar lines. Although the effectiveness of any energy-related benefits will depend on the local energy system, much can be learned from analysis of wider social safety nets about the actual delivery of energy benefits to targeted households. Because the literature relating to the effectiveness of non-energy safety nets is vast, we rely on recent reviews of this literature (e.g. Arnold et al., 2011; Fiszbein et al., 2011; Devereux et al., 2015; World Bank, 2015) and discuss how their findings may also apply to energy safety nets.

Although the number of social safety net programmes has increased over the past decade, they still do not reach most of the poor. Similarly, while an estimated 36% of people covered in the World Bank's analysis escape poverty because of social safety nets, just 18% of the poorest quintile are covered by social safety nets in low-income countries (World Bank, 2018). The figure is also less than half in lower-middle-income countries. The gap in coverage is particularly acute in sub-Saharan Africa and South Asia. In their review, Arnold et al. (2011) note the paradox that countries which would benefit most from accurately targeted social safety nets are where it is least likely to occur. Unfortunately, countries with large general subsidies, which they are often under pressure to reform, also tend to fall into this category, with the administrative capacity of the government to provide social assistance central to the political economy of any reform process (NISER, 2016; World Bank, 2017).

In addition to concerns over coverage, the size of safety net transfers is relatively small. In low-income countries, the average value of cash benefits is equivalent to only 13% of the consumption expenditure of poor households. For comparison, an average poor household spends 4–9% of its budget on energy consumption,[6] though, as detailed below, averages can hide significant variation in terms of energy access.

The need to look beyond averages

The majority of analyses in the literature about social safety nets and energy subsidies reveal little about the impact of energy safety nets on poor people. Insufficient data means that analyses tend to resort to average values to describe whole large segments of the population. Arnold et al. (2011: 81) noted that, when data is gathered, 'certain vulnerable groups tend to be systematically overlooked within the current evidence base and programme strategies'. It is common for populations to be presented and analysed by quintile, or occasionally decile. This level of disaggregation could work well for other development indicators, where 'progress' may be measured along a continuous pathway (e.g. hours spent in school or kilojoule of food energy delivered). In the case of energy services, different energy sources are not necessarily equal substitutes and the consumption of energy from different sources does not follow a linear pattern. Consequently, knowing or estimating the average change due to the introduction of an energy safety net for the poorest 20% (quintile) of the population may tell us very little about its impact on the extreme poor. Similarly, such data provide no information on those

5. A notable exception is Iran, where cash transfers put in place during energy subsidy reform appeared to reduce poverty incidence from 12% to 2% (Vagliasindi, 2015).
6. See http://datatopics.worldbank.org/consumption/sector/Energy

households that do not fall within the bottom quintile but, nonetheless, are energy poor or vulnerable to changes in energy affordability.

Another common approach is to treat the expected behaviour of the population in aggregate. Komives et al. (2005) note that little work has been carried out to distinguish between the reaction of the poor and the non-poor to a change in the price of energy. While aggregate forecasts may make it easier to compare fiscal policy options, this approach fails to take account of heterogeneity in the population. As Flochel and Gooptu (2017: 10) stated: 'Households cope with the same increases in energy prices in different ways, some by cutting back on different types of spending and others by substituting different energy sources'.

It is common in ex ante analyses to use a single aggregated estimate of price elasticity to estimate the impact of price changes on the population. This tells us little about the wider dimensions of energy access. The problems with using a single value are exposed in a rare and highly detailed ex post analysis that looks at the impact of increasing electricity tariffs in Turkey. Here, Zhang (2011) uses household survey data to compute a variable price elasticity across the income distribution. In doing so, Zhang reveals that, as well as substantial intra-quintile variation, the average elasticity of the top quintile is almost three times that of the bottom quintile. This is attributed to poorer households being nearer to their minimum consumption threshold and having fewer options to diversify their energy consumption. Both of these findings were subsequently borne out in qualitative analysis (World Bank, 2015b).

Zhang (2011) also points out that long-term price elasticities are likely to be larger than those observed in the short term, depending on how quickly price signals translate to changes in consumer appliances. As well as pointing to the welfare impact of uniform increases in price rises, Zhang (2011: 13) highlights that 'neglecting heterogeneity in households' price sensitivity not only ignores the distributional impact of price increases, but also underestimates the overall impact on the population.' Bacon et al. (2010) found that cooking with traditional biomass was exceptionally insensitive to price, with over 90% of the fourth wealth quintile in some African countries describing it as their main cooking fuel. Such findings indicate that even if perfect coverage is assumed, when single price elasticities are used to design energy safety nets that cushion energy price increases, they would need to (appear to) significantly overcompensate consumers to ensure no real loss in welfare for the poor.

One final aspect is that energy access is not perfectly correlated with relative or absolute poverty. Thus, coverage values that are based on defining the poor as the bottom income quintile (e.g. World Bank, 2015; 2018) may not provide an accurate picture of whether those households that require assistance to achieve energy access to modern energy services are receiving it. The arbitrary nature of the poverty line is illustrated by another World Bank (2015b) report, where energy issues are considered for the low-income bottom two quintiles. In many developing countries achieving universal access may require an even larger proportion of the population receive assistance to lift themselves out of energy poverty (Toft et al., 2016).

Analysis of energy-related support mechanisms

Two types of analysis dominate the literature on the impacts of energy subsidy reform. The first body of work draws on ex ante analyses conducted as a required prior step in the process of energy price reforms in the former Soviet Union countries. These countries feature some of the most noteworthy examples of government-funded subsidy schemes (Komives et al., 2005), and reportedly have high levels of access to modern energy services. They appear to have garnered interest because of their common drive to liberalise their energy markets and amend distorted markets. This was catalysed by the fact that the energy prices charged by state-run companies were below cost-recovery levels, leading to an inability to invest in maintenance and upgrade energy infrastructure; a common feature in many developing countries today (Komives et al., 2005; Ruggeri Laderchi et al., 2013). The majority of these analyses focus on grid-connected electricity, with almost universal coverage, in

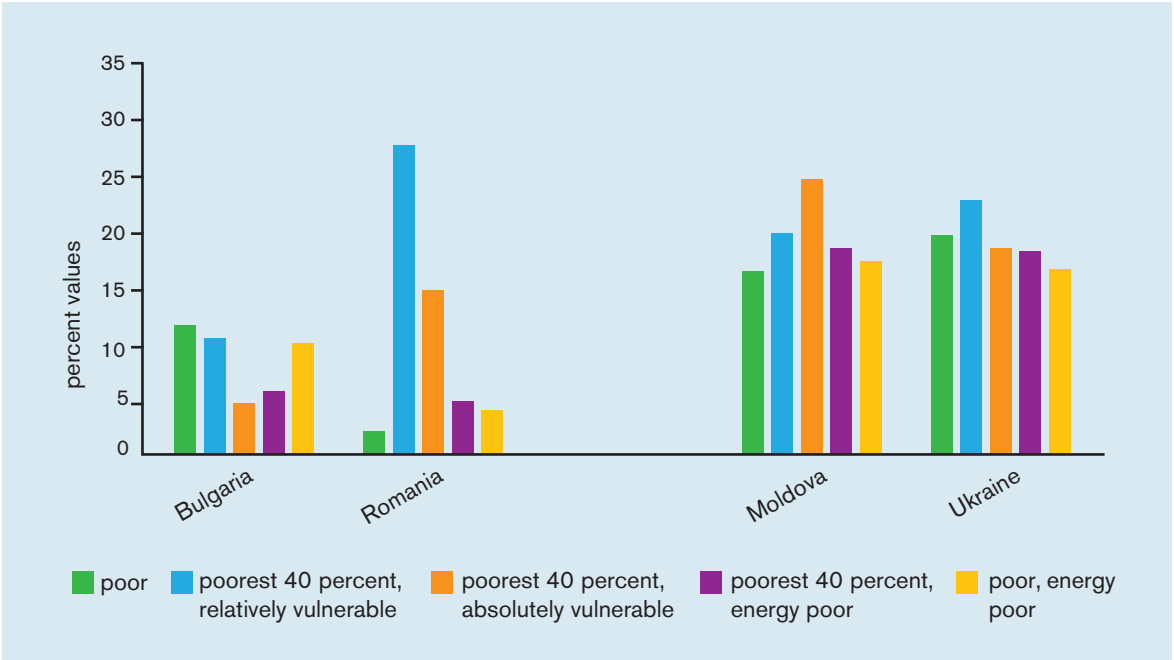
middle-income countries with the capacity–both in terms of fiscal space and existing, targeted social support structures–to implement, manage and measure cash-based transfers to those deemed in need of support.

A second body of work focuses more closely on analysing the removal of general fossil fuel subsidies, in particular those associated with liquid fuels for transport. These are less geographically concentrated, though the MENA region has received considerable attention (see, for example, Verme and Araar, 2017). The analyses also cover a wide range of countries with varying income levels and varyingly structured energy sectors.

While these studies are important in enabling us to understand how governments have provided energy safety nets in specific contexts, it is less clear how well the findings could be relevant for other countries. For example, cash transfers to compensate for reform of utility subsidies in countries of the former CIS offer limited insight into how energy safety nets might function in, for example, a low-income country without existing social registers that can be used for targeting support, or countries where most of the population rely on distributed sources of energy for household uses. Measures to compensate consumers for increases in the costs of liquid transport fuels similarly may have limited applicability to measures aimed at ensuring households have modern energy services.

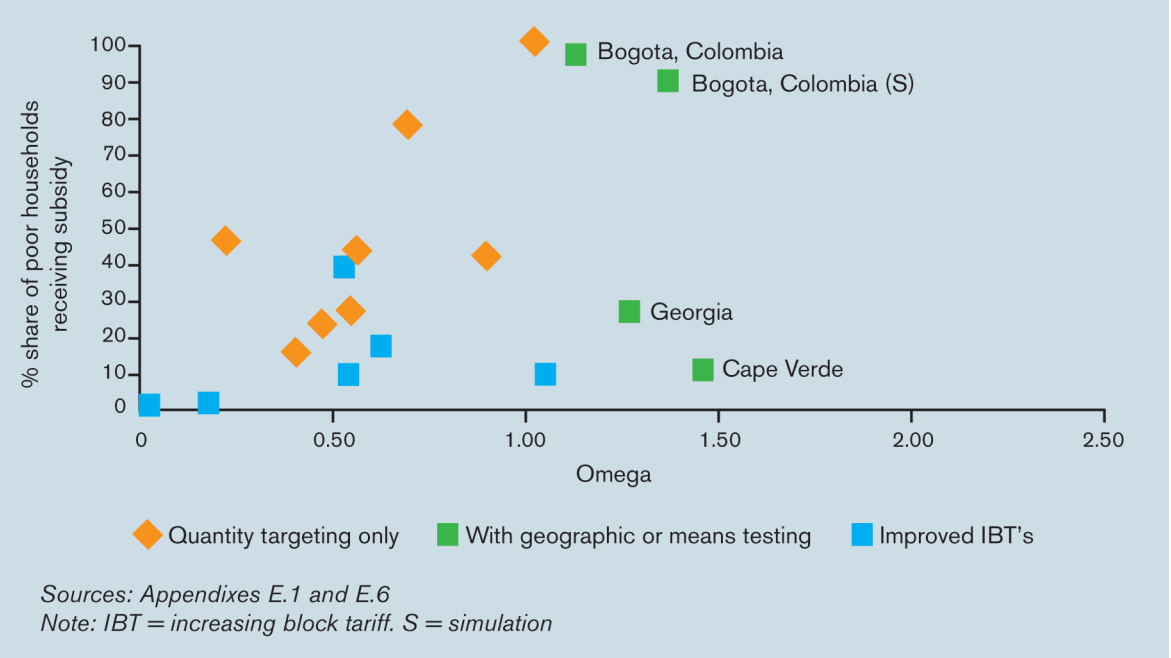
Notwithstanding these caveats, the literature reviewed suggests that most energy safety nets, like wider social safety nets, fail to reach those most in need. The composite analysis shown in Figure 1 demonstrates the proportion of households in four countries which would be protected by an energy safety net from the effects of price changes due to energy subsidy reform. This highlights the importance of defining the beneficiary group and shows that even in countries with relatively well-developed energy safety nets, and irrespective of how the poor are defined, at least two-thirds of poor households would not be protected against the increase in energy prices. The exclusion rate is even higher (typically over 85%) in countries with less-developed safety net capacity. Figure 2 shows that this finding is borne out by another study, for a wider sample of electricity subsidies (Komives et al., 2005).

Figure 1 Energy-related social assistance programme coverage in four countries



Source: Ruggeri Laderchi et al., 2013

Figure 2 Benefit and beneficiary incidence of electricity consumption subsidies



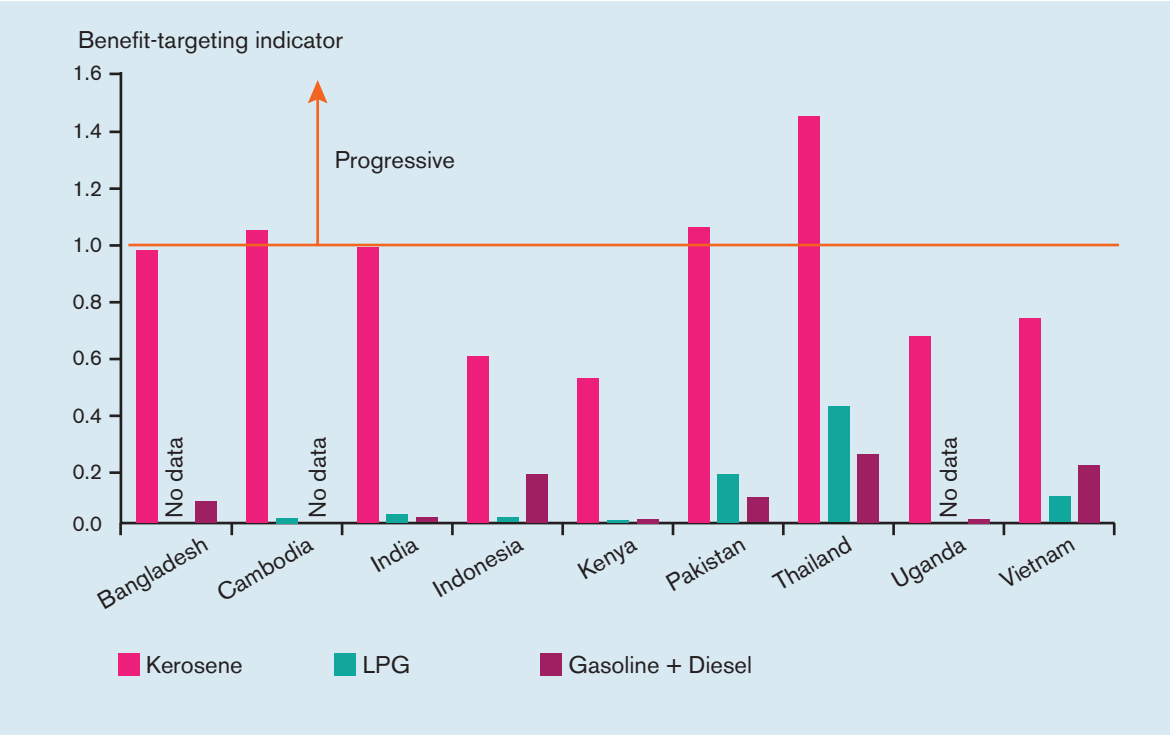
Note: Omega represents the share of the subsidy benefits received by the poor divided by the proportion of the population in poverty.
Source: Komives et al., 2005

To assess the impact and effectiveness of utility subsidies, Komives et al. (2005) use three indicators, which have also been used in later studies of energy subsidies. As summarised by Bacon et al. (2010), these three indicators are:

- Benefit incidence – how well the subsidy targets benefit poor households;
- Beneficiary incidence – the proportion of poor households which receive the subsidy;
- Materiality – the significance of the amount of the subsidy received by poor households.

Bacon et al. (2010) also use the benefit targeting indicator (Ω) from Komives et al. (2005) to directly compare different energy subsidies across different countries. These comparisons can be used to make a high-level assessment of whether a subsidy is a useful way for a government to achieve its (energy) poverty reduction goals. For example, Figure 3 below shows that kerosene subsidies were judged to be progressive in three of the countries analysed (Cambodia, Kenya and Thailand), while LPG, gasoline, and diesel subsidies were always regressive.

Figure 3 Simulated flat-rate universal price subsidy



Source: Bacon et al., 2010

Although useful for making initial comparisons, the value of the benefit targeting indicator (Ω in Figure 2) does not explain any of the underlying data, and tells us little about whether the energy safety net is helpful to the poor.[7] Just as importantly, while this approach may be useful for ex ante analyses (e.g. for deciding between options for future policy changes), its use for understanding how an energy safety net is actually performing is often limited by the availability of the right type of data (discussed further below). As Arnold et al. (2011: 79) note: 'many existing […] social transfer schemes have a tendency to monitor 'process' indicators (inputs and activities) rather than 'impact' indicators (outputs and attributable changes in beneficiary well-being).'

The impact of energy safety nets

A 2009 study that assessed how well existing electricity subsidies in Mexico were targeting poor consumers is an example of the magnitude of work and number of stakeholders involved in assessing impact and effectiveness. This study was commissioned by one government ministry with the backing of several others. The analysis simulated how four policy changes might affect poor people (Komives et al., 2009), and ran to nearly 100 pages. The study was only possible thanks to the availability of recent data from the two-yearly household income and expenditure survey (ENIGH)[8] and detailed consumer utility billing data, which was not publicly available. Moreover, this analysis was just the first of a multi-phase study.

How to implement new energy safety nets, to protect poor and vulnerable people against changes in the existing subsidy structure, was covered separately in later analysis. It addition, this energy safety net focuses on just one energy source – grid-connected electricity – and applies to only one (albeit large)

7. Because the indicator is the product of five ratios, each can exacerbate or cancel out trends shown by the other factors. Moreover, because much of the analysis is dependent on who is classified as poor, the result can be highly sensitive to how poverty is defined (Komives et al., 2005; Bacon et al., 2010).
8. Encuesta Nacional de Ingresos y Gastos de los Hogares (ENIGH). Available at: inegi.org.mx/contenidos/Proyectos/encuestas/hogares/regulares/enhigh/

sector of the population.[9] In short, despite being a sizeable undertaking, this Mexican study addresses only one dimension of understanding access to modern energy services for the country's poor.

The literature review found that ex post analyses of impact are rarer than their *ex ante* counterparts and are usually qualitative or anecdotal in nature. Realistic predictions of the effectiveness of future energy safety nets (e.g. those that may be implemented to cushion the impact of reforms to current energy pricing structures) would ideally draw on actual experience captured in *ex post* analyses. However, most of the literature focuses on *ex ante* analyses rather than empirical *ex post* data. This 'can result in very different results and conclusions depending on the assumptions adopted' (Arnold et al., 2011: 68).

The relative paucity of quantitative ex post analyses may be attributed to:

- **Limited data availability.** Conducting an ex ante analysis on the affordability for households of a price or benefit change, and its effect on the consumption of energy, requires valuation of the financial situation of the household (typically a household expenditure survey) and an approximation of the price elasticity of demand for the energy affected (which could be derived from the same household survey). A quantitative ex post analysis of the same change requires at least two sets of data on household consumption, one on either side of the change occurring (Bacon et al., 2009). A recent study on the effectiveness of cash transfers in Burkina Faso conducted three separate data-gathering exercises (Akresh et al., 2016). Because household surveys are only undertaken once or twice per decade in most developing countries, sufficient data may simply be unavailable. For example, the most recent data available to Ruggeri Laderchi et al. in their 2013 study was between 2004 and 2009, depending on the country. Similarly, data for the energy-related safety nets in the World Bank's 2015 and 2018 State of Social Safety Nets reports was identical because more recent household data was unavailable.

  To fully understand the distributional effects (and not just the average effects) of energy safety nets, microdata from household surveys is required. This is less likely to be publicly available. For example, for the 91 developing countries covered by the World Bank's Global Consumption Database in 2016, only eight provided the associated microdata (World Bank, 2016b). Although household surveys may have questions about electricity and fuels these rarely provide quantitative data, and their analysis rarely associates energy data with other household characteristics.

  Many household expenditure surveys do not include essential questions regarding, for example, the quantity of energy consumed in unmetered households and the distance to the nearest LPG wholesaler. Quantitative analysis of the effectiveness of existing energy safety nets can often only be carried out through supplementary surveys, which usually only cover certain sections of the population and may not necessarily provide sufficient detail on the very poor (Bacon et al., 2010; Koczan, 2016). If the energy safety net is part of a wider social safety net programme (as appears to be more common in Latin America), this additional data gathering could be justified, though even in this case data collection is likely to be arduous. For example, the pilot cash transfer study in Burkina Faso mentioned above, interviewed over 2,700 households per round of data gathering (Akresh et al., 2016). The relative lack of availability of such data, despite the widespread occurrence of energy safety nets, might suggest that countries already struggling with fiscal management may not have the capacity to also engage on programme-by-programme impact analyses.
- **Time lag.** While fuel prices can be notoriously volatile in the short term,[10] other factors that impact the effectiveness of energy safety nets, such as energy consumption behaviour, may change only over much longer timescales. Along with the fact that many subsidy reform efforts are implemented gradually rather than all at once, this may mean that the full impact of energy safety nets can only be assessed a considerable time after their introduction.

9. At the time of the analysis, 4% of households were not connected to the electricity grid and so were unable to take advantage of the energy safety net (Komives et al., 2009). It seems reasonable to assume that at least some – and perhaps all – of those that were unconnected were poor.
10. Protection against such volatility using price-stabilising programmes is the reason for the introduction of many existing universal price subsidies (Whitley and van der Berg, 2015).

- **Challenges with attribution.** A long time-lag between the introduction of an energy safety net and an ex post impact analysis may help to ensure the energy safety net has 'settled'. As with other forms of policy change, this raises the risk of variation in other related parameters (e.g. global fuel prices or developments of alternative energy supply options) and makes it difficult to attribute outcomes to a specific policy change. The impact of these exogenous factors is the main reason given for the range of estimates of the fiscal savings from India's LPG reforms (Mittal et al., 2017). Similarly, isolating the impact of the energy safety net component may be difficult if the same form of support (i.e. unconditional cash transfers) is used to promote different social development objectives (Arnold et al, 2011; Ruggeri Laderchi et al., 2013). The gradual nature of most energy sector reform further complicates attribution. For example, the four countries analysed in a recent report (World Bank, 2017) had implemented around 30 separate reform episodes.
- **More general research focus.** When energy safety nets are introduced as measures to mitigate the effects of other energy policy changes, like the removal of general price subsidies, the fiscal benefit from the policy change is often the main focus of an ex post evaluation, rather than the effectiveness of the energy safety net. As such, reviews of such studies are often forced to make generalisations as to how to best protect the poor (e.g. Vagliasindi, 2013). While some analyses of subsidy reform deepen the understanding of energy safety nets in specific contexts (e.g. De Broek and Kpodar, 2014), others simply suggest that it is important to 'appropriately support the poor' or that social safety nets 'are strengthened', before going on to quantify in detail the potential fiscal and macro-economic benefits from addressing universal fuel subsidies (e.g. Prasad, 2015; Mujeri et al., 2013; 2014). Alongside any net fiscal benefits, the success of subsidy reform is mainly judged on whether the reformed liberalisation of fuel prices is accepted by the public and maintained, not necessarily on whether poor people have seen an improvement in their energy access (see Box 2).

  Equally, where the impacts of reforms to general subsidies of energy products are compensated by the introduction of non-energy safety nets (e.g. Nigeria's Subsidy Reinvestment and Empowerment Programme) it is difficult to identify the impact on energy access.

Challenges for improving energy access through safety nets

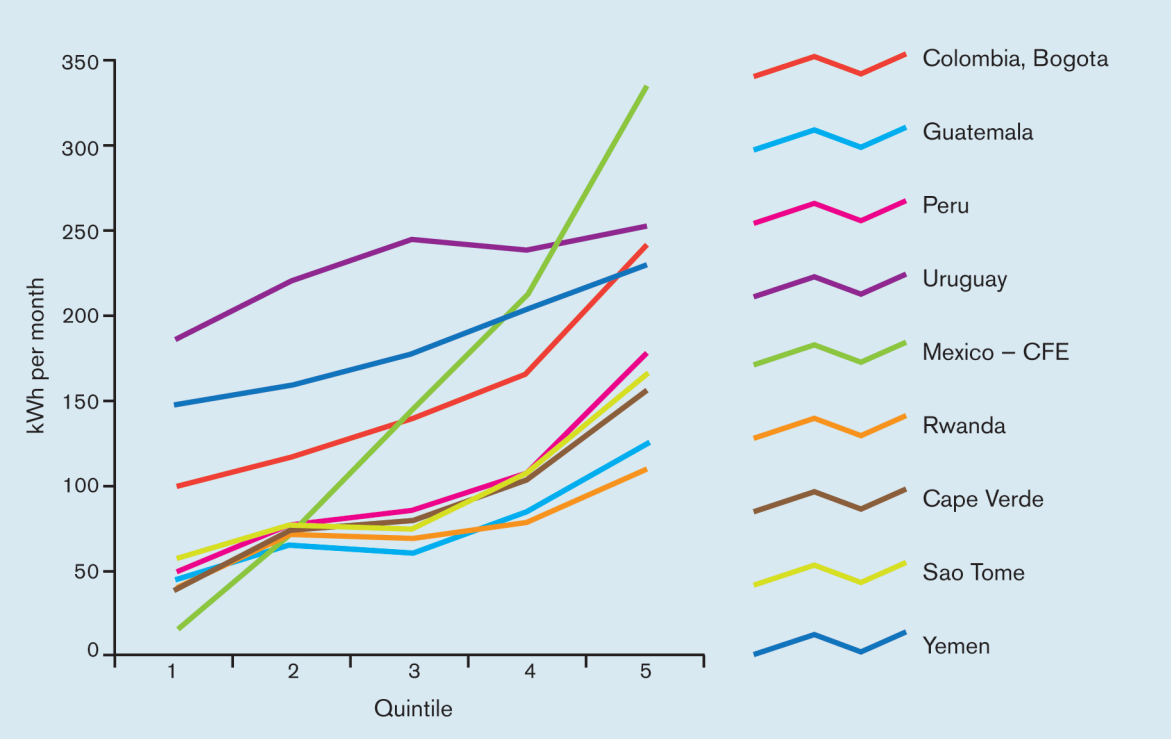
While the evidence base is limited, the literature covering the experience of energy safety nets points to a number of reasons that may prevent them from fully realising universal access to affordable, reliable, sustainable and modern energy services. These potential barriers are discussed below.

Exclusion of large portions of the poor can be inherent in the design of energy production and infrastructure alongside 'safety nets'. Just as general subsidies for transport fuels do not reach poor consumers because they do not consume them, energy safety nets that apply to grid-connected electricity users do not, by definition, improve the lives of people who are unconnected to the grid. Even if connected, unmetered households, those that are indirectly connected via a neighbouring household, and those who share a connection are often excluded from the safety net (Komives et al, 2005; Rudderi Ladderchi et al., 2013; Kojima and Trimble, 2016; Heinrich Böll Stiftung, 2016). In many developing countries, a large proportion of the population are not, and may never be, connected to centralised grids. In these countries, grid-based electricity subsidies would exclude large numbers of poor households.

The quantity of energy consumed is not necessarily correlated with income or vulnerability. As shown in Figure 4, relative income levels are not necessarily a good indicator of a household's energy (in this case electricity) consumption. This means that energy safety nets which use consumption volume or quantity to target recipients (e.g. IBTs, VDTs and rationing programmes) risk significant exclusion errors if the threshold is set too high, or significant inclusion errors if the threshold is set too low. In Honduras, for example, the introduction of a VDT subsidy failed to reach half of all poor

households and had no noticeable impact on the poverty rate (Komives et al., 2005). Similarly, households who perceive their consumption levels to be near to the threshold may be reticent to join the scheme knowing that a small increase in consumption could lead to a large increase in their bills (Ruggeri Laderchi et al., 2013).

Figure 4 Electricity consumption by national income quintile



Source: Komives et al., 2006

Categorical targeting only works well if the category is well correlated with (energy) poor or vulnerable households. Using categories as the sole targeting mechanism can lead to significant errors of inclusion and exclusion. For example, in Tbilisi, Georgia, the initial categorical targeting used for the Winter Housing Assistance Programme included just 13% of the households in the bottom two income quintiles (Komives et al., 2005). Other research in the region found some groups (e.g. the elderly, single parents, and ethnic minorities) were particularly vulnerable to increases in energy tariffs (World Bank, 2015b). In some cases, geographical categories appear to be more likely to ensure higher coverage of the poor. In Bogotá, Colombia, subsidised tariffs provided to the lowest three housing strata encompassed the majority of poor households. However, this targeting scheme had high inclusion errors as some non-poor households were located in these strata. These errors were then further aggravated when populist local authorities declassified the strata of neighbourhoods rather than forcing their residents to accept the higher rates (Komives et al., 2005). As noted in Section 3, employing a variety of targeting measures (more categories or other types of targeting mechanisms) can help reduce inclusion or exclusion errors when measures are deployed side-by-side or consecutively, respectively (Ruggeri Laderchi et al., 2013).[11]

Cash transfers are not a panacea. Cash transfers are widely held up as the gold standard in social assistance and readily prescribed by many seeking to reform general fuel subsidies (e.g. Flochel and Gooptu, 2017). In some cases, cash transfers appear to provide significant support to those in need.

11. Side-by-side means that a recipient qualifies if they satisfy one of several criteria, which broadens the safety net and reduces the exclusion error. Consecutively means that a recipient must satisfy all of the criteria, narrowing the safety net and reducing the inclusion error.

However, as NISER (2016: 34) note: 'Cash transfers are unlikely to be the sole answer'. Ruggeri Laderchi et al. (2013: 96) conclude non-earmarked transfers 'are often found to have inadequate coverage among the poorest groups', while earmarked transfers 'are generally accurate in directing benefits to the poor, but the coverage of the poor is highly uncertain and, in most countries, low'. Even when households receive cash transfers, they do not necessarily guarantee energy access. Although earmarked cash transfers are generally less open to diversion than in-kind benefits, this may not occur without strict controls. Vulnerable households may choose to use non-earmarked cash transfers for other expenditure, especially when there is a lower-cost or lower-quality substitute available for the energy source covered by the safety net, or when payment collection is lax (Komives et al., 2005). Cash transfers may also not be effective at fixing problems with the wider market, for example where consumers are not accustomed to, or willing to pay for, energy infrastructure services (Moerenhout, 2017).

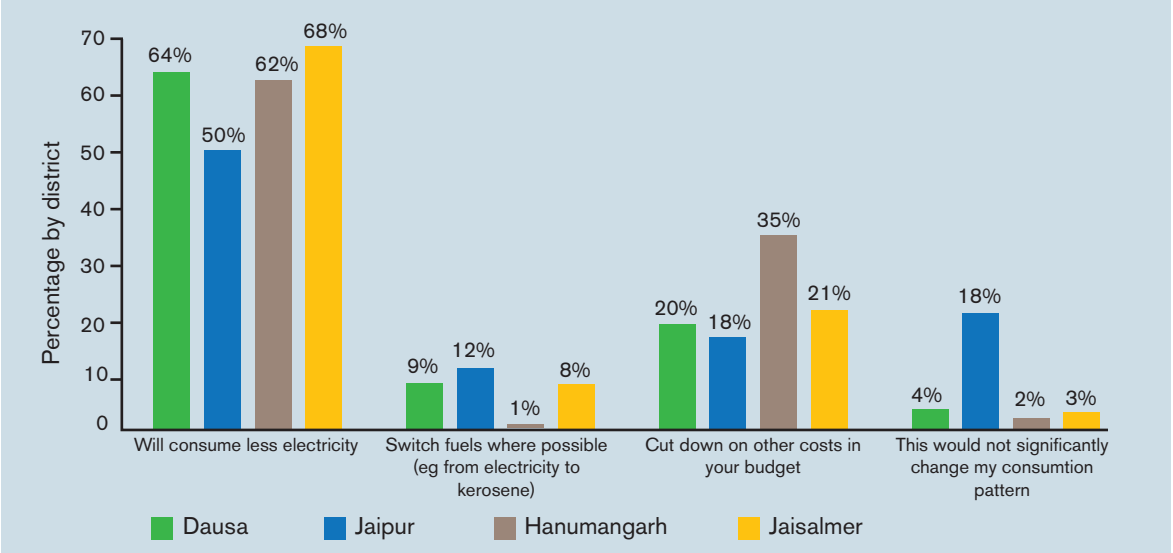
Means testing is usually more accurate than other targeting methods, but more exclusive. Several studies have shown that the transition from universal to categorical to proxy and then to full means-tested targeting, increases the share of the total subsidy going to poor households (i.e. it makes the subsidy more progressive, sometimes denoted as more 'efficient'). However, as targeting narrows, poor households often suffer because they can be excluded alongside non-poor households unless rigorous and accurate means testing is conducted. Nor is the sequence entirely linear. Targeting performance depends on the quality of the targeting mechanism. For example, a proxy means test in Uruguay correctly classified 75% of a sample as poor or non-poor, but 44% of the poor were classified as non-poor. Meanwhile, in Georgia, the government's means-tested cash transfer scheme saw three-quarters of poor households excluded (Komives et al., 2005). Means testing that is based on burden limits has also been shown to be an ineffective targeting mechanism when the portion of household income spent on energy varies little between the poor and the non-poor. Full means tests can also penalise those with seasonal or insecure incomes (World Bank, 2015b).

Enrolment is key to coverage. Even where households are eligible for energy safety net benefits, receipt of support often depends on a successful application for it. This requires applicants to be aware of the energy safety net; that they can afford the financial costs of applying (e.g. travel to the application centre); that they agree to any associated conditionality and can overcome non-financial barriers to applying. One example of an administrative barrier to signing up was in Ukraine where only households who had no utility-related debts were eligible for the country's housing and utility subsidy (Komives et al., 2005). Roma families in Romania, Bulgaria, and Croatia also believed that they may be deemed ineligible because the agents reviewing their applications assume that the applicants have undisclosed incomes (World Bank, 2015b). Research in Serbia found that subsidy benefits were foregone by some of the poorest households because of the requirement to pay bills in full (Ruggeri Laderchi et al., 2013). Eligible households did not sign up to a benefit scheme in Albania because of a lack of transparency related to the benefit being at the discretion of local officials (Ruggeri Laderchi et al., 2013). In Thailand, a number of issues meant that only 400,000 of nearly 8 million eligible beneficiaries signed up to receive the newly reformed LPG subsidy (Toft et al., 2016).

Ineffective energy safety nets on their own can shift the poor deeper into (energy) poverty. Where energy safety nets are implemented to cushion the impact of energy price reforms, evidence suggests that the overall process can reduce access to energy for the poorest households, particularly in the short-term. The World Bank (2015b: 5) cites a 2003 EBRD study that found 'countries had not developed adequate social safety net mechanisms to address the potential impacts of power tariff reforms'. The report goes on to note that: "Rural households report a long-term trend of switching from heating with gas or electricity to wood or coal" potentially owing to poorer and rural households tending to have fewer coping options than their richer and urban counterparts (World Bank, 2015b). Common coping strategies include substitution with lower quality fuels, restricting energy use, and foregoing other essentials, which can have knock-on effects. For instance, in Armenia an increase in electricity tariffs led to 60% of the poor choosing to increase their consumption of wood (Vagliasindi, 2013). This also occurred in Ghana when LPG prices were increased (Whitley and van der Burg, 2015), and was expected to occur in Yemen when a range of fuel prices was increased (Kojima, 2016). This shift to solid fuels has significant downsides,

including an increased potential of harm from increased indoor air pollution. Another secondary impact in Armenia was that the higher electricity tariffs caused households to stop making food at home because they could no longer afford the energy costs associated with refrigeration (World Bank, 2015b). Figure 5, showing results from Rajasthan, suggests the impacts of even a moderate (15%) increase in energy prices can be difficult to predict. In Eastern Europe and Central Asia, cutting spending on food was found to be a primary coping strategy (World Bank, 2015b).

Figure 5 How it would affect consumption patterns if electricity prices were to increase by 15%



Source: Garg et al., 2016

The targeting and delivery mechanisms for safety nets are time-consuming and costly to develop, and absent in many countries. According to the World Bank (2015) social safety net survey, an average developing country has 20 social safety measures in place. However, only 21 of the countries surveyed had fully operational beneficiary registries, while another 26 countries were building such registries. The Universal Social Protection Initiative[12] suggests that 30 low and middle-income countries have universal or near-universal social protection programmes, with over 100 others scaling up such programmes. Although these could be used for energy safety nets, complemented where appropriate by data from energy suppliers, experience shows that the construction of the targeting system consumes considerable government resources. It also typically takes years to build, and many more years to refine (Komives et al., 2005; Ruggeri Laderchi et al., 2013).

The costs and effort required depend on the country context but are almost always sizeable if the scheme is to be successful. Often success rests on the development of supporting infrastructure (e.g. compatible bank accounts, e-cards, or biometric data) and a number of experimental stages (World Bank, 2017). For example, in Mexico, Prospera is the third iteration of the general social protection programme, Chile's Ficha CAS has been iteratively improving for over two decades, and Brazil received over $1.7 billion in support from the World Bank and the IDB to launch Bolsa Familia, which built on the work of several prior schemes (Hall, 2017 pp. 146–7). Similar experience can be found outside Latin America. For example, the Georgian Housing and Water Assistance Programme was modified annually during its first six years of implementation before being replaced in 2012 by another targeting scheme (Komives et al., 2005; Ruggeri Laderchi et al., 2013).

However, new schemes can learn from the experience of building institutional capacity and deploying new technologies elsewhere, for example, the three-year project to develop a social safety net in Mali (De Broek and Kpodar, 2013) or the recent experience in India with the Aadhar scheme (see Box 4). Even if adequate safety nets can be put in place, their operating costs may be high in many countries (of the order of percentage points of GDP). See Figure 6 (Ruggeri Laderchi et al, 2013).

12. ilo.org/global/social-security/WCMS_378991/lang--en/index.htm

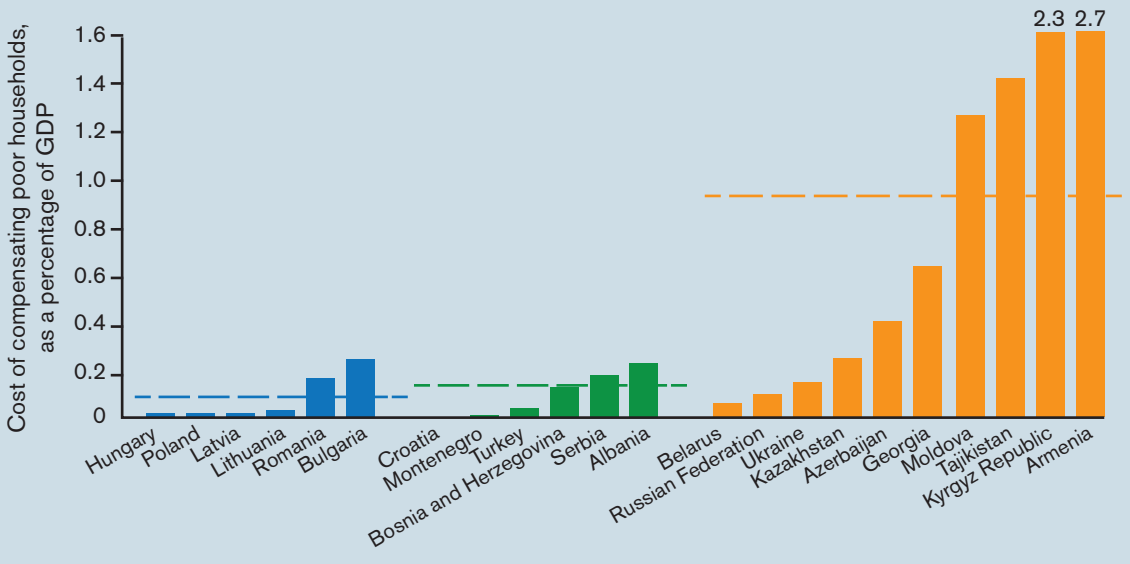
Box 4 Energy safety nets for LPG in India

The recent reform of LPG subsidies in India has attracted much attention from commentators. Fuller chronological details and characteristics of the reform, which we draw on in this overview, are presented elsewhere (e.g. Mittal et al., 2017; Jain et al., 2016). Considering the reform from an energy safety nets perspective, it provides a useful example of the range of aspects for policy-makers to consider and is innovative in terms of deploying a range of initiatives simultaneously. While only LPG subsidies are considered here, recent reforms are much broader and ongoing. Continued support is needed, particularly to help rural households transition away from using kerosene for lighting and for the wider reform of electricity rates to achieve cost recovery. Connected households already report spending over 20% of their income on electricity bills (Garg et al., 2016; 2017).

The main aspect of the reform process was to tighten the targeting of the previous LPG subsidy program, which was generally considered to be wasteful and regressive, and to change the delivery mechanism to an after-sales cash transfer. This was largely achieved by the rollout of the Aadhar biometric card scheme and a simultaneous financial inclusion drive to create new bank accounts. These were essential to receive the cash transfer for the 177 million households currently deemed eligible (Mittal et al., 2017). An unusual aspect of the scheme (not least given its size) has been the way in which it has further outsourced the targeting. The Know Your Customer programme saw retailers aiding the algorithmic detection and removal of so-called ghost connections which were potentially being used to divert the subsidies to undeserving sectors fraudulently. Alongside this, the 'Give It Up' campaign asked richer Indians to opt-out of receiving the LPG subsidy, rewarding all of those who did with a place on a publicly accessible 'Scroll of Honour'. Large employers also made pledges on the behalf of some 3 million employees (Toft et al., 2016). The safety net also has a strong gender targeting aspect as a portion of the saving from the reform process (notably linked to the 'Give It Up' campaign) was to provide women in rural communities with free LPG connections to enable them to then take advantage of the subsidy and attempt to create a shift away from cooking using solid fuels. In this way, the combined approaches have shrunk both the inclusion and exclusion errors of the previous means tested scheme, shifted large numbers of households to cleaner cooking fuels, boosted financial inclusion and promoted gender equality.

The impressive rate at which coverage has been expanded (enrolments to Aadhar were close to 10 million per month in mid-2017) and the enormous resources committed to the project on top of a pre-existing beneficiary registry mean that India is now well-placed to expand its cash-transfer schemes to provide other energy safety nets (for example to enable much needed electricity sector reform). These costs would be a major consideration for countries seeking to emulate India's approach to energy safety nets.

Figure 6 Cost of compensating poor households for energy subsidy reform



Source: Ruggeri Laderchi et al., 2013

6. Conclusions

Energy safety nets are under-researched

This review of energy-related safety nets literature identified few studies specifically focused on energy safety nets, as defined here – targeted social assistance measures that promote access to and consumption of modern energy services by very poor and vulnerable people. There may be several explanations why energy safety nets are largely absent from the wider social safety net discourse, while the literature concerned with the reform of general energy price subsidies was found to address questions relating to energy safety nets only tangentially.

Some examples of comprehensive analysis were found, such as studies of the implementation of energy safety nets in some middle-income countries, including Mexico, Turkey, Ukraine, Montenegro, and Indonesia (Komives et al., 2009; Zhang, 2011; Vagliasindi, 2013; Silva et al., 2007; Durand-Lasserve et al., 2015). These could be models for the detailed analysis of energy safety nets in other countries, which would be a significant undertaking.

Limited evidence of the impact of energy safety nets on energy poverty

Difficulties in distinguishing between general energy subsidies and targeted energy safety nets may be hampering research and the development of policies aimed at making government spending to address energy poverty more efficient and progressive. Consideration of the scale of this spending is focused on general fuel subsidies, usually to the neglect or relegation of energy safety nets. This may be preventing analysis and comparative research on the large number of targeted energy safety nets that already exist. Given that access to modern energy services is an enabler of human development, and the large number of international programmes working towards achieving this, the lack of evidence for the impacts of energy safety nets at domestic, regional and global levels could mean policy-makers are overlooking a significant part of the solution to reach universal access to energy.

Two questions in particular may warrant further investigation:

- To what degree have policies aimed at increasing access to modern energy services been shaped by the (un)availability of knowledge about energy safety nets across different countries?

and

- Has the exclusion of energy safety nets from wider social safety net tracking metrics led to a lack of interest in energy safety nets in governments' energy service planning?

The importance of context for energy safety nets

A large proportion of the literature identified by this review is based on *ex ante* modelling analyses for energy safety nets in middle-income countries and is linked to subsidy reform. Energy systems, and thus the affordability of modern energy services for different segments of the population, vary significantly between, and sometimes within, countries. To answer conclusively the questions framing the literature review, detailed case studies of experiences with energy safety nets would be needed, covering countries with a range of income levels, vulnerable groups, types of energy system, and domestic capacity to operate social assistance programmes. Experiences of energy safety nets in low-income countries are a particularly significant gap, given the link between poverty and energy access (Arnold et al., 2011). There are much richer and more widely available analyses of energy safety nets in middle-income countries. Also, the lack of *ex post* analyses indicates a lack of rigorous impact analyses of how energy safety nets, or social assistance measures used to enable access to energy, have affected poor people. While the literature includes ample analyses of reform of fossil fuel subsidies and electricity tariffs, there are few studies of measures that enable access to off-grid electricity[13] or modern cooking fuels and technologies.

13. An exception is the Better Than Cash Alliance's recent report, which suggested that digital payments could be linked to social assistance schemes to form energy safety nets (UNCDF, 2017).

Ex ante and *ex post* analyses both suggest some commonalities between energy safety net experiences in different countries. However, they make it clear that national experience is not necessarily internationally transferable. The breadth of differences between countries' levels of economic and social development and energy systems means many variables must be considered before making concrete recommendations for energy safety nets (World Bank, 2014). The question of transferability of experiences is not confined to energy safety nets, indeed it can also apply to the design of social safety nets (Arnold et al. 2011), energy reform and public policy more widely. This suggests a need for more context-specific research on energy safety nets.

Although the literature review found limited analysis and evidence about the impacts of energy safety nets, the evidence we do have suggests that, despite being near-ubiquitous in some form or other, energy subsidies fail to reach those most in need of support in a way that materially contributes to achieving universal energy access. The evidence also suggests that, particularly in the short term, attempts to shift policies from general energy subsidies to targeted energy safety nets in countries that do not have strong social safety nets already in place are likely to negatively impact the (energy) poverty of the poorest in society.

Our review of the literature on energy-related safety nets points to the need for detailed case studies to deepen the analysis, test the findings listed at the end of Section 5 and potentially identify which approaches could be most useful for policy-makers seeking to increase access to modern energy. In particular, detailed analysis of the experiences of individual developing countries would help address three critical questions that have been highlighted by a review of the literature.

These include:

Can social assistance programmes be used specifically to support access to modern energy services by poor households?

Is social assistance, in the form of unconditional or conditional cash transfers, an effective way to enable the poorest people in developing countries to access modern energy services?

Can social assistance programmes be used to improve the targeting of energy consumer subsidies?

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This working paper is the first publication from a joint programme of work of CAFOD and ODI that aims to investigate the availability and impact of support for access to modern energy services by very poor and vulnerable people. It follows a preliminary scoping of the evidence on the potential for social assistance measures to enable access to modern energy services. It will be followed by in-depth case study research to learn lessons from experiences to date of the use of social assistance to support access to energy. This research is included in the work programme of Sustainable Energy for All's People Centred Accelerator initiative.

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