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READINESS FOR INVESTMENT IN SUSTAINABLE ENERGY (RISE)

(REPORT SUBMITTED BY THE WORLD BANK GROUP)

PILOT REPORT

RISE

READINESS FOR INVESTMENT IN SUSTAINABLE ENERGY

A TOOL FOR POLICYMAKERS

WORLD BANK GROUP

SUSTAINABLE ENERGY FOR ALL

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FOREWORD

Sustainable energy is vital to economic and social development. Without it, countries cannot eradicate extreme poverty or increase shared prosperity. That is why the World Bank Group is serious about tackling energy poverty.

As a key partner of the Sustainable Energy for All (SE4ALL) initiative, which World Bank Group President Jim Yong Kim co-chairs with United Nations Secretary-General Ban Ki-moon, we are keenly focused on three goals—ensuring universal access to modern energy services, doubling the share of renewable energy in the global energy mix, and doubling the rate of improvement in energy efficiency—all by 2030. To reach these goals an additional $600 billion in annual investments needs to be mobilized over the next 15 years. Much of it needs to come from the private sector, given strained public finances.

The good news? Many countries share this vision for a secure energy future for all people. But for most countries, realizing this vision requires massive investment in sustainable energy and a solid enabling environment of policies, regulations, and institutions.

The Readiness for Investment in Sustainable Energy (RISE) can help countries get to where they want to be. Through a suite of indicators, RISE will provide a global reference point for countries to see how they are performing in energy access, renewable energy, and energy efficiency—and what policies and other instruments they may need to move toward their sustainable energy vision. RISE highlights good practices across countries that can foster a good enabling environment for sustainable energy and support peer learning.

We are pleased to present this pilot report, the starting point for the launch of the global rollout (please visit http://rise.worldbank.org for more comprehensive analysis and data). One objective of this pilot is to get additional feedback from all stakeholders to allow us to further refine the indicators for the global rollout. We have learned much through this pilot, particularly the need for strong data to support the indicators. RISE can help aggregate the many sources of information—from government to private and from utilities to regulators. The data collection process showed us what information is available as well as some of the data gaps that countries can work to fill.

We are very excited about the potential of RISE. We hope it will serve not only as an overview of the sustainable energy environment but also as a useful tool for policymakers. We still have work to do to refine the tool, but from feedback so far we are encouraged by its usefulness at the country level. Going forward, your feedback and ideas will be vital to RISE's development. Let us know what you think by sending an email to rise@worldbankgroup.org.

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RISE was managed by a core team led by Gevorg Sargsyan. Sudeshna Ghosh Banerjee led the preparation of the report as well as authored the energy access chapter. Gabriela Elizondo Azuela and Jonathan Sinton were the primary authors of renewable energy and energy efficiency chapters, respectively. Tanya Primiani and Joonkyung Seong, the coordinators of RISE, led the data collection, data validation, and data analysis. The core team included Asad Ali Ahmed, Joeri Frederik de Wit, Caroline Frontigny, Amrita Kundu, Arsh Sharma, Ruchi Soni, Jayashree Srinivasan, and Melissa Taylor. The team would especially like to acknowledge the advice and support from Vivien Foster, Melissa Johns, and Muthukumara Mani. RISE is a collaboration between the Global Energy and Extractives Practice and the Global Indicators Group of the World Bank Group and benefited from the overall guidance of Anita Marangoly George and Augusto Lopez-Claros.

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Credit: World Bank

EXECUTIVE SUMMARY

Readiness for Investment in Sustainable Energy (RISE) is a suite of indicators that assesses the legal and regulatory environment for investment in sustainable energy. It establishes a framework for better depicting the national enabling environment to attract investment into sustainable energy. In this way, RISE supports the achievement of the objectives of the Sustainable Energy for All initiative (SE4ALL): ensure universal access to modern energy services, double the share of renewable energy in the global energy mix, and double the rate of improvement in energy efficiency by 2030. Reaching the SE4ALL goals will require an almost tripling of historical annual investment flows in these areas to about $1 trillion, such that countries will need to embrace an enabling environment that attracts all forms of investment—public and private.

RISE is aimed at policymakers who focus on actions within their control. Creating this environment is directed by policymakers—the primary constituency RISE aims to influence. Given that the private sector is expected to scale up substantially to support the sustainable energy agenda, it is an important stakeholder as well. However, RISE does not aim to substitute for a comprehensive screening tool for private operators and does not intend to stand in for investors' own due diligence. Rather, it aims to provide a broad picture of the enabling environment and the good faith of governments to support private sector participation in their countries and, potentially, lower risk premiums.

RISE focuses only on the enabling environment as a determinant of investment. Many factors influence investment, including market conditions, macroeconomic stability, resource endowments, and financial environment, but RISE is limited to the policy and regulatory aspect, and so countries with a higher score on RISE may not always attract more investment—and vice versa. Investors evaluate factors individually as well as collectively before making a decision. RISE's evolution over time will allow for rigorous econometric analysis, enabling the relation between RISE and investment to be analyzed, controlled for other factors.

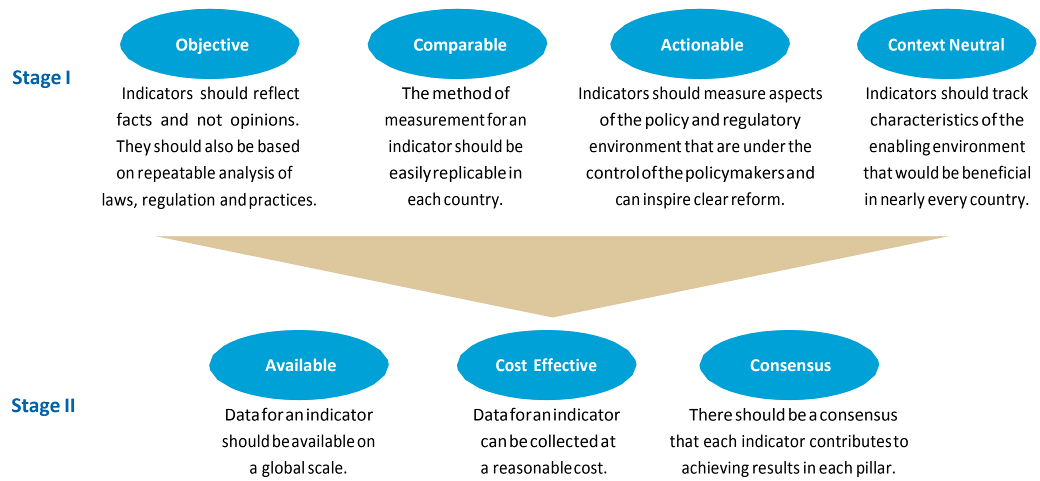
RISE will provide a global reference point that will support decision-making for governments and inform country-level interventions under SE4ALL. RISE will help stimulate policy dialogue and identify priority areas for change. It will provide a first-order snapshot of what exists in a country and point to good practices across nations that could foster an enabling environment for sustainable energy. Underpinned by substantial data collection, RISE is expected to be updated regularly, thus benchmarking country performance and allowing countries to measure incremental changes. This reiteration should also help countries adapt and customize policy measures and compare themselves with peers and good performers.

This report presents the methodology and results of a pilot phase of RISE involving 17 developed and developing countries, as well as an in-depth case study on Kenya. The pilot is supported by data collected between December 2013 and June 2014. The pilot countries, representing varying status in data availability and data quality, are: Armenia, Chile, Denmark, Ethiopia, Honduras, India, Kenya, Liberia, Maldives, Mali, Mongolia, Nepal, the Solomon Islands, Tanzania, the United States, Vanuatu, and the Republic of Yemen. An in-depth exercise was carried out in Kenya to understand better progress in creating an enabling environment.

This pilot report will be the starting point for launching the global rollout. It allows for a validation of the methodology, and for lessons learned from developing and implementing the suite of indicators across these countries. Most important, it will remain a baseline consultation document for the global rollout—expected in 2015 and to cover about 100 countries—helping refine the methodology and interpretation of results.

The indicators were developed after wide-ranging stakeholder consultations. Based on a preliminary long list of indicators, a two-stage screening process (Figure 1) was employed to arrive at the first shortlist, which went through multiple stakeholder consultations and then informed the final suite of indicators for the pilot. The shortlist was discussed with external

Figure 1: A two-stage screening process



Source: Authors.

and internal advisory groups, created for each of the three pillars of RISE (energy access, renewable energy, and energy efficiency) as well as with more than 200 private sector representatives through face-to-face interactions and an online survey in more than 30 countries. Consultations with country representatives of the Scaling Up Renewable Energy in Low Income Countries Program (SREP)—one of the funders of this work—also provided valuable feedback.

RISE encompasses 28 indicators across three pillars of sustainable energy. The pillars of energy access and renewable energy each has seven indicators, energy efficiency 10. Further are four cross-cutting indicators on topics relevant to all three pillars: fossil fuel subsidy, carbon pricing mechanism, utility performance, and retail price of electricity. Each indicator is calculated from a group of sub-indicators (Figure 2).

The indicators are further organized in four broad categories to encompass the multidimensional aspects of enabling environment—planning; policies and regulations; pricing and subsidies; and procedural efficiency. Planning captures the extent to which government vision is translated into meaningful and regularly updated master plans. Policies and regulations address specific policies and regulatory mechanisms to create an attractive business environment. Pricing and subsidies deal with policies and incentives that focus on appropriate price signals to markets and subsidy mechanisms to facilitate the development of sustainable energy. Procedural efficiency measures whether the processes adopted to develop sustainable energy are executed within reasonable time and cost, and captures the administrative ease of doing business.

A "traffic light" system is used to convey performance on individual indicators and can be aggregated to represent performance on different categories or pillars. Most indicators are scored between 0 and 100 and aggregated with equal weights. While each indicator could have a different number of sub-indicators, they all hold equal weight and are aggregated to form the indicator score. The procedural efficiency indicators are scored based on the "distance to frontier" approach, where the frontier represents the best performance by any country observed on each indicator. A higher score indicates a more efficient business environment. A green light highlights countries that are close to good practice, in the context of RISE, on a certain indicator or pillar. A red light indicates that a country has much to improve to achieve good practice on what is measured by RISE. A yellow light shows that a country has embarked on creating an attractive enabling environment but still has some distance to go to achieve a green light. When a country receives a green light, though, it doesn't necessarily mean that it lacks attributes to improve on—rather, it signals its current readiness for investment, which for the investor provides important evidence about the commitment and credibility of government policymaking in creating an enabling environment. Therefore, countries with a higher score in RISE may not always succeed with attracting more investment and vice versa. Investors value various factors individually as well as collectively before making a decision to go ahead.

RISE uses the country as the unit of analysis. The reality in some large countries, particularly those with federal arrangements, is that policies and their enforcement can

Figure 2: RISE—28 indicators and 85 sub-indicators in 4 categories and 3 pillars

	Energy Access	Renewable Energy	Energy Efficiency
Planning	**Electrification plan** *National plan* *Coverage of grid and off-grid* *Regular update*	**Planning for renewable energy expansion** *Renewable energy in expansion planning* *Renewable energy in transmission planning* *Target with an action plan* *High quality resource mapping*	**National plan for increasing energy efficiency** *National energy efficiency targets* *Energy efficiency legislation/action plan* *Sub-sectoral targets* **Entities for energy efficiency policies, regulation and implementation** *Setting energy efficiency policy* *Setting energy efficiency standards* *Regulating energy efficiency activities of suppliers* *Regulating energy efficiency activities of consumers* *Equipment standards compliance* *Building standards compliance*
Policies and Regulations	**Enabling environment for renewable energy developers to invest in mini-grids** *Existence of regulations* *Regulation attributes* *Standards* *Protection against expropriation* *Subsidies or duty exemption* **Enabling environment for standalone home systems** *National program* *Standards* *Subsidies or duty exemption*	**Legal framework for renewable energy** **Regulatory policies** *Incentives to grid-connected renewable energy* *Incentives to distributed renewable energy* **Regulatory policies-policy design attributes** *Predictibility* *Sustainability* *Accessability'* *Remuneration efficiency* **Network connection and pricing** *Connection cost allocation* *Network usage pricing* **Public financial support mechanisms** *Credit enhancement* *Utility payments guarantee* *Fiscal incentives* *Public financing supports*	**Quality of information provided to consumers** *Reports on electricity usage* *Quality of information in report* *Comparison with other users* *Energy saving information* **Incentives or mandates for energy supply utilities** *Mandates for utilities* *Penalties for non-compliance* *Measurement of savings* *Third party validation* *Cost recovery for utilities* **Incentives or mandates for public entities** *Obligations for public buildings* *Obligations for other public facilities* *Public procurement of energy efficiency products* *Multi-year contracts* *Allowance to retain savings* **Incentives or mandates for large-scale users** *Mandates for large-scale users* *Penalties for non-compliance* *Measurement of savings* *Incentives for large-scale users* **Minimum energy efficiency performance standards** *Appliances* *Lighting* *Electric motors* *Industrial equipment* *Regular update* *Penalties for non-compliance* **Energy labeling system** *Appliances* *Lighting* *Electric motors* *Industrial equipment* **Building energy codes** *Residential buildings* *Commercial buildings* *Compliance system* *Renovated buildings* *Building energy information*
Pricing and Subsidies	**Funding support to electrification** *Dedicated funding* *Subsidy to household connection* *Subsidy to grid extension* **Affordability of electricity** **Utility performance** (cross-cutting) *Reporting practice* *Financial performance*	**Fossil fuel subsidy** (cross-cutting) **Carbon pricing mechanism** (cross-cutting) *GHG emission reduction target* *Carbon pricing mechanism* **Utility performance** (cross-cutting) *Reporting practice* *Financial performance*	**Incentives from electricity pricing** *Electricity rate structure* *Charges to large customers* **Fossil fuel subsidy** (cross-cutting) **Carbon pricing mechanism** (cross-cutting) *GHG emission reduction target* *Carbon pricing mechanism* **Retail price of electricity** (cross-cutting)
Procedural Efficiency	**Establishing a new connection** **Permitting a mini-grid**	**Starting a new renewable energy project**	

● *Indicators for a specific pillar* ● *Cross-cutting indicators*

Source: Authors.

vary greatly. In the United States and India, for example, state governments not only have a role in implementing federal policies but set state-specific policies. For simplicity, the largest business city of the economy or the state where the largest business city is located has been chosen for analysis in such countries. In the United States and India, New York City and Mumbai were selected, so some indicators represent policies of New York City and Mumbai (or New York State or Maharashtra if a policy is governed at state level).

RISE's suite of indicators builds on many other initiatives with similar objectives, but distinguishes itself along four major dimensions: it will cover more than 100 countries once the global rollout is complete; encompasses all three pillars (energy access, renewable energy, and energy efficiency) of the SE4ALL initiative; is expected to be frequently updated; and is underpinned by substantial data collection, which will be publicly available for countries and researchers (http://rise.worldbank.org).

RISE is slated to transition to the first global rollout in 2015 with an aspiration to regularly update the exercise until 2030. As a global initiative, it will also likely evolve dynamically: in addition to the core group of indicators, opportunities may exist for designing a secondary set of indicators of interest to groups of countries. RISE is thus a "living" initiative, expected to continue supporting SE4ALL actions.

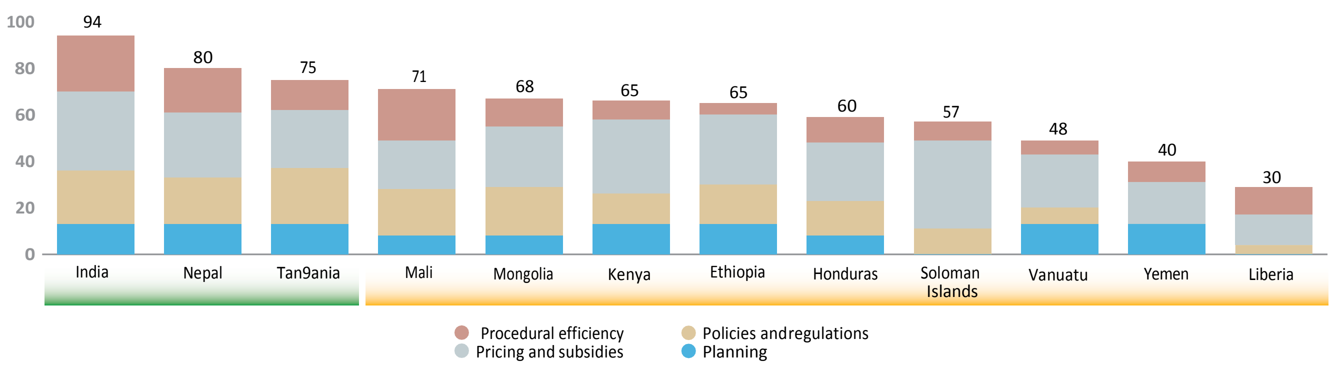
KEY FINDINGS

In energy access, India, Nepal, and Tanzania are in the green zone; the rest are in the yellow zone. None of the countries is in the red zone, demonstrating the headway made by all of them on certain indicators (Figure 3). Particularly, planning is the most widely adopted among categories. All but two have formal electrification plans. However, actions on policies and regulations, pricing and subsidies, and procedural efficiency are still a distance away in many countries. Among the sub-indicators, those related to creating an enabling environment for mini-grids lag the farthest behind.

Still, a handful of countries such as Mali and Tanzania have set up innovative mechanisms to support mini-grid development. These include: regulations outlining rights and mandates of developers, a right to charge a higher tariff than the national level to recover the incremental cost of mini-grids, no requirement of prior regulatory approval before sales, mini-grid standards, protection against expropriation, and duty exemptions or subsidies. Another group of countries including Ethiopia, Kenya, Mongolia, India, and Nepal have regulations explicitly allowing operation of mini-grids, but they are not yet comprehensive. However, only in very few countries do privately owned mini-grids operate and the process to obtain a permit to operate varies widely. As an example, it takes a developer in India about 90 days, $48, and interaction with only one public agency to set up a renewable energy project, while the same activity takes 510 days, $6,620, and interaction with three public agencies in Tanzania, where the process is complicated by costly environmental clearances.

Compared with mini-grids, standalone home systems are promoted more often. Honduras, India, Mongolia, Nepal, and Tanzania all have policies that include desirable attributes to promote such systems, such as national promotion programs, application of minimum quality standards, and duty exemptions or subsidies for these systems. At the other end is Yemen, which has yet to adopt any policy to promote standalone home systems. In all other countries, the missing piece is typically minimum quality standards.

Figure 3: RISE energy access scores



Note: The indicators for energy access are relevant for only 12 countries as Armenia, Chile, Denmark, Maldives, and the United States have already reached universal access.

Source: RISE database.

The time to get a new household electricity connection in rural areas varies from one week in India and Solomon Islands to one year in Ethiopia. In Kenya, it takes nearly three months to obtain a new connection. Customers have to wait a month to receive an inspection visit from the utility's engineers, a month to receive an estimate and sign the supply contract, and another one for the connection works and meter installation. In Tanzania, once all the administrative process is completed, the connection works are often delayed because the utility faces shortages of poles and energy meters.

In renewable energy, countries report a high degree of heterogeneity, ranging from Denmark to Yemen. Four groups can be identified (Figure 4):

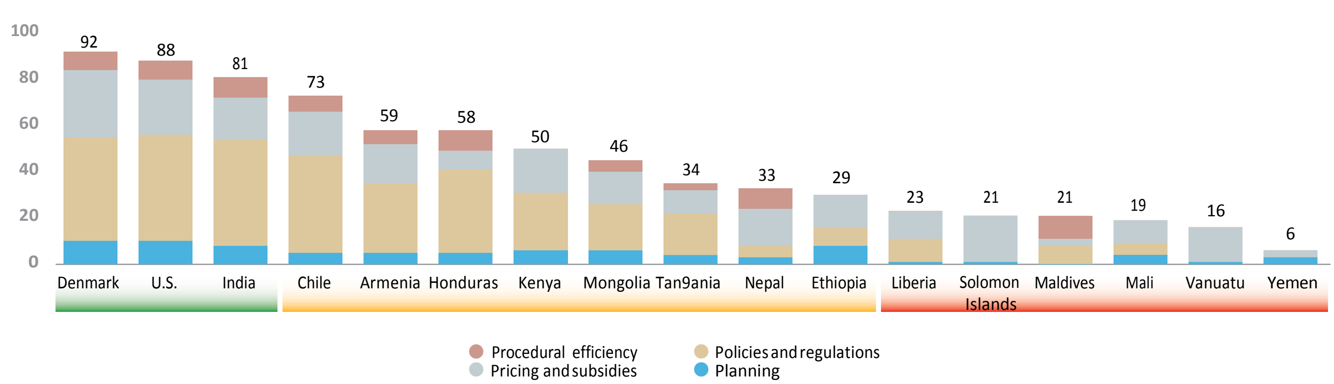
- Countries that exhibit a strong performance and have introduced most of the elements necessary for a robust enabling environment (green traffic light)—Denmark, the United States, and India.
- Countries that have made good progress, but where there is still room for improvement in the areas of planning and of policies and regulations (yellow traffic light)—Chile, Armenia, Honduras, Kenya, and Mongolia.
- Countries in the initial stages of introducing the basic measures to promote investment (yellow traffic light)—Tanzania, Nepal, and Ethiopia.
- Countries in which most of the essential elements are missing—Liberia, the Solomon Islands, Maldives, Mali, Vanuatu, and Yemen (red traffic light).

In planning, many countries still need to develop high-quality resource mapping—ideally associated with strategic planning or zoning guidance—and link data on renewable energy potential to anticipatory planning in expansion of both generation and transmission. Regardless of the size of the system or degree of renewable energy penetration, countries that have committed to specific renewable energy targets need to apply an anticipatory approach to planning to ensure the cost-effectiveness and economic efficiency of the scale-up. Countries with a commitment to increase the penetration of renewable energy will generally need to introduce a cost-effective and customized basket of regulatory, fiscal, and financial incentives.

Countries that have lagged behind in renewable energy have a less diversified fuel mix. A few of them—for example, Ethiopia and Nepal—have a high share of hydropower generation. Others—including, Mongolia, Tanzania, and Yemen—have a high share of fossil fuel–based generation. In these countries, non-hydro renewable energy could be important in reducing either the risk of rationing during dry seasons and acute droughts, or fuel oil dependence. In fact, most of these countries appear to have abundant non-hydro renewable energy resources, and they could consider promoting renewable energy as an energy diversifying strategy.

Most of the countries with a regulatory policy to promote renewable energy still need to improve their design in order to secure the investment grade attributes for attracting private sector participation. A major policy challenge is to balance affordability of support programs on the one hand with effectiveness and the need for improved investor certainty on the other. Policymakers and regulators should ideally conduct ex ante economic analysis of the long-term impact of incentives on affordability. In certain cases, these officials could consider designing price incentives with downward adjustments to reflect changes in technology costs in order to control potential overexpansion of renewable energy capacity.

Figure 4: RISE renewable energy scores



Source: RISE database.

Starting a renewable energy project can be fairly straightforward on time, interactions with number of agencies, and cost in countries like Denmark and Maldives, but much more cumbersome in countries like Tanzania and the United States. There is significant variation in performance across the three dimensions of this indicator. In Maldives, a solar project developer deals only with the State Electric Company and the Maldives Energy Authority and can be up and running in as little as 96 days. In the United States, a solar developer must work with up to six agencies and follow procedures taking almost half a year to get a project running. Whereas permitting and connecting a wind project is of little or no cost in Chile and Denmark, obtaining a land permit and tariff approval, among other procedures, costs over $50,000 in Mongolia. High transactions costs in India and Tanzania tend to be associated with the need to meet environmental safeguards.

For energy efficiency, Denmark and the United States are in the green traffic light zone, while the rest are split between the yellow and red zones (Figure 5). All countries have taken some steps important to incentivizing energy efficiency. Actions such as establishing entities with responsibility (if not always authority) for energy efficiency, setting appropriate electricity rate structures (if not always price levels), and providing customers with information on their power consumption (though even the developed countries can do better here) are commonly seen.

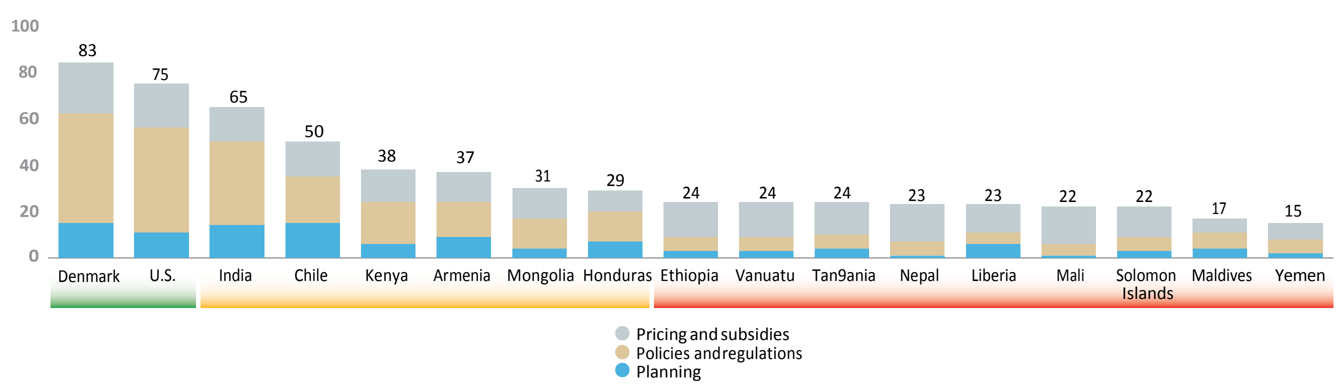
Many countries would benefit from adopting or strengthening national and subnational energy efficiency targets and plans supported by legislation, to provide a firm basis for the detailed policy and regulatory elements. Most countries have already established or taken steps toward establishing the institutions required to carry out energy efficiency policy. Many of them need to take the next step and give these institutions a clear mission and means to achieve it by expressing targets in national (and/or subnational) plans supported by legislation.

The next priority for many countries would be to bring in standards and labels for appliances and equipment, and building energy codes. Standards are an area in which many technical and financial resources for assistance are available; labels and reporting of energy use are proving to be an important means of communicating the market value of energy efficiency and deserve attention. Building energy codes are more challenging, but would be a useful next priority for countries, particularly those rapidly urbanizing. Good places to start for both these elements would be buildings and facilities owned by government agencies themselves.

Most countries can learn from the public procurement and other programs that have proven effective in many countries in reducing government expenditures on energy purchases, and in creating markets for energy-efficient equipment and services. These moves could complement efforts to put in place incentives and mandates for big industrial and commercial energy users, another area in which most countries are deficient. These programs, for public and private entities, require significant capacity to monitor pre- and post-intervention energy consumption in order to evaluate outcomes—capacity that needs to be developed in parallel to designing and rolling out new policies and regulations.

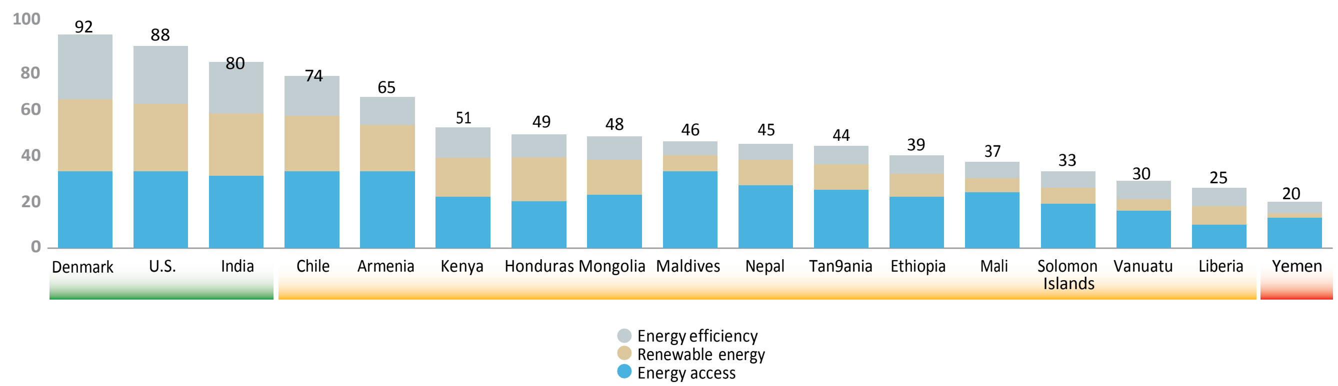
Denmark and the United States rank highest in the RISE aggregate score that combines as a simple average the

Figure 5: RISE energy efficiency scores



Source: RISE database.

Figure 6: RISE aggregate scores



Source: RISE database.

three scores on energy access, renewable energy, and energy efficiency (Figure 6). The score reveals a wide heterogeneity in performance, ranging from 92 in Denmark to 20 in Yemen. Within the group of developing countries, India scores the highest—and not only does it lead in access, it also takes third place in renewable energy and efficiency. Chile is the other developing country that performs relatively well in renewable energy and energy efficiency. Yemen is the only country in the red zone, highlighting that policies and regulations to support sustainable energy are nascent. The remaining 12 countries show a yellow traffic light—suggesting they have either made some progress on each of the pillars or scored highly on one or two of them.

Developing countries appear to prioritize energy access over renewable energy or energy efficiency. All the developing countries are assessed as yellow or green on energy access (or have no energy access challenges), while between six and nine of them still show a red traffic light on renewable energy and efficiency. Countries that tend to do well on renewable energy also perform well on energy efficiency (the correlation coefficient of the two scores is very high at 0.93), as clean energy embracing these two aspects often appears to be pursued in tandem. Still, the renewable scores are typically higher than those for energy efficiency, particularly in Armenia, Chile, and Honduras. Similarly, access scores are frequently higher than those for renewable energy, particularly in Mali, Nepal and Tanzania. The correlation coefficient of the access and renewable energy scores is 0.69, and that of the access and efficiency scores 0.65.

On all three pillars, one group of countries performs well (such as Denmark, India, and the United States) and another group lags behind (such as the Solomon Islands, Vanuatu, and Yemen) (Table 1). On energy efficiency, nine countries are in the red traffic light zone—highlighting the considerable distance they still need to traverse to demonstrate an investor-friendly environment. It also suggests that many countries are yet to prioritize energy efficiency within the sustainable energy space. On all three pillars, the biggest single traffic light group is yellow, suggesting that they have embarked on a path of creating an attractive investment climate, but one still a work in progress.

Table 1: Countries by topic and traffic light

	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	U.S.	Vanuatu	Yemen
Energy Access	–	–	–	Yellow	Yellow	Green	Yellow	Yellow	–	Yellow	Yellow	Green	Yellow	Green	–	Yellow	Yellow
Renewable Energy	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Red	Red	Red	Yellow	Yellow	Red	Yellow	Green	Red	Red
Energy Efficiency	Yellow	Yellow	Green	Red	Yellow	Yellow	Yellow	Red	Red	Red	Yellow	Red	Red	Red	Green	Red	Red

Note: – means the country does not have energy access challenges.

Source: RISE database.

Credit: Yusuf Türker/World Bank

CHAPTER 1
INTRODUCTION

Recognizing the vital role of sustainable energy[1] in sustainable development, the United Nations (UN) Secretary General launched three global objectives in 2011 under the Sustainable Energy for All (SE4ALL) initiative:[2] ensure universal access to modern energy services, double the share of renewable energy in the global energy mix, and double the rate of improvement in energy efficiency—to be accomplished by 2030. The initiative, cochaired by the UN Secretary General and World Bank President, now has more than 85 “opt-in” countries, where country actions are promoted. The SE4ALL goals are included in the standalone energy goal proposed in the UN High Level Panel constituted to establish the post-2015 development agenda[3] and in the Open Working Group document on sustainable development goals that proposes to “ensure access to affordable, reliable, sustainable, and modern energy for all.”[4]

The World Bank Group has been designated as the knowledge hub for SE4ALL working through partnerships with many other stakeholders. The 2013 Global Tracking Framework report, prepared by the World Bank as part of an international consortium, quantified these SE4ALL goals and established the tracking mechanisms, with a commitment to monitor progress every two years (World Bank and IEA 2013). From 2010’s starting point, the rate of access to electricity and the use of modern cooking solutions have to rise from 83 percent and 59 percent, respectively, to 100 percent by 2030. Renewable energy’s contribution to total final energy consumption has to double from 18 percent to 36 percent. And the rate of improvement in energy intensity has to double from 1.3 percent to 2.6 percent during this period.

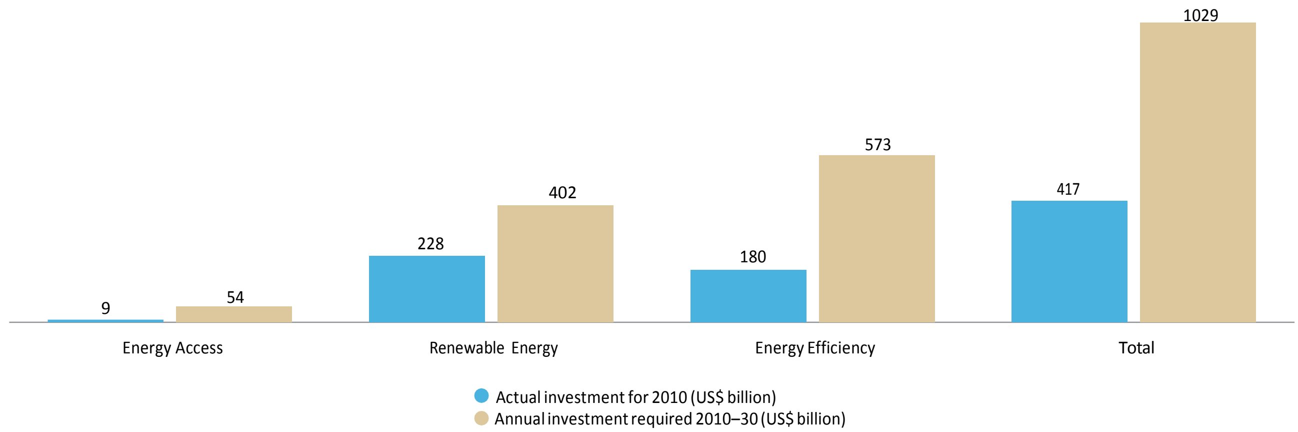
Reaching these goals will require historical capital flows to be almost tripled, as business as usual will not remotely suffice. The Global Tracking Framework (GTF)[5] report estimates that almost a trillion dollars of annual investments are required over 2010–30, against the $400 billion actually spent in 2010. The bulk of those investments are for renewable energy and energy efficiency objectives, with energy access expenditures far smaller (though, at six times, the energy access gap is greater, relatively, than those in renewable energy and energy efficiency—Figure 1-1). Investments of this size cannot be realized through public funds alone—private investment will have to step up. Even then, not all aspects of sustainable energy are equally attractive to the private sector. For energy access, the public sector has historically played the dominant role and will continue to do so in the near future, although the space for private activity is dynamic and evolving.

Countries will need to signal to investors that they are ready for capital flows in sustainable energy, which requires bold policy measures as well as an effective regulatory and institutional environment. Empirical evidence suggests that enabling political, legal, and institutional frameworks form a key determinant of private participation in infrastructure. The Organisation for Economic Co-operation and Development (OECD 2007), in its principles for private sector participation in infrastructure, reinforces the need for an enabling policy framework for investment. Providing certainty, stability, and predictability through the rule of law, property and contractual rights, and credible and enforceable regulatory frameworks is typically important to attracting private investment.[6] Liberalizing the investment regime and creating a competitive environment are

1. In this report, provision of sustainable energy refers to providing and achieving sustainable energy access, improving energy efficiency, and increasing the use of renewable energy, as per the SE4ALL goals.
2. For further information on SE4ALL, see www.sustainableenergyforall.org
3. UN High Level Panel 2013.
4. Open Working Group 2013.
5. World Bank 2014. Global Tracking Framework. Sustainable Energy for All Report 85415, Washington, DC. http://documents.worldbank.org/curated/en/2014/01/19164902/global-tracking-framework

6. Banerjee, Oetzel, and Ranganathan 2006; Basilio 2010; Hammami, Ruhashyankiko, and Yehoue 2006; Harris 2003; Pargal 2003.

Figure 1-1: The projected annual investment shortfall over 2010–30 is enormous



Source: World Bank and IEA 2013.

also important for enhancing the quality of the investment climate and harnessing the potential of private sector participation.[7] In addition, strength of the local capital markets is crucial as local private players are expected to be important investors in sustainable energy.

1.1 WHAT IS RISE?

Readiness for Investment in Sustainable Energy (RISE) is a suite of indicators that assess the legal and regulatory environment for investment in sustainable energy—energy (electricity) access,[8] renewable energy and energy efficiency. RISE is relevant for a wide group of stakeholders. Crucially, it is aimed directly at the policymakers responsible for creating a strong enabling environment and for identifying priority areas for change. However, seeking feedback from the private sector is an important aspect in the RISE development process as the policy and regulatory processes are designed to attract investors. It is a careful balance as policymakers have to design the policy platform not only to secure invest- ments but also to ensure that the platform is for the larger good of achieving sustainable energy for all. By focusing on actions within policymakers' control, RISE will contribute to domestic policy debates by providing a global reference point on actions to facilitate the environment needed to support sustainable energy investments and to inform country interventions under SE4ALL. Along with GTF, RISE will be one of the flagship products prepared by the World Bank Group, in its role as the knowledge hub for SE4ALL.

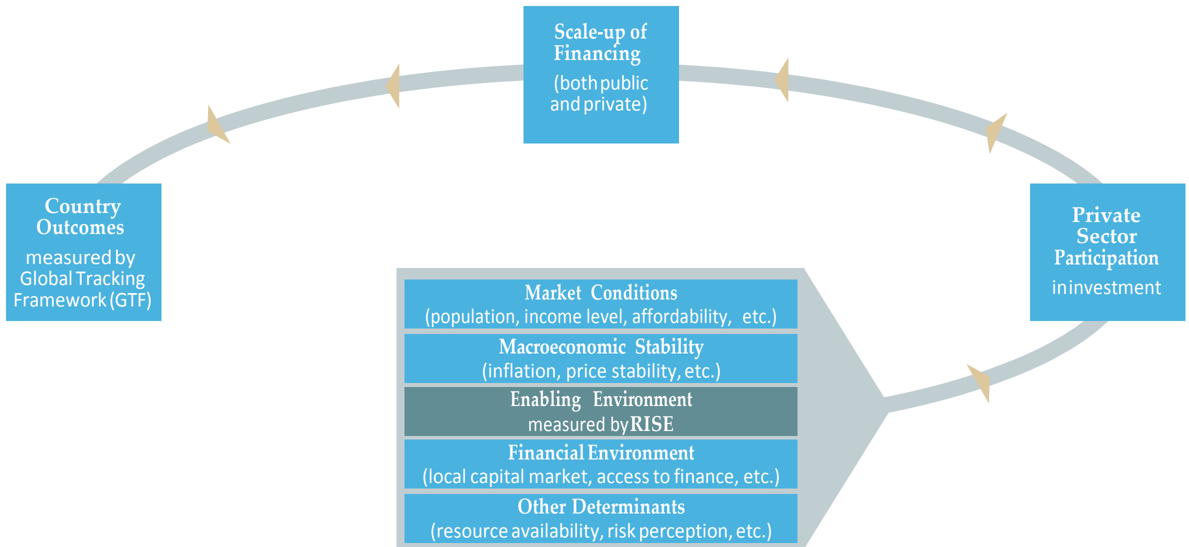
Underpinned by primary data collection, RISE is expected to be updated regularly, thus benchmarking country perfor- mance on the indicators over time while allowing countries to measure incremental changes, which together will help countries adapt and customize policy measures and compare themselves with peers and good performers. The data will be available on the RISE website (http://rise.worldbank.org) as a public good for stakeholders as well as for interested researchers to carry out further analysis.

RISE assesses the investment climate across three pillars of energy access, renewable energy, and energy efficiency in sustainable energy, thus better articulating the link between country policy actions and SE4ALL goals (Figure 1-2). While RISE builds on the hypothesis that the enabling environment is important to generating investment flows to support sustainable energy outcomes in a country, other factors such as the macroeconomic environment, local capital market, and other market conditions also affect investment. A global dataset, particularly in panel format, can allow robust identification of how the enabling environ- ment affects investment flows, controlling for other factors.

RISE originates from a previous World Bank Group initiative, the Climate Investment Readiness Index, which evalu- ated the environment for private investment in climate mitigation and low-carbon technologies in South Asian countries—Bangladesh, India, Maldives, Nepal, Pakistan, and Sri Lanka—compared with other emerging economies and developed regions. The index focused on renewable energy (particularly solar photovoltaic (PV), onshore wind, small hydro, and biomass) and energy efficiency (particularly lighting, appliances, and building codes).

7. Harris 2003; OECD 2007; Pargal 2003.
8. Development of indicators for modern cooking solutions has been excluded in the pilot phase and will be considered in the global rollout.

Figure 1-2: RISE is aligned to realizing SE4ALL goals



Source: Authors.

RISE's value rests on its design attributes that build on current initiatives that measure the enabling environment for sustainable energy in countries across the globe (Figures 1–3 and 1–4). (Relevant indexes are in Annex V.) For example, the International Energy Efficiency Scorecard of the American Council for an Energy-Efficient Economy ranks various energy efficiency policies and programs in the world's 16 largest economies. Climatescope assesses climate-related investments, focusing on Latin America and the Caribbean and on renewable energy; its latest exercise is expanding coverage to Africa and Asia.

However, it is important to highlight two caveats on RISE that arise by virtue of its inherent objective and design.

RISE does not cover other factors relevant for attracting investments. Countries with a higher score in RISE will not

Figure 1-3: RISE draws from current initiatives

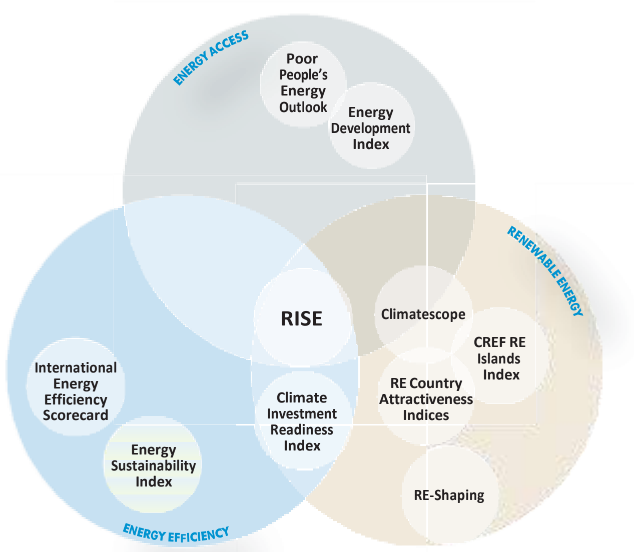
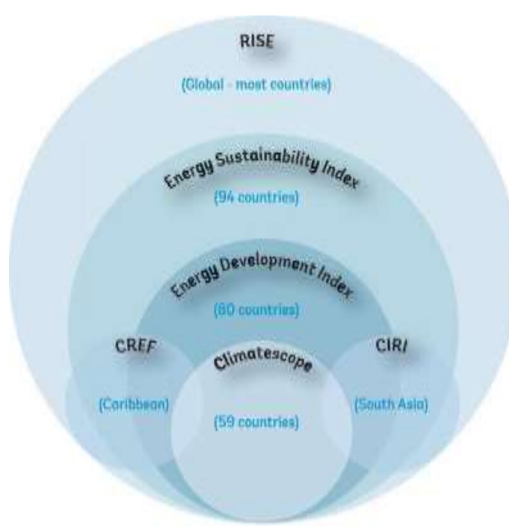


Figure 1-4: Geographic scope of exisiting indexes and RISE



Annual investment requirements have to rise more than double to a trillion dollars to achieve the SE4ALL objectives.

necessarily attract more investment, as it assesses a part of significant determinants to investment decision-making. A country can be *ready* but still not be an *attractive* investment destination, and vice versa: readiness and attractiveness for private investment are not necessarily synonymous. Multiple factors affect private investment decisions, many of them outside the immediate control of policymakers responsible for energy. For instance, market conditions, resource endowments, macroeconomic frameworks, the broader rule of law, and geographic location are all relevant for private sector decisions. Market conditions are characterized by market size, income level, and affordability of consumers, which are critical to the feasibility of infrastructure services and to the reduction of demand risks.[9] In countries with a large population and high GDP per capita, therefore, an ability to pay for infrastructure services is likely to attract more private capital.

Macroeconomic stability is another key factor to reduce risks that private investors are exposed to and thus promote their interest. Limited inflation and price stability provide long-term stability, although risk-financing instruments such as price guarantees may mitigate this risk case by case. The private sector initially seeks low-hanging fruits, and a country can pay a huge risk premium if its policy and institutional mechanisms are only at the nascent stage. Over time, as the country's readiness for sustainable energy evolves, the risk premium may fall, laying the groundwork for systemic change. Thus RISE can provide a signal to investors about a government's commitment in attracting resources and in lowering risks to investment.

RISE does not aim to present exhaustive information set for private investors. Though RISE provides information and measurements on policies and regulations to foster an enabling environ- ment—one of the significant determinants of investment—it is not intended that RISE covers a comprehensive and exhaustive information package for the private sector to assess that environment. As risk appetite varies from investor to investor, investment decision-making is a subjective matter that cannot be replaced by an "information set," "scores," or "traffic lights" based on a standardized methodology that is not customized for individual investors. RISE can let the private sector appreciate the broad picture of a country's enabling environment and identify the good faith of governments undertaking certain actions to support private sector participation—but it will not replace investors' own due diligence.

1.2 HOW WAS RISE DEVELOPED?

This pilot report presents the results of a pilot phase comprising 17 developed and developing countries, and an in-depth case study on Kenya. It is supported by data collected and validated between December 2013 and June 2014, thus reflecting latest data updates as of June 2014. The pilot report allowed for a validation of the methodology, and lessons learnt from the process entailed developing and implementing the suite of indicators across countries that represent a varying status in data availability and data quality. Most importantly, it forms a solid base as a consultation document for the global rollout expected in 2015. It serves as a starting point by allowing for refinements in the methodology and in interpretation of indicators. The global report will serve as a reference point of measurement covering about 100 countries with a goal to regularly assess until 2030, allowing the tracking of the evolution of enabling environment for sustainable energy.

RISE was developed in collaboration with the African Development Bank and the Inter-American Development Bank, and has received funding from the Scaling Up Renewable Energy in Low Income Countries Program (SREP) of the Climate Investment Funds, the International Renewable Energy Agency (IRENA), the U.S. Agency for International Development (USAID), and the Energy Sector Management Assistance Program (ESMAP). The selection of countries is therefore predisposed toward those participating in SREP. Non-SREP countries such as Chile, Denmark, India, and the United States have been included for wider representation.

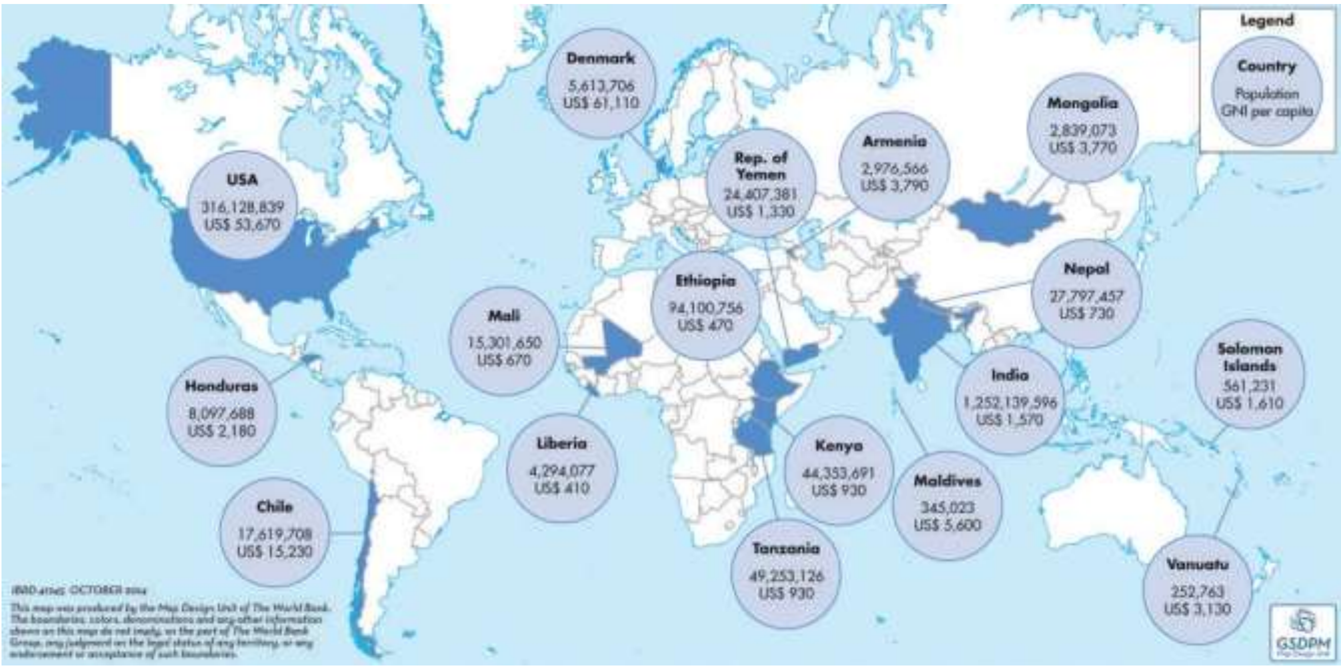
The pilot countries, representing varying status in data availability and data quality, are Armenia, Chile, Denmark, Ethiopia, Honduras, India, Kenya, Liberia, Maldives, Mali, Mongolia, Nepal, the Solomon Islands, Tanzania, the United States, Vanuatu, and the Republic of Yemen (Figure 1-5). They represent a mix of incomes (high, upper middle, lower middle, and low) and most regions (Africa, Americas, Asia and Pacific, Europe, and the Middle East). The indicators for energy access are relevant for only 12 countries as Armenia, Chile, Denmark, Maldives, and the United States have already reached universal access. The case study on Kenya

9. Bannerjee, Oetzel, and Ranganathan 2006; Basillio 2010; Hammami, Ruhashyankiko, and Yehoue 2006; Mengistu 2013.

Source: Authors.

Source: Authors.

Figure 1-5: RISE was piloted in 17 countries

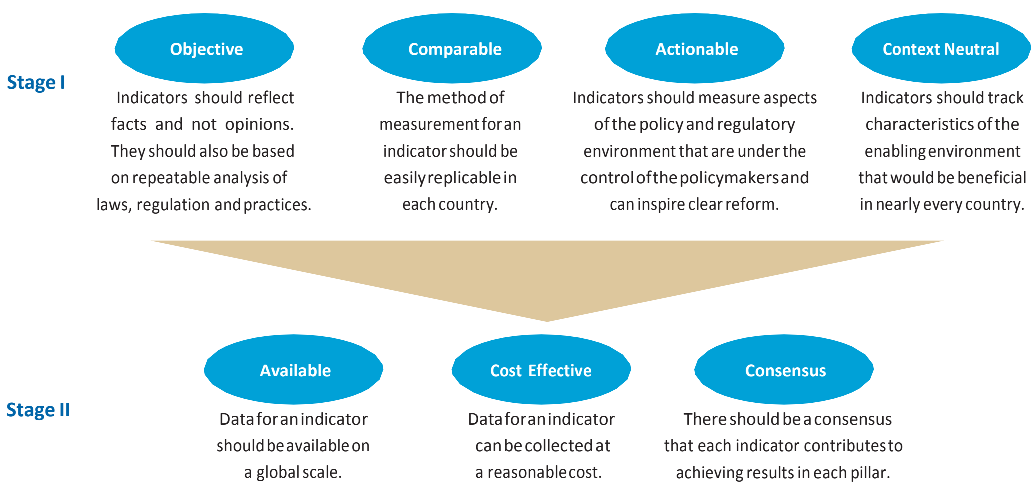


Source: GSDPM, Map Design Unit, World Bank.

aims to depict in a more comprehensive manner progress in creating an enabling environment for sustainable energy. A few text boxes are placed in the three thematic chapters on energy access, renewable energy, and energy efficiency.

The pilot phase was governed by a two-tier arrangement: a steering committee of donors and implementing agencies that set the broad direction for the initiative and mobilized funding; and an external advisory group of technical experts across the three pillars to ensure rigor, quality, and relevance. The external advisory group comprises 30 experts. In addition, an internal advisory group of World Bank Group experts, who have knowledge of the three SE4ALL areas, was consulted to ensure that the initiative

Figure 1-6: A two-stage screening process for indicators was used



Source: Authors.

Table 1-1: Consultations to select RISE indicators

Consultation	Schedule	Number of Participants
RISE Internal Advisory Group	May/October 2013	20+
SREP country representatives	May 2013	40+
Private sector online survey	June 2013	140+
Private sector focus group (Washington, DC)	June 2013	10
Private sector focus group (Delhi, India)	July 2013	15
Private sector focus group (Kathmandu, Nepal)	August 2013	12
Private sector focus group (Nairobi, Kenya)	August 2013	8
Private sector individual interviews	August 2013	11
RISE Extrenal Advisory Group	October 2013	23
RISE Internal Advisory Group	April 2014	20+
RISE External Advisory Group	May 2014	20+

Source: Authors.

was pragmatic and would contribute to the ongoing policy dialogue and operational agenda in client countries (Annex VI).

A preliminary long list of indicators was initially identified based on consultation with various stakeholders (Annex II). A two-stage screening process was then employed to arrive at the first shortlist (Figure 1-6).

Stage I. Four principles of objectivity, comparability, action, and context-neutrality were applied to ensure that indicators will be deployable in almost every country.

An attribute that stood out at this stage was one of reconciling various approaches that are considered good practice at different time points. In renewable energy development for instance, feed-in-tariffs and reverse auctions have both been promoted at various times by different countries. So RISE attempts to be neutral and avoid making value judgments on the approach a country is taking to promote an outcome.

Stage II. Three principles of universal data availability, cost-effectiveness of the data collection, and presence of a common consensus were then used.

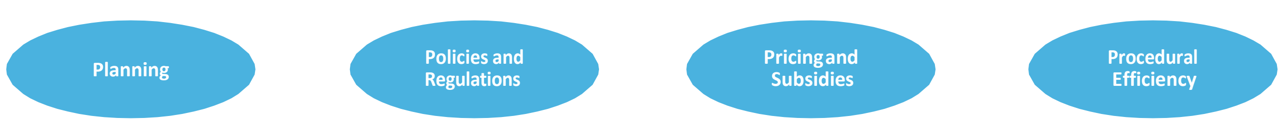
RISE is a suite of indicators to assess the legal and regulatory environment for sustainable energy.

This first shortlist went through multiple stakeholder consultations that informed the selection of the final suite of indicators (Table 1-1). First, the external advisory group provided expert advice and quality control in two rounds of consultations. Similar discussions were held with the internal advisory group—the World Bank Group technical experts, who have knowledge of the three SE4ALL areas. The experts helped incorporate close country knowledge from World Bank Group operations. Second, the selection of indicators and associated methodologies was discussed with private sector representa-tives. As RISE recognizes the importance of engaging that sector, consultations with private developers and investors were held in Washington, DC (all pillars), Nepal (energy access), Kenya (renewable energy), and India (energy efficiency). The selection of indicators also benefited from a private sector survey–based online consultation with more than 140 stakeholder groups in over 30 countries worldwide. The private sector was also represented in the external advisory group to ensure integration of their perspective in the indicators. Third, consultations with country representatives of SREP—one of the programs of Climate Investment Funds as well as funders of this pilot—also provided valuable feedback.

1.3 WHAT ARE THE RISE INDICATORS?

RISE is anchored on a framework developed to encompass multidimensional aspects of a policy framework in a country that fosters an enabling environment for sustainable energy. Four broad categories under the framework are an organizing principle: planning, policies and regulations, pricing and subsidies, and procedural efficiency (Figure 1-7).

Figure 1-7: Categorizing the indicators



Source: Authors.

Planning represents visions of governments translated into master plans at the national level and their attributes for good practice. Policies and regulations address specific policies and regulatory mechanisms to create an attractive business environment. Pricing and subsidies deal with policies and incentives focusing on appropriate price signals to markets and subsidy mechanisms to facilitate the development of sustainable energy. Procedural efficiency measures whether the processes adopted to develop sustainable energy are adopted within a reasonable time and cost, and captures the administrative ease of doing business. Procedural efficiency may be exemplified with the following story. Imagine Abeba, a farmer who lives without electricity in Ethiopia. Last month, engineers installed electricity poles and cables in her rural village. She gathered the necessary money and applied to connect her household. Unfortunately, she will have to wait a year to obtain the connection, as the utility has difficulties coping with the high demand for new connections. Thus even when a legal framework and adequate subsidies are in place, implementation issues—in this case, lack of materials and workforce—may remain.

Development of the framework was informed by results from a 2004 worldwide survey of international power investors, which outlines what they look for while deciding on their investments.[10] The top priority was adequate tariff levels and collection discipline, which allows for reasonable revenue generation. Among the other priorities was a clear and enforceable legal framework. Investors want certainty—where government upholds its commitments to investors. They also sought administrative or government efficiency, allowing them to recoup their investments without government interference. Finally, regulatory arrangements independent from government were also found attractive. The categories of pricing and subsidies, policies and regulations, and procedural efficiency in RISE map into these priorities.

The final list of 28 RISE indicators encompasses the three pillars of energy access, renewable energy, and energy efficiency, as well as four cross-cutting indicators for topics relevant to all three SE4ALL goals (Figure 1-8): fossil fuel subsidy, carbon pricing mechanism, utility performance, and retail price of electricity. Energy access is assessed on eight indicators including one cross-cutting indicator; renewable energy on 10 indicators including three cross-cutting indicators; and energy efficiency on 13 indicators including three cross-cutting indicators.

The unit of analysis in RISE is a country. For large countries with federal arrangements, the biggest business city was chosen for analysis, because policies and their enforcement can vary widely within the country. For instance, in the United States and India, state governments not only have a role in implementation of federal policies but also set state-specific policies. Here, the largest business city of the economy or state where the largest business city was chosen: New York City and Mumbai.

In the three categories of planning, policies and regulations, and pricing and subsidies, indicators are scored between 0 and 100 and aggregated with equal weights. For procedural efficiency, the questions adopt the "distance to frontier" (DTF) approach, where the frontier presents the best performance by any country observed on each indicator. The distance to frontier is a relative measure normalized to range between 0 and 100, with 100 representing the frontier. A higher score indicates a more efficient business environment.

All the indicators are weighted equally. While it can be argued that some indicators are more important than others, a justification in a consistent manner was not applicable in all cases. Further, the *Doing Business* project that inspires RISE has carried out analysis of several ways of weighting indicators that have proved inconclusive, and have not proceeded with weighting. Further, while each indicator in RISE could have a different number of sub-indicators, they each hold equal weight which are aggregated at the indicator level. As a result, the weight for each sub-indicator is different. There is an implicit weighting in the sense that one indicator can have two sub-indicators with 50 percent weight while another indicator may have five sub-indicators with 20 percent weight. The implications of this aspect will be further reviewed at global rollout.

Some indicators present a scalar way of capturing quality of the policy and regulations. Typically, sub-indicators are formulated in a binary form to ensure objectivity, but aggregating all sub-indicators enables the comprehensive presentation of a country's achievement on that indicator. For instance, the indicator on electrification plans in the energy access pillar includes three sub-indicators—whether there is a plan, if it includes both grid and off-grid, and if it is updated

Traffic lights denote the countries' readiness for investment in sustainable energy.

10. aLmechand Saeed 2004.

Figure 1-8: RISE—28 indicators and 85 sub-indicators in 4 categories and 3 pillars

	Energy Access	Renewable Energy	Energy Efficiency
Planning	**Electrification plan** *National plan* *Coverage of grid and off-grid* *Regular update*	**Planning for renewable energy expansion** *Renewable energy in expansion planning* *Renewable energy in transmission planning* *Target with an action plan* *High quality resource mapping*	**National plan for increasing energy efficiency** *National energy efficiency targets* *Energy efficiency legislation/action plan* *Sub-sectoral targets* **Entities for energy efficiency policies, regulation and implementation** *Setting energy efficiency policy* *Setting energy efficiency standards* *Regulating energy efficiency activities of suppliers* *Regulating energy efficiency activities of consumers* *Equipment standards compliance* *Building standards compliance*
Policies and Regulations	**Enabling environment for renewable energy developers to invest in mini-grids** *Existence of regulations* *Regulation attributes* *Standards* *Protection against expropriation* *Subsidies or duty exemption* **Enabling environment for standalone home systems** *National program* *Standards* *Subsidies or duty exemption*	**Legal framework for renewable energy** **Regulatory policies** *Incentives to grid-connected renewable energy* *Incentives to distributed renewable energy* **Regulatory policies-policy design attributes** *Predictibility* *Sustainability* *Accessability'* *Remuneration efficiency* **Network connection and pricing** *Connection cost allocation* *Network usage pricing* **Public financial support mechanisms** *Credit enhancement* *Utility payments guarantee* *Fiscal incentives* *Public financing supports*	**Quality of information provided to consumers** *Reports on electricity usage* *Quality of information in report* *Comparison with other users* *Energy saving information* **Incentives or mandates for energy supply utilities** *Mandates for utilities* *Penalties for non-compliance* *Measurement of savings* *Third party validation* *Cost recovery for utilities* **Incentives or mandates for public entities** *Obligations for public buildings* *Obligations for other public facilities* *Public procurement of energy efficiency products* *Multi-year contracts* *Allowance to retain savings* **Incentives or mandates for large-scale users** *Mandates for large-scale users* *Penalties for non-compliance* *Measurement of savings* *Incentives for large-scale users* **Minimum energy efficiency performance standards** *Appliances* *Lighting* *Electric motors* *Industrial equipment* *Regular update* *Penalties for non-compliance* **Energy labeling system** *Appliances* *Lighting* *Electric motors* *Industrial equipment* **Building energy codes** *Residential buildings* *Commercial buildings* *Compliance system* *Renovated buildings* *Building energy information*
Pricing and Subsidies	**Funding support to electrification** *Dedicated funding* *Subsidy to household connection* *Subsidy to grid extension* **Affordability of electricity** **Utility performance** *Reporting practice* *Financial performance*	**Fossil fuel subsidy** **Carbon pricing mechanism** *GHG emission reduction target* *Carbon pricing mechanism* **Utility performance** *Reporting practice* *Financial performance*	**Incentives from electricity pricing** *Electricity rate structure* *Charges to large customers* **Fossil fuel subsidy** **Carbon pricing mechanism** *GHG emission reduction target* *Carbon pricing mechanism* **Retail price of electricity**
Procedural Efficiency	**Establishing a new connection** **Permitting a mini-grid**	**Starting a new renewable energy project**	

● *Indicators for a specific pillar* ● *Cross-cutting indicators*

Source: Authors.

regularly (in the last five years)—the two follow-up questions to the first question on the existence of plan aim to capture the quality of the plan (or plans). But this approach is by no means complete. Questions can be raised on implementation of such a plan, as well as financial and human resources used. As RISE does not rely on expert judgment, arriving at objective measures of such quality dimensions will continue to evolve. Another example is the indicator on policy design attributes in the renewable energy pillar. Four sub-indicators (capturing predictability, sustainability, accessibility, and remuneration efficiency) were evaluated, together providing a wide-ranging view of the quality of policy design in renewable energy.

A “traffic light” indicates the score for indicators, categories, and pillars. A green light is reported for countries with a score of 75 or more, which are considered close to good practice on a certain indicator or a pillar. A red light indicates that a country scores 25 or less and has a lot to improve to achieve good practice on what RISE measures. A yellow light shows countries that are in between green and red. When a country receives a green light on a pillar, it doesn’t necessarily mean that the country lacks attributes to improve on—rather, it signals its current readiness for investment. For the investor, this provides important evidence about the commitment and credibility of government policymaking to create an attractive enabling environment. (The private sector will of course carry out further due diligence before investing.)

1.4 WHAT ARE THE LIMITATIONS OF THE RISE PILOT?

The RISE pilot is confined to the current set of indicators and there are important limitations to its results. While the pilot has collected data on indicators developed over several rounds of consultations, it has also exposed new information on current availability, credibility, and validity of the indicators.

Implementation of policies and regulations. In RISE, indicators on procedural efficiency attempt to measure effectiveness of policy implementation. However, this still presents the limitation of the complete set of indicators in revealing the implementation or effectiveness of all the policies. One example could be exclusion of indicators on effectiveness of institutions from the RISE pilot, as it is problematic to measure it in a way that is comparable across countries. Government and private sector staff numbers and budgets, for instance, are hard to pin down, in absolute or relative terms, in ways that have the same significance in every country. Further, even where such information is measurable, channels of reporting may limit how easily it is aggregated and made available to the surveyor. Even if staff numbers are known, for example, factors that substantially affect their performance (e.g., technical capability, or degree of authority conferred by their positions) may not be easily accounted for. A small department of energy specialists in one country could be equivalent in impact to an untitled (and therefore uncounted) individual in an influential position in another.

Universal applicability. Some measures on providing sustainable energy have narrow applicability which, if properly used, can help promote better sustainable energy outcomes. However, there may not always be agreement among experts that an indicator reflecting a measure deemed good in one country at a particular time would also be beneficial in another. For instance, subsidies for energy efficiency can be highly effective if well designed and well timed—or they can be very wasteful and ineffective. Similarly, explicit government support is useful especially during early stages of energy-efficient market development, for example, as public funds or rebates for purchases of efficient equipment, or as subsidized loans for larger projects. But such support is rarely suitable for long-term use; while it may represent best practice in certain tight circumstances, it is not universally applicable and is thus excluded from RISE. In addition, some indicators may simply not be relevant in every country.

Quality of indicators. Although RISE attempts to measure the quality of policies by aggregating sub-indicators and presenting each indicator in a scalar way, the extent to which quality is captured is limited to the current set of sub-indicators. For instance, two countries that have electrification plans (grid and off-grid) and are being updated regularly receive the same score under RISE, yet the quality of their plans may vary by other attributes that are not yet assessed through sub-indicators. However, as more attributes are gradually identified as critical for a certain policy, RISE will capture them—in short, the indicator’s quality will evolve and improve. This evolution also means that countries with a green traffic light today cannot stand idle as emerging good practices shift the goalposts, prompting them to work toward a favorable enabling environment.

RISE includes 28 indicators and 85 sub-indicators

As a global initiative, RISE is presumed to evolve dynamically. In addition to the core group of indicators, opportunities may exist in designing a secondary set of interest to certain groups of countries. RISE is a "living" initiative, expected to continue supporting SE4ALL actions, keeping open the options to improve.

1.5 WHAT IS THE STRUCTURE OF THE REPORT?

The rest of the report is organized in five chapters plus annexes. The cross-cutting indicators are discussed in Chapter 2. The thematic elaborations on methodology and results of energy access, renewable energy, and energy efficiency are outlined in Chapters 3, 4, and 5. These chapters also articulate the proposed refinements for the global rollout of RISE planned for 2015. Finally, Chapter 6 aggregates the results of the three pillars and illustrates the relationships between RISE and achievement of the SE4ALL goals, as well as highlighting plans for the global rollout.

Credit: Boris Rumenov BalabanovWorld Bank

CHAPTER 2

CROSS-CUTTING INDICATORS

During the development of RISE, it emerged that four indicators have great influence on the enabling environment across all three pillars of sustainable energy: fossil fuel subsidy, carbon pricing mechanism, utility performance, and retail price of electricity. Collectively, these indicators allude to a price signal: Is the country pricing its electricity aligned with cost? How is the country cross-subsidizing between industrial and residential consumers? How is the country pricing fossil fuels for power generation? And is the country putting a price on carbon? Making energy prices right has been discussed as a means of correcting a distorted incentive structure and promoting sustainable energy technologies. As Parry and others (2014) argue, in many countries, energy prices are set at levels that do not reflect financial or economic cost. The latter omission is particularly important as environmental damage from energy use is not factored into prices.

Each of the cross-cutting indicators is controversial and the subject of much research; there is no readymade data source to draw from. Efforts in this pilot phase have been on highlighting the importance of these indicators to sustainable energy pillars with a more vibrant analytic and data collection agenda in the future. This chapter discusses how the countries were measured on these cross-cutting indicators. More detailed analysis is included in the following chapters, particularly on the cross-cutting indicators as they relate to each pillar.

2.1 WHAT ARE THE CROSS-CUTTING INDICATORS?

Fossil fuel subsidies are prevalent, estimated at about US$600 billion and concentrated in a handful of countries.[11] Particularly problematic, and all too common, are universal price subsidies, which distort market signals, drain government budgets, encourage wasteful energy consumption, disproportionately benefit the better-off—a study of household survey data in several countries found that the bottom 20 percent of the population receives only 7 percent of the benefits[12]—and frequently lead to energy shortages, black markets, smuggling, declining investment, and financial insolvency, leaving energy infrastructure in disrepair. Subsidies of this form actively encourage firms to overproduce and consumers to use more fossil fuels, with heavy environmental implications.[13]

In RISE, the focus is on fossil fuel subsidies for power generation only. If the primary fuel source of the country is subsidized, it artificially lowers the cost of service for both the utilities and consumers. Other things equal, this can make any kind of clean energy investment in either renewable energy or energy efficiency less competitive, and can make it harder to mobilize finance.[14] Coal—responsible for the majority of power generation worldwide—is taxed less than other fossil fuels and is sometimes actively subsidized.

There has not been any single methodology to capture the scale of fossil fuel subsidy to electricity generation in a consistent manner across countries. In this pilot exercise, datasets from the International Energy Agency (IEA) and the International Monetary Fund (IMF) were used to measure it. Instead of the amount of subsidy, RISE calculates the proportion of electricity generated by subsidized fossil fuel as the primary source. For example, if a country produces 60 percent of its electricity from coal and the rest from gas but subsidizes the price of coal, this indicator returns 60 percent regardless of the subsidy value. Because higher is better, the difference with 100 (40 percent) is presented as an indicator. Good practice on this indicator is reported when a country generates more than 75 percent of its electricity from nonsubsidized fossil or other fuels.

11. IEA 2013.

12. IMF 2013.

13. Whitley 2013.

14. Whitley 2013.

Carbon pricing mechanisms, including any form of economic incentives for reducing carbon emissions, are the other side of the coin to fossil fuel subsidies. Policies to introduce carbon pricing instruments are important to create economic incentives for low-carbon technologies and to foster private investment to complement limited public resources.[15] There are typically two forms of pricing mechanisms: cap and trade initiatives (such as emission trading) and a carbon tax. Both have been widely discussed in international climate forums as market-based mechanisms to reduce emissions. Cap and trade mechanisms put a cap on emissions and countries can trade emission credits if they are over or under the cap. By creating a supply and demand for emission credits, the mechanism creates a market and hence a price for carbon.[16] A carbon tax, based on the Pigouvian principle of quantifying the social cost of negative externalities, raises the cost of a fuel based on its carbon content. By making the cost of electricity production based on fossil fuels more expensive, a carbon tax incentivizes energy efficiency and makes renewable energy more cost effective. While a few European countries have adopted some variant of a carbon tax, it remains hotly debated, particularly because of anticipated impacts on consumer welfare stemming from an increase in the cost of service provision. The other concern is carbon leakage: the producer or consumer of fossil fuel may simply leave the area of geographic relevance and settle in a market with a lower price or no price at all.[17]

RISE has included this indicator even though establishing a carbon pricing regime may not be a critical issue for many developing countries whose contribution to global emissions is small and that have other development challenges that need to be tackled first. RISE presents this indicator as a long-run target for those countries, as such mechanisms allow environmental externalities to be internalized and clean energy development made more attractive.

To assess carbon pricing mechanisms, two sub-indicators are used (good practice on this indicator is when a country reports positive responses to both). First, countries are identified if they have a legally binding reduction target for greenhouse gas emissions, introduced by legislation to acknowledge carbon externalities and to commit to emission reduction. Second, the existence of a carbon pricing mechanism is examined. RISE counts only domestic policy mechanisms that put a price on the externalities of carbon emissions, but not any international flexible mechanisms that create additional revenues from other advanced countries, such as the Clean Development Mechanism of the United Nations Framework Convention on Climate Change or similar regional agreements among developed and developing countries. In addition, RISE focuses only on mechanisms that aim to put an explicit price on emissions and does not account for indirect pricing mechanisms such as renewable energy certificates and "white certificates," which naturally lead to lower carbon emissions. The scoring methodology for the four cross-cutting indicators is in Table 2-1.

Retail price of electricity for residential consumers ranges from $0.02/kWh to $0.92/kWh

Utility performance, or the financial situation of the utilities, represents cost recovery from selling electricity. A viable utility can expand service to new areas and consumers, provide better service to existing areas, honor power purchase agreements, and build resources. This indicator is relevant to the energy access and renewable energy pillars. For energy access, while capital expenditure for electrification could be funded out of some form of government support, service delivery to new consumers is the responsibility of the utility. Similarly for renewable energy, the offtake risk is heightened if the utility is unable to pay for renewable energy, which therefore impinges on its creditworthiness and serves as a barrier to entry for private investment. In such cases, the private sector would demand a higher risk premium to invest in developing renewable energy.

Definition of key financial ratios

The utility performance indicator uses five financial ratios as proxies for evaluating key performance and risk factors.

Current ratio: (Current assets)/(current liabilities), to measure liquidity risk; a minimum threshold is 1.0

EBITDA margin: (EBITDA)/(revenue), to measure profitability; a minimum threshold is 0.0

Debt service coverage ratio: (net income available for debt service)/(debt service cost), to measure credit risk; a minimum threshold is 1.0

Days payable outstanding: (accounts payable)/(cost of goods sold)*365, to measure offtake risk; a minimum threshold is 90 days

Days receivable outstanding: (accounts receivable)/(revenue)*365, to measure revenue collection performance; a minimum threshold is 90 days

15. World Bank 2014 a.
16. World Bank 2014 b.
17. ople 2014.

Table 2-1: Scoring methodology—cross-cutting indicators

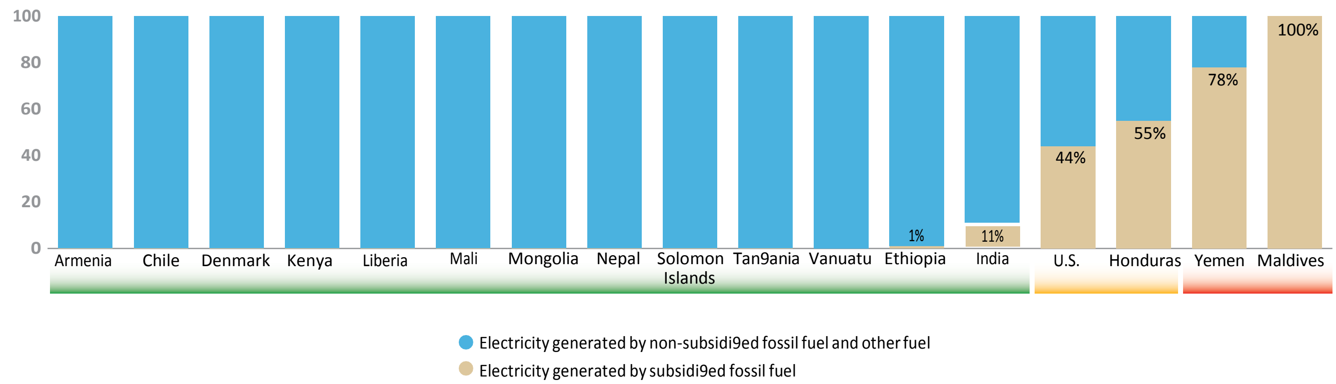
Indicator and Questions	Scoring	Traffic Light
Pricing		
I. Fossil fuel subsidy		
What is the proportion of electricity generation by subsidized fossil fuel?	Percentage of electricity generation by nonsubsidized fossil fuel and other fuel	X≥75 25≤X<75 X<25
II. Carbon pricing mechanism	*Sum and divide by 2*	
Is there a legally binding greenhouse gas emission reduction target in place?	Yes—100, No—0	X≥75 25≤X<75 X<25
Is there any mechanism to price carbon in place (e.g. carbon tax, auctions, emission trading system)?	Yes—100, No—0	
III. Utility performance	*Sum and divide by 2*	
Financial reporting practice (i) Are the financial statements of the largest utility publicly available? (ii) If yes to (i), are they audited by an independent auditor?	Yes to (i) & (ii)—100 Yes to only (i)—50 No to (i) & (ii)—0	X≥75 25≤X<75 X<25
Financial performance (i) Current ratio (ii) EBITDA margin (iii) Debt service coverage ratio (iv) Days payable outstanding (v) Days receivable outstanding	*Sum of five scores of sub-elements* *Score* / *20* / *0* (i) ≥1 / <1 (ii) ≥0 / <0 (iii) ≥1 / <1 (iv) ≤90 / >90 (v) ≤90 / >90	
IV. Retail price of electricity		
What is the unit price of average consumption of electricity for residential users? ($/kWh)	Not scored	n/a
What is the unit price of average consumption of electricity for industrial users? ($/kWh)	Not scored	n/a

Source: Authors.

In countries with multiple electricity utilities, the largest company serving in the largest business city is selected for the utility performance indicator, which has two parts. First, financial reporting practice is examined. Good practice on this sub-indicator is when utility financial statements are both publicly available and independently audited. This allows investors and other stakeholders to do their own financial analysis and credibly value the risk premium. Second, a group of five ratios are computed to understand financial performance—current ratio, EBITDA (earnings before interest, taxes, depreciation, and amortization) margin, debt service coverage ratio, days payable outstanding, and days receivable outstanding. The thresholds are based on the minimum performance needed for the utility to operate. By applying these thresholds, this indicator intends not to acknowledge good performers but to identify utilities that demonstrate undesirably weak financial results on these financial ratios. Countries that report ratios higher than these thresholds score higher on this sub-indicator.

Retail price of electricity for residential consumers reflects cost-of-service delivery, although there are subsidies typically embedded in the tariff structures. For instance, Sub-Saharan Africa reports the highest price of electricity among regions. It is an indicator relevant for the energy efficiency and energy access pillars. It serves as a reference point for adopting demand-side energy efficiency if the retail price is too high. Consumers will be incentivized to move toward more efficient consumption. Therefore the higher the retail price of electricity, the better the incentives for energy efficiency. For energy access, the retail price matters from an affordability perspective. If the price is affordable to people, not only will existing consumers be more willing to pay for electricity service, but it will also be possible to expand service to new areas and consumers. Affordable electricity also reduces the revenue risk for utilities and allows them to invest in capital-intensive infrastructure to scale up access and provide better quality. Thus the lower the retail price of electricity, the better the probability of consumers hooking up and consistently paying for electricity service. For renewable energy, this matters for distributed generation that supplies electricity directly to retail consumers. However, for grid-connected large-scale generation facilities, a wholesale price that offtakers pay to producers, and its cost recovery, are more important. In the

Figure 2-1: Only a few countries in the sample generate electricity with subsidized fossil fuel



Source: RISE database.

renewable energy pillar therefore other indicators on this aspect are considered rather than this indicator.

The retail price of electricity for residential customers is calculated based on average consumption for each country, derived from IEA's National Balances database. For industrial customers, consumption of 10,000 kWh per month is consistently applied across all countries, along with other assumptions on demand and other factors to make data comparable across countries. A unit price calculated at the respective consumption level based on tariff schedules is used. This indicator has not been scored, as there is very little evidence to set the thresholds on high or low retail prices of electricity.

2.2 HOW DID THE COUNTRIES SCORE?

Fossil fuel subsidy. Among the pilot countries, only six are identified as generating electricity with subsidized fossil fuel. In Maldives, for instance, such fuels dominate the entire energy mix for power generation (Figure 2-1).[18] The remaining countries either do not have fossil fuel as a primary contributor to power generation or the fossil fuel is not subsidized. Although this indicator does not capture information on the scale of fossil fuel subsidy to electricity generation, it still provides valuable information on the renewable energy and energy efficiency pillars.

Carbon pricing mechanism. Most countries have not adopted any form of carbon pricing mechanism. Only two countries, Denmark and the United States, have established a reduction target for greenhouse gas emissions that can be a basis for carbon pricing and adopted legislation to make it legally binding (Table 2-2).

These are also the only two countries that have domestic policy mechanisms to price carbon.[19] In the United States, policy mechanisms vary across states. New York State, where the largest business city is located, is participating in the Regional Greenhouse Gas Initiative, along with eight other states. The Regional Greenhouse Gas Initiative is a cap and trade system that allows prices to be set in the market mechanism. Denmark is part of the European Union Emission Trading System (EU ETS), which has formed a carbon market inside the EU. A carbon tax has been imposed on residential and industrial energy consumers since 1992 (Figure 2-2).

Utility performance. The sub-indicator on reporting practice suggests that more pilot countries get their financial statements audited (compared to making them public). Countries such as Liberia, Maldives, Mongolia, Tanzania, Vanuatu, and Yemen audit their statements but do not make them public. Nine countries have utility companies that make their financial statements publicly available. The number of countries where the utility has its financial statements independently audited is larger; among them, eight countries carry out their audits while making their financial statements publicly available. Financial performance, as measured by five key financial ratios, varies: the current ratio and days payable outstanding, which represents liquidity and offtake risk, is where countries have the most difficulty meeting the minimum threshold—only 35 percent do so. Conversely,

18. Tan bars refer to share of power generated from fossil fuels supported by some form of subsidy, direct or indirect. They refer to no information about the size of those subsidies or of their impact on retail electricity prices. Estimating that is a complex analytical task beyond the scope of RISE.

19. In September 2014 Chile passed a tax law, which includes bringing in a carbon tax in 2017. As it occurred after the cut-off date of June 30, this report did not score it.

Table 2-2: Only Denmark and the U.S. have adopted legally binding greenhouse gas emission reduction targets

Countries	Greenhouse gas emission reduction target	Legislation
Denmark	Reduce by 40% by 2020 compared to 1990 levels	A law on climate change approved in June 2014
U.S.	Reduce by 80% by 2050 compared to 1990 levels (New York State)	Executive Order No. 24 (2009) by the Governor of New York State

Source: Authors.

crossing the minimum threshold for financial ratios such as days receivable outstanding and EBITDA margin is relatively easier for a larger group of countries (Figure 2-3).

Retail price of electricity. This is not scored, but indicated as a unit price per kWh. Ethiopia has the lowest average price of electricity among the pilot countries (Figure 2-4), given its abundant hydropower resources. Small island countries such as Maldives, the Solomon Islands, and Vanuatu price electricity high, which reflects their high dependence on diesel and heavy fuel oil, often imported and vulnerable to international price fluctuations. Another inference is a gap between residential and industrial consumers. Only in Ethiopia and Liberia do the two groups pay the same; in Armenia, Denmark, Mali, and Vanuatu, residential consumers pay more per kWh, which may be caused by cross-subsidy between residential and industrial customers or a difference in cost of connecting the two groups. For the rest of the countries, industrial consumers pay more. Yemen stands out—industrial consumers pay five times as much as residential consumers.

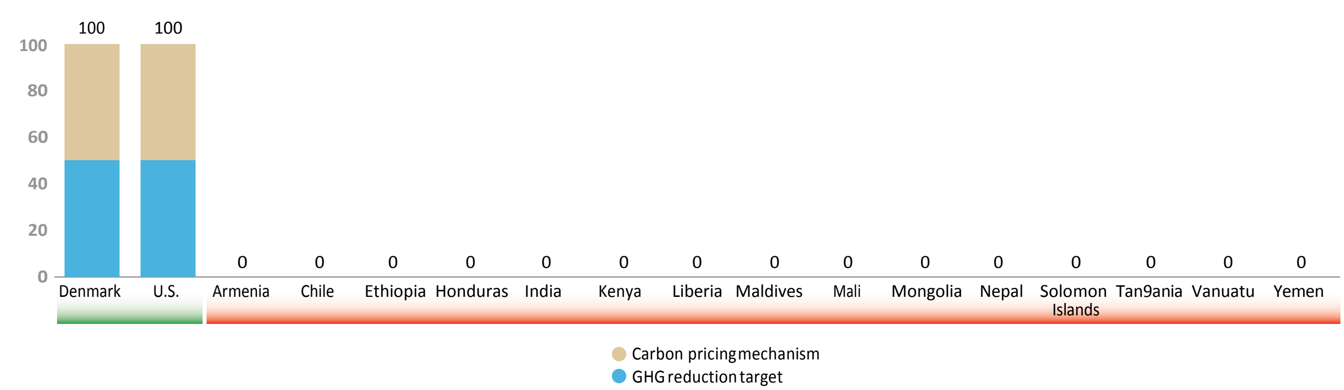
2.3 WHAT ARE THE LESSONS FOR THE GLOBAL ROLLOUT?

The cross-cutting indicators, as key contributors to the enabling environment for sustainable energy, require further refinement in the global rollout. The information on fossil fuel subsidy particularly is inadequate. It is important to understand the opportunity cost of the fuel the utilities buy for power generation. If such fuels are internationally traded (oil and gas), then such a calculation is possible. For coal—the mainstay for power generation in many countries—the opportunity cost is hard to estimate as it has a relatively small international trading market. Moving forward, RISE aims to arrive at a more refined methodology to estimate fossil fuel subsidy for power generation.

The carbon pricing mechanism indicator will be refined to incorporate the quality of carbon pricing mechanisms beyond simply whether there is one. The achievement of emission reduction targets or the carbon price, which captures its effectiveness, along with other alternative sub-indicators will be considered. Merging two indicators—fossil fuel subsidy and carbon pricing mechanism—will also be deliberated as they represent two ends of the spectrum to make the price right, by cutting subsidies or pricing carbon externalities.

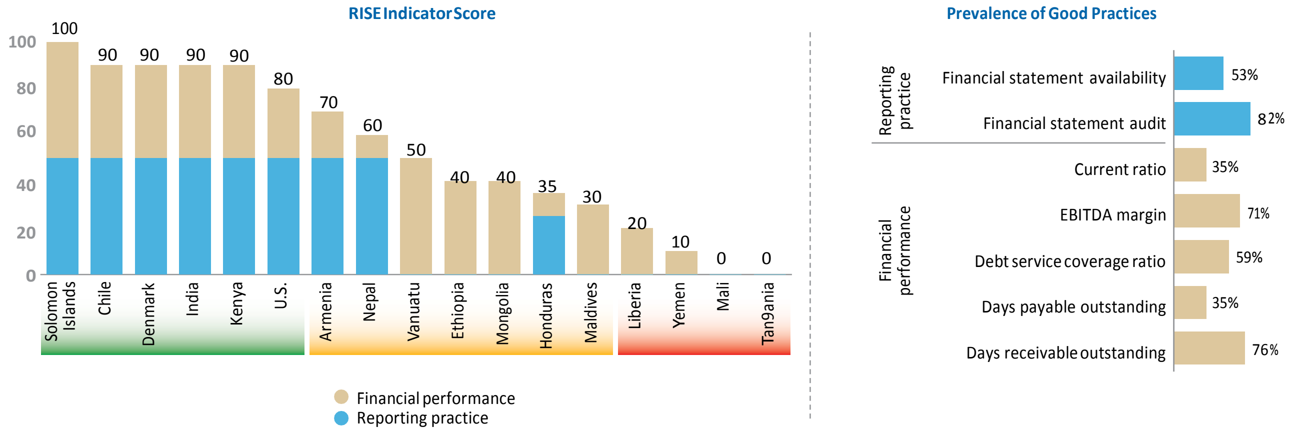
Utilities in very few countries make their financial statements public.

Figure 2-2: Only two developed countries have begun to introduce carbon pricing



Source: RISE database.

Figure 2-3: Utility performance varies widely among countries



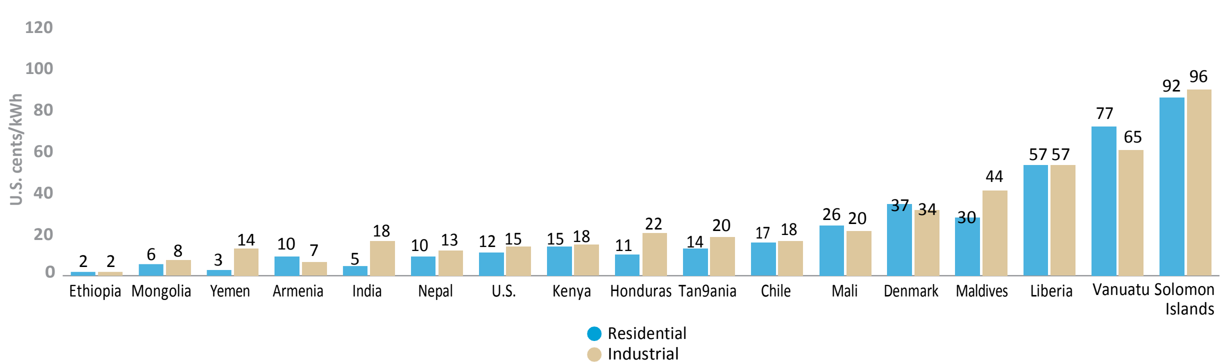
Source: RISE database.

Only two countries, the United States and Denmark, have adopted any form of carbon pricing mechanism.

Measurements on utility performance are limited to a few proxies that represent key financial aspects of the utility. Data collection for this indicator was, however, onerous, as was the derivation of globally relevant minimum thresholds. More discussion is needed on selecting such thresholds and on other indicators that could be easily derivable and present a comprehensive view of utility performance.

Finally, although the retail price of electricity provides valuable information and affects investment decision-making, there have been responses to this indicator that the retail tariff needs to be compared with the cost of electricity. In the global rollout, a methodology to figure out and compare cost recovery of electricity tariffs that can be applied consistently across countries will be sought. The methodology, too, for this indicator could be improved: the retail price of electricity should ideally be measured at a representative level of consumption customized for each country. But such consumption figures, though available for residential consumers, are not so for industrial consumers. In this pilot phase, the same volume has been assumed for each country, which will need to be amended to country contexts in subsequent versions of RISE.

Figure 2-4: Across the sample, electricity prices vary by an order of magnitude



Source: RISE database.

Credit: Sudeshna Ghosh Banerjee/World Bank

CHAPTER 3

ENERGY ACCESS

The summary RISE energy access score (Figure 3-1) places the 12 pilot countries (for this pillar) against the traffic lights of readiness for energy access investments: India, Nepal, and Tanzania are green, reporting “best in class” policy actions; the rest are yellow. RISE quantifies the distance these countries still have to traverse to reach the green zone. None of the countries are in the red zone, demonstrating the headway made by all of them on certain indicators. Planning, particularly, is the most widely adopted among enabling environment categories, but actions on policies and regulations, pricing and subsidies, and procedural efficiency are still a distance away.

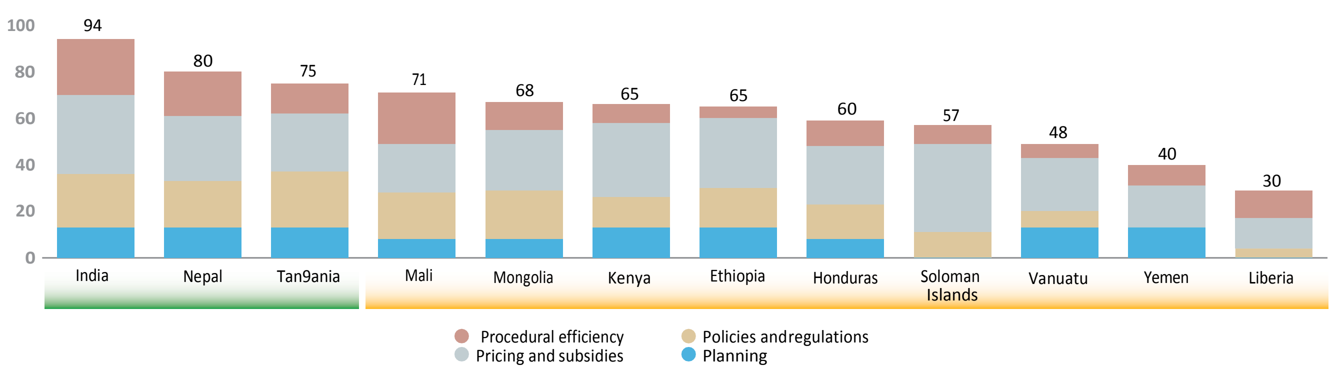
Specifically, creating an enabling environment for mini-grids is a work in progress and very few countries report any private sector mini-grids. The pilot provided insights into what policy actions some of the countries with a green traffic light have adopted and if they can be customized in other country settings. A number of good practices, identified by RISE for energy access, are prevalent among the pilot countries, giving an optimistic view of results as encapsulated in international and national targets.

3.1 WHY DOES RISE MATTER?

The energy access pillar of SE4ALL emphasizes the role of electricity in household welfare and economic growth. For households, the lack of electricity stymies income-generating opportunities and stunts outcomes on education, health, and women’s empowerment (Barnes 2014). For firms, lack of electricity is one of the top constraints to doing business, particularly among the poorest countries.[20] Achieving energy access goals also complements the renewable energy goal to the extent that off-grid electrification, largely driven by local renewable resources, powers new connections in rural areas. New initiatives to integrate energy efficiency mechanisms with energy access are also now being promoted in developing countries.

The goal of achieving the SE4ALL goal of universal access to electricity by 2030 is still far away (Figure 3-2). These 12 pilot countries encompass close to 500 million people—the size of the EU. Among them is India—the country with the largest access deficit—as well as Liberia that reports one of the lowest electrification rates in the world. The small island countries, such as the Solomon Islands and Vanuatu,

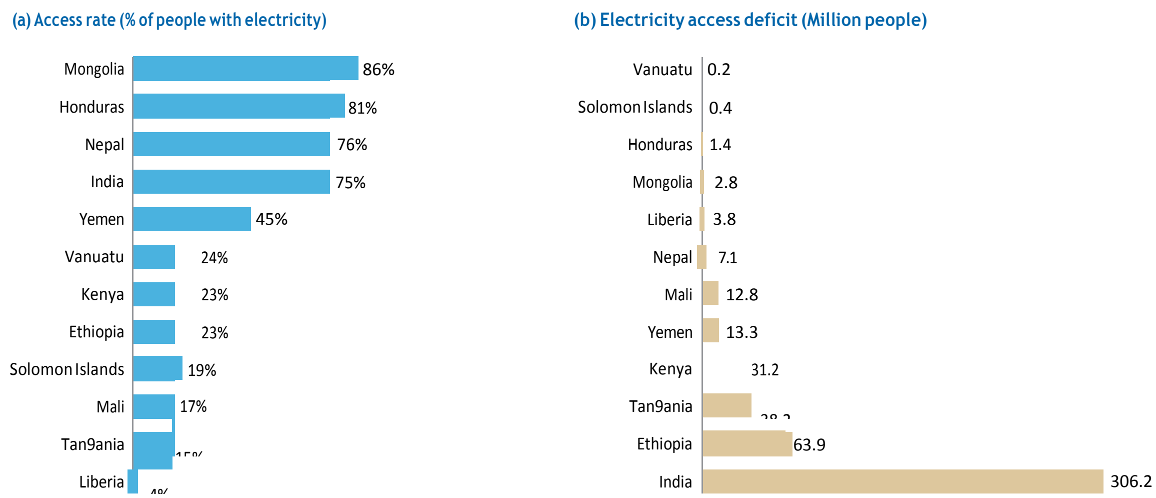
Figure 3-1: RISE energy access score



Source: RISE database.

20. Dethier 2008.

Figure 3-2: Many countries are far from universal electrification



Source: World Bank and IEA 2013.

still have relatively low electrification rates though their access deficit is miniscule. India has scripted a remarkable electrification journey, reaching 474 million people over two decades between 1990 and 2010, or 24 million people annually, with annual growth of around 2 percent, or higher than the global average of around 1 percent. Aside from India, only Honduras and Yemen report access growth of higher than the global average during the 20 years.

The barriers to reaching universal access are manifold, some within the control of policymakers and some—socioeconomic, geographic, and demographic—exogenous to policymaking.

High cost of supply. The challenge of reaching remote and dispersed populations, notably in rural areas, makes capital-intensive electrification even more costly. Infrastructure in network services, such as grid electricity, involves huge investments that are cumbersome during the construction phase. These upfront investments, as well as operating expenses, need to be recovered from consumers through fixed and variable (often) monthly charges. If the high cost is spread across populations that are far apart, remote, and poor, the charges can indeed be prohibitive.[21] Fixed charges are typically recouped through high connection charges and can be a major deterrent for consumers—and is one of the major reasons that providing access to villages or neighborhoods does not translate automatically into household adoption of electricity. Retail tariffs can include fixed and variable charges, reflecting the revenues potentially recouped from consumers and the level of cost recovery. Inadequate resource generation from below cost-recovery tariffs stymies the ability to invest in infrastructure to expand access and improve service quality.

Limited affordability and low returns from poor consumers. Rural areas, with largely low-volume agriculture and residential consumers, are not an attractive revenue base. The limited revenue potential, coupled with the high cost of servicing them and establishing the billing and collection infrastructure, makes it challenging for service providers. This high-cost–low-return investment creates a low-level equilibrium—rural and remote consumers cannot pay cost-recovery tariffs and consume little electricity; service providers do not want to serve unless compensated for the cost; and countries cannot meet the cost of infrastructure from their own resources or domestic capital markets.[22] Also, the weak financial position of utilities, particularly in low-income countries, makes it very difficult for them to access the financing required for extending their distribution grid in a timely manner. Still, affordability is a complex equation as many households pay for kerosene—the most common alternative—which may be more expensive than grid electricity.

21. World Bank 2010.

22. World Bank 2010.

Inadequate regulatory mechanisms. There is an immense onus on regulatory mechanisms to ensure clear articulation of prices and subsidies, quality of service regulations, and a promise to honor any commitments embodied in the licenses, concessions, and bidding documents.[23] Their most important role is to design an appropriate pricing and subsidy mechanism that addresses the trade-off between cost recovery and equity. Allowing cost recovery (either allowing an adequate tariff or through having adequate and credible compensation that covers the gap) for utilities and for off-grid providers is essential to ensure they invest in new connections. However, cost recovery needs to be balanced to reflect consumers' affordability profiles. Aside from tariff setting, the other important work of regulators is setting and enforcing quality of service standards. This has become particularly important for off-grid solutions where such standards are important for market stability (by establishing the credibility of the products and providing assurance to consumers). Finally, the role of regulators is also to set a level playing field for off-grid operators without making it burdensome on them.

Weak planning and implementation capacity. A focused electrification effort—well designed and implemented—requires technical human resources. Various workstreams on planning, prioritizing projects in the geographic areas, strengthening or creating institutions, and setting technical standards are all human-capital intensive. While empirical evidence does not point to the superiority of any one form of institutional structure responsible for electrification, the dedicated body has to be equipped with appropriate and well-trained staff.

RISE aspires to capture in its suite of indicators the policy and institutional mechanisms that address these barriers to promoting access expansion. Policy processes establish the parameters for the function and performance of the electricity sector and are key to the sector's governance. While some of these solutions are context specific and need to be supported by efforts to build the capacity of local institutions, most address generic problems found in most (perhaps all) countries seeking to deliver access to modern energy. They involve topics on the planning, pricing and subsidies, policies and regulations, and procedural efficiency (the framework in Chapter 1) needed to strengthen the operating environment of private developers and service providers.

Seven countries have developed a planning process including grid and off-grid electrification and regular updates.

3.2 HOW DOES RISE MEASURE THE ENABLING ENVIRONMENT?

Resources—private and public—can flow into the sector if the inherent and emerging risks are managed. Investments are capital intensive and uneven, and returns come in much later and are typically not enough to recoup the cost. That is why electrification has traditionally been in the government domain—both as a funder and operator of services. The traditional grid solution of utilities is now being complemented by off-grid options, encompassing mini-grids and standalone home systems, which are evolving in response to a realization that large, capital-intensive solutions may not be the most appropriate to serve low-volume consumers with limited capacity to pay. The scale of investment to achieve universal access presents an important business opportunity for the private sector: the International Finance Corporation (IFC) estimates there is an $18 billion market to serve these bottom-of-the-pyramid consumers that represents an untapped market opportunity for the private sector.[24]

The role of the government consequently extends from financing infrastructure functioning to facilitating—through policy and regulatory support—emergence of a private sector supply chain and viability-gap funding support to meet any shortfall in revenues for the financial sustainability of private operators. This role starts from good planning carried out on least-cost principles and supported by geographic data, which establish which communities will be electrified through grid extension in what time frame, helping provide clarity to the private sector on which communities can be targeted through off-grid activities.

Similarly, grid extensions can benefit from government interventions that improve the private sector operating environment, including removing limits on service area if appropriate, easing mechanisms for serving illegal urban areas, rationalizing tariff structures, and providing connection cost subsidies to final beneficiaries.[25] Sanghvi and Barnes (2001) highlight the importance of an appropriate legal framework and risk-mitigation mechanisms to ensure both a level playing field and the flexibility to charge cost-recovery tariffs.

23. Reiche, Tenenbaum, and de Mästle 2006.

24. IFC 2012.
25. IFC 2012.

Table 3-1: Scoring methodology—planning

Questions	Scoring	Traffic Light
Planning		
I. Electrification plan	*Sum and divide by 3*	If the score X is
1. Is there a national electrification plan? 1.1. Does it include both grid and off-grid? 1.2. When was the last update?	Yes—100, No—0 Yes—100, No—0 <5 yrs.—100, other—0	X≥75 25≤X<75 X<25

Source: Authors.

Although off-grid modes of serving the bottom of the market can be commercially viable, they need specific business ecosystem conditions in the form of policy and regulatory enablers. Policymakers create an enabling environment by promoting a level playing field that includes technology awareness, product standards, and nondiscriminatory duty and tax arrangements. A comprehensive policy framework supporting mini-grids would involve institutional structure and governance, technical studies and surveys, and financial incentives, financing, and tariffs.[26] The ideal operating environment—particularly for small mini-grids—is a clear and light-handed regulatory framework that is adapted to the small project needs; allows them to legally operate in off-grid areas and to charge cost-recovery tariffs; provides clarity on technical and safety standards; ensures publically available information on government-led electrification plans, loads, and renewable energy resources; and assures access to finance.

Planning

Indicator 1: Electrification plan

Irrespective of the institutional set-up, the planning of programs that provides a clear and transparent, overarching framework is critical to enabling economic efficiency. Typically, good practices of rural electrification planning include:

- A well-articulated system of prioritized areas to be electrified, and when.
- Implementation of a multiyear vision coordinating both grid and off-grid efforts and underpinned by optimized technology options, grid/off-grid comparative economic analysis, and publicly disclosed market studies.
- An inclusive regional development approach that holistically considers other aspects of rural development (access to markets, roads, skills, etc.).
- A clearly laid out institutional framework of the roles and responsibilities of key stakeholders, including private and public parties.[27]

A country prioritizes access to energy via a national electrification plan (grid and off-grid) that is frequently updated based on current technical, financial, and sociopolitical attributes (Table 3-1). Setting a vision and target is the first indication of government commitment, although the target doesn't mean much unless accompanied by planning on how electrification will proceed—which areas get electricity, when, and how. Legislation or electricity-sector policies on these plans play a crucial role in shaping discussions and implementation.

Policies and Regulations

Indicator 2: Enabling environment for renewable energy developers to invest in mini-grids[28]

Indicator 3: Enabling environment for standalone home systems[29]

Mini-grid operators, many of them first-time entrepreneurs, will invest if they have the certainty of being allowed to carry on operations on a level playing field and a chance of building sustainable revenue.[30] For the former, policymakers can create an environment that permits mini-grids to operate and should ensure regulations outlining the rights of operators. These could be as licenses allowing them to operate under certain conditions and for a given time. Typically, licenses are for larger businesses and registration is for smaller mini-grids. Registration is not a regulatory approval, rather it signals to the government and regulators that these operators exist and are providing a service.[31] The risk of expropriation must be mitigated, especially when there is uncertainty about the arrival of large grids in areas operated by mini-grids. While ensuring technical synchronization of

26. Deshnukh, Carvallo, and Gambhir 2013.
27. World Bank 2010.

28. Mini-grids come under various names—they are energy producers who sell electricity either to the consumers directly or to the national grid or as an isolated mini-grid. The focus in RISE is on mini-grids as service providers to consumers. Mini-grids are small systems of varying capacities (typically 5–500 kW) supporting a local area distribution network. Mini-grids can be underpinned by one or more technologies and provided by the community, private sector, utility, or hybrid business models.
29. Standalone home systems are defined as facilities to provide basic electricity services at home, including solar photovoltaic (PV) systems and lanterns. Solar PV systems can be simple solar or rechargeable lanterns as well as "plug and play" solar kits.
30. Gacor and Nsom 2014.
31. Gacor and Nsom 2014.

Table 3-2: Scoring methodology—policies and regulations

Questions	Scoring	Traffic Light
Policies and Regulations		
II. Enabling environment for renewable energy developers to invest in mini-grids	*Sum and divide by 5*	If the score X is X≥75 25≤X<75 X<25
2. Are there regulations outlining rights of mini-grid operators?	Yes—100, No—0	
2.1 Can mini-grid operators charge tariffs that exceed the national tariff level?	Yes—50, No—0	
2.2 Do mini-grid operators need prior regulatory approval to enter into a power sales contract with consumers?	Yes—0, No—50	
3. Are safety, reliability, and voltage and frequency standards for mini-grids made publicly available?	Yes—100, No—0	
4. Is there any general law that deals with expropriation of mini-grids?	Yes—100, No—0	
5. Are there duty exemptions or subsidies for mini-grid renewable energy technology?	Yes—100, No—0	
III. Enabling environment for standalone home systems	*Sum and divide by 3*	If the score X is X≥75 25≤X<75 X<25
6. Are there duty exemptions or subsidies for standalone home systems?	Yes—100, No—0	
7. Are there minimum quality standards for standalone home systems?	Yes—100, No—0	
8. Are there national programs that promote the deployment of standalone home systems?	Yes—100, No—0	

Source: Authors.

mini-grids with larger grid networks is an operational matter, from the mini-grid operators' point of view, having legal rights that prevent sudden appropriation by government is crucial. Therefore, good practice in creating an enabling environment for mini-grids includes regulations outlining their rights as well as enforcing a law against expropriation.

For the latter, commercial viability depends on revenues that should allow the mini-grid operator to at least break even. However, the operator may not be allowed to charge a cost-recovery tariff so as to appease political constituen-cies or to enforce a uniform tariff in the country. But for mini-grids to survive and thrive, they not only have to have a flexible system of payment for connection charges but also charge a "reasonable" tariff that at least meets costs. Given the low consumption in rural areas, the cost-recovery tariff can often be exorbitant.[32] Therefore, arriving at a common understanding between the operators and regulators (and government) on the size of the cost-revenue gap is important for assessing how to close that gap. Measures may include allowing mini-grids to charge above the national tariff, cross-subsidizing consumer groups, and having the flexibility to decide on tariff structures most appropriate for operators.[33] Or the government can provide a subsidy to developers to close the gap (often called "viability gap funding").

Regulators also have a responsibility to protect consumers by imposing quality standards, considering three design elements: whether quality of service is affordable, whether quality of service standards are monitorable and enforceable, and whether the standards will be on inputs (typically techni-cal specifications) relative to outputs that require regular and costly monitoring.[34] Whatever the design, the crucial aspects are that consumers perceive the service as value for money and that mini-grid operators are responsible for service standards—both necessary for building trust and ensuring sustainability of service delivery. Finally, the government has a responsibility to reduce costs for mini-grid operators by imposing duty exemptions for mini-grid technology.

Good practice thus includes the ability to charge tariffs higher than the national tariff, no requirement for regula-tory approval for getting into power sales contracts with consumers, public availability of quality standards, and duty exemptions for mini-grid technology. The regulatory mecha-nism needs to be light-handed, and not impose a burden on either regulators or operators, particularly for small projects.

With standalone home systems, discriminatory import tariffs on components raise the cost and distort the playing field. The IFC (2012) argues that such tariffs create perverse incentives to move provision from renewable energy–based access programs. Duties and exemptions are

32. Tenenbaum and others 2014.
33. Tenenbaum and others 2014.
34. Tenenbaum and others 2014.

therefore relevant, as are quality standards for products. For consumers, such quality standards build credibility of products and prevent market spoilage—for instance, the Lighting Africa program and the Bangladesh Solar Home System program have shown the importance of quality standards. Finally, a national commitment in the form of a program signals government credibility to pursue this option and its integration in energy access. Existence of all three—duty exemptions, minimum quality standards, and a national program promoting standalone home systems—represents good practice for this indicator (Table 3-2).

Pricing and Subsidies

Indicator 4: Funding support to electrification

Indicator 5: Affordability of electricity

Indicator 6: Utility performance

These indicators collectively represent the ability of government and utilities to build capital-intensive infrastructure and to provide electricity services to consumers, as well as consumers' ability to pay.

Funding support for electrification (indicator 4), from the government's point of view, reveals the priority it places on this agenda as its fiscal ability to allocate resources. This funding support at different levels of the sector value chain can be a dedicated budget line or a fund for capital costs; covering part of the household connection costs; or financing distribution lines to villages. In RISE, existence of all three funding avenues represents good practice (Table 3-3).

Affordability (indicator 5), from the consumers' perspective, reveals their potential contribution to electricity service provision, allowing policymakers to estimate the gap to be filled in order to reach cost recovery. For regulators, the challenge is to design a tariff structure that balances cost recovery with affordability among a wide group of consumers. If electricity is unaffordable, access expansion is compromised, although prices should not be kept artificially low to make energy affordable as that undermines utility viability. There is no universally accepted definition of affordability, however: households typically spend

Only five countries have quality standards for standalone home systems.

Table 3-3: Scoring methodology—pricing and subsidies

Questions	Scoring	Traffic Light
Pricing and Subsidies		
IV. Funding support to electrification	*Sum and divide by 3*	If the score X is X≥75 25≤X<75 X<25
9. Does the government have a dedicated funding line or budget for electrification?	Yes—100, No—0	
10. Does the utility or government cover a portion of the costs for the household connection?	Yes—100, No—0	
11. Do capital subsidies exist for utilities to provide distribution lines to villages?	Yes—100, No—0	
V. Affordability of electricity	*Use the score below*	If the score X is X≥75 25≤X<75 X<25
12. What is the annual cost of subsistence consumption (30kWh/month) as percentage of GNI per household?	If the percentage X is: X≤5% → 100 5%<X<10% → scale X≥10% → 0	
VI. Utility performance	*Sum and divide by 2*	If the score X is X≥75 25≤X<75 X<25
13. Reporting practice of financial statements (i) Are the financial statements of the largest utility publicly available? (ii) If yes to (i), are they audited by an independent auditor?	Yes to (i) & (ii)—100 Yes to only (i)—50 No to (i) & (ii)—0	
14. Financial performance (i) Current ratio (ii) EBITDA margin (iii) Debt service coverage ratio (iv) Days payable outstanding (v) Days receivable outstanding	Sum of five scores of sub-elements Score / 20 / 0 (i) / ≥1 / <1 (ii) / ≥0 / <0 (iii) / ≥1 / <1 (iv) / ≤90 / >90 (v) / ≤90 / >90	

Source: Authors.

Table 3-4: Typical procedures to operate a mini-grid

No	Procedures	Agencies involved
1	Obtain approval from the central or municipal government	Central or municipal governments
2	Obtain agreement with the community	User community
3	Publication to encourage competition	Rural electrification agencies
4	Obtain water rights (for small hydro)	Government authorities
5	Obtain environment clearance	Environment authorities
6	Obtain technical approval	Rural electrification agencies
7	Obtain operating permit	Electricity authorities

Note: Not all procedures are required in all countries. Each country has different steps with different types of agencies to pass through. These procedures may vary depending on size of the mini-grid.

Source: Authors.

anywhere from 3 percent of household expenditure in South Asia and 6 percent in Sub-Saharan Africa to up to 20 percent in Eastern Europe and Central Asia, where the heating load is part of the household energy bill.[35]

There is some value judgment on what constitutes affordability, depending on spending envelopes and geographic context. As the access deficit is overwhelmingly in countries in South Asia and Sub-Saharan Africa, a threshold of 5 percent is considered appropriate for RISE. This threshold is then compared with a subsistence volume of electricity, typically accepted as 1 kWh a day per household or 30 kWh a month per household. In RISE, electricity is considered affordable if annual expenditure on a basket of 30 kWh per month is less than or equal to 5 percent of gross national income (GNI) per household. A country gets a zero on this metric if the basket costs more than 10 percent of GNI per household. Ideally, the expenses associated with electricity should be compared with the household budget, but recent household surveys were unavailable for some of the countries in the pilot, and so a proxy of GNI per household was used.

Utility performance (indicator 6), scores the importance of service providers' financial position in expanding access. (For RISE, in countries with multiple utility companies, the largest one in the largest business city was selected.) Two sub-indicators are assessed: reporting practice and financial performance. In many countries, financial statements of the utility are not even available to the public, which limits any feasibility analysis from potential investors. Credibility of the statements is another issue, which can be resolved only by independent audit. For RISE, good practice encompasses public availability of audited financial statements.

To examine utilities' financial performance, five key ratios are calculated. The purpose of this sub-indicator is not to give credit to the most profitable utility but to flag those below minimum performance. Each ratio is evaluated whether it is beyond a minimum threshold, identified by good practices in the industry.

Procedural Efficiency

Indicator 7: Establishing a new connection

Indicator 8: Permitting a mini-grid

Establishing a new connection (indicator 7) records all procedures required for rural customers to connect to the grid in a village where electricity service is available. These procedures include applications and contracts with electricity utilities, all necessary inspections and clearances from the utility and other agencies, and the external and final connection works. The indicator measures the time and cost to complete the connection process.

To make the data comparable across economies, several assumptions about households and connections are used. The connection is single-phase, 10 kVA and the household is in a rural area where electricity service is available. The measure captures the median duration that households indicate is necessary in practice, rather than required by law, to complete a procedure with minimum follow-up and no extra payments. All the fees and costs associated with completing the connection procedures are recorded, including those

It costs $6,620 to set up a mini-grid in Tanzania compared with $48 in India and $37 in Nepal.

35. Banerjee and others 2008; Banerjee and others 2014; Fankhauser and Tepic 2007.

Table 3-5: Scoring methodology—procedural efficiency

Questions	Scoring	Traffic Light
Procedural Efficiency		
VI. Establishing a new connection	*Average of time and cost DTF score*	If the score X is
15. Time and cost to connect to the grid by rural customers	Distance to frontier (DTF) method for cost and time	X≥75 25≤X<75 X<25
VII. Permitting a mini-grid	*Average of three DTF scores*	If the score X is
16. Time and cost to provide licenses/permits to operate a mini-grid	DTF method for cost, time and number of agencies	X≥75 25≤X<75 X<25

Source: Authors.

Only seven countries have developed regulations allowing mini-grids to operate and allowed developers to charge a higher tariff—among them only five have standards for mini-grids.

related to obtaining clearances from government agencies, applying for the connection, receiving inspections of both the site and the internal wiring, purchasing material, getting the actual connection working, and paying a security deposit. Information from households and from regulations and fee schedules are used as sources for costs. If several households provide different estimates, the median reported value is used. The cost excludes bribes.

Permitting a mini-grid (indicator 8) records all procedures necessary to obtain permits to operate a mini-grid (typical procedures are summarized in Table 3-4). The indicator measures the number of agencies involved, time necessary for these agencies to deliver the required approvals, and cost to be paid to the agencies. The data were collected from mini-grid developers in each country. The type and size of mini-grid permit studied is the most likely scenario for its development for each country. When the estimates from respondents differ, the median reported value is used. The cost excludes bribes.

The score on the procedural efficiency indicators is the simple average of the "distance to frontier" (DTF) on its component indicators (time and cost). The DTF measure illustrates the distance of an economy to the frontier, which represents the most efficient practice achieved on each of the component indicators across countries. To calculate the DTF, first, individual indicator scores are normalized to a common unit: (max − y)/(max − min), with the minimum value (min) representing the frontier—the highest performance on that indicator across all countries. Second, for each country the scores for individual indicators are aggregated through simple averaging into one DTF score. An economy's DTF is indicated on a scale from 0 to 100, where 0 represents the lowest performance and 100 the frontier (Table 3-5).

3.3 HOW DID THE COUNTRIES SCORE?

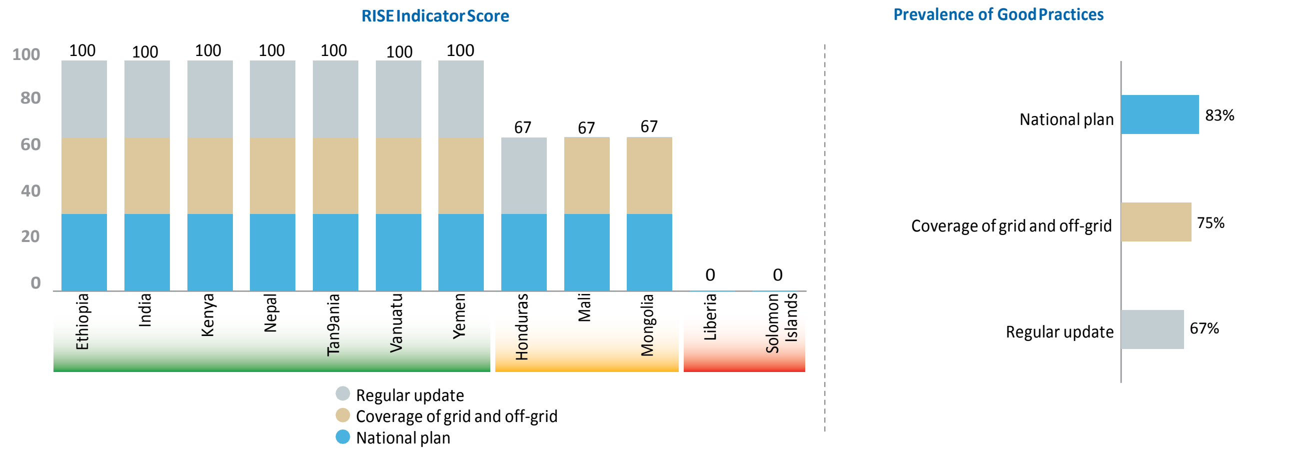
Indicator 1: Electrification plan

All the pilot countries, apart from Liberia and the Solomon Islands, have made some progress on the planning process (Figure 3-3). They have an electrification plan and all of them, Honduras aside, include grid and off-grid projects in their plans. A number of countries have updated their electrification plans in the last five years; most have either a 2012 or 2013 plan in place (except Yemen, which is using a 2009 version). This suggests proactivity, commitment, and consistency to the planning process. Mali and Mongolia have not, however, updated their plans in the last five years. Based on these dimensions, seven countries are in the green traffic light zone, three in the yellow, and two in the red.

The countries have approached planning in their own way. Those in the green zone have not only identified electrification as a critical national goal but have also set ambitious and time-bound targets with a government entity responsible for implementing and monitoring programs. Most of these countries have now branched out from only on-grid power and have started emphasizing off-grid electricity as well.

For instance, Kenya in its second Rural Electrification Master Plan, which was set up in 2009, aims to achieve an electrification rate of 40 percent by 2020. The plan covers

Figure 3-3: Existence of an electrification plan is widely prevalent



Source: RISE database.

not only grid extension in urban areas but also off-grid solutions, including local mini-grids for rural towns.

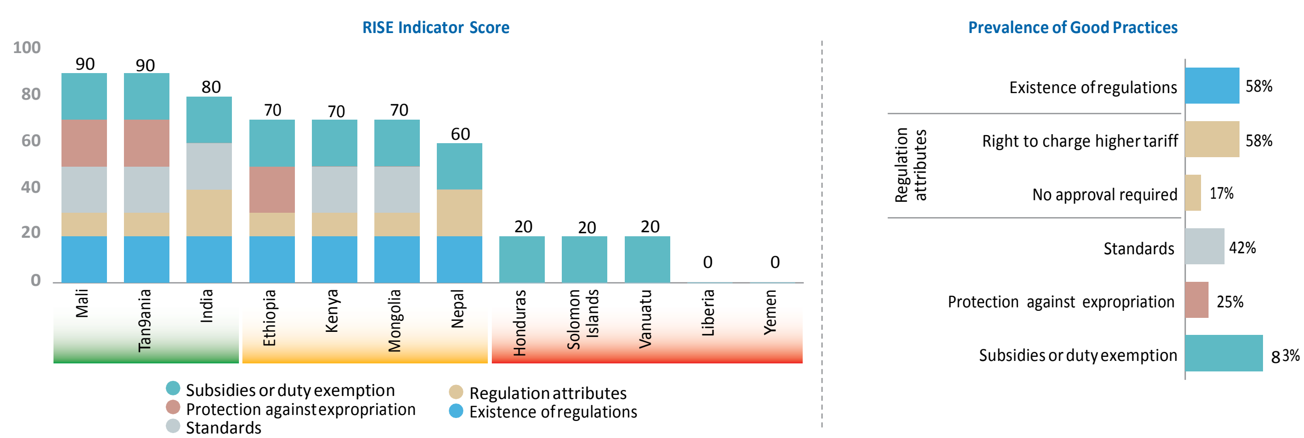
Similarly in Tanzania, the Power System Master Plan 2010–2035 targets an electrification rate of at least 75 percent by 2035. In the short term, the government is targeting 30 percent by 2015. The Rural Energy Policy and the National Electrification Investment Prospectus serve as guidelines. The prospectus, launched in February 2013, covers 2013–2022 aims to advance electrification cost-efficiently, including grid and off-grid means.

In India, the national flagship rural electrification program—Rajiv Gandhi Grameen Vidyutikaran Yojana—was launched in 2005 and aimed to cover 125,000 unelectrified villages and 78 million households. The Rural Electrification Corporation is the nodal agency for the program's implementation and financing.

Indicator 2: Enabling environment for renewable energy developers to invest in mini-grids

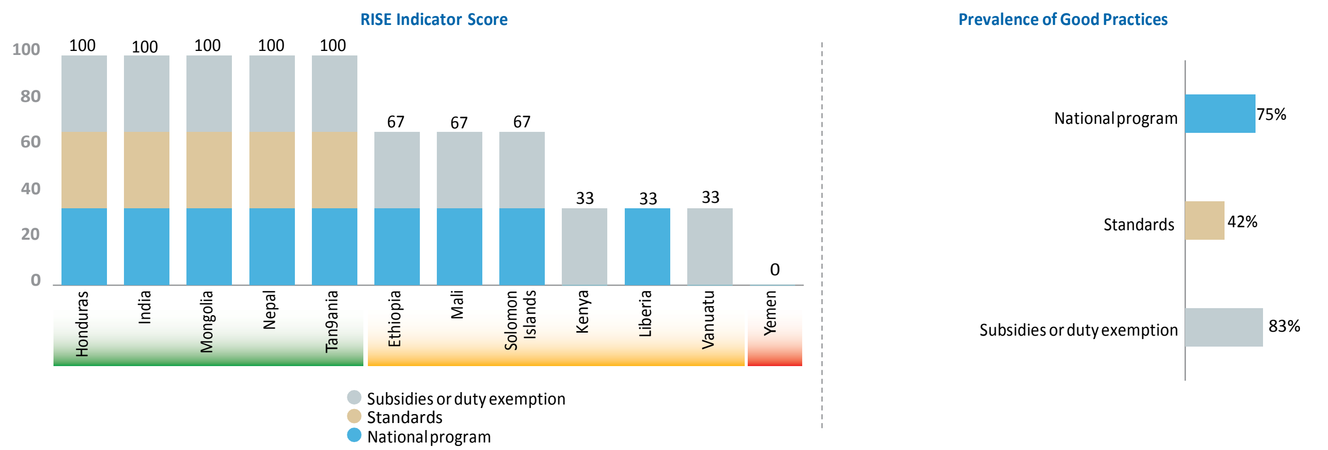
Mali and Tanzania demonstrate a strong enabling environment that incentivizes private, mini-grid developers (Figure 3-4). It includes regulations outlining rights and mandates of developers, a right to charge a higher tariff than the national rate (to recover the incremental costs of mini-grids),

Figure 3-4: A handful of countries have performed well in creating an enabling environment for mini-grids



Source: RISE database.

Figure 3-5: Countries have taken investor-friendly steps for standalone home systems



Source: RISE database.

mini-grid standards, protection against expropriation, and duty exemptions or subsidies (although there is a requirement of prior regulatory approval before sales).

In Mali, very well-defined legal guidelines have been established to support development and smooth functioning of mini-grids. The Ministry of Energy grants authorization to operators to establish and operate power plants distributing low-voltage electricity with installed capacity of 50–250 kW; operators for over 250 kW must obtain a concession. Supply contracts between a concessionaire and the customers are approved by the Mali Electricity and Water Regulatory Commission, which also sets the tariffs while ensuring cost recovery for mini-grids. In 2009, Mali suspended collection of value-added tax (VAT) and duties on renewable energy equipment for five years.

In Tanzania, the Energy and Water Utilities Regulatory Authority has drafted the Small Power Projects (SPP) Rule,[36] which establishes a comprehensive framework for regulations on operating SPPs, whether grid connected (under 10 MW) or mini-grids. Legislation[37] also exempts smaller projects (including mini-grids) under 1 MW from licensing requirements. Although prior regulatory approval on tariffs by the authority is required to sell electricity to final customers, mini-grid operators are allowed to charge a higher tariff than the national rate, and in flexible ways. In addition, the procedure for tariff approval for mini-grids is simplified so as not to provide an excessive burden on service providers or the regulator.

Countries such as Ethiopia, India, Kenya, Mongolia, and Nepal have regulations explicitly allowing mini-grids, but they are not comprehensive. Honduras, the Solomon Islands, and Vanuatu do not have such regulations but have some of the regulatory elements desirable for mini-grid developers, such as duty exemptions or subsidies on mini-grid technologies. At the other end of the spectrum are Liberia and Yemen, which do not have such a policy framework.

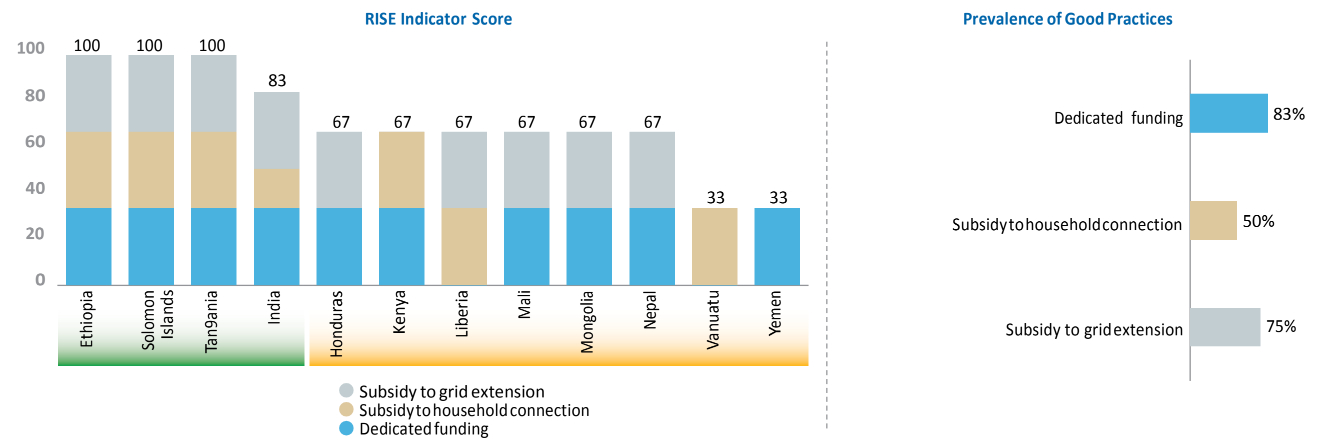
In Ethiopia, mini-grid operators must follow the same safety standards and conditions as on-grid operators. When the utility takes over the power supply activity of mini-grids, the operator is provided with prompt, fair, and adequate compensation. In Kenya, a supply and distribution license, environmental impact assessment license, and other resource-specific permits are required to launch a mini-grid. In India, all off-grid solar PV systems get a 30 percent capital subsidy if they use PV modules made in India; imported solar PV modules, inverters, and other system components get an excise duty exemption.

Indicator 3: Enabling environment for standalone home systems

Honduras, India, Mongolia, Nepal, and Tanzania have policies that include desirable attributes to promote standalone home systems, such as the existence of national promotion programs, the application of minimum quality standards, and

36. Eligible SPPs range from 100 kW to 10 MW and use renewable energy sources intended to supply commercial electricity to the national grid or isolated grids, and therefore match the definition of mini-grids in RISE.
37. These include the Electricity Act 2008, Energy and Water Utilities Regulatory Authority (EWURA) Act Cap 414, Guidelines for Development of Small Power Projects, Standardized Small Power Purchase Agreements (SPPAs), and Standarized Tariff Methodologies.

Figure 3-6: All countries provide some form of dedicated support for electrification



Source: RISE database.

duty exemptions or subsidies (Figure 3-5). Yemen by contrast has yet to adopt any policy to promote home systems. In all other countries, the missing piece is typically minimum quality standards for standalone home systems. Countries promote these systems more often than mini-grids.

The off-grid component of Tanzania's Energy and Development Access Project (TEDAP) sets solar PV institutional and household systems as an important objective and provides technical and financial support. Tanzania also provides duty exemptions and subsidies for standalone home systems—in 2005 the Value Added Tax Act, 1997, was amended to exempt solar energy system components and wind energy technology rated up to 30 kW; TEDAP provides solar home systems with a subsidy up to $0.25/Watt peak (Wp). Similarly, Kenya exempts 10 percent of import duty for solar PV equipment and accessories, and the Bureau of Standards sets standards for solar PV systems.

Among the Asian countries surveyed, Mongolia's National 100,000 Solar Ger Electrification Program, which began in 2000, provides portable solar PV home systems for nomadic herders. In India, a capital subsidy under the Jawaharlal Nehru National Solar Mission (JNNSM) applies to solar home systems. The JNNSM promotes off-grid applications of solar energy and provides financial supports along with minimal technical requirements and quality standards for off-grid solar PV systems.

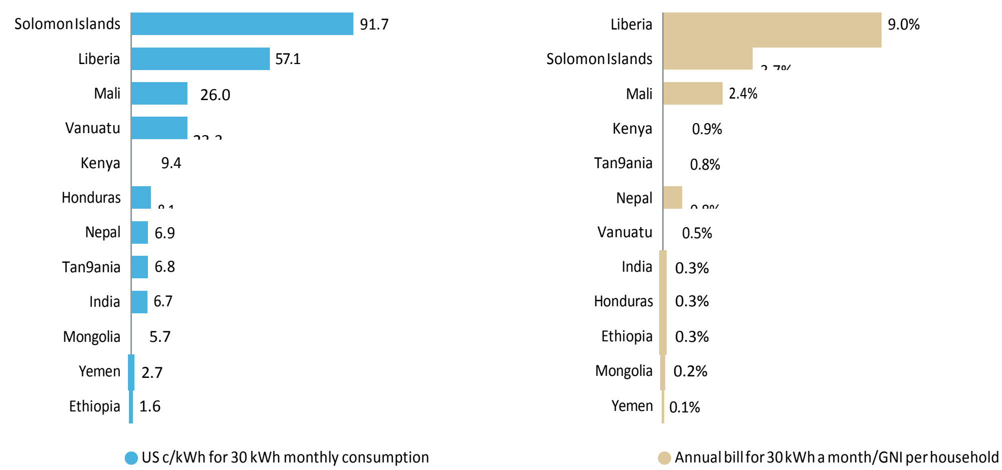
Honduras has a different framework for standalone home systems. The Rural Electrification Program with Solar Energy (PROSOL), part of the off-grid electrification subcomponent in the World Bank-supported Honduras Rural Infrastructure Project, has installed more than 5,000 solar PV systems over the period of 2007-2013 to households and rural community facilities that lack access to the national grid . Additional funding was approved in 2013, which will support the installation of 7,200 solar PV systems in total by 2016. The Honduran Fund of Social Investment—the program's executing agency—has accredited local solar PV companies that meet the minimum criteria including system standards. Accredited companies can seek financial support and technical assistance through PROSOL.

Indicator 4: Funding support to electrification

All countries provide some sort of financial support for electrification (Figure 3-6). The best performing, such as Ethiopia, the Solomon Islands, and Tanzania, have dedicated funding or a budget for electrification, capital subsidies to utilities for extending distribution lines to villages, and government- or utility-supported financing to cover a portion of new household connection costs. At the other end are countries such as Vanuatu and Yemen that offer only one of these three types of support. Among all countries, the most common type is dedicated funding, reported by all except Vanuatu and Liberia; also relatively common (nine

Affordability to pay for subsistence electricity is a concern only in Liberia.

Figure 3-7: Tariffs and affordability vary widely among countries



Source: RISE database.

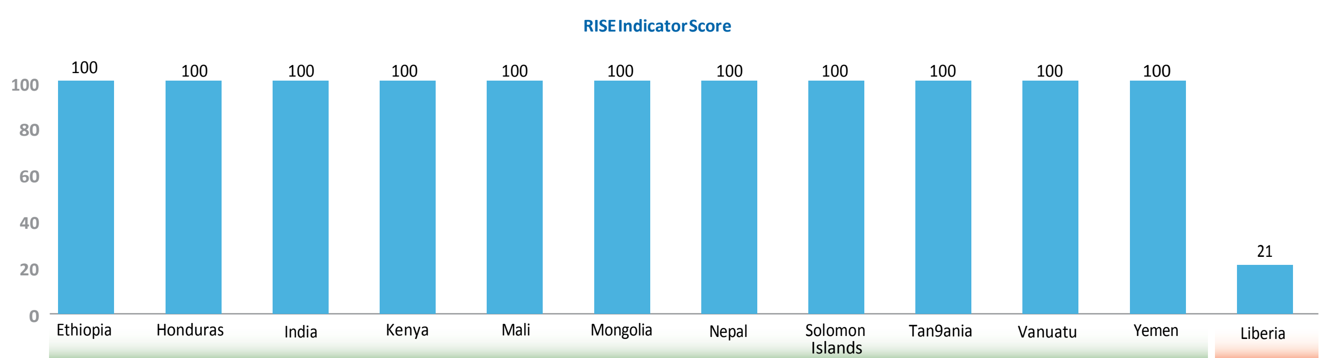
out of 12 countries) are subsidies for extending distribution lines; and financing for household connection costs is available in six countries.

In Ethiopia, the government has established the Rural Electrification Fund for off–grid, private sector–led rural electrification. The fund has very structured responsibilities, including financing rural electrification projects that are carried out by the private sector; promoting and facilitating technical, operational, and business development support services for rural electrification; and preparing an off-grid rural electrification master plan and feasibility studies to identify renewable energy projects for the private sector.

The Tanzanian government also has a dedicated funding line. The Rural Energy Agency (REA) sets out financial prospects to achieve electrification targets by 2020 and provides support of about $400 million a year for grid and off-grid activities. Funding support from REA includes capital subsidies for utilities to provide distribution lines to villages as well as technical support and training in PV system design, installation, maintenance, and repair, at vocational education training centers in rural areas. REA is funded by the government budget, levies on electricity, and development partners like the World Bank and Swedish International Development Cooperation Agency.

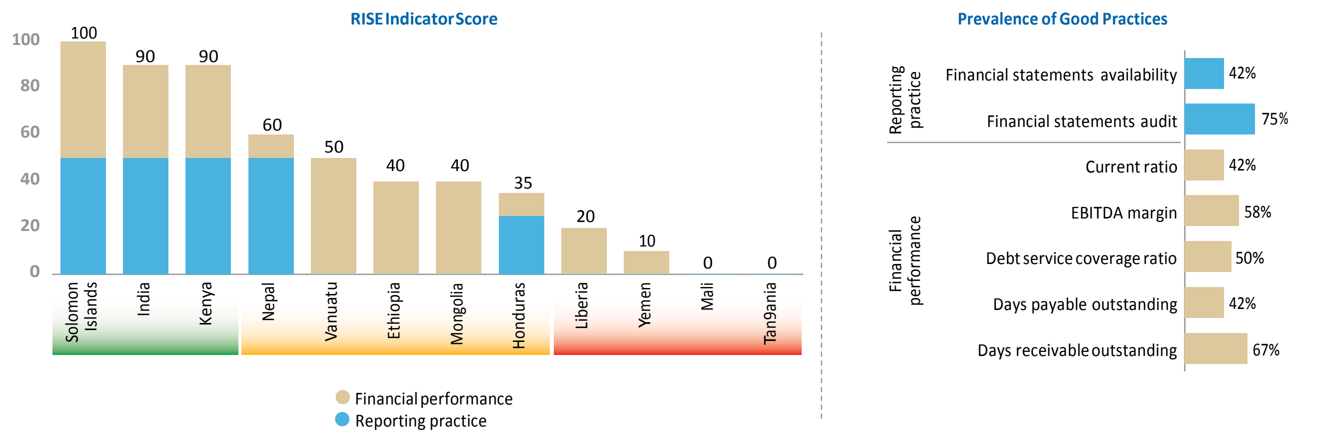
India's Rajiv Gandhi Grameen Vidyutikaran Yojana offers

Figure 3-8: Subsistence level of electricity is affordable for most of the countries



Source: RISE database.

Figure 3-9: Utility performance varies widely among countries



Source: RISE database.

funding support. The government covers some of the costs of connecting "below poverty line" households. In Honduras, the government contributes at least HNL 10 million ($469,484)[38] to the Social Fund for Electricity Development annually; companies in the electricity sector, including Empresa Nacional de Energia Electrica, contribute 15 percent of net profit to this fund.

Indicator 5: Affordability of electricity

Households around the world pay a wide range of tariffs for subsistence consumption—30 kWh per month (Figure 3-7). In the small island state of the Solomon Islands, for example, which is highly dependent on imported fossil fuels, consumers pay 91.7 c/kWh for 30 kWh—hugely more than Ethiopia's consumers who pay only 1.6 c/kWh. In some countries, small-volume consumers are required to pay a nominal amount called a lifeline or social tariff: in eight of the 12 countries, charges are less than 10 c/kWh. The burden it imposes on households as a share of GNI also varies dramatically—from about 0.1 percent in Yemen to 9 percent in Liberia.

Affordability to pay for subsistence consumption is not a barrier in most of the pilot countries (Figure 3-8). All countries except Liberia score 100—suggesting subsistence volume of electricity is affordable to the population. However, in Liberia, electricity expenses for 30 kWh/month are 9 percent of GNI per household, imposing a substantial burden on potential consumers.

Indicator 6: Utility performance

Reporting practices are still nascent in many pilot countries. Even though financial statements are audited in three-fourths of the countries, they may not be publicly available (Figure 3-9). The financial ratios suggest many countries are commercially unviable, where just about half the countries are meeting the minimum threshold of good practice. On these two sub-indicators, the Solomon Islands, India, and Kenya perform the best, Mali and Tanzania the worst.

Indicator 7: Establishing a new connection

The time to get a new connection varies from around one week to one year (Table 3-6). In Kenya, for example, one

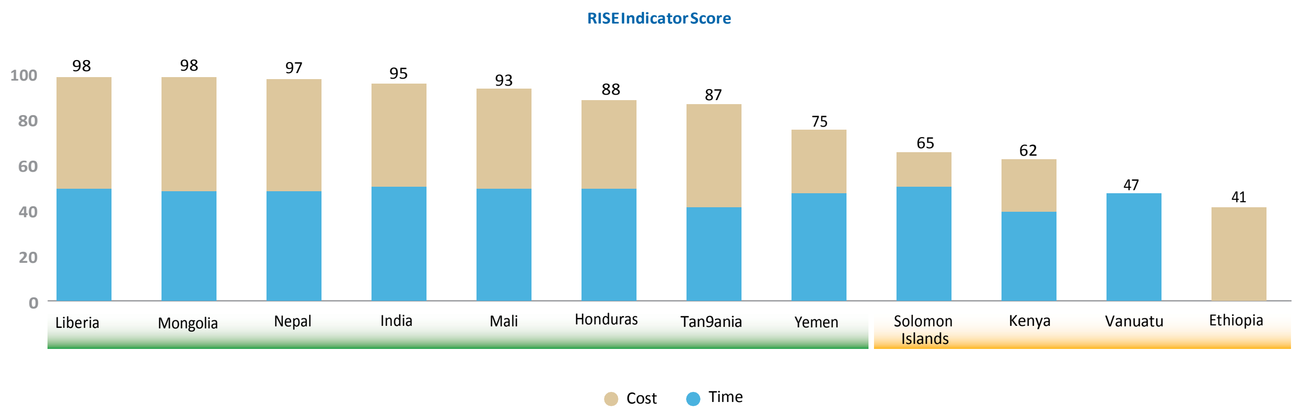
Table 3-6: Time and cost of getting an electricity connection varies widely among countries

Countries	Time (days)	Cost ($)
Ethiopia	365	126
Honduras	17	156
India	8	74
Kenya	83	369
Liberia	14	20
Mali	18	86
Mongolia	21	10
Nepal	21	26
Solomon Islands	8	470
Tanzania	69	73
Vanuatu	28	675
Yemen	30	303

Source: RISE database.

38 Assuming $1=21.3HNL.

Figure 3-10: In a handful of countries, the cost and time for getting an electricity connection are high



Source: RISE database.

of the higher cost and time countries, it takes nearly three months to obtain a new connection. Customers have to wait roughly a month to receive an inspection visit from the utility's engineers, another month to receive an estimate and sign the supply contract, and another one for the connection works and meter installation. In Tanzania, once all the administrative process is completed, the connection works are delayed because the utility faces shortages of poles and energy meters. Comparatively, this whole connection process takes only a week in India and Solomon Islands.

The cost to obtain a new electricity connection is often a fixed fee for households. The fees usually depend on the voltage or the number of phases of the connection. In Liberia and Mongolia the fixed fees for new connection are less than $20. Nevertheless, fixed fees can be high for a new connection – in Kenya the fee for a single-phase

Box 3-1: Mini-grid development in Kenya

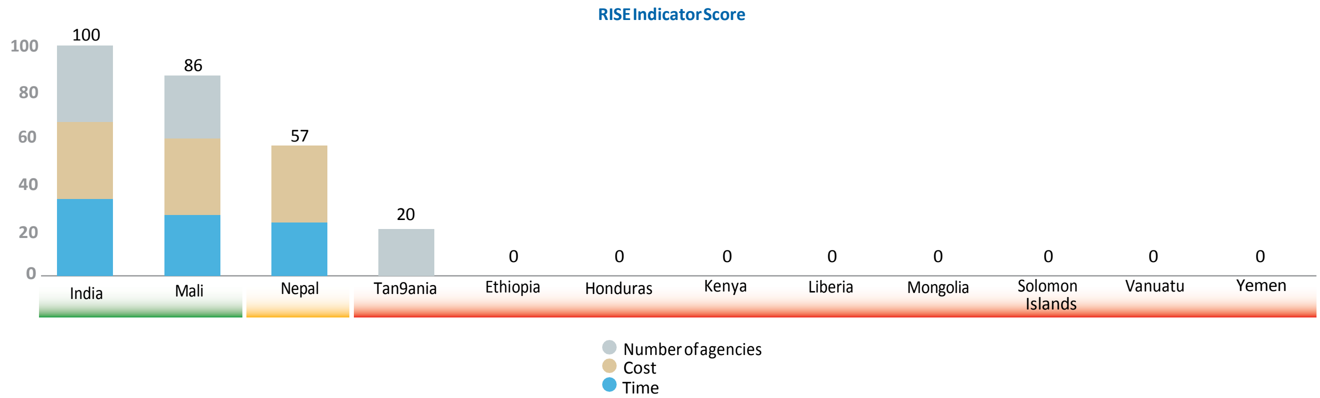
Kenya is still at an early stage of promoting private investment in renewable energy-based mini-grids. Most of the existing ones are community-based or private sector pilots.

On the policy level, the 1997 Rural Electrification Master plan focused on central grid extension without addressing decentralized or off-grid supply options, covering 46 of the 68 districts. This approach dramatically changed in the 2009 Rural Electrification Master Plan, which deals with off-grid electrification. Due to this shift at least 18 isolated grids (in remote and isolated areas, including islands) have been constructed and commissioned by REA and are managed by Kenya Power and Lighting Company. REA hands over completed projects to Kenya Power and Lighting Company for operation and maintenance based on service level agreements.

At least three community-based mini-grids are operational in Kirinyaga, Embu, and Meru. A research-focused mini-grid is being implemented by the University of Southampton (United Kingdom) in Kitui County under the five-year "replication of rural decentralized off-grid electricity generation through technology and business innovation" program. Another research project is the Ikisaya solar energy center model, also in Kitui County. The University of Oslo, with the Research Council of Norway and local partners, have set up a 2.16 kW solar PV system that provides electricity for lantern charging and renting, and charging of mobile phones and battery-based lighting systems . The center also provides IT services, TV and video shows and has the capacity to serve up to a total of 180 households. Although not funded commercially, the project aims for economic sustainability after the demonstration phase.

The few private sector pilots include Powerhive's solar PV and battery system in Kisii County; and three from Powergen: Takawira Island 1.4 kW system for 31 customers, Mageta Island 0.36 kW system for seven customers, and Remba Island 3 kW solar-wind hybrid system.

Figure 3-11: Very few countries have any experience on implementing processes for mini-grid operations



Source: RISE database.

connection is over $350, which represents 10 percent of the gross national income (GNI) per household.

Among the 12 countries, eight score well, reflecting an efficient method of establishing a new connection. India and the Solomon Islands score the best for time (Figure 3-10), each taking only eight days to get a connection, while in Mongolia, it costs the least to get an electricity connection ($10). Ethiopia has the worst time performance of 365 days, and so scores 0 on that variable. Similarly Vanuatu, with the worst cost performance, scores 0 on that variable.

Information was also collected for time and cost to get new connections in peri-urban areas. In most countries, a title of property is not required, which makes it easier for informal parts of a city to get connected. However, in four out of the 12 countries—Ethiopia, Honduras, India, and Vanuatu—the distribution utility requires new clients to produce legal documents showing housing ownership. In Mongolia, an informally settled family can receive an official temporary address from their administration unit, with which they can apply for a connection.

Indicator 8: Permitting a mini-grid

Among the pilot countries, only a handful has operational privately owned mini-grids. There are no privately owned, renewable energy–based mini-grids in, for example, Ethiopia, Liberia, Mongolia, the Solomon Islands, and Yemen. The reasons for their absence are diverse: in some countries, private mini-grids are simply forbidden as the utility keeps a monopoly on electricity distribution; in others, the framework for mini-grid development and operations are still nascent, probably deterring private investment; and in still other countries, the legal framework for mini-grids is in place, but their market is not ready to operate commercial mini-grids using renewable energy sources. It is important to underline that comparisons across countries are difficult because of the very small sample of countries with any mini-grid activity.

Kenya has 18 operational diesel-based isolated mini-grids under Kenya Power and 15 more in development through a partnership with the Rural Electrification Agency (REA) and Kenya Power. Only four non-Kenya Power mini-grids exist, but none of them is purely commercial (and see Box 3–1). In Honduras mini-grids are small—almost all 5–30kW—and operated by municipalities. The country requires no permits or licenses for generation, distribution, environmental impact, or tariff because it has no regulations on mini-grids, which it considers social solutions for isolated communities. In Vanuatu, as the Utilities Regulatory Agency does not regulate electricity services outside concession areas, no rule, permit, or license is required for mini-grids. A few very small mini-grids run on copra oil, but they are not regulated, and charge over US$2.00/kWh to customers.

For countries where privately owned mini-grids operate, the process to obtain a permit varies. Some have light regulations for mini-grid operations: in India for example, biomass mini-grids do not need a permit, and the only document required is a “no objection certificate” from the Pollution Control Board, which can be obtained in three months for less than $50. In Nepal too, the government has kept the cost minimal at $37. It also provides subsidies to mini-grid promoters. Still, the process to obtain all the necessary approvals is quite long and burdensome, as it requires approvals from six agencies and takes more than seven months. Partly for these reasons,

Table 3-7: Time and cost to developers to set up mini-grids can vary widely

Country	Time (days)	Cost ($)	Number of agencies
India	90	48	1
Mali	181	-	2
Nepal	215	37	6
Tanzania	510	6,620	3

Source: RISE database.

these countries do well on the RISE score (Figure 3-11).

Yet seven months is still quite quick relative to the process in Tanzania, where most mini-grids are owned by the utility (and former power monopoly) TANESCO as isolated diesel powered grids. There are a number of private, small hydro plants that provide electricity to isolated churches and other facilities and, after the REA provided incentives for developers (such as $500 per connection), the private sector has invested again in mini-grids. Small rural power projects below 1 MW are exempted from licenses from the Energy and Water Utilities Regulatory Authority. However, to operate a mini-grid, promoters have to obtain an environmental clearance from the National Environment Management Council, depending on size and technology—a small solar-based system, for example, does not need a clearance. For others, it takes a little less than a year to get but costs more than $6,000, or 10 times GNI per capita (Table 3-7).

Compare this to Mali, where the utility also requires a report of socioeconomic and environmental impacts of the mini-grid, but usually approves it in four months. The government and the rural electrification agency require no fee for the mini-grid permit, aiming to make the sector attractive to the private sector.

3W.4CAHNOCOUNTRIES IMPROVE THEIR PERFORMANCE?

India, Nepal, and Tanzania are the top performers in this pilot, with green lights, and have incorporated almost all the critical pieces to create an enabling environment. The remaining countries are in the yellow zone (none has a red traffic light). Planning is the most prevalent attribute adopted by countries. Policies and mandates for off-grid electrification through renewable energy mini-grid development and standalone home systems lag behind. Countries have recognized the importance of funding support for electrification and most countries have some sort of dedicated funding support.

India is the only country with a green light on all indicators. The remaining countries have a pending agenda for creating an enabling environment (Table 3-8). For instance, Honduras could emphasize the development of mini-grids for off-grid electrification, achievable by including off-grid projects in the national electrification plan and by subsequently introducing regulations that create a favorable operating environment for mini-grids. There could also be a provision for the

Table 3-8: All countries have areas of opportunity for improving the enabling environment

	Ethiopia	Honduras	India	Kenya	Liberia	Mali	Mongolia	Nepal	Solomo n	Tanzania	Vanuatu	Yemen
Electrification plan	Green	Yellow	Green	Green	Red	Yellow	Yellow	Green	Red	Green	Green	Green
Enabling environment for renewable energy developers to invest in mini-grids	Yellow	Red	Green	Yellow	Red	Green	Yellow	Yellow	Red	Green	Red	Red
Enabling environment for standalone home systems	Yellow	Green	Green	Yellow	Yellow	Yellow	Green	Green	Yellow	Green	Yellow	Red
Funding support to electrification	Green	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Green	Yellow	Yellow
Affordability of electricity	Green	Green	Green	Green	Red	Green	Green	Green	Green	Green	Green	Green
Utility performance	Yellow	Yellow	Green	Green	Red	Red	Yellow	Yellow	Green	Red	Yellow	Red
Establishing a new connection	Yellow	Green	Green	Yellow	Green	Green	Green	Green	Yellow	Green	Yellow	Yellow
Permitting a mini-grid	Red	Red	Green	Red	Red	Green	Red	Yellow	Red	Red	Red	Red

Source: RISE database.

government or the utility to cover a portion of the costs for new household connections.

The Solomon Islands has strong funding support to electrification, and electricity prices in the islands are affordable. However, the country could tap renewable energy–based mini-grid potential to achieve off-grid electrification through stronger regulations and mandates. The Renewable Energy Investment Plan, which has been prepared but not yet adopted, includes components of a national electrification plan and could strengthen the planning category of energy access once adopted. Finally, standalone home systems in the country should have minimum quality standards.

Nepal could improve its mandates for mini-grids by including provisions for reliability and safety, and laws against expropriation. It could also usefully seek to adopt financing for rural and new household connections. For its part, Ethiopia needs to focus on reducing the time to get a new connection—one year. Mali needs to update its electrification plan (dated 2007); it also needs to bring in minimum quality standards for standalone home systems and to provide financing for new connections.

3.5 WHAT ARE THE LESSONS FOR THE GLOBAL ROLLOUT?

While all indicators in energy access will be retained, many of them will be refined and indicators added to better reflect the policy and institutional profile needed to support energy access investments. Questions and survey methodologies will be refined, as feedback is collected from stakeholders. A few proposals are presented below.

For indicator 1, electrification plan, the second question will be reframed to check whether the national plan has considered both grid and off-grid options to reach every household, although it ends up choosing only grid extension in the plan. In the pilot countries, no issue has arisen from this. However, not

> **It takes a year to get a rural household electricity connection in Ethiopia versus 8 days in India and Solomon Islands.**

all countries need to deploy both grid and off-grid applications for achieving universal access, but they have to consider both options to find the best way. Also, "electrification" needs to be defined clearly to ensure it refers to household use— some countries use different definitions.

In indicator 2, enabling environment for renewable energy developers to invest in mini-grids, the term "mini-grid" will be more clearly defined because countries use it differently in their regulatory framework. For indicator 8, permitting a mini-grid, the indicator will be presented with well-specified case studies, which will ensure comparability of results across countries. Among pilot countries, only a few have had private developers operating renewable energy–based mini-grids, and even among them size and technology vary. During the global rollout, making the data comparable would be important for the analysis.

A new indicator on the enabling environment for grid electrification in peri-urban areas will be considered. As urbanization is set to gain momentum, electrification in peri-urban areas will become critical and require new approaches by policymakers and service providers. The policy and regulatory framework particularly needs to be aligned to embrace people who have migrated from rural areas and informally settled in slum areas. An indicator that captures mitigating mechanisms to address the illegality of tenure arrangements in peri-urban areas could therefore be considered.

Finally, off-grid space is still nascent, but dynamic. Business models are evolving and so is the understanding of what a supportive operating environment looks like. There will be opportunities to reflect on this in future editions of RISE.

Credit: Dana Smillie/World Bank

CHAPTER 4
RENEWABLE ENERGY

Performance on the RISE index for renewable energy varies hugely, from a normalized score of 92 in Denmark (out of 100) to 6 in Yemen (Figure 4-1). Four broad groups can be distinguished:

- Countries that exhibit a strong performance and have introduced most of the elements necessary to offer a robust investment climate for private participation in renewable energy development (green light)—Denmark, the United States, and India.
- Countries that have made good progress, but still have room to improve planning, and policy and regulation, including in pricing carbon and electricity and in procedural efficiency (yellow light)—Chile, Armenia, Honduras, Kenya, and Mongolia.
- Countries in the initial stages of introducing the basic measures to promote renewable energy investment (yellow light)—Tanzania, Nepal, and Ethiopia.
- Countries in which most of the essential elements for an adequate investment climate are still lacking (red light)—Liberia, the Solomon Islands, Maldives, Mali, Vanuatu, and Yemen.

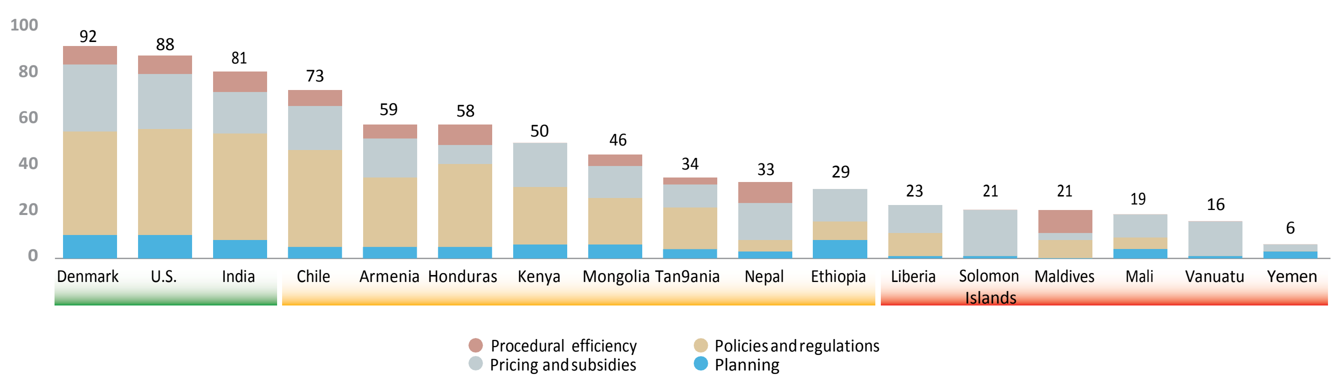
The pilot exercise revealed the combination of measures adopted by best performing countries and what kind of policy actions are still missing in countries with lower scores. Progress and good practice are features of many of the countries in different areas of the RISE index.

4.1 WHY DOES RISE MATTER?

The SE4ALL goal of doubling the share of renewable energy in the global energy mix between 2010 and 2030 will bring substantial benefits to all countries. Renewable energy deployment can improve energy security, increase energy access, reduce global and local pollutants (with associated health gains), and create new markets and jobs.

The global expansion of renewable energy markets, manufacturing, and investment has been remarkable in recent years. In electricity, renewable source-based power generation grew 5.5 percent annually over 2006–13, up from 3 percent a year over 2000–06.[39] The compound annual growth rate of final energy consumption from wind, biogas, and solar has been in the order of 25, 17, and 11 percent, respectively,

Figure 4-1: RISE renewable energy score



Source: RISE database.

39. IEA 2014a.

over 1990–2010.[40] The economic case for the transition to a higher and substantial share of renewable energy is compelling; however, important obstacles remain.

Investment trends. The investment volume required for a large-scale transition to sustainable energy is huge. The SE4ALL Global Tracking Framework 2013 reports that a doubling of the share of renewable energy in total final energy consumption to 2030 will require an average annual global investment of $250 billion–$400 billion. The IEA has recently estimated cumulative investment needs of around $6 trillion for renewable energy expansion over 2014–35 under the New Policies Scenario—about $270 billion a year—and up to $9 trillion dollars under the 450 Scenario—roughly $400 billion a year.[41]

However, the reality is that total new investment in renewable energy—excluding large hydropower—reached $214 billion in 2013, down 14 percent from 2012 and 23 percent lower than the record in 2011. This second consecutive year of decline in investment, after several years of growth, has been attributed to dramatic reductions in technology costs—especially in wind and solar—but also to increased policy uncertainty.[42] Indeed, recent analysis by the IEA suggests that increasing policy and market risks raise concerns over how fast renewable energy can scale up to meet long-term global deployment objectives.

A substantial increase in the share of renewable energy depends heavily on private sector participation, as the availability of finance from traditional sources—utilities, commercial-bank project finance, and governments—is limited, representing a key constraint to achieving the SE4ALL goal.

Economic barriers. Depending on technological maturity and the extent to which external costs and benefits are internalized, renewable energy technologies differ in their competitiveness from conventional energy technologies,[43] the lack of externality pricing constitutes an economic barrier to deploying renewable energy technologies.

Multiple and differentiated risks. Risks associated with renewable energy projects stem from underlying economic and noneconomic barriers. Some of the noneconomic barriers are:

- *Regulatory and policy uncertainty,* which relate to suboptimal policy design, or discontinuity and/or insufficient transparency of policies and legislation.
- *Market barriers* such as inconsistent pricing structures that disadvantage renewables, asymmetrical information, market power, financially unsustainable utilities (offtakers), subsidies for fossil fuels, and the failure of costing methods to include social and environmental costs.
- *Financial barriers* associated with an absence of adequate funding opportunities and financing products for renewable energy.
- *Infrastructure barriers* that mainly center on the flexibility of the energy system to integrate and absorb renewable energy generation, e.g., access to the electrical grid.
- *Lack of knowledge and adequate planning* relating to insufficient knowledge of resource potential, availability and performance of renewables, and lack of rigorous and anticipatory planning for renewable energy scale-up.
- *Institutional and administrative barriers* that include the lack of strong, dedicated institutions; absence of clear responsibilities; and complicated, slow, or nontransparent permitting procedures.

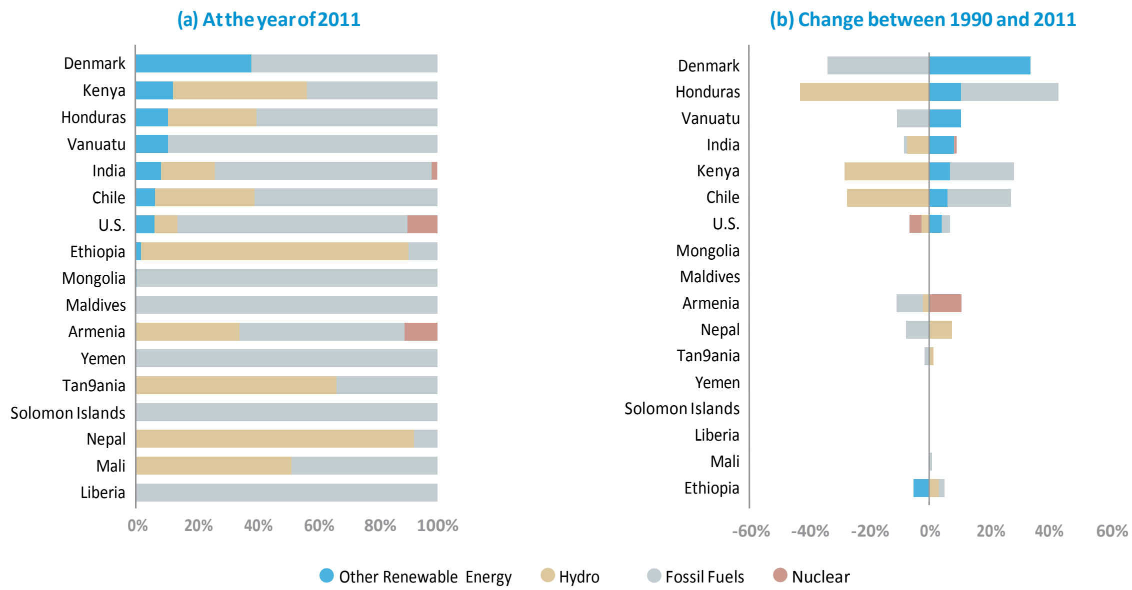
These barriers translate into multiple risks that affect the private decision to invest. Thus a fundamental goal of the policymaker today is to develop plans and to implement policies, regulatory measures, and administrative processes that address the various risks that concern private investors, while making sure there is a net benefit for consumers and the economy. This is a delicate balancing act, where information asymmetries and key considerations need to be weighed and continuously calibrated.

The RISE framework in renewable energy focuses on the elements of the business environment considered essential in attracting private sector participation in renewable energy development across four dimensions: planning; policies and regulations; pricing and subsidies; and procedural efficiency. RISE is intended to support policymakers in identifying challenges, good practices, and opportunities to improve the existing framework and practices that directly affect the private decision to invest in renewable energy.

All countries in the pilot have a high resource potential in one or more of the renewable energy options; however, RISE does not assume that all countries will commit to develop all existing options—especially those exhibiting a high incremental cost due to existing market barriers—or to attract private sector investment in renewable energy scale-up. A low RISE score simply means that a particular system or market does not offer an attractive business environment for such

40. World Bank and IEA 2013.
41. IEA 2014.
42. REN21 2014.
43. External costs may include those associated with greenhouse gas emissions reductions, pollution remediation, and damage to health. The benefits of renewable energy can include a reduction of greenhouse gas emissions, a contribution to energy security, and many others.

Figure 4-2: Share of installed capacity by technology



Source: Authors, based on data from the Energy Information Administration.

investment; this may be the case, for example, in systems with vertically integrated monopolies that do not offer the option of public–private partnerships (such as independent power producers) or in very small markets, where the scale of capacity additions and scope for competition are limited.

The RISE score is expected to correlate with increases in renewable energy capacity fully or partly financed by the private sector.

It is not possible at this time to draw conclusions from the correlation (or lack thereof) between past renewable energy trends and results of the pilot survey, in part because not all capacity additions in renewable energy have been supported by a robust investment climate and the participation of the private sector (Figure 4-2a). In many developing countries, public and concessional financing is helping demonstrate renewable energy scale-up, even in systems where the investment climate is still not conducive to private sector participation.

In 2011, fossil fuels and hydropower accounted for the bulk of installed power generating capacity in the pilot countries (Figure 4-2a); renewables other than hydropower experienced large increases in capacity share over 1990–2011 (Figure 4-2b).

As future rounds of RISE accumulate results, it is expected that the relationship between private investment and RISE scores will emerge clearly. For now, it suffices to note that the pilot survey covers countries spanning the global range of renewable performance, and it is hoped that lessons drawn in this exercise will be useful in preparing for the next step toward a global survey.

4.2 HOW DOES RISE MEASURE THE ENABLING ENVIRONMENT?

The RISE framework in renewable energy scores all countries on seven indicators specific to renewable energy and three cross-cutting indicators, which apply also to the energy efficiency and energy access pillars. One indicator concerns planning; five, policies and regulations; and one, procedural efficiency. The three cross-cutting indicators are carbon pricing mechanism, utility performance, and fossil fuel subsidy. The scope of the RISE framework is limited to grid-connected renewable source–based power generation, and does not apply to renewable energy development in off-grid and mini-grid markets.

Planning

Indicator 1: Planning for renewable energy expansion

RISE captures good practice on this indicator through the following sub-indicators: definition of a target with a corresponding action plan; inclusion of existing renewable energy options in long-term expansion planning using traditional least-cost planning and, if possible, other complementary or

Table 4-1: Scoring methodology—planning

Questions	Scoring	Traffic Light
Planning		
I. Planning for renewable energy expansion	*Sum and divide by 4*	
Target with an action plan • Does a renewable energy target exist? • If yes, does a renewable action plan to attain the target exist?	Yes—50, No—0 Yes—50, No—0	
Planning: • Does an electricity expansion plan that includes renewable energy development exist?	Yes—100, No—0	
Incorporation of renewable energy in transmission expansion: • Does current transmission planning consider renewable energy scale-up? • Is there an anticipatory planning process for least cost expansion of transmission network infrastructure in order to connect one or more renewable energy plants?	Yes—50, No—0 Yes—50, No—0	
High quality resource mapping • Does a high quality validated national atlas of renewable energy resource potential exist?	A full score of 50 for resource mapping requires that it possess three standards: 1. Modeling outputs that are validated by ground level measurements for at least one year 2. A spatial resolution of 10km or better 3. Temporal coverage equal to or greater than 10 years The standards have equal weight and the resource with the most attributes is chosen for the final score.	X≥75 25≤X<75 X<25
• Does strategic planning or zoning guidance for renewable energy resources exist?	A full score of 50 for strategic planning and zoning guidance requires that it possess four attributes: 1. Considered systematic renewable energy mapping outputs alongside other factors 2. Undertaken as part of a strategic environmental social assessment 3. Included appropriate stakeholder engagement 4. Is consolidated into government policy and communicated to stakeholders The attributes have equal weight and the resource with the most attributes is chosen for the final score.	

Source: Authors.

cutting-edge tools; anticipatory transmission expansion planning; and comprehensive, high-quality and validated resource assessment and mapping, ideally including the publication of a strategic planning or zoning guidance (Table 4-1).

The setting of a specific renewable energy target and the preparation of an action plan or policy mission to promote renewable energy development provide a particularly strong signal of government commitment.[44] Financiers look for a clear outline and plan for renewable energy market development along scale and time, investment required, and mechanisms that will facilitate the challenge. In RISE, countries are assessed on whether they have a renewable energy target and an action plan for achieving it. In general, a good target is ambitious, realistic, and time-bound, while an action plan for achieving the target should be as concrete as possible, detailing steps, phases, and measures.

Traditional long-term expansion planning (also known as least-cost approach) determines the type, size, and timing of capacity additions in generation, transmission, and distribution required to meet future electricity demand at minimum cost while satisfying reliability criteria and other potential constraints (technical, social, financial, political, geographic, and environmental, etc.).[45] Renewable energy resources exhibit, however, distinct characteristics that do not apply to conventional or fossil fuel–based generation, including

44. A recent survey on the drivers and barriers for private finance in renewable energy in developing countries confirms that a national target is the most powerful mechanism for unlocking private investment in renewable energy (UNEP 2012).

45. In monopolies, the least-cost expansion plan is traditionally conducted by the vertically integrated utility; however, in liberalized markets a reference expansion plan is also normally prepared by the planning authority or the independent system operator to guide investors on the optimal technical and economic evolution of the system.

resource variability, zonal spread, and learning effects. Integrating renewable energy into long-term expansion planning requires special attention to these characteristics, for which cutting-edge planning tools have been developed, although traditional methods and tools can also be adapted.[46]

Ideally, planning renewable energy expansion involves two tiers: incorporation of the specific characteristics of renewable energy into long-term expansion planning; and use of other complementary tools to assess the contribution of renewable energy to individual or multiple policy objectives (energy security, economic growth, energy access, and global or local environmental sustainability). For practical reasons—and as a first stage—RISE assesses good practice simply by whether or not renewable energy is integrated into long-term expansion planning.

It is essential that expansion planning and decisions are coordinated and followed by appropriate procurement and regulatory mechanisms.[47] Such mechanisms, like feed-in tariff (FIT) policies, renewable portfolio standards with or without tradable certificates, competitive bidding, and auctions, vary among countries; however, the planning exercise must lead to the commissioning of renewable energy projects through any of these mechanisms. The existence of explicit procurement or regulatory mechanisms is included in RISE.

One of the main obstacles to scaling up renewable energy is connecting sites to the grid efficiently. Sites with renewable energy resource potential are often dispersed across multiple locations or far from consumption centers and the transmission system. Unlike fossil fuel–based generation capacity whose technologies are more modular and fuel sources more mobile, renewable energy capacity is more constrained by the location of the resource and for this reason transmission networks need to be extended to reach them. Transmission expansion has traditionally been reactive, responding to interconnection requests. A forward-looking approach to transmission planning, however—one that explicitly takes into account the geographic spread and potential scale-up of renewable energy—can in the long run be more cost effective and increase the technical efficiency of the grid.

In RISE, good practice in transmission expansion that incorporates renewable energy is assessed on two tiers: first, simple consideration for renewable energy in transmission expansion; second, use of a forward-looking transmission expansion approach conceived to introduce a set of projects in a geographic area, thereby reducing costs and improving efficiency.[48]

Mapping renewable energy resources is a crucial step for governments looking to encourage scale-up and commercial investment in clean energy. Mapping raises awareness of a country's resource potential, potentially reduces information costs and shortens project timelines for commercial developers, and provides valuable information for designing zoning guidance, tariff levels, and other policies.

In RISE, best practice in resource mapping involves two elements: the existence of a high-quality validated national atlas, and the publication of a strategic planning or zoning guidance. The standards considered in RISE to verify the existence of a high quality validated national atlas are: modeling outputs validated by ground-level measurements for at least one year; a spatial resolution of 10km or better; and temporal coverage of at least 10 years.

An appropriate strategic planning or zoning guidance in RISE conforms to the following standards: systematically considers renewable energy mapping outputs alongside other factors, including environmental, social, physical, and infrastructural; is undertaken as part of a strategic environmental and social assessment or equivalent process; includes appropriate stakeholder engagement and consultation; and consolidated into government policy and communicated to stakeholders.

Pricing and Subsidies

Indicator 2: Fossil fuel subsidy
Indicator 3: Carbon pricing mechanism
Indicator 4: Utility performance

Cost-reflective pricing is a fundamental criterion for economic efficiency. Prices should direct investment toward the goods

Thirteen countries have a renewable energy target, but only 8 have an action plan to attain the target and 2 a high quality resource map.

46. For instance, in the least-cost approach the incorporation of renewable energy could be modeled as follows: representing renewables as a "unreliable thermal unit" or as a "run-of-river hydro plant;" through adjustments to the net load duration curve; and determining the "firm capacity" of renewable energy source generation offline and adjusting upwards the assumption on reserve requirement in the model.

47. We refer to "procurement" when a firm supplies a good to the government and to "regulation" when it supplies a good to consumers on behalf of the government (defined in Laffont and Tirole 1999).

48. It is possible that this last provision does not apply to island countries; in this case RISE scoring is adjusted to avoid unfair penalization.

Table 4-2: Scoring methodology—pricing and subsidies

Questions	Scoring	Traffic Light
Pricing and subsidies		
II. Fossil fuel subsidy		
What is the proportion of electricity generation by subsidized fossil fuel?	Percentage of electricity generation by unsubsidized fossil fuel and other fuel	X≥75 25≤X<75 X<25
III. Carbon pricing mechanism	*Sum and divide by 2*	
Is there a legally binding greenhouse gas emission reduction target in place?	Yes—100, No—0	X≥75 25≤X<75 X<25
Is there any mechanism to price carbon in place (e.g., carbon tax, auctions, emission trading system)?	Yes—100, No—0	
IV. Utility performance	*Sum and divide by 2*	
Reporting practice of financial statements (i) Are the financial statements of the largest utility publicly available? (ii) If yes to (i), are they audited by an independent auditor?	Yes to (i) & (ii)—100 Yes to only (i)—50 No to (i) &	X≥75 25≤X<75 X<25
Financial performance (i) Current ratio (ii) EBITDA margin (iii) Debt service coverage ratio (iv) Days payable outstanding (v) Days receivable outstanding	*Sum of five scores of sub-elements* *Score* — *20* — *0* (i) ≥1 <1 (ii) ≥0 <0 (iii) ≥1 <1 (iv) ≤90 >90 (v) ≤90 >90	

Source: Authors.

and services that provide the greatest benefit to society, which requires that prices reflect both private and external costs (climate change is an example of a market failure involving externalities and public goods). Fossil fuel subsidies and the absence of carbon pricing violate this principle and lead to energy prices that increase fossil fuel consumption, limit renewable energy consumption, and cause welfare loss.

In RISE, the absence of fossil fuel subsidies and presence of carbon pricing are therefore standards of good practice (Table 4-2). A legally binding greenhouse gas emission target is also considered good practice as it signals a government's intent to reduce such emissions; this adds credibility to any carbon pricing mechanisms in place. Primary mechanisms for pricing carbon are carbon taxes and emission trading systems. In 2014, 39 national and 23 subnational jurisdictions, accounting for more than 22 percent of global emissions, implemented or are scheduled to implement these two mechanisms (World Bank 2014). Aside from creating a more level playing field for renewables vis-à-vis conventional fuels, carbon pricing mechanisms can also raise revenues to provide renewable energy investors with additional incentives.

The financial sustainability of the offtaker is critical to renewable energy investment and financing. Limitations in the utility's credit quality, corporate governance, management and operational track record or outlook, or even unfavorable policies on the utility's cost-recovery arrangements create high counterparty risk. The financial performance of utilities is therefore verified in RISE through two sets of sub-indicators as a proxy for offtake risk: public disclosure and third-party auditing of financial statements; and a combination of five financial performance measures as described in Chapter 2.

Policies and Regulations

Indicator 5: Legal framework for renewable energy
Indicator 6: Regulatory policies and procurement
Indicator 7: Regulatory policies—policy design attributes
Indicator 8: Network connection and pricing
Indicator 9: Public financial support mechanisms

The existence of robust policy, legal, and regulatory frameworks remains central for attracting financing in renewable energy. Indeed, investors examine national policy conditions reflecting client interest, or as specific market opportunities arise. Financiers are interested in clear, investment-related information on national drivers as well as legal and regulatory regimes that detail the types of renewable energy supported, the types of incentives, and other provisions associated with market development and the conditions to enable investment.

A solid framework provides clarity on the size and stability of revenues in renewable energy projects and contributes

Table 4-3: Scoring methodology—policies and regulations

Questions	Scoring	Traffic Light
Policies and regulations		
V. Legal framework for renewable energy		X=100 X=0
Does a legal framework for renewable energy development exist?	Yes—100, No—0	
VI. Regulatory policies and procurement		X=100 X=50 X=0
Are there incentives for grid-connected renewable energy generation?	Yes—50, No—0	
Are there incentives for distributed renewable energy generation?	Yes—50, No—0	
VII. Regulatory policies—policy design attributes	*Sum and divide by 3*	X≥75 25≤X<75 X<25
Predicability: Does the policy possess the following attributes: • Renewable purchase obligation? • Rules on price level modification and frequency? • Provisions in auctions to deter aggressive pricing?	Maximum of following Yes—100, No—0 Yes—100, No—0 Yes—100, No—0	
Sustainability: Does the policy possess the following attributes: • The renewable energy subsidy is passed through to the consumer tariff? • The renewable energy subsidy is less than 2% of total residential electricity bill?	Yes—50, No—0 Yes—50, No—0	
Accessibility: Does the policy possess the following attributes: • Prioritized access to the grid (priority dispatch)? • Grid code with measures or standards to manage/operate variable renewable energy? • Clear polices/rules on curtailment cost (full, partial, or no compensation)?	Yes—33.3, No—0 Yes—33.3, No—0 Yes—33.3, No—0	
Remuneration Efficiency: • Does the policy lead to a price incentive that is sufficient to cover the costs of generation?	Not scored in the pilot stage	
VIII. Network connection and pricing	*Sum and divide by 2*	
Connection cost allocation policy • Are there rules about the allocation of connection costs? • If yes, what is the type of the connection cost allocation policy (super-shallow/shallow/deep)?	Yes—50, No—0 Super shallow—50 Shallow—25, Deep—0	X≥75 25≤X<75 X<25
Network usage pricing • Are there rules defining who pays for transmission and distribution wheeling charges?	Yes—100, No—0	
IX. Public financial support mechinisms		
Does the government off the following: • Fiscal incentives for renewable energy?	Yes—25, No—0	X≥75 25≤X<75 X<25
• Public financial incentives for renewable energy?	Yes—25, No—0	
• Backing of utility payments (with letter of credit or other)?	Yes—25, No—0	
• Credit enhancement or risk mitigating (through reserve accounts, sovereign guarantees or other)?	Yes—25, No—0	

Source: Authors.

to lower the cost of financing by addressing the policy risk, while delivering renewable energy at lowest cost to society. The financial sustainability of the offtaker is also critical to financing; policymakers can implement measures or enhancements—in tariff or performance regulation, or through risk mitigation—to promote good practice and reduce or eliminate the offtake risk.

In RISE, good practice in policies and regulations, including procurement, is verified through several indicators (Table 4-3).

Price- or quantity-setting regulatory policies include FITs, feed in-premiums (FIPs), renewable portfolio standards (with or without certificate markets), and tenders (henceforth

Nine countries have a specific regulatory policy to support renewable energy, with an equal distribution of policy choice between FIT/FIPs, RPS and auctions.

regulatory policies).[49] Absent direct externality pricing, these policies are essential for effective promotion of renewable energy options that exhibit an incremental cost compared with conventional alternatives. There are several incentives for distributed renewable energy generation, although in the RISE pilot scoring is limited to the existence of net-metering policies.

Regulatory policies to support grid-connected renewable energy function as the cornerstone instrument for transformation efforts; however, the design of these instruments has to embrace the attributes to attract private investment, i.e., (in RISE) predictability,[50] sustainability, accessibility, and remuneration efficiency (or appropriate compensation).[51] [52]

- *Predictability* is assessed through existence of three elements: (i) purchase obligation imposed on utilities, discos (distribution companies) or other service providers, (ii) explicit rules for price level modifications and their frequency, and (iii) inclusion of mechanisms in tenders that promote realistic price bids (so that investors know that aggressive price bidding is penalized later on for delays in the—or for no—construction of plants).[53]
- *Sustainability* of incentives is measured through the existence of two elements: (i) a pass-through to the consumer tariff (surcharge), and (ii) consumer affordability, which is measured as the impact of the subsidy on the average residential bill as well as on per-capita income. Thresholds and a good practice frontier for "affordable" and "not affordable" subsidies will be derived as RISE progress to a global level.
- *Accessibility* is associated with renewable energy access to the grid. The three elements included are: (i) prioritized access to the grid (or priority dispatch), (ii) existence of a grid code that includes measures or standards for managing and integrating variable renewable energy, and (iii) clear policies or rules on curtailment costs (full, partial or no compensation).
- *Remuneration efficiency* refers to appropriate compensation. While policymakers need to ensure that the price incentive is closely aligned to costs, investors welcome and advocate for higher price incentives. In RISE, the level of price incentives is compared with actual project costs to ensure that incentives are at least within appropriate country and regional ranges, but not below.[54]

RISE does not advocate for any specific type of regulatory policy and focuses on the attributes and monitoring elements required to unlock financing. These attributes and rules can be included either in regulatory frameworks or codes, or embedded in contract design. Indeed, each regulatory policy has its own advantages (and disadvantages). The choice of regulatory policy, instrument design, and complexity of policy package (or regulatory regime) should be tailored to the conditions of the system and type of market, nature and level of risks, and institutional and administrative capacity.

Investors are also concerned about the clarity and design of network connection and pricing. Transmission infrastructure cost-allocation and network-pricing policies are critical to renewable energy development as they can signify high costs to developers and so become an important determinant of investment.[55] Although these policies are generally included in formal regulatory frameworks, some may be included in standardized power purchase agreements, or even in wheeling service agreements. In RISE, good practice in network connection and pricing involves two tiers: existence of explicit and clear policies or regulations, and preference for rules that lower the burden on renewable energy (e.g., super-, semi-, or shallow interconnection cost policies as opposed to deep interconnection cost policies; and connection cost paid over a period as opposed to a one-time payment).[56]

49. Many sources describe price- and quantity-setting instruments in detail. The economics literature shows that in the presence of a binding emissions cap, additional renewable policies of any kind do not affect emissions but could, however, correct for market failures (e.g. market and regulatory barriers, spillovers from technological innovation and learning) (Fischer and Preonas 2010).
50. Inclusion of mechanisms in tenders that promote realistic price bids enables investors to know that aggressive price bidding is penalized later for delays—or even cancellation—in plant construction.
51. In RISE, the level of price incentives is compared to actual project costs to ensure that incentives are at least within appropriate country and regional ranges, but not below.
52. See Elizondo and Barroso (2012).
53. For example, a limit on the quantity of energy that is stimulated by price setting FIT and FIP policies can be achieved with a program cap, while a price control in a quantity-setting renewable purchase obligations program can be achieved with price floors and ceilings.
54. The data on renewable energy project costs at country level will be sourced by the International Renewable Energy Agency's Costing Alliance initiative.
55. See Madrigal and Stoft (2012) for a detailed description of transmission cost allocation policies, connection costs, and usage pricing policies, including curtailment.
56. Costs of extending transmission or upgrading transmission infrastructure are typically allocated between the project developer and the transmission system operator (TSO) using one of the four cost-allocation policies: super-shallow, semi-shallow, shallow, or deep (see Table 4-3). In a super-shallow policy, the project developer has to pay only for the installation of enabler facilities or immediate connection assets (internal substation, transformer); in a deep policy, developers are responsible for all transmission infrastructure costs, including construction of enabler facilities, system extension, and network upgrades. Semi-shallow and shallow are in the middle of these two extremes.

Table 4-4: Scoring methodology—procedural efficiency

Questions	Scoring	Traffic Light
Procedural efficiency		
X. Starting a new renewable energy project		
Time taken, cost incurred and number of agencies contacted to start a renewable energy project of types: 1) Small hydro 2) Solar, wind, or biomass (choosing the technology that is in most widespread use	Higher average (between hydro and non-hydro projects) of three DTF measures on time, cost, and number of agencies contacted	X≥75 25≤X<75 X<25

Source: Authors.

Regulatory and procurement instruments can be designed to function simultaneously as policy de-risking, financial de-risking, and output-based instruments.[57] However, regulatory policies alone may not be sufficient to promote renewable energy, especially in economies or business environments that exhibit multiple and high risks. These instruments are usually supplemented by fiscal and financial incentives to address residual investment risks (those associated with the business environment, including offtake risk and the lack of affordable equity or debt financing). Different types of public finance instruments can be used to address these constraints (public loans, partial loan guarantees, political risk insurance, partial risk guarantees, and others). Ultimately, the customized basket of incentives should be designed to achieve a cost-effective and economically efficient support scheme.

The RISE indicator on public financial support mechanisms verifies for the existence of four types of renewable energy support mechanisms[58] other than regulatory policies: (i) fiscal incentives (capital subsidies, grants or rebates, investment or production tax credits, tax reductions, energy production payments, or other), (ii) public financing support (public investment, loans or grants, and public competitive bidding/tendering), (iii) credit enhancement and risk mitigation (such as reserve accounts, direct sovereign guarantees, credit lines, or soft loans), and (iv) utility payments guarantee (a letter of credit or other).

Procedural efficiency

Indicator 10: Starting a new renewable energy project

Renewable energy developers need to go through multiple bureaucratic procedures, requiring them to deal with a raft of institutions. Some of these licenses and permits include concessions to exploit natural resources, licenses to generate power, zoning authorizations, building permits, clearance or approval of engineering standards, environmental impact assessment approvals, environmental licenses, and technical approvals for connection to the grid.

In RISE, the good practice frontier in procedural efficiency is defined by the time, cost, and number of agencies contacted for a renewable energy developer to construct a plant, connect to the grid, and operate and sell its electricity output to the grid (Table 4-4). To make data comparable across economies, RISE tests procedural efficiency with hypothetical projects or cases where the capacity, distance to grid, operating lifetime, environmental safeguards, and other parameters are established ex ante.[59]

Thresholds and a good practice frontier for "best" and "worst" performers will be derived as RISE progresses to global level. A distance to frontier (DTF) approach is applied to this indicator to illustrate the distance of an economy to the frontier, which represents the most efficient practice achieved on each of the component indicators across countries. The DTF metrics in each of the three dimensions (time, cost, and number of agencies involved in permitting or licensing) is added for a total score. The project (hydro or non-hydro) with the highest total score is the final measure on procedural efficiency.

4.3 HOW DID THE COUNTRIES SCORE?

Indicator 1: Planning for renewable energy expansion

All pilot countries except Maldives and Tanzania have established renewable energy targets (Figure 4-3). These are typically defined as shares of electricity generation or energy consumption, although a few countries including India and Kenya (Box 4–1) specify capacity targets. Most countries with targets publish action plans.

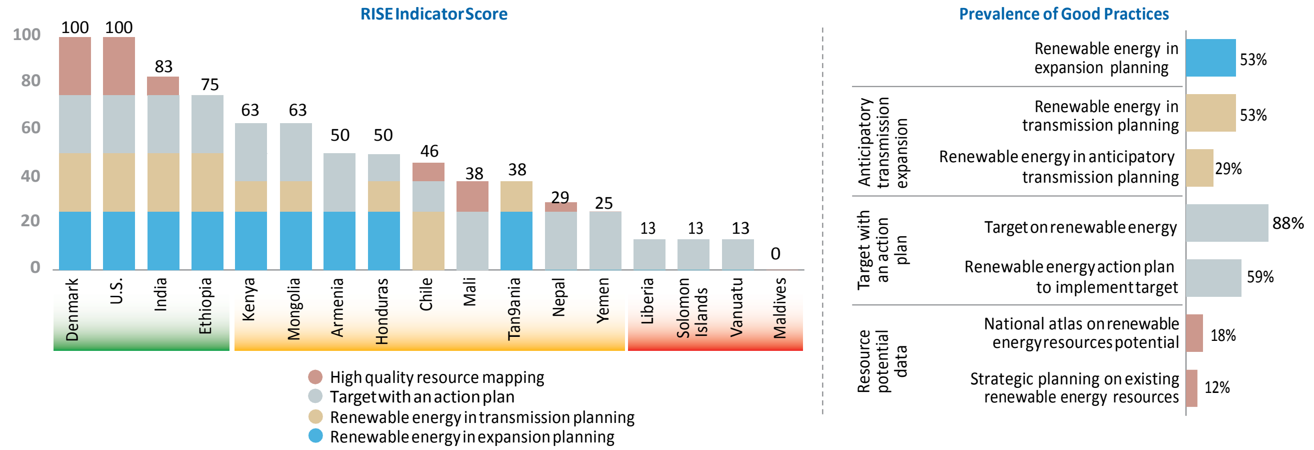
In addition to Denmark, the United States, and India, many of the pilot countries are now explicitly integrating renewable energy into expansion planning. Ethiopia in particular has conducted a strong planning exercise and issued its five-year

57. For instance, elements of policy such as guaranteed access to the grid and must-take requirements function as policy de-risking instruments, a guaranteed price over several years provides financial de-risking, and incentives paid against energy delivered are output based. Both price- and quantity-setting instruments can include a combination of these elements, in either regulatory or contract design.

58. Source of information on (i) fiscal incentives and (ii) public financing support is REN21 (2014).

59. For each the indicator on procedural efficiencies three non-hydro cases and one hydro case are described: an 80 MW grid-connected wind based generation plant, a 1 MW grid-connected solar PV plant, a 10 MW grid-connected biomass plant, and an 80 MW grid-connected hydropower plant.

Figure 4-3: Planning for renewable energy expansion



Source: RISE database.

Growth and Transformation Plan, which sets ambitious targets to 2015 (75 MW of geothermal capacity, 10.6 GW of hydropower, and 770 MW of wind power); in addition Ethiopia is aiming to reach 1 GW of geothermal capacity and 22 GW of hydropower capacity by 2030.[60] Kenya is also progressing in aligning renewable energy scale-up with transmission expansion planning.

The strongest performers on planning (Denmark, the United States, India, and Ethiopia) conduct anticipatory transmission planning. In India for instance, the National Electricity Plan incorporates renewable energy expansion and its large-scale integration to the grid with the development of green corridors. The nature and sophistication of such planning varies greatly, even within, say, the United States (some states, such as Texas with its renewable energy zones, are ahead).[61]

Only very few countries—such as Denmark, the United States, and Chile—have prepared and made available comprehensive, high-quality, and validated resource maps as well as strategic planning or zoning guidance for some—if not all—of their renewable energy sources. India, Armenia, Chile, Mali, Nepal, and the Solomon Islands are progressing on this front.

Indicator 2: Fossil fuel subsidy

Six of the 17 countries—Maldives, Yemen, Honduras, the United States, India, and Ethiopia—subsidize fossil fuels used in electricity generation: all six subsidize oil, the United States

60. REN21 2014.

61. Texas has devised a planning process that quickly connects RE to the transmission system. The system is based on the designation of "competitive renewable energy zones" (Madrigal and Stoft 2012).

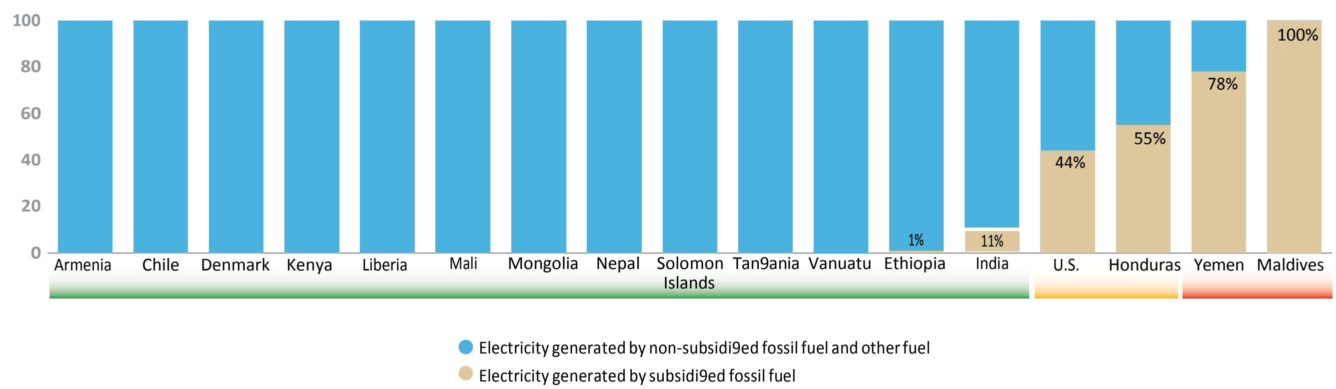
Box 4-1: Renewable energy target and planning in Kenya

A new government elected in April 2013 has launched "5000+MW by 2016, Power to Transform Kenya" program, which includes targets for additional generation capacity of 1,646 MW from geothermal, 1,050 MW from natural gas, 630 MW from wind, and 1,920 MW from coal. The program also mentions the construction of 4,679 kilometers of high voltage transmission lines (132 KV, 500 KV) and 3,579 kilometers of distribution line.

This follows the Least Cost Power Development Plan (LCPDP) 2011. The plan defines geothermal, hydro, and wind power among others as least-cost expansion options. Geothermal is highlighted as the resource of choice and plans are to increase capacity to 5,530 MW by 2030, or 26% of the installed capacity. Geothermal scores high on the LCPDP because it is abundantly available in the Rift Valley, can be used as baseload power, has low greenhouse gas emissions and is cheaper on levelized cost terms.

The LCPDP outlines the required additional transmission and distribution capacity each year for the planning period and goes into detail including the location, length, voltages, and rationale. A focus is placed on evacuating power from high-potential renewable energy production areas including the Rift Valley geothermal production zones. Quantitative targets are set in the LCPDP for system stability, including caps for system frequency and voltage deviation. Apart from wind, which is expected to contribute marginally to overall capacity, the selected renewable energy options are dispatchable, lowering risks of intermittency.

Figure 4-4: Only a few countries in the sample generate electricity with subsidized fuel(s)



Source: RISE database.

subsidizes coal, and India subsidizes gas (see Figure 4-4). The presence of subsidies for the production and consumption of fossil fuels remains a huge impediment to renewable energy development and the global shift to sustainable energy, as they force renewables to operate on an uneven playing field in which energy prices do not fully reflect externalities.

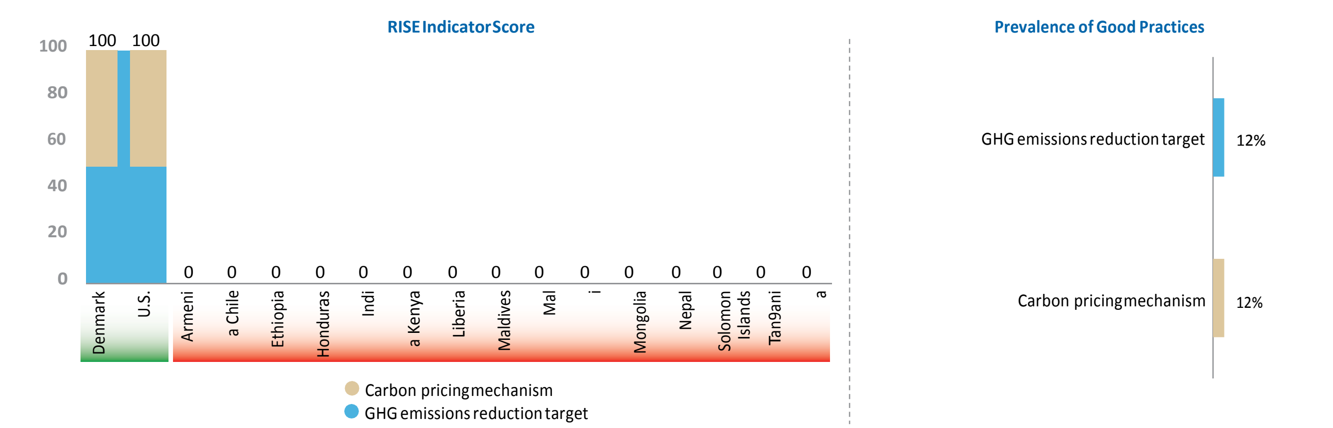
Of the countries that provide fossil fuels, all except Yemen simultaneously support renewable energy with economic, fiscal, and financial incentives.

Indicator 3: Carbon pricing mechanism

Only Denmark and the United States (New York State) have legally binding greenhouse gas emission reduction targets (Figure 4-5).[62]

Six other countries have non-binding greenhouse gas targets including Chile, Ethiopia, India, Liberia, Maldives and Mongolia. Targets are usually set as a percentage emission reduction below the level in a base year. Denmark and the United States (New York State) are also the only countries to have issued a carbon pricing policy. Denmark introduced a carbon dioxide tax in 1992, which applies to oil, gas, coal, and electricity and covers around 45 percent of total greenhouse gas emissions. It also participates in the EU Emissions Trading System. New York State is one of the nine member

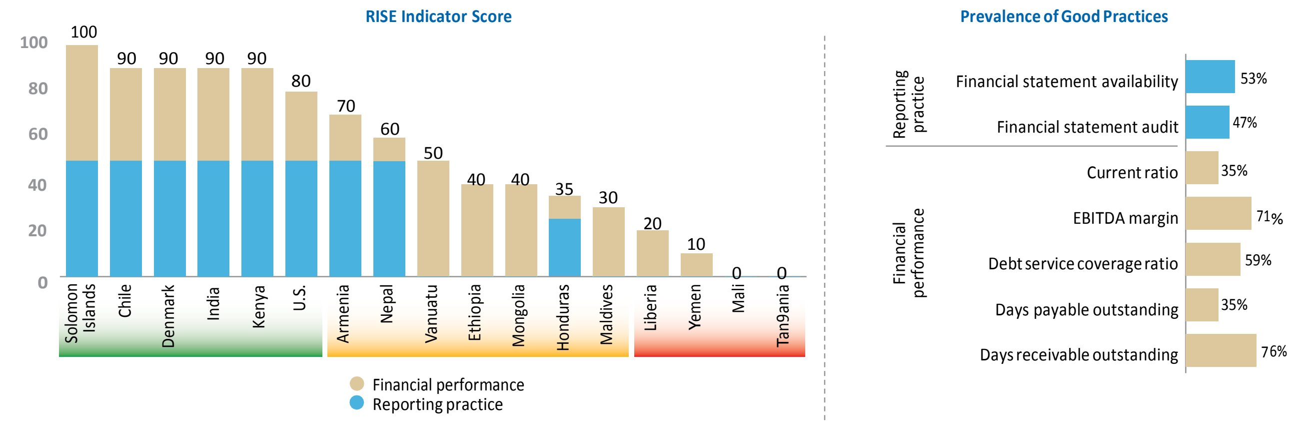
Figure 4-5: Only two countries have a legally binding greenhouse gas emission reduction target or a carbon pricing mechanism



Source: RISE database

62. nSeptember 2014 Chile passed a tax law, which includes bringing in a carbon tax in 2017. As it occurred after the cut-off date of June 30, this report did not score it.

Figure 4-6: Six pilot countries indicate green traffic lights on their utility performance



Source: RISE database.

states of the Regional Greenhouse Gas Initiative, a cap and trade system.[63]

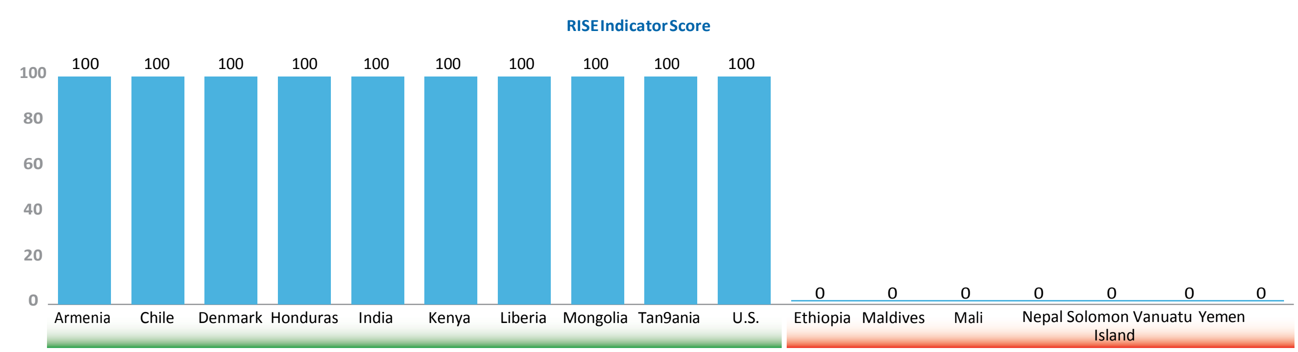
Indicator 4: Utility performance

Utilities in high- and middle-income economies score well on utility performance, as do some in low-income countries (Figure 4-6).

The Solomon Islands Electric Authority performs very well, with maximum score on the seven elements of this indicator, reflecting a strategy that combines asset revaluations, resolution of outstanding payments, streamlined logistics, and increased number of supply agreements, leading to very low liabilities, no debt, and relatively low system losses.[64]

Both Tata Power in India and the Kenya Power and Lighting Company score relatively well on this indicator. Tata Power operates in the wealthiest and most developed state in India, where billing collection and the level of electricity tariffs are less of a concern. The latter company also scores well onboth reporting practice and financial performance, except onthe number of days payable outstanding. The power sector in Kenya is largely financially sound due to robust regulatory policies, especially for design of contracts and retail tariffs.

Figure 4-7: More than half the sample countries have a legal framework to support renewable energy



Source: RISE database.

63. This is a market-based greenhouse gas reduction program covering carbon dioxide emissions from power plants in nine Northeast and Mid-Atlantic states of the United States. Emission permit auctioning began in September 2008 and proceeds are used to promote energy conservation and renewable energy. The system affects fossil fuel power plants with 25 MW or more generating capacity. The regional cap on emissions is reduced periodically and set to decline by a further 2.5 percent each year from 2015 to 2020. The auctioned price has hovered between $2 and $4.

64. Government of Solomon Islands 2013.

Indicator 5: Legal framework in renewable energy

Armenia, Chile, Denmark, and Mongolia have already introduced dedicated renewable energy laws, while Honduras, India, Kenya, Tanzania, Liberia, and the United States have laws on renewable energy embedded in broader legislation (Figure 4-7). A dedicated renewable energy law is often an indication of a comprehensive legal framework, one that lays down national targets, incentive mechanisms, duties and responsibilities of key institutions, and other criteria. Countries without dedicated renewable energy laws have legal provisions for renewable energy scattered in broader legislation; however RISE does not verify the degree to which such legislation is comprehensive.

Indicator 6: Regulatory policies and procurement

Nine countries use regulatory policies to support grid-connected renewable energy and four support distributed renewable energy (Figure 4-8). Many countries have introduced price- or quantity-setting regulatory policies to promote grid-connected renewable energy, including FITs in Armenia, Kenya, Maldives, and Mongolia; premiums in Honduras and India (generation-based incentives for wind and solar); and renewable portfolio obligations in the United States (New York State) and Chile.

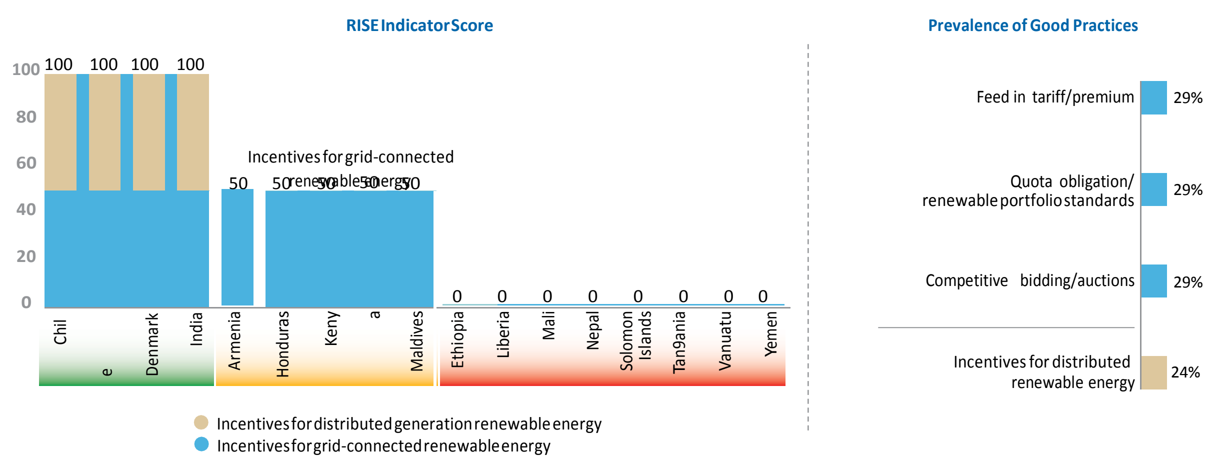
Chile in 2013 introduced a mix of economic incentives to fit the conditions of its liberalized electricity market: a target of 20 percent of renewable energy in the national energy mix by 2025, a purchase obligation of 10 percent imposed on electricity generators with portfolios or capacities larger than 200 MW, a tradable certificates system, and tenders or auctions for price premiums.[65]

Denmark, New York, and Chile have net metering policies in support of distributed generation for solar PV and other small-scale renewable energy. Denmark revised its policy in 2013 restricting payments for self-generation by moving from yearly to hourly net metering and setting an eligibility cap of 20 MW for solar PV systems. In the United States, net metering policies apply in 43 states, Washington, D.C., and four territories. New York tripled its solar PV capacity cap in 2013, opening the program to more consumers.[66] Chile introduced its net metering policy in 2012, with an eligibility cap on residential users of 100 kW and a purchase obligation imposed on electricity companies with installations or purchases higher than 200 MW. In India, solar rooftop development is already supported by several states employing various incentives.

Indicator 7: Regulatory policies—policy design attributes

The United States and Denmark score very high on policy design attributes as they have gradually designed policy instruments that provide investors with the following: a certain degree of predictability regarding price adjustments either in regulation or procurement; subsidies paid through sustainable recovery mechanisms (typically a direct pass-through to consumer tariffs); and clear rules on access to the grid including prioritized dispatch, network integration, and curtailment.

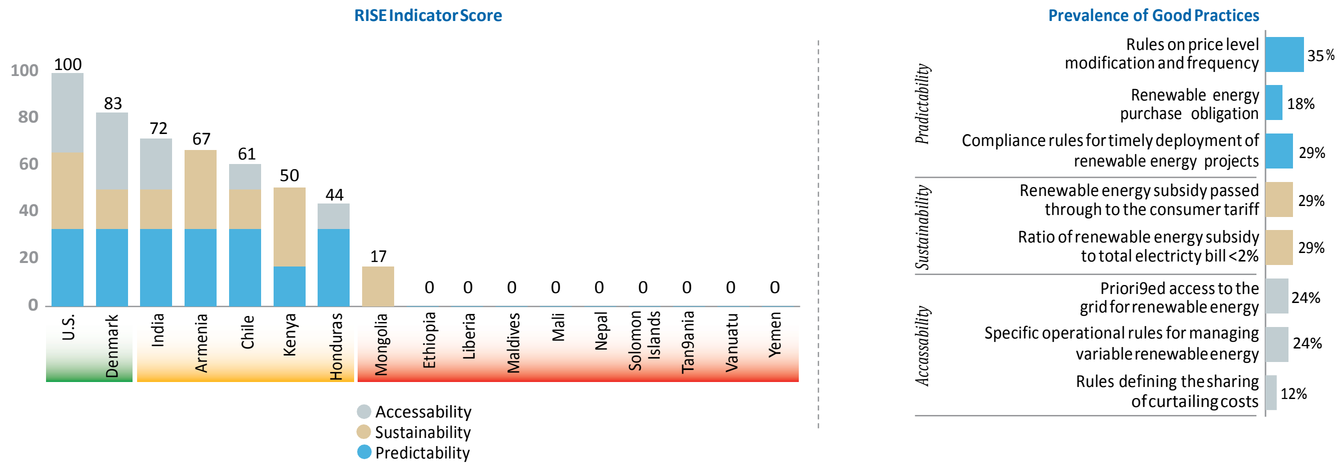
Figure 4-8: Nine countries have introduced economic incentives to support renewable energy



Source: RISE database.

65. The framework for renewable energy certificates is in the design stage.
66. REN21 2014.

Figure 4-9: Regulatory policies—policy design attributes



Source: RISE database.

The regulatory policies of other countries could still be improved, especially sustainability and accessibility as defined by RISE (Figure 4-9).

Predictability. A country can score full points when its regulatory policy includes any of the following: transparency on price or premium calculations and adjustments (FIT and FIP); existence of a renewable purchase obligation/renewable portfolio standard program that provides assurance of continued renewable energy support (FIT, FIP, renewable portfolio standards, and auctions); or existence of compliance mechanisms that help ensure effective procurement and construction of plants (tenders and auctions).

The states of Maharashtra and New York employ all three types of regulatory policy and satisfy the predictability criteria for each type. All five countries that use auctions reported that the design of the auction would typically feature compliance mechanisms. Maldives and Mongolia are the only countries that do not satisfy any of the predictability criteria. They run FIT programs without clearly specifying how or when FIT levels can be adjusted.

Sustainability—incremental cost-recovery mechanism. All of the eight countries with some type of regulatory policy employ either FIT or FIP programs, signifying additional cost to taxpayers or consumers. Of these, only five reported passing on the costs of the subsidy to consumers. When the policy or regulation mandates a pass-through to the consumer tariff, it is rarely in full and is not straightforward to calculate. Kenya is an exception, as it states that 70 percent of the costs of the FITs for wind, hydro, biomass, and geothermal, and 85 percent of the costs of solar FITs, should be passed on to consumers (Box 4-2).

Where there is no pass-through, the implications for the effectiveness of the policy can be steep. For instance, although India has deployed different price and quota mechanisms with fairly sophisticated and customized designs, the sustainability of incentives is still perceived as weak because there is no clarity as to how the cost of the incentives will be covered. The perception that the transfer of a government subsidy to utilities is unlikely or partial affects the decision to invest, notably when there is a track record of transfer or payment defaults. In Chile, renewable portfolio standards are in the design stage and there is still no clarity on the nature of the incremental cost-recovery mechanism.

Sustainability—affordability. A high penetration of renewable energy can have a notable impact on residential electricity bills, and consumer affordability may impose a de facto threshold on the volume of the incentive. A key element of the sustainability of economic incentives is the capacity of electricity consumers—or taxpayers—to afford the incremental cost associated with some types of renewable energy over time. Spain, Denmark, and Germany, for example, have increased renewable energy penetration in their power systems to the point that renewable energy subsidies have a more visible impact on the residential bill, of 3.35 percent, 3.20 percent, and 2.38 percent, respectively (Figure 4-10a).

Some countries with high renewable energy penetration have had to adjust their incentive programs—policy caps or even moratoriums—in response to political or consumer concerns.

Box 4-2: Evolution of feed-in tariff policies in Kenya

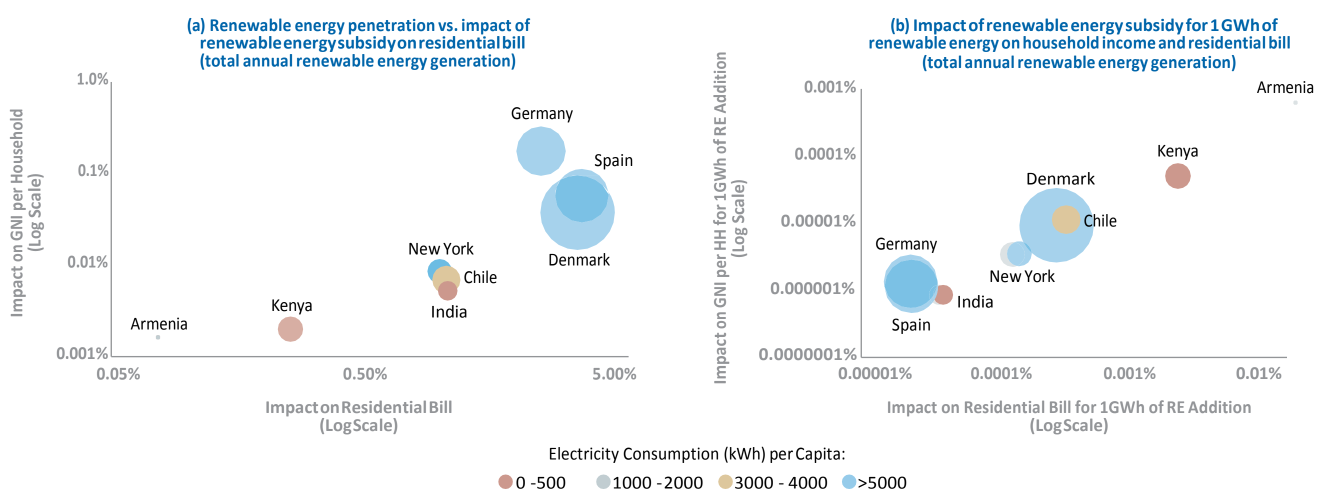
Kenya adopted a feed-in tariff (FIT) policy in March 2008; a second iteration was released in 2010; and the policy was further revised in December 2012 (see table).

Year	Technologies	PPA Contracts	Term (years)	Tariff basis	Interconnection
2008	Wind, small hydro (up to 10 MW), biomass	Negotiated. KPLC recovers any cost above US 2.6c/kWh from consumers	20	Cost plus reasonable return but with regard to avoided cost. Firm and non-firm tariffs.	Connection costs may be paid by KPLC and recovered from the tariff payments. Guaranteed priority purchase.
2010	Wind, small hydro, biomass, biogas, solar, geothermal	Negotiated. KPLC recovers 70% of the FIT portion from consumers (85% for solar PV)	20	Cost plus reasonable return, avoided cost, other FIT policies and socioeconomic conditions in Kenya. Firm and non-firm tariffs	Connection costs may be paid by KPLC and recovered from the tariff payments. Guaranteed priority purchase.
2012	Wind, hydro, biomass, biogas, solar (grid), solar (off-grid), geothermal	Standardized for small generators up to 10MW. Standardized but optional for generators over 10 MW. KPLC recovers 70% of the FIT portion from consumers (85% for solar PV)	20	Cost plus reasonable return (with an escalable portion) but not to exceed the long-run marginal cost under the Least Cost Power Development Plan	Connection costs paid by the developer and paid up front. Guaranteed priority purchase (take or pay) for small generators.

By mid-2012, 84 expressions of interest had been accepted by the FIT committee. Wind represented 76 percent of potential installed capacity and 40 percent of all applications. Hydro-based projects remained prominent on number of applications (38 percent) although the project sizes were small, accounting for only 7 percent of the potential installed capacity with biomass accounting for 9 percent. Most of the solar project developers were targeting higher off-grid tariffs.

Despite the growing interest from local and international investors, only one operational project (Imenti Tea Small Hydro) has been completed under this policy. However, several other projects have closed financing arrangements and are at an advanced stage.

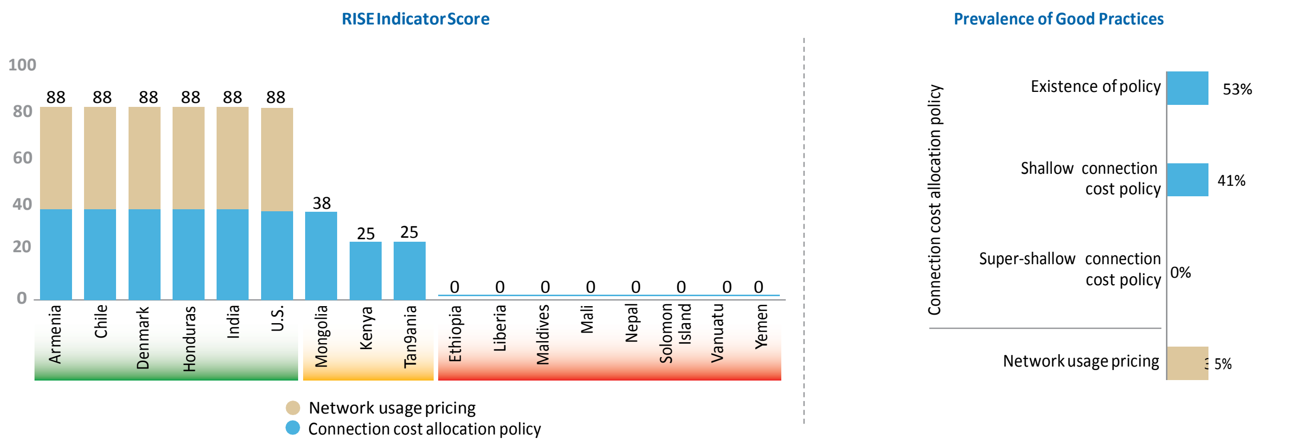
Figure 4-10: Policymakers need to be aware of the economic impact and efficiency of renewable energy subsidies



Note: Bubble size denotes renewable energy penetration.

Source: Authors.

Figure 4-11: Network connection and pricing



Source: RISE database.

Affordability is even more important in low-income countries, where renewable energy subsidies may have a high impact on household revenue, regardless of renewable energy penetration (as shown in Figure 4-10b, which depicts the impact for one unit of renewable energy penetration). Of course, the social and economic impacts of the subsidy depends on a range of variables (e.g., level electricity tariffs, type and mix of renewable energy introduced, resource potential, equipment sourcing and cost, and system's supply-demand dynamics). Furthermore, any consideration regarding the impact of renewable energy incentives needs to be carefully contextualized, balanced, and complemented with actions aimed at rationalizing inefficient fossil fuel subsidies that encourage wasteful consumption.

Except for Denmark, none of the countries in the pilot have introduced renewable energy incentives with an impact on residential bills higher than 2 percent (Figure 4-10a).

Accessibility. Of the three elements scored (see Figure 4-9), only Denmark, the United States, India and Honduras mandate prioritized access to the grid for renewable energy. Chile, Denmark, India, and the United States have a grid code or operational rules to allow a better integration of renewable energy into the grid. Only Denmark and the United States provide clear rules on curtailment.

Remuneration efficiency. Countries have not been scored on this attribute due to insufficient data points to deliver a robust analysis. A brief discussion on this issue as well as a the

Figure 4-12: A layer-cake of public financial support mechanisms

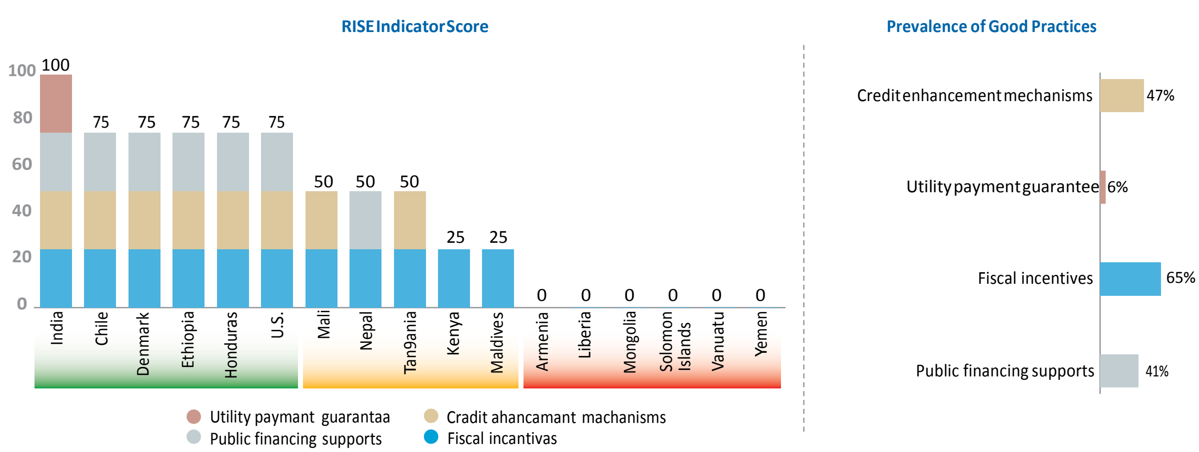
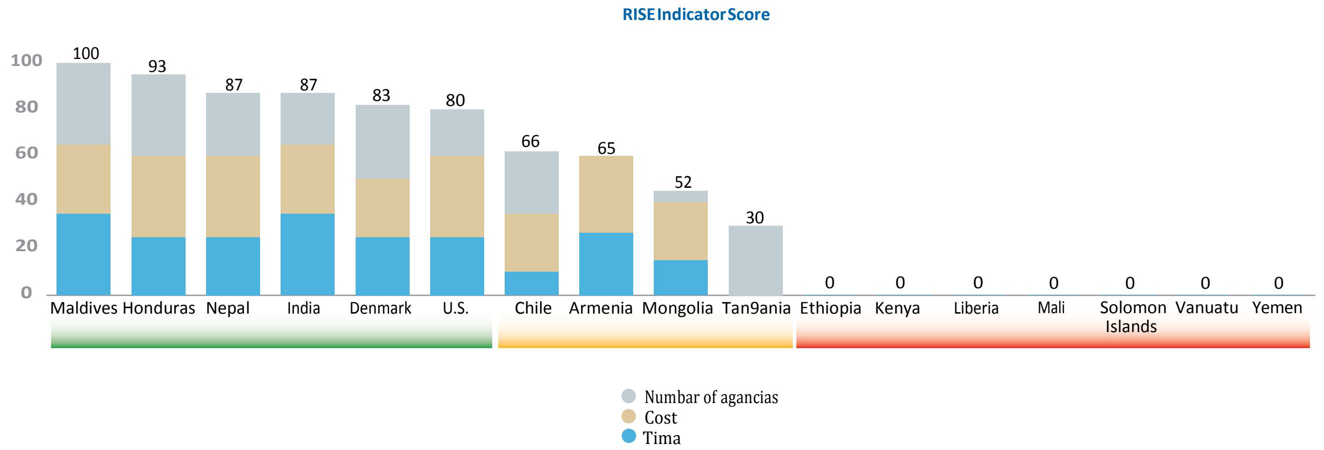


Figure 4-13: The ease of getting a renewable energy project running varies enormously



Note: Countries without scores are where no data could be collected given the absence of a private developer or very limited experience in starting renewable energy projects.

Source: RISE database.

results of an analysis that compares the per kilowatt-hour price incentives resulting from regulatory support policies with the costs of generating power using renewable technologies is in Section 4.5.

Indicator 8: Network connection and pricing

All high-income and a few middle-income countries in the pilot have a shallow transmission-infrastructure cost-allocation policy as well as regulated network pricing (Figure 4-11). Denmark, the United States, India, Chile, Honduras, Armenia, and Mongolia have clear network cost-allocation policies that support a shallow allocation. Kenya and Tanzania, however, have introduced deep interconnection cost policies, which could represent a heavy financial burden on renewable energy developers. Most low-income countries have yet to introduce cost-allocation policies for transmission infrastructure.

Only a few countries, including Denmark, the United States, India, Chile, Honduras, and Armenia, apply network pricing.

Indicator 9: Public financial support mechanisms

All high-income and many middle-income countries offer a range of fiscal and financial incentives to complement their regulatory instruments. Fiscal incentives—specifically tax reductions—are the most prevalent. Credit-enhancement mechanisms are used in half the pilot countries and come in many guises including soft loans (Chile), sovereign guarantees (Honduras and Mali), and escrow accounts (India).

Public financing in the form of investments, loans, or grants is used in Denmark and the United States, as well as Chile, India, Honduras, Ethiopia, and Nepal (Figure 4-12). India is the only country where the government backs utility payments (with a letter of credit), thereby giving it a maximum score on this indicator. In fact, India applies all forms of public financial support that are categorized and assessed by RISE.

Time to obtain permits/licenses to set up a new renewable energy facility ranges from 96 days in Maldives to 840 days in Tanzania.

Source: RISE database.

Indicator 10: Starting a new renewable energy project

Starting new projects can be fairly straightforward for time, number of agencies involved in permitting or licensing procedures, and cost in, for example, Maldives and Denmark but much more cumbersome in, say, the United States and Tanzania (Figure 4-13).[67]

The three aspects show significant performance variation. In Maldives, a solar project developer deals only with the State Electric Company and the Maldives Energy Authority, and can be up and running in as little as 96 days (Table 4-5). In the United States (New York State), a solar developer must work with six agencies and follow procedures taking about half a year to get the project "live." Whereas permitting and connecting a wind project is of little to no cost in Denmark

67. Performance on this indicator is assessed on standard case studies: the case study on hydro was chosen for Armenia, Honduras, India, and Nepal; the case study on wind in Chile and Denmark; the case study on solar in Maldives and the United States; and the biomass case study in Tanzania.

Table 4-5: Projects assessed for procedural efficiency

Economy	Technology	Time (days)	Agencies contacted	Cost ($) final
Armenia	Hydro	340	14	4,882
Chile	Wind	610	5	70
Denmark	Wind	317	4	0
Honduras	Hydro	531	1	7,500
India	Hydro	270	5	99,010
Maldives	Solar	96	2	0
Mongolia	Wind	387	9	52,974
Nepal	Hydro	570	3	7,141
Tanzania	Biomass	840	3	192,631
U.S.	Solar	179	6	7,690

Source: RISE database.

and Chile, obtaining a land permit and tariff approval among other procedures costs over $50,000 in Mongolia. High costs in Tanzania and India are associated with environmental safeguards.

4.4 HOW CAN COUNTRIES IMPROVE PERFORMANCE?

Most countries in the pilot can introduce additional measures to enhance the business environment for investments in renewable energy. Denmark is the only country that scores a green traffic light on all RISE indicators (Table 4-6). The United States is also approaching the frontier of good practice.

In planning, many of the pilot countries still need to develop high-quality resource mapping—with associated strategic plan or zoning guidance—and link data on renewable energy potential to anticipatory planning in expanding both generation and transmission.

Regardless of the size of the system or degree of renewable energy penetration, countries committed to targets need to apply an anticipatory approach to ensure cost-effective and economically efficient scale-up. Various organizations and international coalitions are supporting countries on this front by providing state-of-the-art modeling and geo-spatial tools, technical assistance, or concessional financing.

Countries with a commitment to increase the penetration of renewable energy—especially in the case of renewable

Table 4-6: All countries have areas of opportunity for improving the enabling environment

	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	U.S.	Vanuata	Yemen
Planning for renewable energy expansion	Yellow	Yellow	Green	Green	Yellow	Green	Yellow	Red	Red	Yellow	Yellow	Yellow	Red	Yellow	Green	Red	Yellow
Fossil fuel subsidy	Green	Green	Green	Red	Yellow	Red	Green	Green	Red	Green	Green	Green	Green	Green	Yellow	Green	Red
Carbon pricing mechanism	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red
Utility performance	Yellow	Green	Green	Yellow	Yellow	Green	Green	Red	Yellow	Red	Yellow	Yellow	Green	Red	Green	Yellow	Red
Legal framework for renewable energy	Green	Green	Green	Red	Green	Green	Green	Green	Red	Red	Green	Red	Red	Green	Green	Red	Red
Regulatory policies and procurement	Yellow	Green	Green	Red	Yellow	Green	Yellow	Red	Yellow	Red	Yellow	Red	Red	Red	Green	Red	Red
Regulatory policies—policy design attributes	Yellow	Yellow	Green	Red	Yellow	Yellow	Yellow	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red
Network connection and pricing	Green	Green	Green	Red	Green	Green	Yellow	Red	Red	Red	Yellow	Red	Red	Yellow	Green	Red	Red
Public financial support mechanisms	Red	Green	Green	Green	Green	Green	Yellow	Red	Yellow	Yellow	Red	Yellow	Red	Yellow	Green	Red	Red
Starting a new renewable energy project	Yellow	Yellow	Green	Red	Green	Green	Red	Red	Green	Red	Yellow	Green	Red	Yellow	Green	Red	Red

Source: RISE database.

energy options that exhibit an incremental cost—will needto introduce a cost-effective and customized basket of regulatory, fiscal, and financial incentives. The policy choice and design of incentives need to be consistent with the characteristics of the system for size, market structure and dynamics, institutional capacity, affordability constraints, resource endowments, availability of concessional finance, and the overall investment climate.

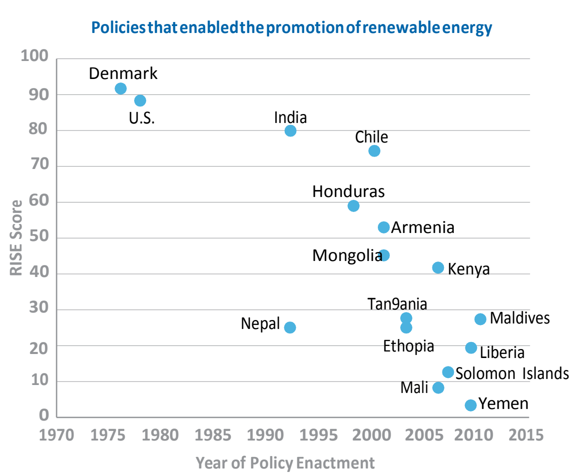
Countries with a long track record of experience in the design and implementation of policies to support renewable energy development score high on RISE. Their experience with incentives, and their capacity to pay for clean energy through market volume or high consumer income have allowed countries like Denmark, the United States, and India to test and improve the design of policy measures and so transform the market substantially.

India, for example, started to promote renewable energy in 1982 with the creation of the Department of Non-Conventional Energy Sources and the Solar Energy Centre, the precursors to the Ministry of New and Renewable Energy in 1993, which introduced its first Renewable Energy Tariff Guidelines soon after it was created.

Countries with overall scores in RISE below 50 percent have only recently started to introduce policy and strategic frameworks to promote renewable energy (Figure 4-14).

In most countries the type and size of existing risks call for the design of a package of economic, fiscal, and financial incentives tailored to the system's conditions.

Figure 4-14: Year when policy to promote renewable energy was first enacted against RISE score



Source: RISE database.

Denmark, India, and the United States have comprehensive policy and regulatory frameworks in place. These countries have either a dedicated renewable energy law (Denmark) or legal provisions to promote renewable energy embedded in energy or electricity laws (United States, India), quota-type instruments with competitive biddings (the United States with renewable portfolio standards, and Denmark and India with auctions), and price-setting instruments (India with FIT and Denmark with FIP).[68]

Denmark, India, the United States, and Chile have introduced net metering policies to support renewable energy in distributed generation schemes. All high-income and many of the middle-income countries offer fiscal and financial incentives. Some of the countries with less experience in renewable energy incentives are leapfrogging and making progress in structuring regulatory policy packages.

Countries that have lagged behind in the implementation of measures to promote renewable energy and that score low on RISE are also those with less fuel-source diversity (measured with the Herfindahl-Hirschman concentration index—Figure 4-15a). A few of them—Ethiopia and Nepal—have a high share in hydropower generation; others—Mongolia, Yemen, and Tanzania—have a high share of fossil fuel–based generation. In these countries, non-hydro renewable energy could play an important role in reducing either the risk of rationing during dry seasons and acute droughts, or of fuel oil dependence. In fact, most of these countries appear to have abundant non-hydro renewable energy resources, and could consider promoting renewable energy as an energy security strategy (Figure 4-15b).

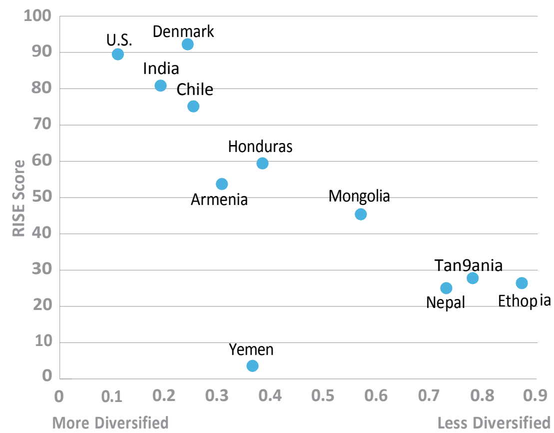
Most of the pilot countries with a regulatory policy to promote renewable energy still need to improve their design to embrace the policy design *attributes* necessary to attract the private sector—introducing a sustainable, incremental cost-recovery mechanism is crucial, for example. Fiscal transfers or surcharges to consumer tariffs need to be transparent, sustainable, and limited, although fiscal transfers' stabil- ity—especially when delivered through or in special agree- ments with SOEs—is less predictable and requires financially sustainable utilities.

A major policy challenge is to balance the affordability of support programs with effectiveness and the need for

68. India has a sophisticated package of incentives that applies differently to various types of renewable energy, including renewable purchase obligations on utilities; a REC market with solar and non-solar RECs; auctions to award contracts with FITs; and premiums (also known as generation-based incentives), as well as a range of fiscal and financial incentives. Policy effectiveness has not always been guaranteed (see Elizondo and Barroso 2011).

Figure 4-15: Countries with low fuel source diversity also have abundant renewable energy resource potential

(a) RISE Score vs. Diversity in Generation Mix



Source: Estimated by authors, using a Herfindahl-Hirschman Index (2010 data).

(b) Resource potential

	Wind	Solar	Hydro	Biomass	Geothermal	Ocean
Armenia	3	5	5	1	2	x
Chile	5	5	5	5	5	?
Denmark	5	2	1	5	?	5
Ethiopia	5	5	5	5	5	x
Honduras	5	5	5	5	5	?
India	5	5	5	5	5	?
Kenya	5	5	5	3	5	3
Liberia	1	3	5	5	?	3
Maldives	3	5	?	3	?	1
Mali	5	5	5	3	?	x
Mongolia	3	5	5	5	5	x
Nepal	3	5	5	5	?	x
Solomon Island	3	5	3	1	3	1
Tanzania	5	5	5	5	5	3
U.S. (New York)	?	3	?	?	?	?
Vanuata	3	5	1	1	5	3
Yemen	3	5	?	5	?	?

	High				Low	Not Known/ Applicable
LEGEND	5	4	3	2	1	?/x

Source: IRENA (2014).

investor certainty. Policymakers and regulators need to conduct ex ante economic analysis of the long-term impact of incentives on affordability, in some cases considering the design of price incentives with adjustment mechanisms against falling technology costs, so as to control potential overexpansion of renewable energy capacity. Indeed, a central challenge facing regulators today is to balance the need to deploy renewable energy at lowest cost with the need to attract private sector participation, while managing information asymmetries and the complexity of regulatory and procurement activities.

Given the pilot countries' striking variations in time, cost, and number of agencies involved in permitting or licensing procedures to start a new renewable energy project, more laggard performers may consider the following: easily accessible information on permit fees, application requirements, and processes (for example, via websites); faster review processes (over-the-counter reviews, electronic processing); standard and transparent permitting requirements; capped and efficient permitting fees (flat rather than value-based fees or fees that reflect fairly administration costs); and one-window processing of permits and licenses.

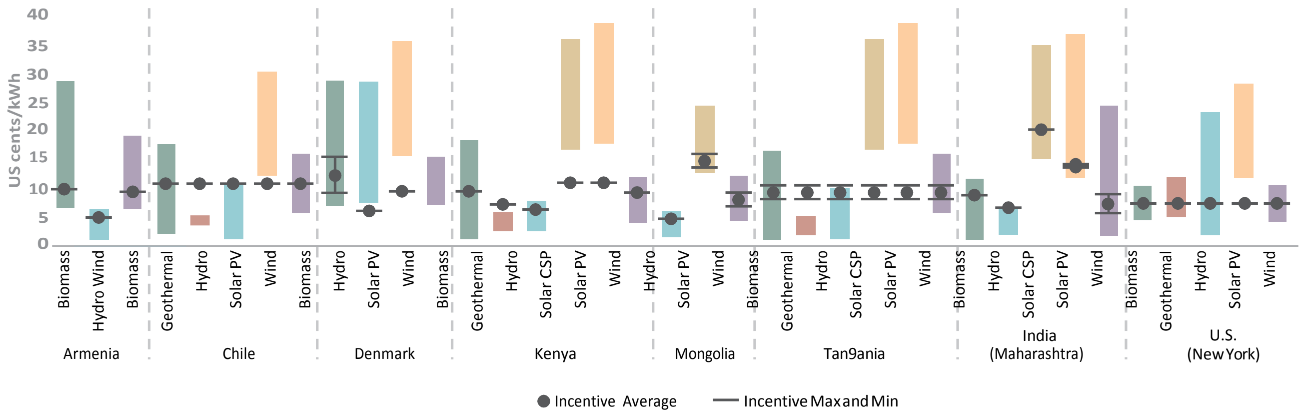
4.7 WHAT ARE THE LESSONS FOR THE GLOBAL ROLLOUT?

During the design of the RISE framework, great efforts were made to balance the complexity of the factors that drive the private decision to invest in renewable energy with the need to design a simple and practical index applying to a range of country and market conditions, all while complying with the principles established for RISE (Chapter 1). This meant omitting many possible indicators. Those left in the pilot survey provided useful results, and all will be retained for the next version of RISE. Yet future versions of RISE will likely incorporate three types of changes, exemplified in the following.

Clarity of questions and terms. The pilot provided information on possible ambiguities or omissions in the questionnaire or its glossary of terms (Annex III). For example, confusion existed over the meaning of "pass-through (of policy cost to the consumer tariff)" and "renewable purchase obligation," whether the Clean Development Mechanism counts as carbon pricing or not, and what exactly constitutes an electricity expansion plan. In the next stage, with guidance for respondents and tighter phrasing, the questions and terms will be made fully clear.

Building on existing questions. Although it is expected that the full list of existing indicators will be preserved, the information they collect or the way they are ordered, scored, and weighted in the RISE index will be adjusted to better measure readiness for investment in sustainable energy.

Figure 4-16: Regulatory policy incentive level and LCOE



Note: The levelized cost of energy (LCOE) range for each incentive-eligible technology is represented by a bar (green for biomass, blue for hydro, etc).

Source: LCOE data from the International Renewable Energy Agency's Renewable Costing Alliance; Incentive level data compiled by authors.

Two indicators likely to be modified are " planning" and "policy design attributes."

A more nuanced measure of "planning" will be sought to distinguish between anticipatory and proactive planning. Anticipatory planning for transmission expansion is conceived to introduce a set of projects in a geographic area, thus reducing costs and improving efficiency. In proactive planning, the relevant planning entity goes one step further and uses information on combined transmission and generation costs to ensure that the most cost-effective solution is exploited first, so as to achieve renewable energy development goals more efficiently. This approach internalizes the trade-off between spending more on transmission and accessing higher-quality but more remote sites.[69] In the RISE pilot, evidence of anticipatory planning (at a minimum) was determined as good practice, but if possible the proposed two-tier measure (anticipatory and proactive planning) will be adopted.

In "policy design attributes," additional effort will be made to analyze how the incentives provided by regulatory policies compare with generation costs. During the RISE pilot, an attempt was made to indicate whether FITs, FIPs, renewable purchase obligations, or auctions provided appropriate incentives for grid-connected renewable energy generation. This exercise involved benchmarking the price incentive against the levelized cost of energy (LCOE) for each incentive-eligible renewable technology (Figure 4-16).

The main challenge of this exercise is the lack of data on real project costs for different technologies at the country level and the need to rely on LCOE ranges based on only a few projects or on regional data. For many countries, the quality of data at the level of granularity required is not available at present. The Costing Alliance of the International Renewable Energy Agency (IRENA) is building a database of LCOEs based on actual project costs that, over time, may be sufficiently rich to allow a robust analysis.[70]

Additional questions or modules. In the next stage, an updated questionnaire could include the following additions:

- An updated version of *policy design attributes* that includes tighter definitions of *predictability* and the addition of *stability* as a new attribute to reflect a precedent (or lack thereof) in retroactive policy changes or unexpected adjustments to policy design.
- A new subsection or module that deals with the design of power purchase agreements (for example, whether they are long term, standardized, and enforceable).
- Consideration of regulatory incentives other than net metering for promoting distributed renewable energy.
- A more refined set of questions to assess the effectiveness of net metering policies (for example, including a comparison with existing electricity prices).
- Additional questions to better assess the transparency and competitiveness of procurement processes, as well as how effectively the planning of renewable energy is bridged or coordinated with its procurement.

69. Madrigal and Stoft 2012.

70. Representative project-level cost data is not available for all of the RISE pilot countries. Where such data is missing, regional LCOE ranges are plotted in Figure 4-16.

Credit: Jorge Royan

CHAPTER 5

ENERGY EFFICIENCY

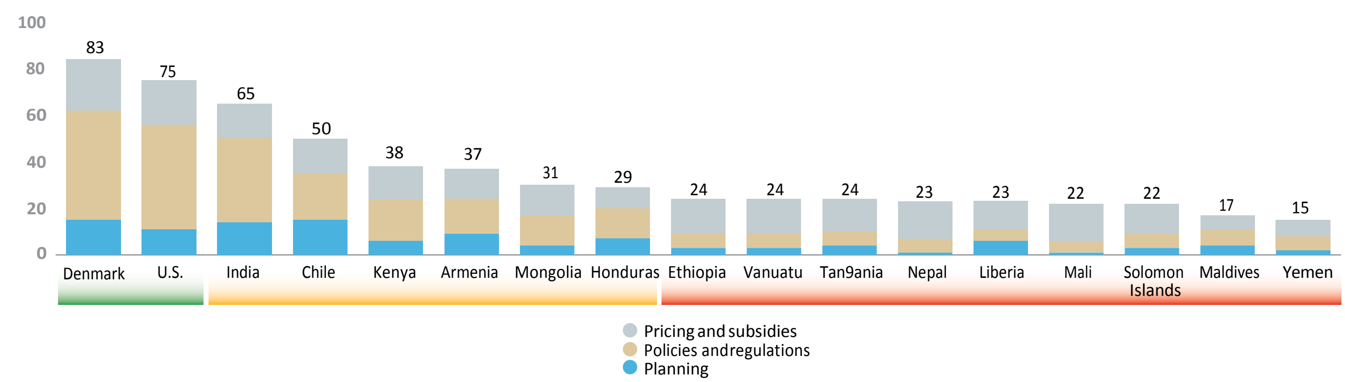
Summary results for readiness for energy efficiency investments for the 17 pilot countries were distributed widely across the range of possible scores. Two, Denmark and the United States, are in the green zone, while the rest are split between the yellow and red zones (Figure 5-1). All countries have taken some steps important to incentivizing energy efficiency, particularly in establishing entities with responsibility (if not always authority) for energy efficiency, setting appropriate electricity rate structures (if not always price levels), and providing customers with information on their power consumption (though even the developed countries can do better here). RISE suggests that many of the pilot countries would benefit by adopting or strengthening national and subnational energy efficiency targets and plans supported by legislation, to provide a firm basis for the detailed policy and regulatory elements that are so important in the efficiency arena.

The next priority for many countries would be standards and labels for appliances and equipment, an area in which many technical and financial resources for assistance are available. Building energy codes is more challenging, but they would be a useful next step for countries, particularly those rapidly urbanizing. Most countries in the survey can learn from the public-procurement and other programs that have already proven effective in many countries in reducing government expenditures on energy purchases, and in creating markets for energy-efficient equipment and services. This could complement efforts to put in place incentives and mandates for big industrial and commercial energy users, another area in which most countries were deficient. For all these efforts, implementation would be enhanced by better capacity to monitor energy use and evaluate outcomes.

5.1 WHY DOES RISE MATTER?

Reaching the SE4ALL goal of doubling the rate of improvement in energy efficiency worldwide will contribute to important development goals in every country. The environmental benefits are legion, whether improving indoor air quality, reducing emissions of pollutants of local concern, or mitigating greenhouse gases. Higher energy productivity contributes to economic competitiveness. It contributes to energy access, delivering greater development impact for every kWh or liter of fuel delivered. Efficiency is integral

Figure 5-1: More-developed countries scored far higher on RISE energy efficiency indicators; emerging economies displayed varying strengths



Source: RISE database.

Only four countries have national energy efficiency targets that cover all sectors.

to meeting the SE4ALL goal for renewable energy, as it reduces overall growth in demand for energy, so a given amount of renewable energy will provide a larger proportion of total supply.

The investment opportunities are big, as the IEA has recently outlined.[71] Estimated global investment in energy efficiency was $130 billion in 2012—small when set against investments in the power sector and fossil fuels. Implementing policies to which countries have already committed will require annual investment in efficiency to more than quadruple by 2035. As an additional challenge, meeting the goal of limiting atmospheric carbon dioxide concentrations to 450 parts per million requires investments in efficiency to rise eightfold over the same period, to $1.1 trillion a year.

Opportunities range from purchases of readily available, relatively inexpensive appliances and equipment and housekeeping measures at factories, to complex, systemic, and costly changes in power and transportation systems. In countries with high energy intensities, solutions that have worked elsewhere can help point the way to quick improvements, though the process is far from automatic. Every country, every market, and to a certain extent every household is unique, and adapting existing approaches requires effort. Countries that are already among the most energy-efficient are also fertile ground for improvements, as, for instance, the progress in developing very low- and net-zero energy homes demonstrates.

Many if not most of the efficiency investments needed to reach development and climate goals are cost effective, and from a social perspective they will pay for themselves through lower expenditures on energy supply and other benefits. Still, someone has to make those investments and changes in behavior and operations, and a rich body of literature has grown in past decades enumerating the barriers to them. RISE attempts to measure the efforts of countries to overcome these barriers through a raft of approaches that have been shown effective and that are typically available to policymakers. The pilot survey demonstrates that virtually all countries have made some important moves to adopt good practices in creating an environment conducive to energy efficiency investments, but even the best among them have some distance to go in adopting all the good practices to hand.

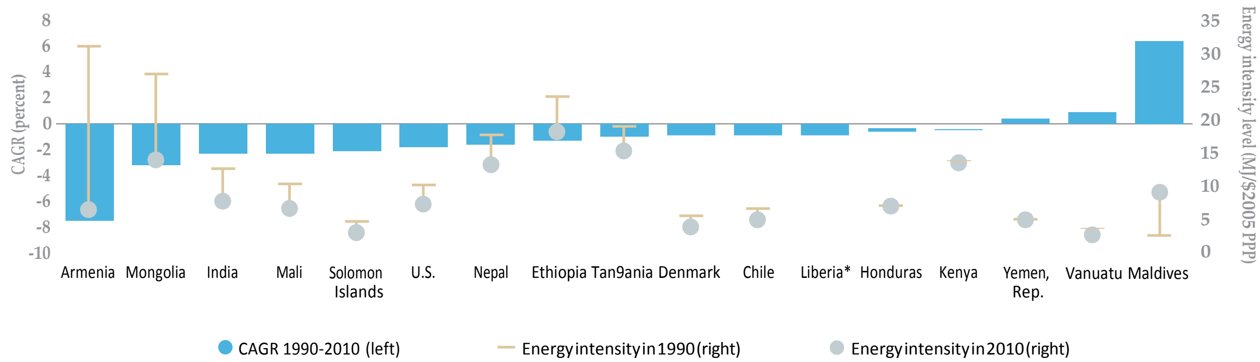
Even more so than other areas of clean energy, "best practice" in energy efficiency can vary tremendously depending on sector, geography, socioeconomic factors, technical capacity, markets, infrastructure, climate, and a host of site-specific circumstances. Success in implementing efficiency requires aligning incentives correctly along lengthy supply chains and across stakeholder groups with different and often divergent interests. Analysts concerned with efficiency have for decades spent considerable effort cataloging, in a variety of contexts, the barriers to carrying out energy efficiency measures that are cost effective and technically feasible but left undone. These barriers have been the target of interventions in many countries. Even after decades of consistent action on energy efficiency in many countries, a lack of information persists, in large part because energy is an intermediate good and often plays a hidden role. Efficiency is a field requiring a great deal of specialization, and a paucity of trained personnel and of technical and managerial expertise is common. Unfamiliarity with efficient technologies may lead to a perception of higher risk than is warranted.

Energy prices that are not cost reflective, whether by subsidies or other means (or which are otherwise distorted), contribute fundamentally to blocking uptake of efficiency measures. Even where energy prices are rational, and where environmental and other externalities are factored in, other barriers interfere with the operation of the simple economic logic of higher relative energy prices leading to higher efficiency. High transactions costs, for instance, are common, and high discount rates of end users may lead them to undervalue the benefits of investments with very short payback times. Efficiency measures require initial, sometimes large, investments, and end users may lack access to capital and credit. Finally, there are often mismatches between the incidence of costs and benefits of efficiency investments (principal–agent issues), as with the owners and occupants of rental housing.

Overcoming these barriers is a matter of reorganizing and reforming institutions—that is, the formal and informal rules that establish how market players interact—to facilitate broader adoption of technically feasible and

71. 2IE0A14d.

Figure 5-2: Pilot countries experienced a wide range of levels and trends in primary energy intensity over 1990–2010



* Liberia's energy intensity is out of the range of the secondary axis: between 1990 and 2000 the figure dropped from 73 to 50MJ/$2005 in purchasing power parity terms.

CAGR = compound annual growth rate.

Source: Authors, based on World Bank and IEA (2013).

cost-effective energy efficiency measures.[72] Establishing and overseeing such institutions is the business of government, and as said the RISE indicators have been designed to measure the degree to which countries have adopted approaches known to be effective in addressing the barriers. The indicator "Entities for energy efficiency policy, regulation and implementation," for instance, addresses the barrier posed by an absence of regulation. The indicator "Fossil fuel subsidy" elicits information on an important possible cause of the barrier posed by energy prices below marginal cost.

Most of the countries in the pilot survey sample experienced falling energy intensity in the two decades from 1990 to 2010, some of them considerably exceeding the global average rate of decline of 1.3 percent a year (Figure 5-2). Energy intensity varies greatly among the sample countries, with more than an order of magnitude separating the highest and lowest. It is not, however, possible at this time to draw conclusions from the correlation (or lack thereof) between energy intensity levels or trends and the results of the pilot survey. By way of example, comparison of these energy intensity trends with retail electricity prices (Figure 5-15) shows that two of the countries with rising energy intensity, Yemen and Vanuatu, have among the lowest and the highest electricity prices among the sample countries, respectively. Still, as future rounds of RISE accumulate results, it is expected that relationships between country performances in energy efficiency and the RISE indicators can be discerned in a comprehensive way. For now, it suffices to note that the pilot survey covers countries spanning the global range of efficiency performance, so lessons drawn from this exercise ought to be useful in preparing for the next step toward a global survey.

5.2 HOW DOES RISE MEASURE THE ENABLING ENVIRONMENT?

While one cannot pretend to measure best practice in energy efficiency comprehensively or exhaustively, the RISE energy efficiency indicators have been designed to indicate the degree to which a given country approaches complete adoption of an important set of best practices relevant for most economies. The scoring is intended to indicate where performance could move closer toward the best-practice frontier, not to single out "poor" performers among countries.

All countries in the survey were scored on 10 energy efficiency and two cross-cutting (fossil fuel subsidies and carbon pricing mechanism) indicators. Two of the indicators concern planning, seven policies and mandates, and three (including the two cross-cutting ones) pricing. A third cross-cutting indicator—retail prices of electricity—has an important bearing on energy efficiency and on renewable energy supply, but is problematic to score, so only a qualitative analysis is attempted in a later section of this chapter.

Planning

Indicator 1: National plan for increasing energy efficiency
Indicator 2: Entities for energy efficiency policy, regulation and implementation

Energy efficiency doesn't happen on its own, and it has long been known that among the most important ingredients in enabling energy efficiency is having firm targets, plans to reach

72. Taylor and others 2008.

Table 5-1: Scoring methodology—planning

Questions	Scoring	Traffic Light
Planning		
I. National plan for increasing energy efficiency	*Sum and divide by 3*	
1. Is there an energy efficiency target at the national level?	Yes—100, No—0	X≥75 25≤X<75 X<25
2. Is there national energy efficiency legislation and/or an action plan?	Yes—100, No—0	
3. Does the energy efficiency plan include: (i) Supply side targets? (ii) Residential targets? (iii) Commercial targets? (iv) Industrial targets	Sum and divide by 4 For each target, Yes—100 Partial—50 No—0	
II. Entities for energy efficiency policy, regulation and implementation	*Sum and divide by 6*	
4. Are governmental or independent bodies responsible for: (i) Setting energy efficiency (EE) strategy? (ii) Setting EE standards? (iii) Regulating EE activities of energy suppliers? (iv) Regulating EE activities of energy consumers? (v) Certifying compliance with equipment EE standards? (vi) Certifying compliance with building EE standards?	For each part, Yes—100, No—0	X≥75 25≤X<75 X<25

Source: Authors.

them, and technically competent entities with enough resources to pursue those goals. Energy efficiency is certainly not the only arena for which this is true, but—because efficiency is an invisible, intermediate factor rather than a tangible product—these elements of the enabling environment are crucial. In RISE, good practice in this area is captured by indicators on national plans and entities responsible for energy efficiency (Table 5-1).

Having a national plan for energy efficiency, with specific targets and supporting laws and plans to meet them, is key to setting direction for all stakeholders in making decisions on energy efficiency investments (indicator 1). This indicator takes into account whether there is a national target for energy efficiency and targets for particular sectors. It also reflects whether there is supporting legislation or an action plan in place to reach those targets, as simply articulating a target is rarely sufficient to achieve it.

In that spirit, RISE also has an indicator on countries' entities for energy efficiency policy, regulation and implementation (indicator 2). Energy efficiency is a diffuse and varied field, and such bodies may need to have specialized functional competencies or be located at different levels of government, depending on local circumstances. Functions that have proven important include setting energy efficiency policies and standards, regulating energy efficiency activities on the supply side and among end users, and monitoring compliance with energy performance standards. RISE does not attempt to judge which approach is best but scores based on the number of functional areas covered. In addition, some features of indicator 2 are covered by several of the indicators below on sector policies. For instance, indicator 4, incentives or mandates to utilities, measures the presence of specific mechanisms—and by implication the entities required for implementation.

Policies and Regulations

Indicator 3: Quality of information provided to consumers about electricity usage

Indicator 4: Incentives or mandates for energy supply utilities to invest in energy efficiency

Indicator 5: Incentives or mandates for public entities[73] to invest in energy efficiency

Indicator 6: Incentives or mandates for large-scale users[74] to invest in energy efficiency

Indicator 7: Minimum energy efficiency performance standards

Indicator 8: Energy labeling systems

Indicator 9: Building energy codes

Approaches to energy efficiency vary widely among sectors, and so the largest number of indicators for this concerns the policies, regulations, and pricing that are crucial to the viability of investments (Table 5-2). RISE will eventually include indicators tailored to all major energy-consuming activities,

73. Public entities include services provided by local government exclusive of energy supply (that is the energy-consuming sector).

74. Large-scale users include SOEs in the industrial and commercial sector.

Table 5-2: Scoring methodology—policies and regulations

Questions	Scoring	Traffic Light
Policies and regulations		
III. Quality of information provided to consumers about electricity usage	*Sum and divide by 4*	
5. Do consumers receive reports of their electricity usage?	Yes—100, No—0	X≥75 25≤X<75 X<25
6. If yes to Question 5,	Sum and divide by 3	
(i) At what intervals do they receive these reports?	≤1 month—100 1-6 months—75 6-12 months—50 >12 months—0	
(ii) Do their reports include price levels?	Yes—100, No—0	
(iii) Does a bill or report show electricity usage over time?	Yes—100, No—0	
7. Do customers receive a bill or report that compares them to other users in the same region and/or class?	Yes—100, No—0	
8. Do utilities provide customers with information on how to use electricity more efficiently, through bills or ther means?	Yes—100 Intermittent—50 No—0	
IV. Incentives or mandates for energy supply utilities to invest in energy efficiency	*Sum and divide by 5*	
9. Are utilities required to carry out energy-efficiency or carbon-reduction activities?	Yes—100, No—0	X≥75 25≤X<75 X<25
10. Are there penalties in place for non-compliance with utility EE or carbon-reduction mandates?	Yes—100, No—0	
11. Are energy savings measured to track performance in meeting EE or carbon-reduction mandates?	Yes—100, No—0	
12. Are measured energy savings or carbon-reductions validated by an independent third party?	Yes—100, No—0	
13. Is there a mechanism for utilities to recover costs of or revenue lost from demand-side management activities?	Yes—100, No—0	
V. Incentives or mandates for public entities to invest in energy efficiency	*Sum and divide by 5*	
14. Are there binding energy savings obligations for public buildings?	Yes—100, No—0	X≥75 25≤X<75 X<25
15. Are there binding energy savings obligations for other public facilities (may include water supply, wastewater services, municipal solid waste, street lighting, and transportation)	Yes—100, No—0	
16. Is there a policy in place for public procurement of energy-efficient products and services at the	Sum and divide by 2	
(i) National level? (ii) Municipal level?	For each level Yes—100 Voluntary program—50 No—0	
17. Do public entities engage in multiyear contracts with service providers?	Yes—100, No—0	
18. Do public budgeting regulations and practices allow public entities to retain energy savings at	Sum and divide by 2	
(i) National level? (ii) Municipal level?	For each level Yes—100 No—0	
VI. Incentives or mandates for large-scale users to invest in energy efficiency	*Sum and divide by 4*	
19. Are there energy-efficiency mandates for large energy users? If yes, which are applicable attributes? (i) Targets (ii) Mandatory audits (iii) Action plans (iv) Progress/tracking reports (v) Energy-management system	Number of applicable attributes x 20	X≥75 25≤X<75 X<25

(continued)

Table 5-2: Scoring methodology—policies and regulations (continued)

Questions	Scoring	Traffic Light
20. Are there penalties in place for non-compliance with regulatory obligations for energy efficiency?	Yes—100, No—0	X≥75 25≤X<75 X<25
21. Measurement of energy savings (i) is there a measurement and verification program in place? (ii) is it carried out by a third party?	Sum and divide by 2 For each part Yes—100 No—0	
22. Are energy efficiency incentives in place for industrial customers?	Yes—100, No—0	
VII. Minimum energy efficiency performance standards	*Sum and divide by 6*	
23. Have minimum energy efficiency (performance) standards been adopted for? (i) appliances (ii) lighting equipment (iii) electric motors v) (i industrial equipment	For each part Yes—100 Voluntary program—50 No—0	X≥75 25≤X<75 X<25
24. Is there any provision for regular updates to the energy efficiency standards?	Yes—100, No—0	
25. Is there a penalty for non-compliance with energy efficiency standards?	Yes—100, No—0	
VIII. Energy labeling systems	*Sum and divide by 4*	
26. Have energy efficiency labeling schemes been adopted for? (i) appliances (ii) lighting equipment (iii) electric motors v) (i industrial equipment	For each part Yes—100 Voluntary program—50 No—0	X≥75 25≤X<75 X<25
IX. Building energy codes	*Sum and divide by 5*	
27. (i) Are there energy codes for new residential buildings? (ii) If yes, is there a provision for regular updates?	Sum and divide by 2 Yes—100 No—0	X≥75 25≤X<75 X<25
28. (i) Are there energy codes for new commercial buildings? (ii) If yes, is there a provision for regular updates?	Sum and divide by 2 Yes—100 No—0	
29. Is there a system to ensure compliance with energy codes?	Yes—100, No—0	
30. Are renovated buildings required to meet a building energy code, in eside(ni)tial andr (ii) commercial sectors?	Sum and divide by 2 Yes—100 No—0	
31. Building energy information and labeling: s the(i)e a standardized rating or labeling system for the energy performance of existing buildings? (ii) Are commercial and residential buildings required to disclose property energy usage at the point of sale or when leased? (iii) Are large commercial and residential buildings required to disclose property energy usage annually?	Sum and divide by 3 For each part Yes—100 Voluntary program—50 No—0	

Source: Authors.

but in its sector-specific indicators the pilot survey covered only three: buildings (which consume about 31 percent of final energy worldwide); industry (responsible for about 37 percent of final energy use); and the utility sector (which consumes 38 percent of world primary energy).[75]

Enabling investment in energy efficiency is often conceived of as overcoming barriers. For instance, economically attractive measures are often left undone because stakeholders may be unaware that such measures exist. If they are, they may have little or unreliable information, or may lack the technical capacity to evaluate and carry them out. A supportive enabling environment, therefore, is one in which information on availability and features of energy efficiency measures are available to all stakeholder groups, who are aware of, able, and motivated to act on them. Among the energy efficiency indicators in RISE is one on the information that consumers receive about their electricity usage—how much they use, how much they pay, how often they receive it, and

75. 2IEOA14a. Roughly one-third of the primary energy input to the utility sector is delivered to end-use sectors, including industry and buildings, for final consumption.

Table 5-3: Scoring methodology—pricing and subsidies

Questions	Scoring	Traffic Light
Pricing and subsidies		
X. Incentives from electricity pricing	*Sum and divide by 2*	
32. What types of electricity rate structure do the (i) residential, (ii) commercial, and (iii) industrial customers face? (Tick all that apply) - Flat fee (per connection) - Constant (Uniform) block rates - Declining block rates - Increasing block rates	Flat fee—33 Declining block—0 Constant block—67 Increasing block—100 If a country selects more than one option, the highest score is selected. Average score of each customer type	X≥75 25≤X<75 X<25
33. Which of the following charges do large electricity customers in the (i) industrial and (ii) commercial sector pay? (Tick all that apply) - Energy (kWh) - Demand (kW) - Reactive power (kVAr)	For each part, number of applicable options X 33.3 Sum score for industrial and commercial sector and divide by 2	
XI. Fossil fuel subsidy		
34. What is the proportion of electricity generation by subsidized fossil fuel?	Percentage of electricity generation by unsubsidized fossil fuel	X≥75 25≤X<75 X<25
XII. Carbon pricing mechanism	*Sum and divide by 2*	
35. Is there a legally binding greenhouse gas emission reduction target in place?	Yes—100 No—0	X≥75 25≤X<75 X<25
36. Is there any mechanism to price carbon in place (e.g. carbon tax, auctions, emission trading system)?	Yes—100 No—0	
XIII. Retail price of electricity		
37. What is the unit price of average consumption of electricity for residential users? ($/kWh)	Not scored	n/a
38. What is the unit price of average consumption of electricity for industrial users? ($/kWh)	Not scored	

Source: Authors.

whether they are given comparisons with other users in the same class or information on available efficiency measures (indicator 3).

Another set of indicators relates to incentives and mandates to raise energy efficiency (indicator 4), measuring them for energy utilities, public sector entities (excluding SOEs; indicator 5), and large-scale industrial and commercial end users (indicator 6). These indicators measure the extent to which the policy and regulatory measures important to creating and enforcing incentives for improving efficiency are in place, such as energy performance standards, labeling systems, and requirements for audits with independent monitoring and verification. For energy supply utilities, expanding into energy efficiency requires both mandates to achieve savings, and a change in regulations that allows them to recover costs of and even to profit from customers' efficiency investments. For government agencies, rules requiring public procurement to privilege efficient devices and budget rules that permit entering into multiyear contracts with energy service companies have proven fundamental to implementing efficiency measures. Several questions in the pilot survey aim to capture the status of such provisions in each country.

Energy efficiency standards, codes, and labels (indicators 7 and 8) have proven essential in building and maintaining strong markets for energy efficiency. Well-designed minimum energy performance standards (MEPS) for appliances, lighting systems, equipment (represented in the survey by electric motors, the single largest end-use category of electricity

All countries have institutions for setting energy efficiency policy, although they vary in their mandates and capabilities.

worldwide), and industrial equipment are fundamental to effective national approaches to efficiency. Alongside mandatory (and occasionally voluntary) standards, energy efficiency labels are important complementary tools in ensuring that market players have appropriate information for decision-making; RISE also measures implementation of these. Building energy codes (indicator 9), which are more complex to design and implement, are also an important area of best practice.

Pricing and subsidies

Indicator 10: Incentives from electricity pricing
Indicator 11: Fossil fuel subsidy
Indicator 12: Carbon pricing mechanism
Indicator 13: Retail price of electricity

Ideally, to promote uptake of available energy efficiency measures, energy prices (Table 5-3) should be cost-reflective and undistorted relative to other goods and services, externalities should be incorporated, and market actors (particularly consumers) should be aware of and able to respond to those prices. This means that subsidies for energy supply (indicator 11) ought to be minimal, if not entirely absent, as artificially low costs of energy supply make energy efficiency relatively more expensive. Results from this cross-cutting indicator are important to understanding countries' environments for efficiency investments.

Environmental externalities could be mitigated through regulatory requirements concerning technology, but appropriate environmental charges, such as carbon pricing mechanisms (indicator 12, also cross-cutting), in principle should also tend to promote adoption of energy efficiency measures in cases where fossil fuel use will be reduced. Market mechanisms, like trading of white certificates (certified energy savings) under a cap, can perform a function similar to environmental taxes and so also promote energy efficiency.

There are other incentives from electricity pricing other than absolute price levels (indicator 10), and RISE attempts to measure some of these. Electricity rate structures have been shown to have a powerful impact on adoption of efficiency, so several survey questions elicit information on whether different customer classes face declining, uniform, or inclining block tariffs. For larger industrial and commercial end users, charges for demand and reactive power alongside charges for energy consumption can be an inducement for load shifting, which may not have a very large impact on-site but which can be associated with efficiency gains for the utility.

National performance in this arena, which is so fundamental to the investment environment for energy efficiency, is very difficult to measure in a way that fairly and transparently compares performance across countries. For example, although higher retail electricity prices tend to induce greater adoption of efficiency by end users, the impact of a given price may be quite different across countries as well, so it proved impossible to devise a scoring method for retail electricity prices (indicator 13). Nevertheless, this is important information, and the RISE pilot results include a comparison of normalized industrial and residential electricity prices.[76]

While the RISE energy efficiency indicators are designed to be as broadly applicable as possible, owing to different national circumstances not every best practice represented is applicable to every country. Thus it is not possible for any country to achieve a full score on the energy efficiency pillar of RISE.[77]

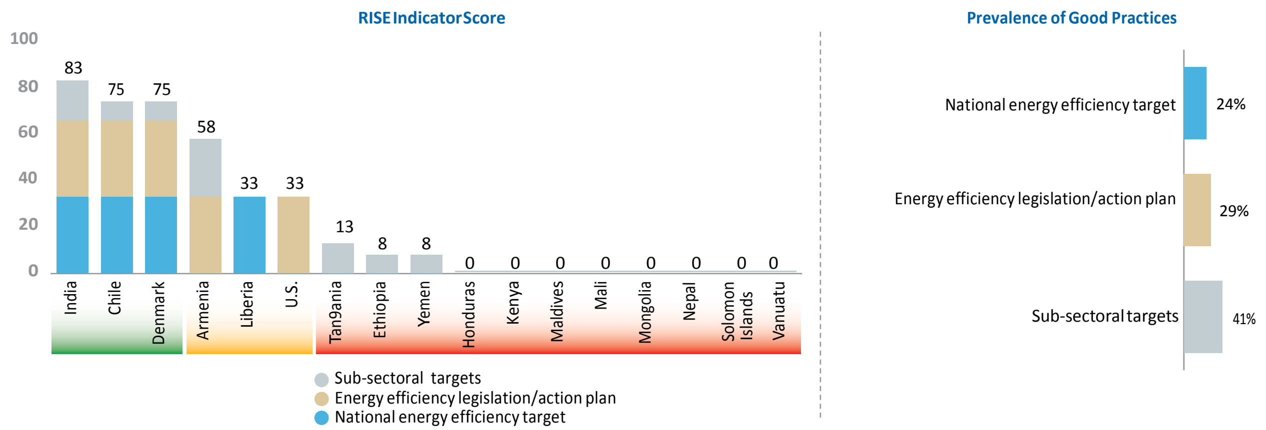
5.3 HOW DID THE COUNTRIES SCORE?

As might be expected, given their high levels of economic development and early adoption of efficiency measures, Denmark and the United States were the strongest performers among the pilot countries, reflecting broad adoption of good practices in planning, institutions, policies, regulations, and pricing (see Figure 5-1). Of the developing countries, India and Chile performed markedly better than others, as both have for some years pursued a strong energy efficiency agenda. India performs well due to the recent introduction of comprehensive energy efficiency strategies, establishment of the Bureau of Energy Efficiency, standards and labeling on appliances and buildings, and incentives for large consumers to adopt and promote energy efficiency through its Perform, Achieve and Trade program. Chile provides good guidance on

76. From a macro perspective, an essential characteristic of efficient prices is cost-reflectiveness. It has so far been impossible, however, to devise a consistent, easy-to-apply method of measuring the degree of cost-reflectiveness of electricity prices. In addition, there are significant variations in energy resource endowments and geography among countries, which also contribute to differences in prices. For these reasons among others, a direct comparison of retail price levels does not necessarily provide an accurate guide to the relative incentive value of electricity prices.

77. As with the renewable energy indicators, potential scores are not adjusted so that countries do have a theoretical opportunity to receive a full score, as to do so would require customizing the scoring method for each one, or at least for groups of similar countries. The number of sub-indicators that are not applicable to all countries is very limited, however, and does not significantly affect relative overall performance.

Figure 5-3: Nearly half the sample countries lack national plans or targets for energy efficiency



Source: RISE database.

energy efficiency to the public and private sectors through its Plan de Acción de Eficiencia Energética 2020. It has strong institutions for attaining its energy efficiency goals, and effective energy standards and labels for equipment and buildings.

Most of the pilot countries are at relatively early stages of the energy efficiency policy process and have the opportunity to draw on the experiences that higher-scoring countries have accumulated. A number of countries have put in place important elements of the comprehensive approach that energy efficiency requires, without also adopting complementary practices needed to take full advantage of those already in place. Some have adopted energy efficiency plans or set up agencies responsible for energy efficiency, but have not designed the policies, mandates, and regulations needed for implementation.

Indicator 1: National plan for increasing energy efficiency

Only a handful of countries—Chile, Denmark, India, and Liberia—have national energy efficiency targets that cover all sectors (Figure 5-3). In the first three of these the targets are established through national energy efficiency legislation and/or action plans. Two other countries have such legislation or action plans. Armenia, for instance, has legislation on energy efficiency and specific sector targets but lacks a national target. Sector targets are more common than national targets; countries with high losses in electricity transmission and distribution (such as Ethiopia, Tanzania, and Yemen) have targets only for supply-side efficiency.

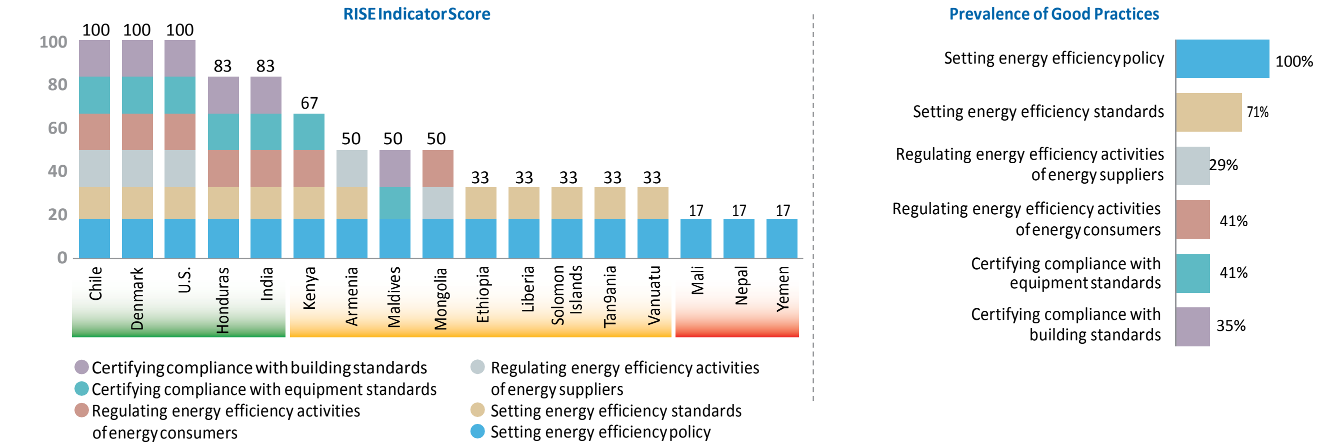
Three of the countries—Chile, India, and Denmark—score very high. Specific national commitments to energy efficiency are often important to the effectiveness, or spur action on other elements in a country's portfolio of measures, better enabling energy efficiency to flourish. Most of the countries have much work to do on this aspect.

The top performers all have numeric national energy efficiency targets with timelines, targets for some sectors, and extensive planning and legislative support behind them. Denmark, for instance, is subject to the 2012 EU Energy Efficiency Directive that requires member states to set targets that contribute to the EU-wide goal of reducing energy use by 20 percent in 2020 relative to 2014. It has accordingly in its Energy Agreement set annual targets for quantities of energy savings, which are more stringent than percentage targets that it set on its own in the previous decade and which had been exceeded. Denmark also has a target for the utility sector, but not for end-use sectors.

India amended its 2001 Energy Conservation Act in 2010 and established a National Mission for Enhanced Energy Efficiency. It has quantitative targets for both fuel and energy savings at the national level, and has targets for several industries (facilities covered by the Perform, Achieve and Trade program, discussed below), but not for buildings. State governments are responsible for taking their own steps toward contributing to the national goals.

Chile complements its national target with ones for industry, construction, and transport. Its Plan de Acción de Eficiencia Energética 2020 guides public and private efforts to increase these sectors' energy efficiency. The only other country with a national target was Liberia. It put forward a national

Figure 5-4: All countries have some entity overseeing energy efficiency



Source: RISE database.

savings target in its National Energy Policy, but the other aspects measured by this indicator are absent.

Unlike India, which also has a federal structure, the United States lacks a national target or an overarching national energy efficiency strategy. Still, when the RISE pilot survey was conducted, 25 U.S. states had incorporated Energy Efficiency Resource Standards, which specify state-level efficiency targets and policies.

Besides addressing transmission and distribution losses and residential lighting, Ethiopia, Tanzania, and Yemen have not set energy efficiency targets or developed plans and legislation. The remaining pilot countries are just beginning to take steps toward preparing efficiency assessments and targets. Of course, the impact of having a target may vary from country to country and over time, but it remains an important element to track.

Indicator 2: Entities for energy efficiency policy, regulation and implementation

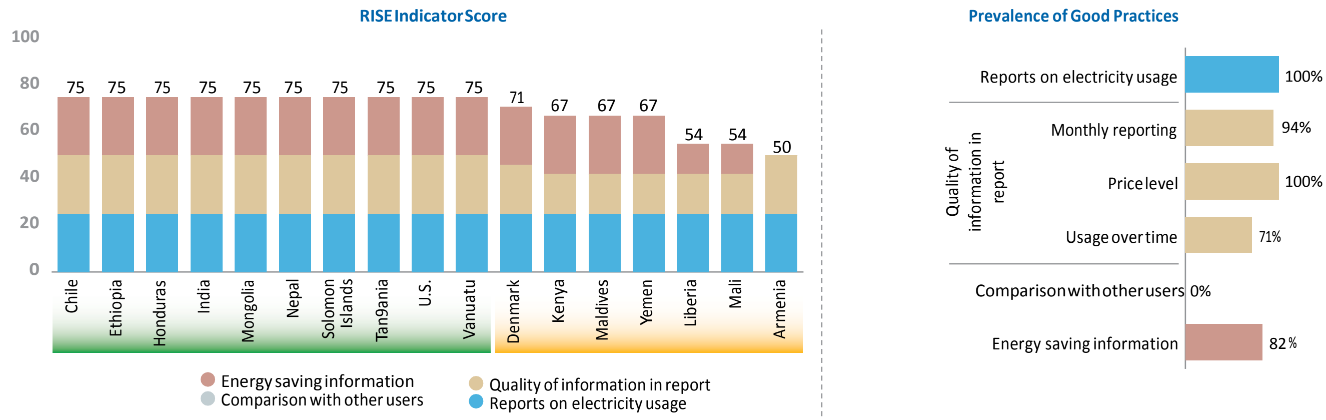
All pilot countries have at least one government entity responsible for setting and implementing energy efficiency policies and regulations (Figure 5-4). In most cases it is an arm of a ministry with responsibility for the energy sector, as with, for example, the Bureau of Energy Efficiency in India, the Energy Regulatory Commission in Kenya, the Ethiopian Energy Authority, and the Chilean Energy Efficiency Agency. In other countries, responsibility for efficiency is dispersed among many bodies.

Mismatches (presence of mandates without corresponding institutions, or vice versa) arise frequently. Armenia, for instance, has equipment and building energy standards and labeling schemes, but no entity to certify compliance. And while twelve countries have entities responsible for setting energy efficiency standards, only four of them (Chile, Denmark, India, and the United States) have actually enacted mandatory MEPS (see Figure 5-9).

Chile and Denmark have nongovernmental bodies responsible for implementing energy efficiency policies. In Chile the Superintendencia de Electricidad y Combustibles has given the responsibility to independent laboratories to test and certify compliance with energy efficiency standards, and in Denmark, energy service companies (ESCOs) and energy suppliers take on a significant role. In the United States, many of the responsibilities, including formulating energy efficiency policies and regulating energy efficiency activities of energy suppliers, devolve to the states. Of course, most countries have a variety of authorities allocated to different, sometimes overlapping national and subnational authorities. It is not possible to make generalizations about the "right" level for assigning a given type of energy efficiency–related authority, so countries are evaluated on whether there is any agency at any level that holds the types of oversight powers important to effective implementation.

In Mali, Nepal, and Yemen, the energy ministries are responsible for forming energy efficiency policy and strategy. In the absence of efficiency policies and mandates, however, institutional arrangements for implementation have yet to be formed.

Figure 5-5: Comparing energy use of nearby consumers is not a common practice in any pilot country



Source: RISE database.

Indicator 3: Quality of information provided to consumers about electricity usage

In all the pilot countries (represented by the largest utility, in the case of countries with more than one), consumers receive information on their electricity usage and tariffs. The frequency of billing statements—the chief means of conveying to consumers how much electricity they consume—varies from semi-monthly to annual, with monthly the most common. In over 70 percent of countries, consumers also receive information on electricity consumption over time, so they can compare the current statement with past performance. With the exception of Armenia, consumers also receive information on ways to use electricity more efficiently, either through printed material, broadcast media, or utility websites.

What is striking, however, is that none of the countries provides consumers with a piece of information that has been shown to be very effective in motivating customers to lower their energy consumption: comparisons of energy use with that of neighboring or otherwise comparable customers (Figure 5-5). Although a few U.S. utilities provide such information to customers, it is not common practice throughout the country.[78] Consumers in Mongolia, in addition to monthly electricity bills, have since 2009 also received annual reports summarizing the monthly bills, so they can see their usage over time.

In Denmark, payments for electricity are debited directly from consumers' bank accounts without itemized bills. Usage is reported annually, based on meter readings that consumers take themselves. In some countries, such as Liberia and Tanzania, the practice of prepaying for electricity is widespread. This works differently from the usual post-paid electricity usage reporting practice, and future RISE surveys will need to account for the frequency and quality of information conveyed to consumers by such approaches.

Aside from providing consumers with information on ways to save electricity through Chilectra's website, the Chilean Energy Efficiency Agency gives efficiency seminars, courses, and workshops for schools and municipal governments. Consumers in Liberia and Mali receive information on energy efficiency as a part of consumer-awareness efforts by international development organizations. A common risk of aid-driven programs, of course, is the possibility that they will cease when the initial projects end, unless a sustainable footing is pursued as an explicit goal.

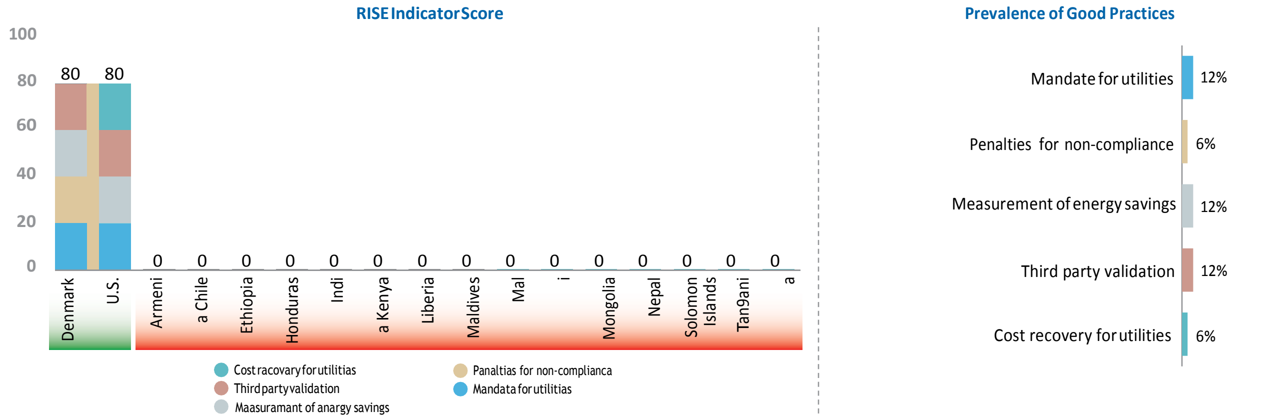
Beyond providing information to consumers, some programs also seek to influence future consumers. In the Solomon Islands, the draft Energy Efficiency Strategy and Investment Plan calls for course materials to teach energy efficiency in primary and secondary schools from 2019.

Indicator 4: Incentives or mandates for energy supply utilities to invest in energy efficiency

Energy utilities have large reservoirs of efficiency potential in their own right and the means to reach huge networks of consumers, making incentives to energy suppliers (Figure 5-6) important tools in pursuing national efficiency goals. Except for the developed countries in the survey—the United

78. American Council for an Energy-Efficient Economy 2014.

Figure 5-6: Incentives for energy suppliers are absent in all developing countries in the pilot



Source: RISE database.

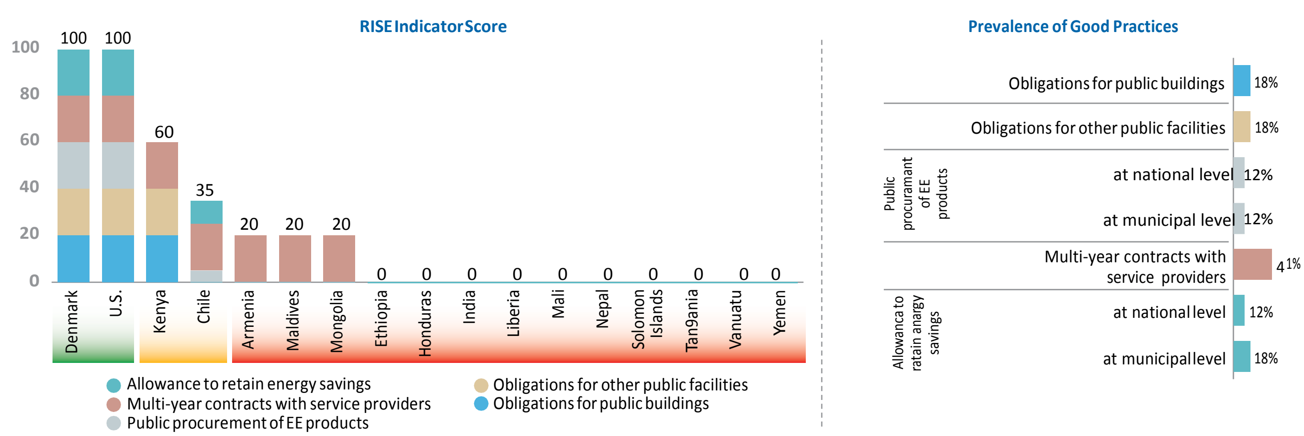
States and Denmark—no other country has mandates for utilities to invest in energy efficiency.

In Chile, although incentives or mandates are missing, the Chilean Energy Efficiency Agency provides resources for energy efficiency audits, programs for human capital, and other indirect support. Similarly in Armenia, although formal mandates to invest in energy efficiency are lacking, utility investment plans are reviewed and approved by the government, and energy efficiency is among the service quality requirements. Future RISE surveys may be modified to reflect the value of such practices, which, though they fall short of mandates, nevertheless have a positive influence on the environment for efficiency.

Denmark's Energy Agreement of 2012 set energy efficiency targets for electric utilities, oil and natural gas companies, and district heating companies. Rigsrevision, the government auditing institution that reports to Parliament's Public Accounts Committee, examines overall carbon dioxide reductions, and undertakes spot checks on energy companies. There is also self-policing by energy associations.

In the United States, as alluded to earlier, mandates vary from state to state. As part of New York's[79] Energy Efficiency Resource Standard program to reduce electricity usage by 15 percent by 2015, the state's utilities were required to file energy efficiency programs. The utility shareholder incentive mechanism is structured over three tiers, allowing rewards or imposing penalties, depending on the share of annual saving

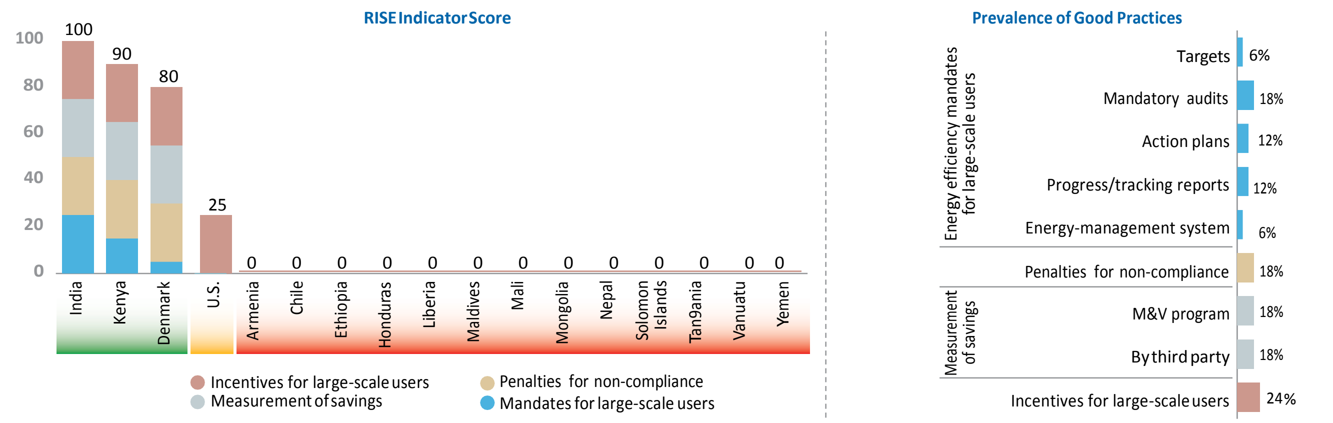
Figure 5-7: Only three countries have energy saving obligations for public agencies



Source: RISE database.

79. New York State is the representative subnational region for the United States in this questionnaire; Consolidated Edison ("Con Edison") is the representative utility.

Figure 5-8: India, Kenya, and Denmark have the strongest mandates for large-scale users to invest in energy efficiency



Source: RISE database.

targets achieved. Several states in the United States have expanded the business environment to support investment in efficiency programs by electric utilities. Thirty-two states have approved fixed-cost recovery mechanisms—14 with revenue decoupling (including New York) and 18 with lost-revenue adjustment mechanisms.

Indicator 5: Incentives or mandates for public entities to invest in energy efficiency

Many countries have used the market power of their government agencies to jump-start markets for energy efficiency goods and services through incentives and mandates for public agencies (Figure 5-7).[80] None of the developing countries surveyed has a comprehensive approach in this area. Only the United States and Denmark have a broad set of policies concerning public buildings and other such facilities, including energy savings obligations, policies for public procurement of energy efficient products and equipment, and public budgeting regulations to allow entities to retain energy savings.

Among the developing countries, Kenya and Chile stand out. Kenya's Energy Management Regulation of 2012 applies to public buildings and facilities, mandating binding energy savings obligations and performance tracking. Chile has a voluntary policy and guidelines for procurement of energy efficient products through the government's purchasing system, Mercado Publico. Armenia, Maldives, and Mongolia, which lack mandates but have allowed public entities to engage with energy efficiency service providers for multi-year contracts, earn partial scores.

Some countries have acknowledged the need for mandates for public agencies but have yet to pursue or enforce them. For example, Honduras has expressed its intent to reduce energy consumption in public buildings, but has no mandate requiring purchase of energy efficient appliances. Similarly in India, guidelines on Energy Conservation Building Codes exist for public buildings, but are not enforced. A related program, though not an incentive scheme, is the Bureau of Energy Efficiency's Bachat Lamp Yojana program, which is replacing older incandescent lamps with compact fluorescent lamps (CFLs) in public buildings.

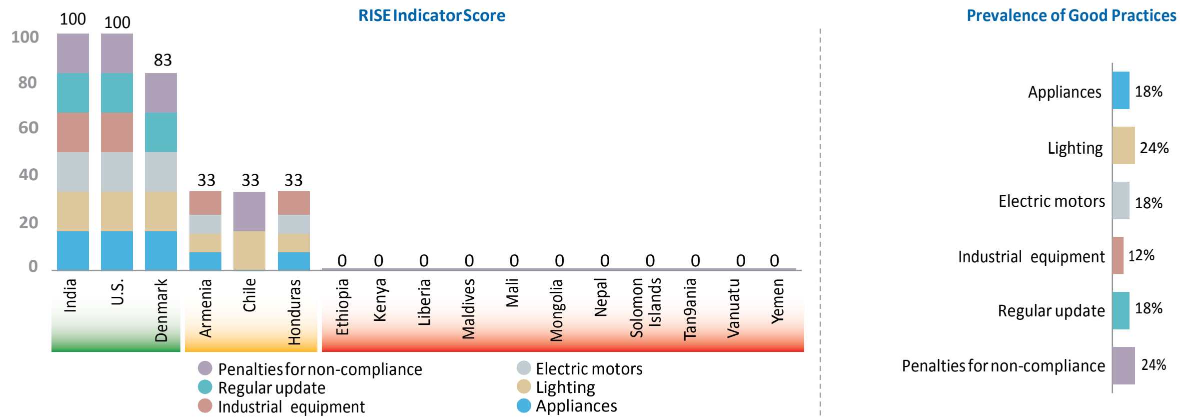
Indicator 6: Incentives or mandates for large-scale users to invest in energy efficiency

An important means for encouraging energy efficiency investments in the private sector (and in SOEs in many countries) is to provide incentives to and enforce mandates on large-scale energy users, usually industrial and commercial facilities (Figure 5-8). Denmark, India, and Kenya are the only countries with mandates for large-scale consumers to invest in energy efficiency. The United States provides some incentives to large-scale users, while the remaining countries have neither mandates nor incentives in effect.

In Denmark, the mandates arise from the EU Energy Efficiency Directive. Denmark is also preparing a law to require energy audits every four years, with fines for non-compliance. India's Perform, Achieve and Trade program covers 478 companies in nine energy-intensive sectors, with the aim of achieving least-cost energy savings through trading of white certificates. The verification program involves validation of energy savings by accredited third-party energy auditors, and imposes penalties for non-compliance. Kenya's Energy Regulatory Commission ensures that large

80. In this survey, "public agencies" excludes the state-owned or state-invested enterprises that are prominent players in many economies.

Figure 5-9: Only six countries have mandatory or voluntary MEPS



Source: RISE database.

consumers of electricity[81] adhere to the Energy Management Regulations of 2012. This requires firms to conduct energy audits by licensed energy auditors and to submit the reports to the Commission. They must also prepare an implementation plan based on the audit recommendations and carry out at least half of them or face penalties.

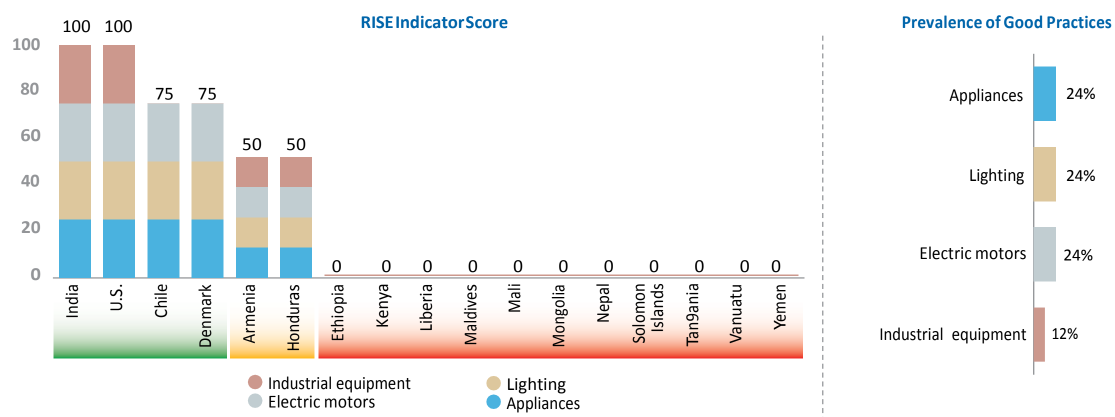
Although there is no energy efficiency mandate for large users in the United States, federal, state, and municipal governments provide loans, technical assistance, and other incentives to foster energy-efficient practices in industry. The Energy Policy Act of 2005 established a tax deduction for qualifying energy-efficient systems in commercial buildings.

Indicator 7: Minimum energy efficiency performance standards

Only four countries have enacted mandatory MEPS (India, the United States, Denmark, and Chile), and only India and the United States have MEPS for all four surveyed categories of products (Figure 5-9).[82] MEPS for lighting and appliances are typically the first that countries adopt, followed by electric motors and industrial equipment. Enforcement mechanisms for MEPS exist in all four countries, with penal- ties for non-compliance.

MEPS have been adopted for all four categories of products in India through the 5 Star program administered by the

Figure 5-10: Country performance on energy labels follows that on energy standards



Source: RISE database.

81. nEterprises consuming over 180 MWh per year.

82. deally, RISE would allocate credit for MEPS according to the share of energy use covered, but such data are difficult to obtain. Scoring based on number of equipment categories or types of facilities covered is also problematic, due to significant structural differences in sectors and markets between countries.

Bureau of Energy Efficiency, and in the United States via the Energy Star program of the Environmental Protection Agency. Denmark has enacted EU-compliant energy efficiency standards for all categories except industrial equipment. Chile recently applied MEPS to lighting products, gradually phasing out substandard products from November 2013 to January 2015. It is considering MEPS for other products.

Some of the countries are showing progress in formulating and adopting MEPS. Armenia and Honduras have voluntary efficiency standards, but they are far less effective than mandatory standards, so for this exercise only partial credit was given. Kenya's Bureau of Standards is developing criteria for lighting, air conditioners, refrigerators, and standalone motors. Similarly, Liberia's Rural Renewable Energy Agency is adopting regional standards prepared by the Centre for Renewable Energy and Energy Efficiency of the Economic Community of West African States (ECOWAS). Ethiopia is drafting regulations for energy efficiency standards for lighting and domestic appliances. Vanuatu in 2013 authorized drafting of legislation for MEPS. Scores for this indicator may therefore look very different several years hence.

Indicator 8: Energy labeling systems

Energy efficiency labels are typically based on norms associated with MEPS, so performance on this indicator is quite similar to the previous one (Figure 5-10). The four top performers are again India, the United States, Denmark, and Chile, although the latter two lack labels for industrial equipment. Armenia and Honduras receive some credit for their labeling efforts, which are voluntary and thus less effective as only some products are labelled.

Several countries that did not receive scores for this indicator are establishing labeling programs. In Kenya, a draft regulation on energy efficiency labels is under public review, to be forwarded to the Ministry of Energy for its endorsement (Box 5–1). Since 2012, Pacific island countries such as the Solomon Islands have been assisted by the Secretariat of the Pacific Community to prepare legislation on appliance energy labels. Vanuatu is participating in the Pacific Appliance Labeling and Standards program, which supports introduction of energy standards and labels for electrical appliances throughout the region.

Indicator 9: Building energy codes

Only one-third of the surveyed countries have building energy codes, and of those none scores in the green traffic light zone, sending a clear signal that all have substantial progress to make (Figure 5-11). Ensuring compliance with energy building codes is a critical piece that is missing even in developed countries like the United States and Denmark. There are building energy labeling programs in all countries with building codes, except Armenia, where building energy labeling is voluntary.

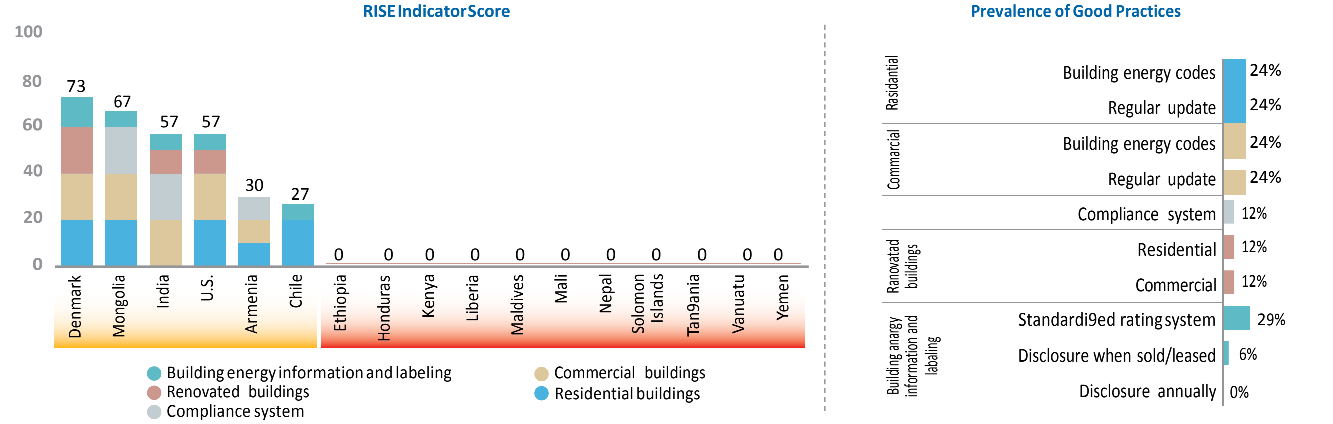
Box 5-1: Progress toward an energy-efficient Kenyan economy

A new energy bill and an energy policy now being drafted aim to support energy efficiency in Kenya. On March 14, 2014, the Ministry of Energy and Petroleum held a national workshop to gather public comments on the energy bill and energy policy. The energy bill would establish an Energy Efficiency and Conservation Agency whose mandate would be, among other things, to "coordinate the development of and updating of the national energy efficiency and conservation action plan biennially with relevant stakeholders and statutory authorities." The agency would also promote the adoption of energy-efficient processes, equipment, devices, and systems. Measures and mandates on energy efficiency and conservation are covered in the draft. The energy policy—the basis of the bill—states that the Energy Efficiency and Conservation Agency would lead "energy efficiency and conservation activities to improve the energy security and mitigate the effects of climate change." A consolidated energy fund would be set up to cover the costs of operations.

Energy performance standards and labeling are also being developed. The Energy Efficiency Standards and Labelling Programme is a GEF-funded project executed under the United Nation's Development Programme's National Execution Modality, with the Ministry of Industrialization as the national executing partner. This is a five-year initiative with its inception in July 2010 and completion expected in 2015. The program seeks to improve the energy efficiency of selected appliances and equipment in residential, commercial, and industrial sectors, by introducing MEPS and removing barriers to uptake of energy efficiency equipment and appliances.

The Energy Regulatory Commission with the Ministry of Industrialization and the Kenya Bureau of Standards have drafted appliance energy performance and labelling regulations that are now available for public comment. The regulations propose the registration of all importers and manufacturers of electrical devices by the commission and provide a schedule of all the appliances to which this regulation applies..

Figure 5-11: About one-third of the pilot countries have building energy codes



Source: RISE database.

Energy codes and labels are most prevalent for newly constructed buildings. Denmark has building energy codes and labeling programs for both new residential and commercial buildings and for existing buildings that undergo renovation. New construction must be approved by the municipality and comply with the building codes, which are meant to be updated every five years.

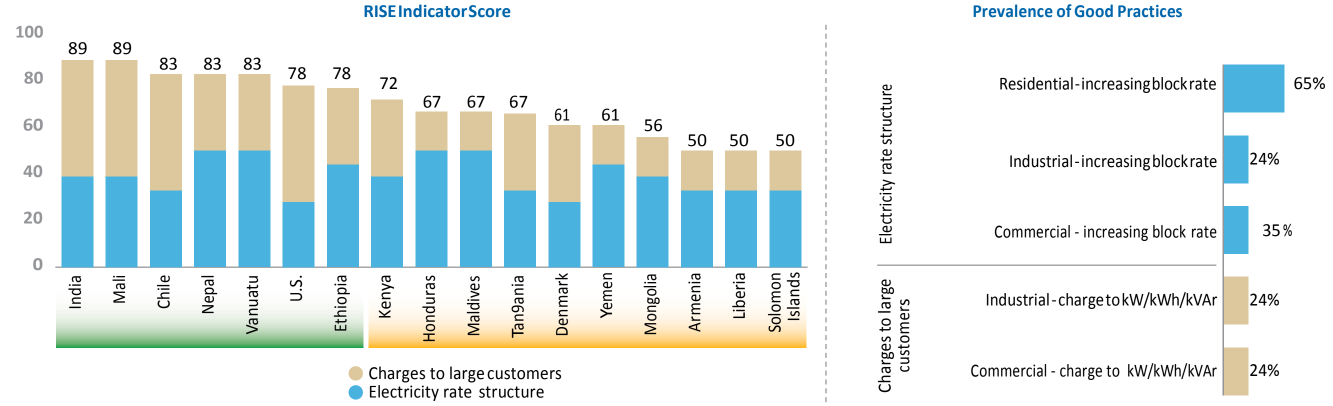
In the United States, building codes vary from state to state. Although the federal government provides research to help strengthen building codes, it has not adopted a national code. It is common practice for states to adopt the 2009 IECC and ASHRAE Standard 90.1-2007 for both residential and commercial buildings to meet the energy code compliance requirement under federal law (Energy Policy Act 1992; American Recovery and Reinvestment Act of 2009). The ENERGY STAR labeling program promotes efficient buildings. In India, building codes are in place for commercial buildings, along with labeling for energy performance, but disclosure of energy usage is not mandatory.

Chile has mandatory thermal conditioning requirements for new residential buildings and has recently started a labeling program for energy efficient housing. Armenia has energy codes for both residential and commercial buildings, but they are voluntary; if a developer chooses to apply them, the Urban Development State Inspectorate of the Ministry of Urban Development reviews compliance.

Indicator 10: Incentives from electricity pricing

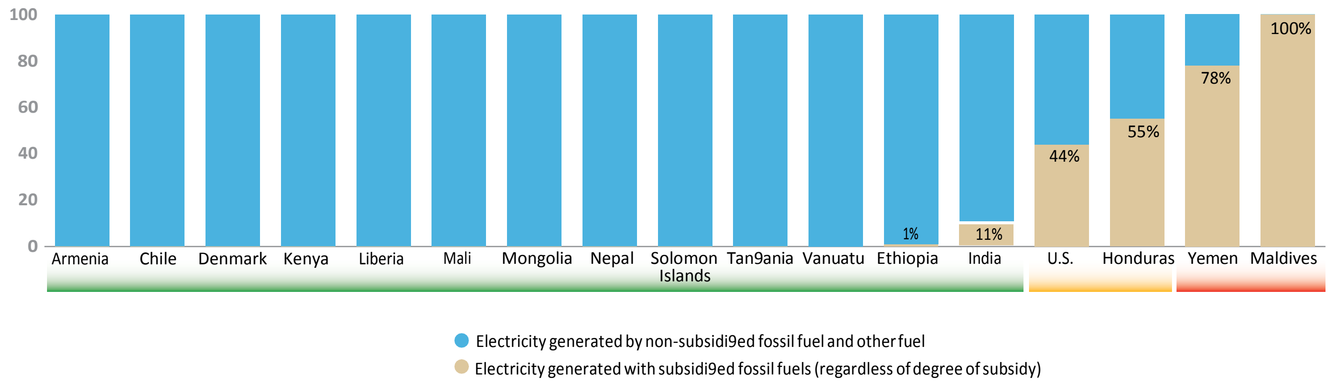
All the pilot countries have adopted approaches to electricity pricing that provide incentives for energy efficiency,

Figure 5-12: Increasing block tariffs are common for the residential sector



Source: RISE database.

Figure 5-13: Only a few countries in the sample generate electricity with subsidized fossil fuel



Source: RISE database.

though all have room for improvement (Figure 5-12). Some of the developing countries in the sample outperformed the developed ones on this indicator, especially electricity rate structures. Large customers in the United States[83] pay decreasing block rates, while those in Denmark are charged at constant block rates, rather than at increasing block rates, which represent better practice.

Residential consumers in two-thirds of the countries (the exceptions are Armenia, Chile, Denmark, Liberia, the Solomon Islands, and Tanzania) are charged increasing block rates for power consumption. Flat connection charges are also applied to customers in many countries, so that consumers face both fixed and variable charges. In India, consumers qualifying for "below poverty line" service pay a flat fee, and there are no variable charges related to consumption levels.

Unlike in the residential sector, industrial consumers in many countries benefit from either a constant or declining block rate. While the latter may make sense from the utility's point of view as a seller of electricity, it is a barrier to energy-efficient behavior. Commercial customers are charged at constant or increasing block rates in most of the countries. Industrial and commercial consumers in all countries pay for energy consumed (kWh), but in only eight of the countries do they also pay demand charges (based on their maximum demand in kW), and in only six do they pay for reactive power (kVAr).

Indicator 11: Fossil fuel subsidy

Six of the countries generate electricity with subsidized fossil fuels, which makes energy supply artificially cheaper relative to efficiency (Figure 5-13). Many countries keep the prices of fossil fuels down to achieve important social and economic development aims. Countries where these subsidies are widespread, like Maldives where all power is generated with imported fuels, or producer countries like Yemen, have considerable potential for improving the incentives for conserving energy. Even where subsidies are relatively low and so not easily felt by consumers, as in the United States, their prevalence can still be a factor in making decisions on efficiency. Unwinding subsidies is, of course, never simple, and promoting energy efficiency is rarely a motivating factor, but efficiency programs can be important elements in approaches to ameliorate the impacts of such reform efforts.

Indicator 12: Carbon pricing mechanism

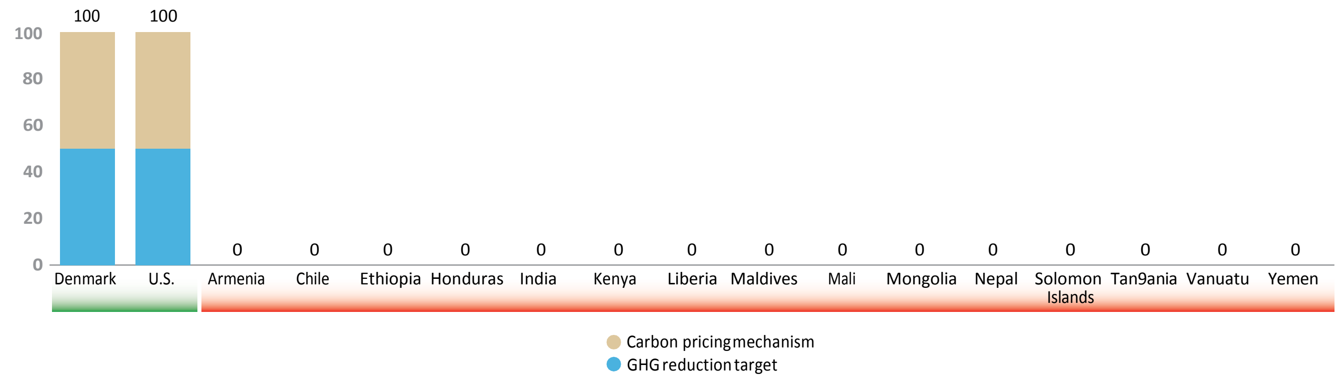
Turning to another cross-cutting indicator, it is perhaps not a surprise that only Denmark and the United States have introduced carbon pricing mechanisms. (Figure 5-14). Worldwide, there are currently no carbon prices in effect anywhere that are high enough to provide a significant incentive for energy efficiency or low-carbon energy supply investments. Rather, this is a mechanism that is expected to be of use in future, when carbon prices begin to rise. A positive score in this arena is a signal that the groundwork is being laid for the operation of a mechanism that will help to provide a more positive environment for such investments.

Indicator 13: Retail Price of Electricity

All the pricing indicators concern influences on price levels, but they do not represent actual retail electricity prices, which are the signals that consumers see and respond to (Figure 5-15). Since electricity rates are complex, and customer classes in different utility territories face diverse

83. ConEd (New York), the representative utility.

Figure 5-14: Only two developed countries have begun to introduce carbon pricing



Source: RISE database.

rates, arriving at a single "average" number is something of an art (Annex II). Nevertheless, this comparison gives an idea of the relative incentives that consumers in different countries face to avoid electricity purchases through investing in efficiency.

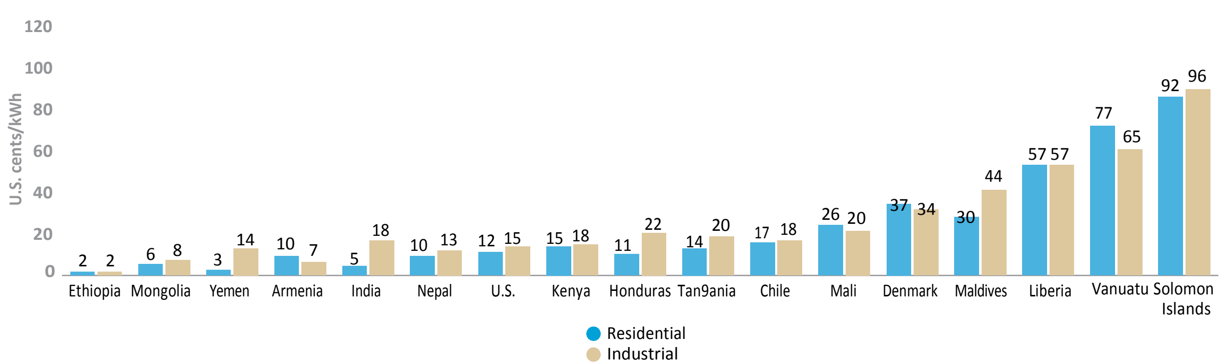
It is unsurprising that electricity is so expensive on the small island states of Vanuatu and the Solomon Islands, or in a country like Liberia where access to electricity is still quite rare. It seems within expectations that the two OECD countries in the sample, Denmark and the United States (which have the highest overall scores on the RISE pilot energy efficiency indicators), would also have high electricity prices relative to most of the poorer countries (though the level for industrial customers seems quite elevated). Higher prices for industrial customers seems to be the general rule; Armenia, Denmark, Mali, and Vanuatu are the only exceptions. Cross-subsidizing residential customers is a common practice and may explain this in some countries.

It is difficult to draw conclusions from a snapshot comparison of electricity prices. Current, absolute price levels are important to investment decision-making, but just as, if not more, important are recent and expected trends in prices. This initial view of electricity prices, then, is a step toward preparing the baseline against which to measure future movements. As the RISE survey develops over time and results are accumulated, the possible correlation of price levels with other RISE indicators, as well as with energy intensity and other measures of energy efficiency, will be carefully watched.

5W.4CAHNOCOUNTRIES IMPROVE THEIR PERFORMANCE?

While Denmark and the United States are the top scorers, with all indicators falling into the green or yellow zones, there is always the potential to do more (Table 5-4). For Denmark, providing better feedback to consumers on their energy use and using tariff structures to strengthen incentives to conserve are key areas in which more could be done. For the United States,

Figure 5-15: Across the sample, electricity prices vary by an order of magnitude



Source: RISE database.

Table 5-4: All countries have opportunities to improve the enabling environment for investing in energy efficiency

	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon	Tanzania	U.S.	Vanuatu	Yemen
National plan for increasing energy efficiency	Yellow	Green	Green	Red	Red	Green	Red	Yellow	Red	Red	Red	Red	Red	Red	Yellow	Red	Red
Entities for energy efficiency policy, regulation and implementation	Yellow	Green	Green	Yellow	Green	Green	Yellow	Yellow	Yellow	Red	Yellow	Red	Yellow	Yellow	Green	Yellow	Red
Quality of information provided to consumers	Yellow	Green	Yellow	Green	Green	Green	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Green	Green	Green	Yellow
Incentives or mandates for energy supply utilities to invest in energy efficiency	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red
Incentives or mandates for public entities to invest in energy efficiency	Red	Yellow	Green	Red	Red	Red	Yellow	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red
Incentives or mandates for large-scale users to invest in energy efficiency	Red	Red	Green	Red	Red	Green	Yellow	Red	Red	Red	Red	Red	Red	Red	Yellow	Red	Red
Minimum energy efficiency performance standards	Red	Yellow	Green	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red
Energy labeling systems	Yellow	Green	Green	Red	Yellow	Green	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red
Building energy codes	Yellow	Yellow	Yellow	Red	Red	Yellow	Red	Red	Red	Red	Yellow	Red	Red	Red	Yellow	Red	Red
Incentives from electricity pricing	Yellow	Green	Yellow	Green	Yellow	Green	Yellow	Yellow	Yellow	Green	Yellow	Green	Yellow	Yellow	Green	Green	Yellow
Fossil fuel subsidy	Green	Green	Green	Green	Yellow	Green	Green	Green	Red	Green	Green	Green	Green	Green	Yellow	Green	Red
Carbon pricing mechanism	Red	Red	Green	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red

Source: RISE database.

taking a national approach to efficiency will be challenging, but this offers the opportunity to push for greater achievements, as would targeting large energy users with incentives and mandates beyond those effective measures already taken. Both countries could do better on building energy codes, which of course are challenging to implement anywhere.

Most of the pilot countries have already established, or taken steps to establish, the institutions needed to carry out energy efficiency policy. Many of them need to take the next step and give these institutions a clear mission and

Six countries have building energy codes, and all but one of those also have building energy labeling programs.

means to achieve it by expressing targets in national (and/or subnational) plans supported by legislation. This may be the first priority for many countries, as it provides a firm basis for the detailed policy and regulatory elements that are so crucial to the energy efficiency pillar.

The next priority for many countries should be to adopt standards and labels for appliances and equipment. While these are not necessarily simple, there is a great deal of experience in other countries, and technical and financial resources are available to help those with an interest to move relatively quickly to cover commonly used devices that absorb significant fractions of energy use. This is an area where many countries are only beginning to take action, and where relatively rapid progress may well be seen in future rounds of the RISE survey.

Building energy codes are more challenging to design and implement but would be a useful subsequent priority for countries, particularly those rapidly urbanizing. In all climates, space conditioning, lighting, and other needs can be met much more efficiently in new and existing buildings. Labels and reporting of energy use are proving to be an important means of communicating the market value of energy efficiency, and thus also deserve attention. There are more stakeholders involved than with equipment efficiency, however, and greater problems of agency and authority, so quick results should not be expected.

A good place to start with building energy use, and market creation for more efficient equipment, is in buildings and facilities owned by government agencies themselves. Most of the pilot countries have an opportunity to learn from the public procurement and other programs that have already proven effective in many countries in reducing government expenditures on energy and in developing domestically appropriate approaches to efficiency that can inform efforts in other sectors. This could complement efforts to put in place incentives and mandates for big industrial and commercial energy users, another indicator on which most of the countries scored poorly. These programs, for both public and private entities, require large capacity to monitor pre- and post-intervention energy consumption in order to evaluate outcomes—capacity that needs to be developed in parallel to designing and rolling out new policies and regulations.

5.6 WHAT ARE THE LESSONS FOR THE GLOBAL ROLLOUT?

In designing the indicators and survey questions, significant efforts were made to account for the varying availability and quality of information from different countries. This meant omitting many possible indicators. Those that remained in the pilot survey provided useful results, and all will be retained for the next version of RISE, with some modifications proposed below. Future versions of RISE will likely also gradually add more energy efficiency indicators; several candidates are listed below as well. Input from users of RISE on indicators is very welcome. There will be an effort to develop scalar indicators, so that a relatively rich gradient of performance can be measured.

In some countries, particularly those with a federal structure, subnational governments play roles that in smaller or more centralized nations are taken by the national government. In the next step of scaling up RISE towards global coverage, for instance, it will be important to revise the indicators on national energy efficiency plans and on entities for implementing energy efficiency policy, so as to capture and credit developments at subnational levels, where appropriate. The level of sector detail reflected in the energy efficiency entities indicator will be considered, and balanced with the need to reflect sector-specific actions in other indicators. Comparing results across countries will of course be challenging. Further consideration must be given to sector targets. One potential problem to be avoided is double counting, which can happen when the utility sector is subject to targets that may be achieved through efficiency measures in end-use sectors, which in turn are subject to their own, separate targets.

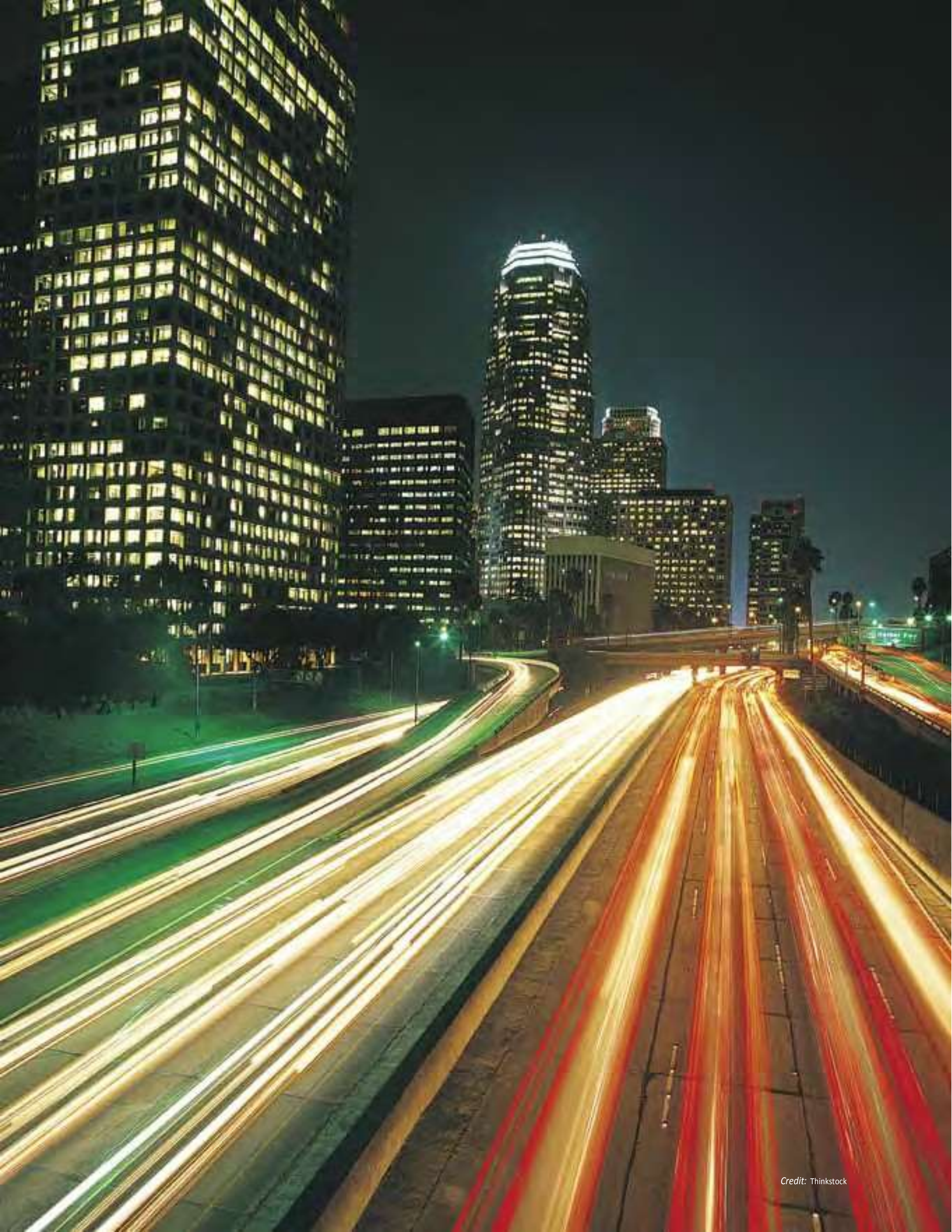
> **Only four countries have enacted minimum energy efficiency performance standards.**

The pilot survey revealed unanticipated aspects concerning the information on electricity use and energy efficiency opportunities that end users receive. Treatment of information by customers who use prepayment services to buy electricity, for instance, will need to be considered. The next RISE survey will better reflect the variety found across countries in media used for transmitting this information to customers, its quality and its impact.

In the pilot survey, no distinction was made between voluntary and mandatory standards and labels, but this difference can have a large impact on their effectiveness. This factor will be reflected in the future questionnaires and scoring. There are also opportunities for deepening the analysis of appliance and equipment standards to provide higher resolution of the range of performance in this area, measuring, for instance, the devices covered by standards and the types of labels used. The indicator on building energy codes can, with relatively little extra data-collection effort, be modified to capture significant features of such codes that are associated with greater or lesser effectiveness, as has been done in the American Council for an Energy-Efficient Economy's *2014 International Energy Efficiency Scorecard.*

In the pilot survey, it was not possible to include indicators for all sectors that are important for energy efficiency. Transportation efficiency measures are one area that will be added to future RISE surveys, beginning, perhaps, with the status of fuel economy standards for light- and heavy-duty vehicles. Supply-side energy efficiency represents a large portion of the efficiency potential in many countries, and it will be important to capture the aspects of it that are subject to policy and regulatory influence. Combined heat and power generation, both utility- and industry-scale, are important to capture, and, for many countries, district energy is as well. Distribution utilities play a large role, both through reducing line losses in transmission and distribution infrastructure and in enabling efficiency at customer sites and systemwide through smart grid upgrades and improved interconnections. For many countries, agricultural energy efficiency is very important to achieving development goals. An indicator that is concerned with measures to improve water pumping for irrigation and other key agricultural activities may be introduced.

Energy efficiency projects that are good bets on paper often have difficulty attracting financing, so indicators on the availability of financing mechanisms and allied capacity building should be tracked. In the initial stages of market creation, public financing can be an important tool and, although it should be phased out as commercial financing becomes more common, it may be a good idea to track countries in the early stages of supporting energy efficiency investments. Finally, whether and how to include an indicator on procedural efficiency, as was done for renewables and for energy access, will be considered.



Credit: Thinkstock

CHAPTER 6

RISE, THE OVERALL INVESTMENT CLIMATE, AND SE4ALL GOALS

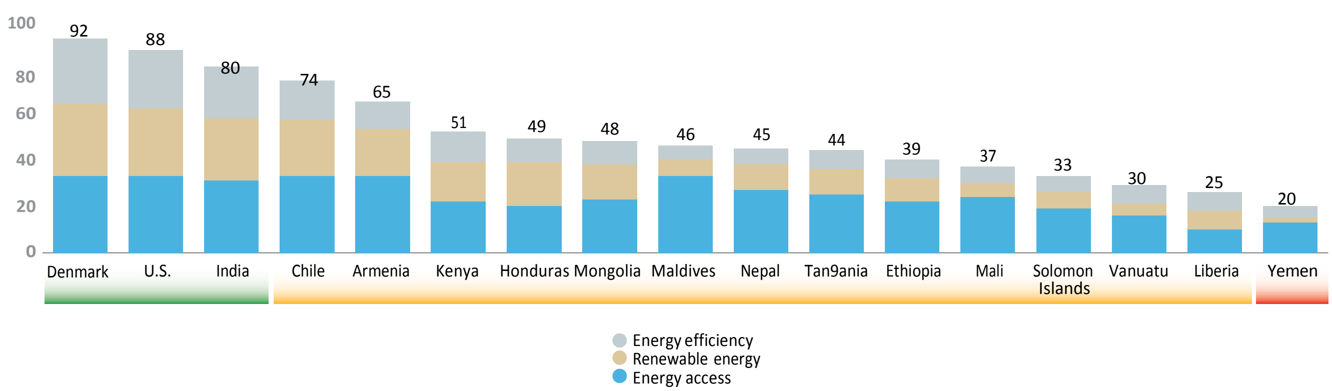
6.1 RISE SCORES IN A NUTSHELL

A RISE aggregate score—combining as a simple average the results of the three pillars of energy access, renewable energy, and energy efficiency—signals a pilot country's readiness for investments in sustainable energy and allows one to appreciate some order of priority among the pillars. Denmark and the United States rank highest as expected on this score, presenting a green traffic light. There is a wide heterogeneity in performance—from 92 in Denmark to 20 in Yemen, the only country in the red traffic light zone, highlighting its nascent policies and regulations. Among the developing countries, India scores the highest followed by Chile, the first of the 13 countries showing a yellow traffic light, suggesting that they have either made some progress on each of the pillars or scored highly on one or two of them.

Of the three pillars, developing countries appear to prioritize energy access. All of the developing countries are yellow or green on energy access (or have no energy access challenges), while between six and nine of them still display a red traffic light on renewable energy and energy efficiency. Countries that tend to do well on renewable energy also perform well on energy efficiency—clean energy embracing these two pillars often seems pursued in tandem, as evidenced by a very high correlation coefficient between the two scores of 1.93. Still, the renewable energy scores are typically higher than energy efficiency, particularly in Armenia, Chile, and Honduras. Similarly, access scores are frequently higher than those for renewable energy, particularly in Tanzania, Mali, and Nepal. The correlation coefficient of the access and renewable energy scores is 0.69, and that of the access and efficiency scores 0.65, suggesting degrees of association less than that between renewable energy and energy efficiency.

The analysis showcases a group of countries that have performed well on all three pillars (such as the United States, Denmark, and India) and projects another group of countries that lag behind on all three pillars, such as the Solomon Islands, Vanuatu, and Yemen (Table 6-1). On energy efficiency, nine countries are in the red traffic light zone—highlighting the considerable distance they still need to traverse to demonstrate an investor-friendly environment. It also suggests that many countries are yet to prioritize energy efficiency within the sustainable energy space—the concept of energy efficiency as a low-hanging fruit is not borne out

Figure 6-1: RISE aggregate score



Source: RISE database.

Table 6-1: Countries and traffic light by pillar

	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	U.S.	Vanuatu	Yemen
Energy Access	–	–	–	Yellow	Yellow	Green	Yellow	Yellow	–	Yellow	Yellow	Green	Yellow	Green	–	Yellow	Yellow
Renewable Energy	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Red	Red	Red	Yellow	Yellow	Red	Yellow	Green	Red	Red
Energy Efficiency	Yellow	Yellow	Green	Red	Yellow	Yellow	Yellow	Red	Red	Red	Yellow	Red	Red	Red	Green	Red	Red

Note: – means the country does not have energy access challenges.

Source: RISE database.

by these results. On all three pillars, the maximum number of countries find themselves in the yellow traffic zone, suggesting they have embarked on a path of creating an attractive investment climate, but one still a work in progress.

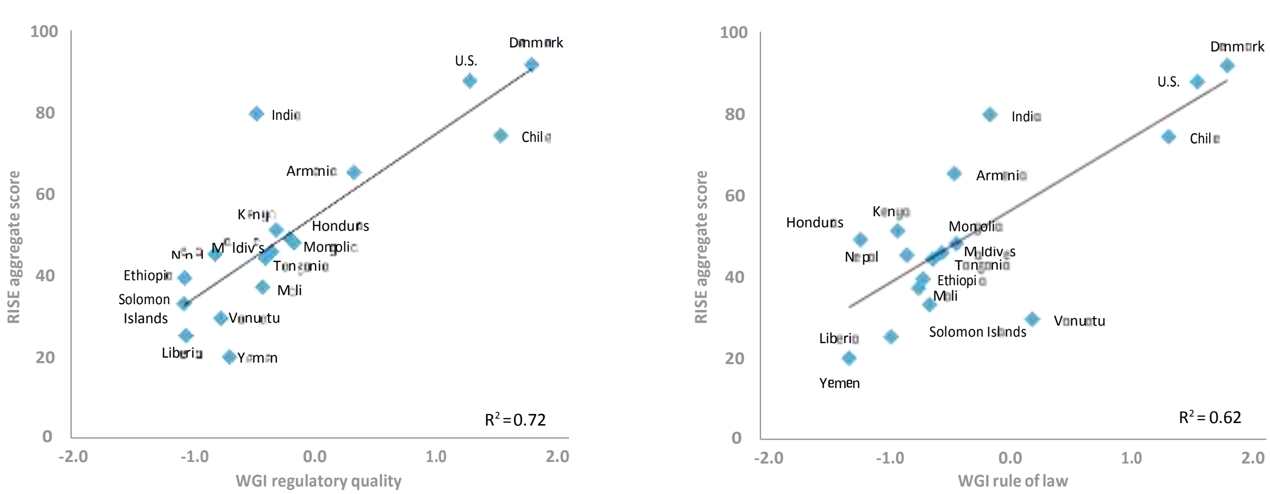
6W2SHROISE RELATED TO THE OVERALL INVESTMENT CLIMATE?

A country's investment climate for sustainable energy cannot be viewed in isolation. The RISE aggregate score shows a generally positive relationship with the regulatory quality index and with the rule of law index, as reported by the World Bank's Worldwide Governance Indicators (WGI). However, a number of countries are on the left side of the trend line, suggesting that their RISE score is better than their WGI score (and vice versa for countries on the right side). For instance, India reports a much higher RISE score than its regulatory quality and rule of law would suggest (vice versa for Liberia, Vanuatu, and Yemen). These findings also strengthen the case for developing RISE further, as countries do invest specifically in energy policies and regulations, aside from their overall rule of law or regulatory quality.

Access scores are higher than renewable energy and energy efficiency scores for all countries.

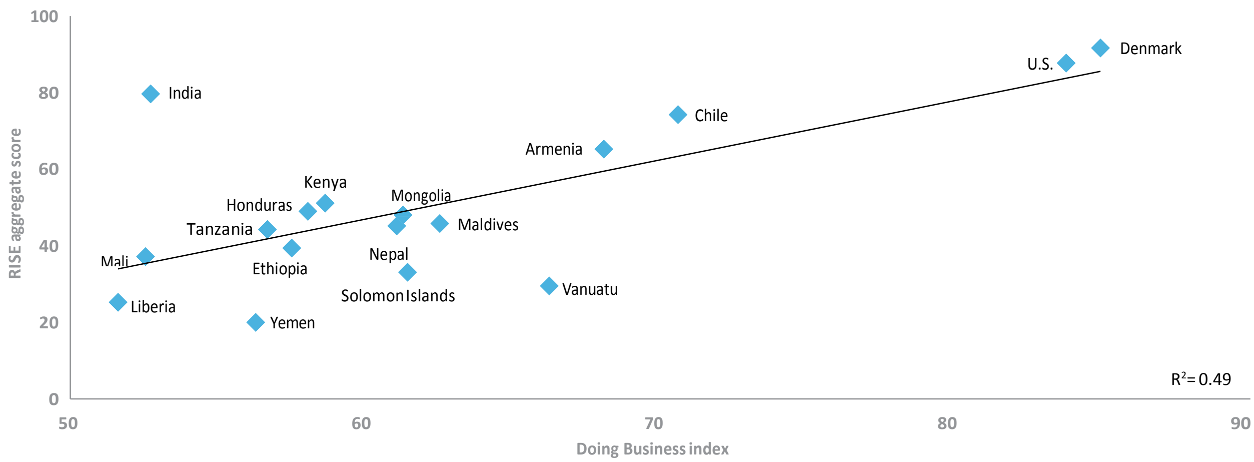
RISE is also linearly related to the Doing Business index, which measures business regulations and enforcement, with countries on either side of the trend line. Once again, India scores higher on RISE than on Doing Business (and Liberia, Yemen, and Vanuatu the opposite). Similar to the inference with WGI, countries can strengthen their energy-specific enabling environment so that it outperforms their overall

Figure 6-2: RISE aggregate score and WGI



Source: Authors.

Figure 6-3: RISE aggregate score and Doing Business index



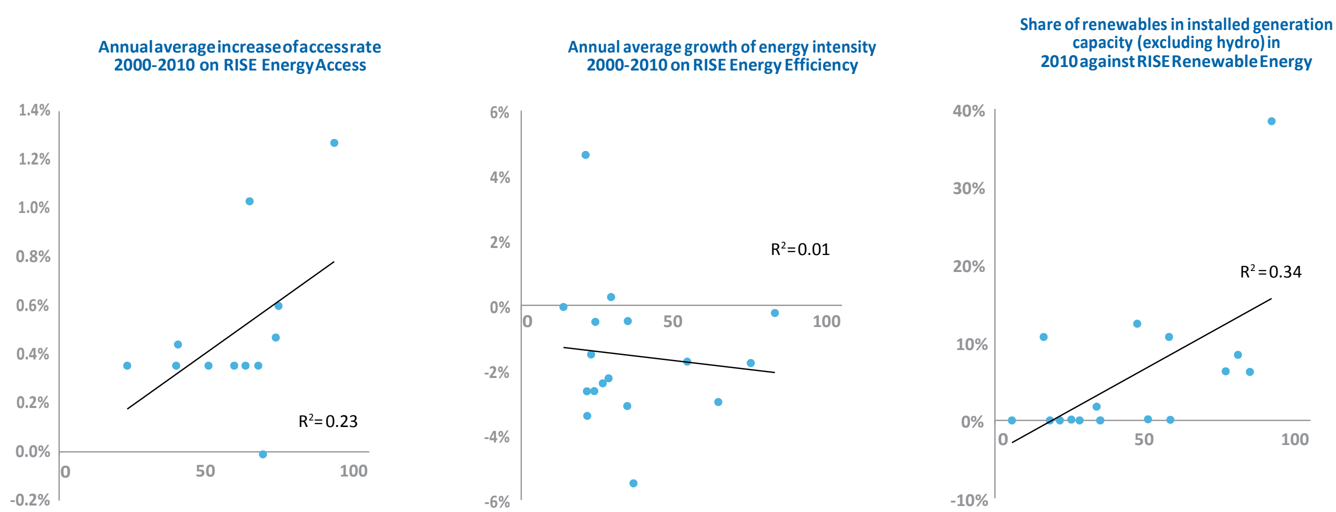
Source: Authors.

investment climate, even though both are generally positively correlated.

6.4 HOW DOES RISE RELATE TO THE THREE SE4ALL GOALS?

Understanding the investment climate for the three SE4ALL goals (ensure universal access to modern energy services, double the rate of improvement in energy efficiency, and double the share of renewable energy in the global energy mix by 2030) is foundational for achieving them. The objective of RISE is to measure the elements that encompass an investment climate for sustainable energy. Over time, progress in RISE scores ought to demonstrate relationships with flows of private investment as well as with incremental achievements in the SE4ALL goals. Because this is a pilot report comprising only 17 countries, identification of such relationships is illustrative purposes. The pilot is too small to draw any robust inferences. For energy access, the sample size is even smaller (12 countries). Even then, for energy access and renewable energy, the relationship appears linear, while the correlation with energy efficiency is fairly weak, so the correlation may not indicate any robust relationship. The strength of the relationship, signaled by R^2, is highest for renewable energy followed by energy access.

Figure 6-4: Correlation between RISE score and GTF indicators



India lies farthest ahead among developing countries.

Further, there is discrepancy in time between RISE score and SE4ALL Global Tracking Framework (GTF) indicators. RISE measures the current enabling environment, while the SE4ALL indicators used in Figure 6-4 are typically of improvements between 2000 and 2010. Considering that the impact of today's policies may take some years to translate into tangible outcomes, this pair of inputs and outputs cannot indicate a strong relationship. Further, the relationships with the current status of SE4ALL indicators is misleading as the goal is to measure progress rather than the situation today, which may be defined by many factors. In the future, successive editions of RISE and GTF will allow analysts to measure the incremental difference and the relationship between the investment climate and SE4ALL goals.

However, the investment climate is but one of the determinants of private investment in energy infrastructure. Others include market conditions and attractiveness characterized by market size, income level, affordability of consumers, and macroeconomic stability (Chapter 1). Once the global rollout is complete and data are available for a large sample of countries, an econometric analysis is possible where other factors can be controlled for and relationships with RISE variables quantified. This kind of analysis will also capture the time dimension of policy measures, so as to assess if a policy measure in place longer has more of an impact on SE4ALL goals. Many countries have recently adopted an ambitious policy trajectory, but how long before they see a change in their sector performance outcomes remains to be seen.

6.4 HOW DOES RISE MOVE FORWARD?

RISE is slated to transition to the first global rollout in 2015, with an aspiration to regularly update the exercise until 2030, similar to the GTF.

RISE presents an opportunity for countries to up their game on data collection. The RISE development process highlighted the poor quality of data in many countries. RISE will be as robust as the data that underpin it. In spite of a selection of indicators where data were understood to be available, data quality varied widely. The responsibility lies not only with governments, but also with private developers, regulators, industries, and utilities to come together to provide a coherent picture of the policy profile of a country. Public availability of information also allows investors to trust the policy pronouncements of governments, limiting—for RISE and other initiatives tracking policy and regulatory arrangements—misrepresentation of country efforts stemming from data issues and credibly showcasing a country's achievements.

The dynamism of both RISE and the sustainable energy ecosystem allows opportunities to arise in refining and adding to existing indicators and in designing a secondary set of indicators for specific country groups. RISE will remain dynamic, as it evolves into a benchmarking and experience-sharing tool for countries while they choose pathways to accomplish international and national sustainable energy targets.

Source: Authors.

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ANNEX I

RISE SCORE

Energy Access

Indicator/ Sub-indicator	Question	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	United States	Vanuatu	Yemen, Rep.
Planning																		
I. Electrification plan		N/A	N/A	N/A	100	67	100	100	0	N/A	67	67	100	0	100	N/A	100	100
National Plan	Is there a national electrification plan?				Y	Y	Y	Y	N		Y	Y	Y	N	Y		Y	Y
Coverage of grid and off-grid	If Yes, does the electrification plan include both grid and off-grid?				Y	N	Y	Y	N/A		Y	Y	Y	N/A	Y		Y	Y
Regular update	If yes, was the last update within five years?				Y	Y	Y	Y	N/A		N	N	Y	N/A	Y		Y	Y
Policies and Regulations																		
II. Enabling environment for renewable energy developers to invest in mini-grids		N/A	N/A	N/A	70	20	80	70	0	N/A	90	70	60	20	90	N/A	20	0
Existence of regulations	Are there regulations outlining rights of mini-grid operators?				Y	N	Y	Y	N		Y	Y	Y	N	Y		N	N
Regulation attributes	If yes, can mini-grid operators charge tariffs that exceed the national tariff level?				Y	N/A	Y	Y	N/A		Y	Y	Y	N/A	Y		N/A	N/A
	If yes, do mini-grid operators need prior regulatory approval to enter into a power sales contract with consumers?				Y	N/A	N	Y	N/A		Y	Y	N	N/A	Y		N/A	N/A
Standards	Are safety, reliability, and voltage and frequency standards for mini-grids made publicly available?				N	N	Y	Y	N		Y	Y	N	N	Y		N	N
Protection against expropriation	Is there any general law that deal with expropriation of mini-grids?				Y	N	N	N	N		Y	N	N	N	Y		N	N
Subsidies or duty exemption	Are there duty exemptions or subsidies for mini-grid renewable energy technology?				Y	Y	Y	Y	N		Y	Y	Y	Y	Y		Y	N
III. Enabling environment for standalone home systems		N/A	N/A	N/A	67	100	100	33	33	N/A	67	100	100	67	100	N/A	33	0
National program	Are there national programs that promote the deployment of standalone home systems (solar photovoltaic systems and lanterns)?				Y	Y	Y	N	Y		Y	Y	Y	Y	Y		N	N
Standards	Are there minimum quality standards for standalone home systems?				N	Y	Y	N	N		N	Y	Y	N	Y		N	N
Subsidies or duty exemption	Are there duty exemptions or subsidies for standalone home systems?				Y	Y	Y	Y	N		Y	Y	Y	Y	Y		Y	N
Pricing and Subsidies																		
IV. Funding support to electrification		N/A	N/A	N/A	100	67	83	67	67	N/A	67	67	67	100	100	N/A	33	33
Dedicated funding line	Does the government have a dedicated funding line or budget for electrification (such as a funded national program, budget item, or rural electrification fund to finance electrification including grid, mini-grid, and standalone home systems)?				Y	Y	Y	Y	N		Y	Y	Y	Y	Y		N	Y
Subsidy to household connection	Does the utility or government cover a portion of the costs for the household connection?				Y	N	P	Y	Y		N	N	N	Y	Y		Y	N
Subsidy to grid extension	Do capital subsidies exist for utilities to provide distribution lines to villages?				Y	Y	Y	N	Y		Y	Y	Y	Y	Y		N	N
V. Affordability of electricity		N/A	N/A	N/A	100	100	100	100	21	N/A	100	100	100	100	100	N/A	100	100
Affordability of electricity	What is the relative cost of subsistence consumption as percentage of gross national income per household? (%)				0.3	0.3	0.3	0.9	9.0		2.4	0.2	0.8	3.7	0.8		0.5	0.1

N/A is not applicable. Y is yes; N is no; P is partial.

Energy Access (continued)

Indicator/ Sub-indicator	Question	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	United States	Vanuatu	Yemen, Rep.
Pricing and Subsidies																		
VI. Utility Performance		N/A	N/A	N/A	40	35	90	90	20	N/A	0	40	60	100	0	N/A	50	10
Reporting practice	Are the financial statements of the utility publicly available?				N	Y	Y	Y	N		N	N	Y	Y	N		N	N
	If yes, are they audited by an independent third party?				N/A	N	Y	Y	N/A		N/A	N/A	Y	Y	N/A		N/A	N/A
Financial performance	Current ratio				1.3	0.4	0.9	1.0	1.8		0.9	0.9	0.4	7.9	0.6		1.9	0.8
	EBITDA margin (%)				1	−8	26	15	−27		−10	7	0	19	−32		23	−6
	Debt Service Coverage Ratio				0.3	N/A	2.2	2.9	N/A		N/A	8.1	0.4	No deb	N/A		7.6	No debt
	Days receivable outstanding				2	99	68	138	121		153	16	757	27	225		70	677
	Days payable outstanding				6	40	46	68	64		185	24	126	64	139		60	259
Procedural Efficiency																		
VII. Establishing a New Connection		N/A	N/A	N/A	41	88	95	62	98	N/A	93	98	97	65	87	N/A	47	75
Procedural time	What is the procedural time to establish a new connection? (days)				365	17	8	83	14		18	21	21	8	69		28	30
Procedural cost	How much is the procedural cost to be paid? ($)				126	156	74	369	20		86	10	26	470	73		675	303
VIII. Permitting a Mini-grid		N/A	N/A	N/A	0	0	100	0	0	N/A	86	0	57	0	20	N/A	0	0
Procedural time	What is the procedural time to permit a mini-grid? (days)				N/A	N/A	90	N/A	N/A		181	N/A	215	N/A	510		N/A	N/A
Procedural cost	How much is the procedural cost to be paid? ($)				N/A	N/A	48	N/A	N/A		0	N/A	37	N/A	6,620		N/A	N/A
Number of agencies	How many agencies are there to go through?				N/A	N/A	1	N/A	N/A		2	N/A	6	N/A	3		N/A	N/A
Energy Access Total		**N/A**	**N/A**	**N/A**	**65**	**60**	**94**	**65**	**30**	**N/A**	**71**	**68**	**80**	**57**	**75**	**N/A**	**48**	**40**

Renewable Energy

Indicator/ Sub-indicator	Question	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	United States	Vanuatu	Yemen, Rep.
Planning																		
I. Planning for Renewable Energy expansion		50	46	100	75	50	83	63	13	0	38	63	29	13	38	100	13	25
Target with an action plan	Is there a target on renewable energy?	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y
	Does the country have a renewable energy action plan to implement the targets?	Y	N	Y	Y	N	Y	N/A	N	N	Y	Y	Y	N	N/A	Y	Y	Y
Renewable energy in expansion planning	Does the country have an electricity expansion plan that includes renewable energy development?	Y	N	Y	Y	Y	Y	Y	N	N	N	Y	N	N	Y	Y	N	N
Renewable energy in transmission expansion planning	Does the current transmission planning consider renewable energy scale-up?	N	Y	Y	Y	Y	Y	Y	N	N	N	Y	N	N	Y	Y	N	N
	Is there an anticipatory planning process or mechanism that allows the least cost expansion of transmission network infrastructure to connect one or more renewable energy plants?	N	Y	Y	Y	N	Y	N	N	N	N	N	N	N	N	Y	N	N
Resource potential data	High-quality validated national atlas of renewable potential (maximum number of attributes)	0	2	3	0	0	2	0	0	0	3	0	1	0	0	3	0	0
	Strategic planning or zoning guidance (maximum number of attributes)	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4	0	0
Pricing and Subsidies																		
II. Fossil Fuel Subsidy		100	100	100	99	45	89	100	100	0	100	100	100	100	100	56	100	22
Fossil fuel subsidy	What is the proportion of electricity generation by subsidized fossil fuel? (%)	0	0	0	1	55	11	0	0	100	0	0	0	0	0	44	0	78
III. Carbon Pricing Mechanism		0	0	100	0	0	0	0	0	0	0	0	0	0	0	100	0	0
Greenhouse gas emission reduction target	Is there a legally binding greenhouse gas emission reduction target in place?	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
Existence of carbon pricing mechanism	Is there any mechanism to price carbon in place (carbon tax, auctions, emission trading system)?	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N

N/A is not applicable. Y is yes; N is no; P is partial.

Renewable Energy (continued)

Indicator/ Sub-indicator	Question	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	United States	Vanuatu	Yemen, Rep.
Pricing and Subsidies																		
IV. Utility Performance		70	90	90	40	35	90	90	20	30	0	40	60	100	0	80	50	10
Reporting practice	Are the financial statements of the utility publicly available?	Y	Y	Y	N	Y	Y	Y	N	N	N	N	Y	Y	N	Y	N	N
	If yes, are they audited by an independent third party?	Y	Y	Y		N	Y	Y					Y	Y		Y		
Financial performance	Current ratio	0.7	0.9	1.3	1.2	0.4	0.9	1.0	1.8	0.7	0.9	0.9	0.4	7.9	0.6	1.0	1.9	0.8
	EBITDA margin (%)	10	16	19	1	−8	26	15	−27	11	−10	7	0	19	−32	26	23	−6
	Debt Service Coverage Ratio	0.2	2.6	1.2	0.3	N/A	2.2	2.9	N/A	3.9	−2.0	8.1	0.4	No deb	−2.0	3.7	7.6	No deb
	Days receivable outstanding	105	89	145	2	99	68	138	121	95	153	16	757	27	225	92	70	677
	Days payable outstanding	56	58	79	6	40	46	68	64	80	185	24	126	64	139	43	60	259
Policies and Regulations																		
V. Legal Framework for Renewable Energy		100	100	100	0	100	100	100	100	0	0	100	0	0	100	100	0	0
Legal framework	Does the country have a legal framework on renewable energy development?	Y	Y	Y	N	Y	Y	Y	Y	N	N	Y	N	N	Y	Y	N	N
VI. Regulatory Policies and Procurement		50	100	100	0	50	100	50	0	50	0	50	0	0	0	100	0	0
Incentives for grid-connected renewable energy generation	Does the country use competitive bidding or auctions to promote renewable energy development?	N	Y	Y	N	Y	Y	Y	N	N	N	N	N	N	N	Y	N	N
	Do price subsidies or premiums exist to support renewable energy generation?	Y	Y	Y	N	Y	Y	Y	N	Y	N	Y	N	N	N	Y	N	N
Incentives for distributed renewable energy generation	Does a net metering program exist?	N	Y	Y	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N
Predictability	Do the legal or regulatory frameworks include a formula for price change/adjustment?	Y	N	N	N/A	Y	N	Y	N/A	N	N/A	N	N/A	N/A	N/A	Y	N/A	N/A
	If yes, is the frequency of allowed renewable energy price level modifications specified in the regulatory framework?	Y	N/A	N	N/A	Y	N/A	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y	N/A	N/A
	If no, is such formula included in standard contractual agreements?	N/A	Y	Y	N/A	N/A	Y	N/A	N/A	N	N/A	N	N/A	N/A	N/A	N/A	N/A	N/A
	If yes, is the frequency of allowed renewable energy price level modifications specified in the contract?	N/A	Y	Y	N/A	N/A	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Does a renewables purchase obligation exist?	N	Y	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N
	Does the design of the auction mechanism or bidding include compliance rules to ensure timely completion and deployment of renewable energy projects?	N/A	Y	Y	N/A	Y	Y		N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y	N/A	N/A
Sustainability	Is the renewable energy price subsidy or premium passed through to the consumer tariff?	Y	N	Y	N/A	N	N	Y	N/A	N	N/A	Y	N/A	N/A	N/A	Y	N/A	N/A
	Is the ratio of renewable energy subsidy to total electricity bill less than 2%?	Y	Y	N	N/A	Y	Y	Y	N/A	Y	N/A	Y	N/A	N/A	N/A	Y	N/A	N/A
Accessibility	Is there a prioritized access to the grid for renewable energy?	N	N	Y	N	Y	Y	N	N	N	N	N	N	N	N	Y	N	N
	Is there a grid code – or specific operational rules – for managing variable renewable energy?	N	Y	Y	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N
	Are there rules defining the sharing of curtailment costs?	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N

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Renewable Energy (continued)

Indicator/ Sub-indicator	Question	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	United States	Vanuatu	Yemen, Rep.
VIII. Network Connection and Pricing		88	88	88	0	88	88	25	0	0	0	38	0	0	25	88	0	0
Connection cost policy	Is there secondary legislation or regulations for the allocation of connection costs?	Y	Y	Y	N	Y	Y	Y	N	N	N	Y	N	N	Y	Y	N	N
	If yes, what is the cost policy? (SS: super-shallow/S: shallow/D: deep)	S	S	S	N/A	S	S	D	N/A	N/A	N/A	S	N/A	N/A	D	S	N/A	N/A
Network usage pricing rule	Are there rules defining who pays for the wheeling charges of transmission and distribution network?	Y	Y	Y	N	Y	Y	N	N	N	N	N	N	N	N	Y	N	N
IX. Public Financial Support Mechanism		0	75	75	75	75	100	25	0	25	50	0	50	0	50	75	0	0
Fiscal incentives	Does the government offer fiscal incentives for renewable energy?	N	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N	Y	Y	N	N
Public financing	Does the government offer public financial incentives for renewable energy?	N	Y	Y	Y	Y	Y	N	N	N	N	N	Y	N	N	Y	N	N
Government-backed utility payment	Does the government back utility payments with specific mechanisms?	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N
Credit enhancement or risk mitigation mechanisms	Does the government offer credit enhancement or risk mitigation mechanisms to renewable energy developers?	N	Y	Y	Y	Y	Y	N	N	N	Y	N	Y	N	Y	Y	N	N

Procedural Efficiency

Indicator/ Sub-indicator	Question	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	United States	Vanuatu	Yemen, Rep.
X. Starting a New Renewable Energy Project		65	66	83	0	93	87	0	0	100	0	52	87	0	30	80	0	0
Technology	W: wind / S: solar / B: biomass	B	W	W			S			S		W			B	S		
Procedural time	What is the procedural time to permit and start operating a new renewable energy project?	313	610	345	N/A	N/A	276	N/A	N/A	96	N/A	387	N/A	N/A	840	481	N/A	N/A
Procedural cost	How much is the procedural cost to be paid? ($)	5,317	70	27k	N/A	N/A	0.3m	N/A	N/A	0	N/A	53k	N/A	N/A	0.2m	8,260	N/A	N/A
Number of agencies	How many agencies are there to go through?	11	5	4	N/A	N/A	8	N/A	N/A	2	N/A	9	N/A	N/A	3	8	N/A	N/A
Technology	Small hydro																	
Procedural time	What is the procedural time to permit and start operating a new renewable energy project?	340	1,605	N/A	N/A	531	300	N/A	N/A	N/A	N/A	N/A	570	N/A	N/A	N/A	N/A	N/A
Procedural cost	How much is the procedural cost to be paid? ($)	4,882	1.4m	N/A	N/A	7,500	1.3m	N/A	N/A	N/A	N/A	N/A	7,141	N/A	N/A	N/A	N/A	N/A
Number of agencies	How many agencies are there to go through?	14	7	N/A	N/A	1	5	N/A	N/A	N/A	N/A	N/A	3	N/A	N/A	N/A	N/A	N/A
Renewable Energy Total		**59**	**73**	**92**	**29**	**58**	**81**	**50**	**23**	**21**	**19**	**46**	**33**	**21**	**34**	**88**	**16**	**6**

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Energy Efficiency

Indicator/ Sub-indicator	Question	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	United States	Vanuatu	Yemen, Rep.
Planning																		
I. National Plan for Increasing Energy Efficiency		58	75	75	8	0	83	0	33	0	0	0	0	0	13	33	0	8
National energy-efficiency target	Is there an energy-efficiency target at the national level?	N	Y	Y	N	N	Y	N	Y	N	N	N	N	N	N	N	N	N
Energy-efficiency legislation or action plan	Is the national energy-efficiency target supported by legislation or an action plan?	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N
Subsectoral target	Does the energy-efficiency plan include supply-side target?	N	N	Y	Y	N	Y	N	N	N	N	N	N	N	Y	N	N	Y
	Does the energy-efficiency plan include residential target?	Y	N	N	N	N	N	N	N	N	N	N	N	N	P	N	N	N
	Does the energy-efficiency plan include commercial target?	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Does the energy-efficiency plan include industrial target?	Y	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N
II. Entities for Energy Efficiency Policy, Regulation and Implementation		50	100	100	33	83	83	67	33	50	17	50	17	33	33	100	33	17
Entities for energy-efficiency policy, regulation, and implementation	Are there governmental or independent bodies concerned with the followings?																	
	Setting energy-efficiency strategy and policy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Setting energy-efficiency standards	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	N
	Regulating energy-efficiency activities of energy suppliers	Y	Y	Y	N	N	N	N	N	N	N	Y	N	N	N	Y	N	N
	Regulating activities of energy consumers	N	Y	Y	N	Y	Y	Y	N	N	N	Y	N	N	N	Y	N	N
	Certifying compliance with equipment energy-efficiency standards	N	Y	Y	N	Y	Y	Y	N	Y	N	N	N	N	N	Y	N	N
	Certifying compliance with building energy-efficiency standards	N	Y	Y	N	Y	Y	N	N	Y	N	N	N	N	N	Y	N	N
Policies and Regulations																		
III. Quality of Information Provided to Consumers about Electricity Usage		50	75	71	75	75	75	67	54	67	54	75	75	75	75	75	75	67
Reports on electricity usage	Do consumers receive reports of their electricity usage?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Quality of information in report	At what intervals do they receive these reports? (months)	1	1	12	1	1	11	1	1	1	1	1	1	1	1	1	1	1
	Do the reports include price levels?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Do customers receive a bill or report that shows their electricity usage over time?	Y	Y	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	N
Comparison with other users	Do customers receive a bill or report which compares them with other users in the same region and class?	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Energy saving information from utilities	Do utilities provide customers with information on how to use electricity more efficiently, whether through bills or other means?	N	Y	Y	Y	Y	Y	Y	P	Y	P	Y	Y	Y	Y	Y	Y	Y
IV. Incentives or Mandates for Utilities to Invest in Energy Efficiency		50	75	71	75	75	75	67	54	67	54	75	75	75	75	75	75	67
Mandate for utilities	Are utilities required to carry out energy-efficiency or carbon-reduction activities?	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
Penalties	If yes, are there penalties in place for noncompliance with utility energy-efficiency or carbon-reduction mandates?	N/A	N/A	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N	N/A	N/A
Measurement of energy savings	If yes, are energy savings measured to track performance in meeting energy-efficiency or carbon-reduction mandates?	N/A	N/A	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y	N/A	N/A
Third-party validation	If yes, are measured energy savings or carbon-reductions validated by an independent third party?	N/A	N/A	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y	N/A	N/A
Cost recovery for utilities	If yes, is there a mechanism for utilities to recover costs associated with or revenue lost from mandated demand-side management activities?	N/A	N/A	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Y	N/A	N/A

N/A is not applicable. Y is yes; N is no; P is partial.

Energy Efficiency (continued)

Policies and Regulations (continued)

Indicator/ Sub-indicator	Question	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	United States	Vanuatu	Yemen, Rep.
V. Incentives or Mandates for Public Entities to Invest in Energy Efficiency		20	35	100	0	0	0	60	0	20	0	20	0	0	0	100	0	0
Obligations for public buildings	Are there binding energy savings obligations for public buildings?	N	N	Y	N	N	N	Y	N	N	N	N	N	N	N	Y	N	N
Obligations for other public facilities	Are there binding energy savings obligations for other public facilities (may include water supply, wastewater services, municipal solid waste, street lighting, transportation, and heat supply)?	N	N	Y	N	N	N	Y	N	N	N	N	N	N	N	Y	N	N
Public procurement of energy efficient products	Is there a policy in place for public procurement of energy-efficient products and services at national level?	N	P	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
	Is there a policy in place for public procurement of energy-efficient products and services at municipal level?	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
Multi-year contracts with service providers	Do public entities engage in multi-year contracts with service providers?	Y	Y	Y	N	N	N	Y	N	Y	N	Y	N	N	N	Y	N	N
Allowance to retain energy savings	Do public budgeting regulations and practices allow public entities to retain energy savings at national level?	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
	Do public budgeting regulations and practices allow public entities to retain energy savings at municipal level?	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
VI. Incentives or Mandates for Large-scale Users to Invest in Energy Efficiency		0	0	80	0	0	100	90	0	0	0	0	0	0	0	25	0	0
Mandates for large users	Are there energy-efficiency mandates for large energy users? If yes, which of the following?	N	N	Y	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N
	Targets	N/A	N/A	N	N/A	N/A	Y	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Mandatory audits	N/A	N/A	Y	N/A	N/A	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Action plans	N/A	N/A	N	N/A	N/A	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Progress and tracking reports	N/A	N/A	N	N/A	N/A	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Energy-management system	N/A	N/A	N	N/A	N/A	Y	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Penalties	If yes, are there penalties in place for non-compliance with regulatory obligations for energy efficiency?	N/A	N/A	Y	N/A	N/A	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Measurement of energy savings	If yes, is there a measurement and verification program in place?	N/A	N/A	Y	N/A	N/A	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	If yes, is it carried out by a third party?	N/A	N/A	Y	N/A	N/A	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Incentives for industrial consumers	Are energy-efficiency incentives in place for industrial customers?	N	N	Y	N	N	Y	Y	N	N	N	N	NN	N	N	Y	N	N
VII. Minimum Energy Efficiency Performance Standards		33	33	83	0	33	100	0	0	0	0	0	0	0	0	100	0	0
Appliance	Have minimum energy efficiency (performance) standards been adopted for appliance?	P	N	Y	N	P	Y	N	N	N	N	N	N	N	N	Y	N	N
Lighting	Have minimum energy efficiency (performance) standards been adopted for lighting?	P	Y	Y	N	P	Y	N	N	N	N	N	N	N	N	Y	N	N
Electric motors	Have minimum energy efficiency (performance) standards been adopted for electric motors?	P	N	Y	N	P	Y	N	N	N	N	N	N	N	N	Y	N	N
Industrial equipment	Have minimum energy efficiency (performance) standards been adopted for industrial equipment?	P	N	N	N	P	Y	N	N	N	N	N	N	N	N	Y	N	N
Regular update of standards	Is there any provision for regular updates to the energy efficiency standards?	N	N	Y	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N
Penalty for non-compliance	Is there a penalty for non-compliance with energy efficiency standards?	N	Y	Y	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N

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Energy Efficiency (continued)

Indicator/ Sub-indicator	Question	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	United States	Vanuatu	Yemen, Rep.
Policies and Regulations (continued)																		
VIII. Energy Labeling Systems		50	75	75	0	50	100	0	0	0	0	0	0	0	0	100	0	0
Appliance	Have energy-efficiency labeling schemes been adopted for appliance?	P	Y	Y	N	P	Y	N	N	N	N	N	N	N	N	Y	N	N
Lighting	Have energy-efficiency labeling schemes been adopted for lighting?	P	Y	Y	N	P	Y	N	N	N	N	N	N	N	N	Y	N	N
Electric motors	Have energy-efficiency labeling schemes been adopted for electric motors?	P	Y	Y	N	P	Y	N	N	N	N	N	N	N	N	Y	N	N
Industrial equipment	Have energy-efficiency labeling schemes been adopted for industrial equipment?	P	N	N	N	P	Y	N	N	N	N	N	N	N	N	Y	N	N
IX. Building Energy Codes		30	27	73	0	0	57	0	0	0	0	67	0	0	0	57	0	0
Residential buildings	Are there energy codes for residential buildings?	P	Y	Y	N	N	N	N	N	N	N	Y	N	N	N	Y	N	N
	Is there any provision for regular updates to the energy code?	P	Y	Y	N	N	N	N	N	N	N	Y	N	N	N	Y	N	N
Commercial buildings	Are there energy codes for commercial buildings?	P	N	Y	N	N	Y	N	N	N	N	Y	N	N	N	Y	N	N
	Is there any provision for regular updates to the energy code?	P	N	Y	N	N	Y	N	N	N	N	Y	N	N	N	Y	N	N
System to ensure compliance	Is there a system to ensure compliance with building energy codes?	P	N	N	N	N	Y	N	N	N	N	Y	N	N	N	N	N	N
Codes for renovated buildings	Are renovated buildings required to meet a building energy code in residential sector?	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
	Are renovated buildings required to meet a building energy code in commercial sector?	N	N	Y	N	N	Y	N	N	N	N	N	N	N	N	N	N	N
Building energy information and labeling	Is there a standardized rating or labeling system for the energy performance of existing buildings?	N	Y	Y	N	N	Y	N	N	N	N	Y	N	N	N	Y	N	N
	Are commercial and residential buildings required to disclose property energy usage at the point of sale or when leased?	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	Are large commercial and residential buildings required to disclose property energy usage annually?	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Pricing and Subsidies																		
X. Incentives from Electricity Pricing		50	83	61	78	67	89	72	50	67	89	56	83	50	67	78	83	61
Electricity rate structure	What types of electricity rate structure do the following customers face? (F: flat fee per connection / C: constant block rates / D: declining block rates / I: increasing block rates)																	
	Residential customers	F,C	C	F,C	I	I	I	I	C	I	I	F,C,I	F,C,I	C	C	F,D,I	F,I	I
	Industrial customers	F,C	C	F,D	C	I	C	C	C	I	C	C	F,C,I	C	C	F,D	F,I	C
	Commercial customers	F,C	C	F,C	I	I	C	C	C	I	C	C	F,C,I	C	C	F,D	F,I	I
Charges to large customers	Which of the following charges do large electricity customers in the following sector pay? (E: energy (kWh) / D: demand (kW) / R: reactive power (kVAr))																	
	Industrial sector	E	E,D,R	E,D	E, D	E	E,D,R	E,D	E	E	E,D,R	E	E,D	E	E,R	E,D,R	E,R	E
	Commercial sector	E	E,D,R	E,D	E, D	E	E,D,R	E,D	E	E	E,D,R	E	E,D	E	E,R	E,D,R	E,R	E
XI. Fossil Fuel Subsidy		100	100	100	99	45	89	100	100	0	100	100	100	100	100	56	100	22
Fossil fuel subsidy	What is the proportion of electricity generation by subsidized fossil fuel? (%)	0	0	0	1	55	11	0	0	100	0	0	0	0	0	44	0	78

N/A is not applicable. Y is yes; N is no; P is partial.

Energy Efficiency (continued)

Indicator/ Sub-indicator	Question	Armenia	Chile	Denmark	Ethiopia	Honduras	India	Kenya	Liberia	Maldives	Mali	Mongolia	Nepal	Solomon Islands	Tanzania	United States	Vanuatu	Yemen, Rep.
Pricing and Subsidies (continued)																		
XII. Carbon Pricing Mechanism		0	0	100	0	0	0	0	0	0	0	0	0	0	0	100	0	0
Greenhouse gas emission reduction target	Is there a legally binding greenhouse gas emission reduction target in place?	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
Existence of carbon pricing mechanism	Is there any mechanism to price carbon in place? (e.g. carbon tax, auctions, emission trading system)	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
XIII. Retail Price of Electricity		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Residential	What is the unit price of electricity for average residential consumption? ($/kWh)	0.10	0.17	0.37	0.02	0.11	0.05	0.15	0.57	0.30	0.26	0.06	0.10	0.92	0.14	0.12	0.77	0.03
Industrial	What is the unit price of electricity for industrial consumption of 10,000 kWh per month? ($/kWh)	0.07	0.18	0.34	0.02	0.22	0.18	0.18	0.57	0.44	0.20	0.08	0.13	0.96	0.20	0.15	0.65	0.14
Energy Efficiency Total		**37**	**50**	**83**	**24**	**29**	**65**	**38**	**23**	**17**	**22**	**31**	**23**	**22**	**24**	**75**	**24**	**15**

N/A is not applicable. Y is yes; N is no; P is partial.

N/A is not applicable. Y is yes; N is no; P is partial.

ANNEX II

RISE METHODOLOGY

This annex is divided into three different areas of methodology that have been used for RISE.

I. Arriving at the short list of pilot indicators
II. Selecting the unit of analysis for data collection
III. Calculating indicators based on raw data

I. ARRIVING AT THE SHORT LIST OF PILOT INDICATORS

A preliminary long list of indicators was initially identified based on literature reviews and consultation with various stakeholders. An individual expert was hired in each of the 17 countries that fielded a questionnaire to elicit responses on these sub-indicators.

Indicator	Final selection
Cross-cutting	
Average retail price of electricity	Y
Average retail price of gas and oil derivatives	N
Average retail price of district heating	N
Public availability of financial statements of utility companies	Y
Whether the financial statements of utility companies are audited by an independent party	Y
Commercially viability of utility companies	Y
Technical and commercial losses	N
Level of fossil fuel subsidies	Y
Carbon tax	N
Carbon pricing mechanism	Y
Energy Access	
National Electrification Plan	
National vision for electrification	Y
Timeframe for electrification plan	N
Electrification plan includes both grid and off-grid	Y
Cost-of-service study is updated regularly	N
Enabling Environment for Expanding Grid Access	
Presence of ring-fenced financing for electrification plan	N
Capital subsidies exist for cost of grid connection	Y
Subsidies for grid connection are output based	N
Presence of information technology platform for effective delivery of subsidies	N
Quality of Regulation for Off-grid Renewable Energy	
Laws in place to allow mini-grids to operate	Y
Time, cost and number of procedures to permit a mini-grid	Y
Anticipatory regulation for connecting mini-grids to larger grid	N
Appropriate tariff regulation for off-grid renewable energy developers	Y
Quality of Support for Mini-grid Renewable Energy Developers	
Dedicated source of funding for renewable energy mini-grid subsidies	N
Subsidies for connecting users to mini-grids are output based	N
Existence of mechanism to encourage lowest subsidy per new connection	N
Quality of Support for Off-grid Standalone Home Systems	
Customs duty exemption for renewable energy standalone systems	Y
Subsidies in place for standalone renewable energy systems	Y
Absence of subsidies for kerosene fuel	N
Getting a New Connection	
Affordability of connection	N
Cost and number of procedures to get a new connection	Y
Number of procedures for getting financing for customer connections	N
Affordability of electricity	Y

Y is yes; N is no.

Indicator	Final selection
Technology	
Availability of technologies	N
Knowledge of technologies	N
Energy Efficiency	
Price Signals	
Price of energy to end-user as consumption increases	Y
Economic efficiency of end-user price subsidies	N
Low power factor penalty	N
Utility Incentive Alignment	
Linkage between revenues and profits (presence of decoupling)	Y
Financial incentives for utilities to exceed compliance requirements	Y
Presence of cap for the ability of utilities to pass through costs of losses on to customers	Y
Savings Mandates for Energy Suppliers	
Binding savings obligations over time	Y
Quality of measurement and verification	Y
Standard offers and white certificates in place for utilities to buy “energy savings”	N
Savings Mandates for Energy Consumers	
Binding savings obligation over time for government buildings	Y
Binding savings obligation over time for large users	Y
Absence of rolling blackouts	N
Energy-Efficient Procurement in the Public Sector	
Energy efficiency taken into account in the specification or award of materials and services	Y
Allowance of savings retention for energy-efficiency capital expenditures	Y
Allowance of multiyear energy-efficiency contracts	Y
Benchmarking measurement and verification of energy efficiency and usage in public buildings	Y
Model documents for energy performance contracts	N
Enabling Investment in Energy-Efficient Buildings	
Building codes are updated regularly	Y
Enforcement of building codes	N
Existence of penalties for not meeting code	Y
Presence of voluntary building code	N
Applicable across jurisdictions	N
Codes apply to existing buildings that do not meet energy-efficiency requirements	Y
Contract enforcement	N
Laws supporting appropriate ownership models	N
Access to Information	
Quality of information available to customer on their energy usage	Y
Frequency of collection	Y
Property energy data and rating disclosure policy	Y
Presence of energy labeling system for appliances and equipment	Y
Energy-Efficiency Standards for Products	
Regularly updated energy-efficiency standards for common appliances	Y
Regularly updated energy-efficiency standards for industrial equipment	Y
Penalty to manufacturers for noncompliance with energy-efficiency standard	Y
Energy Efficiency for Institutions	
Demand is considered an elastic variable in energy sector plan	N
Existence of a national energy-efficiency plan integrated into the energy suppliers sectoral plans	Y
Obligated energy-efficiency institution with access to customer usage data	N
Education and Training	
Strength of research and development	N
Education and training programs	N
Access to Energy-Efficiency Financing	
Effectiveness of loan guarantees	N
Robustness of financial institutions	N
Effective implementation of subsidies	N
Collateral required for energy-efficiency investments	N

Y is yes; N is no.

Indicator	Final selection
Renewable Energy	
Level of Financial, Economic, and Fiscal Support for Renewable Energy	
Years of remuneration guaranteed to generator	Y
Value to generator of renewable energy capital cost subsidies	N
Level of remuneration available to generator	Y
Available rate of return on investments in renewable energy	N
Revenue Risk Facing Renewable Energy Projects	
The price paid in for power purchase agreements is not tied to market fluctuations such as fuel prices or system costs	N
Existence and type of cost- recovery mechanism for renewable energy subsidies and incentives	Y
Availability of sovereign risk guarantees for renewable energy projects	Y
Percentage of remuneration for renewable energy that is from subsidy	N
Burden of renewable energy subsidies on government budgets	N
Renewable energy targets	Y
Transparency of Subsidies for Renewable Energy Projects	
Whether the total amount of subsidy for RE renewable energy is specified in laws or policies	N
Duration of subsidies for renewable energy is specified	N
How often and when remuneration rates and incentives for RE renewable energy can be modified by government is specified in laws or regulation	Y
Whether the amount of adjustment that can be made to remuneration rates and incentives for renewable energy by government is identified in laws or regulations	Y
Renewables purchase obligations	Y
Quality of Transmission Framework for Renewable Energy Projects	
Which entities pay for each aspect of transmission interconnection for RE renewable energy are defined in laws, regulations, or rules	Y
The cost of transmission usage for renewable energy is defined	Y
Transmission pricing for renewable energy is based on a transmission expansion plan	N
Rules exist that define how renewable energy sources will be operated on the power grid	Y
Ability of Power Systems to Integrate Renewable Energy Sources	
Grid code with measures or standards to manage/operate variable renewable energy	Y
Prioritized access to the grid	Y
Clear policies/rules on curtailment	Y
Quality of electricity supply (frequency of outages)	N
Diversity of electricity supply	N
Long-term master plan for the system	Y
Independent regulator	N
Country Llegal Sstability	N
Level of corruption	N
Ease of Siting and Permitting a Renewable Energy Project	
Time and number of procedures to get environmental permits for a renewable project	Y
Time and number of procedures to get land use permits for a renewable project	Y
Time and number of procedures to get resource permits for a renewable project	Y
Time and number of procedures to negotiate an offtake agreement for a renewable project	N
Availability of the national mapping information on renewable energy sources	Y

Y is yes; N is no.

A two-stage screening criteria was sequentially employed to arrive at the first shortlist.

Stage 1. Four principles of objectivity, comparability, action, and context-neutrality were applied to ensure that indicators will be deployable in nearly every country.

An attribute that stood out at this stage was reconciling trends. Various approaches are considered as good practices at different points in time. For instance, in renewable energy development, feed-in-tariffs and reverse auctions have been both promoted at various times by different countries. Therefore, in RISE, efforts have been made to be neutral, and to avoid making any value judgment on the approach the country is taking to promote an outcome.

Stage 2. Three principles of universal data availability, the cost-effectiveness of the data collection, and the existence of a common consensus were then employed.

This first shortlist went through multiple stakeholder consultations that informed the selection of the final suite of indicators. First, both an internal and external advisory group to provide expert advice and quality control was created. Two rounds of internal consultations with World Bank Group technical experts with knowledge of the three Sustainable Energy for All initiative areas were conducted. The experts helped incorporate knowledge from the World Bank Group operations. In parallel, two rounds of consultation over the indicators were also conducted with the external advisory group. Second, this was discussed with representatives of the private sector. Several focus group discussions were held with private sector developers and investors in Washington, DC (all areas), Nepal (energy access), Kenya (renewable energy), and India (energy efficiency). It also benefited from private sector survey- based consultation with more than 150 stakeholder groups in over more than 30 countries in all regions of the world. Third, the indicators were reviewed by the external advisory group that comprises of experts in the space (complete list of experts in Annex VI) who provided their objective feedback and review of the indicators. Consultations with country representatives of the Scaling Up Renewable Energy in Low Income Countries Program (SREP), one of the programs of Climate Investment Funds, also provided valuable feedback.

FINAL SET OF INDICATORS

Cross-cutting

I. Fossil Fuel Subsidy
II. Carbon Pricing Mechanism
- Greenhouse gas emission reduction target
- Existence of carbon pricing mechanism

III. Utility Performance
- Reporting practice
- Financial performance

IV. Carbon Pricing Mechanism
- GHG Greenhouse gas emission reduction target
- Existence of carbon pricing mechanism

V. Retail Price of Electricity
- Average retail price of electricity for residential customers
- Average retail price of electricity for industrial customers

Energy Access

I. Electrification Plan
- National plan
- Coverage of grid and off-grid
- Regular update

II. Enabling Environment for Renewable Energy Developers to Invest in Mini-grids
- Existence of regulation
- Regulation attributes
- Standards
- Protection against expropriation
- Subsidy or duty exemption

III. Enabling Environment for Standalone Home Systems
- National program
- Standards
- Subsidy or duty exemption

IV. Funding Support to Electrification
- Dedicated funding line
- Subsidy to household connection
- Subsidy to grid extension

V. Affordability of Electricity
VI. Utility Performance
- Reporting practice
- Financial performance

VII. Establishing a New Connection
VIII. Permitting a Mini-grid

Renewable Energy

I. Planning for Renewable Energy Expansion
- Renewable energy in expansion planning
- Proactive transmission expansion
- Target with an action plan
- Resource potential data

II. Fossil Fuel Subsidy
III. Carbon Pricing Mechanism
- Greenhouse gas emission reduction target
- Existence of carbon pricing mechanism

IV. Utility Performance
- Reporting practice
- Financial performance

V. Legal Framework for Renewable Energy
VI. Regulatory Policies and Procurement
- Incentives to grid-connected renewable energy
- Incentives to distributed generation renewable energy

VII. Regulatory Policies – Policy Design Attributes
- Predictability
- Sustainability
- Accessibility
- Remuneration efficiency

VIII. Network Connection and Pricing
- Connection cost allocation
- Network usage pricing

IX. Public Financial Support Mechanisms
- Credit enhancement
- Utility payments guarantee
- Fiscal incentives
- Public financing supports

X. Starting a New Renewable Energy Project

Energy Efficiency

I. National Plan for Increasing Energy Efficiency
- National energy efficiency target
- Energy efficiency legislation/action plan
- Sub-sectoral targets

II. Entities for Energy- Efficiency Policy, Regulation, and Implementation
- Setting energy efficiency policy
- Setting energy efficiency standards
- Regulating energy efficiency activities of suppliers
- Regulating energy efficiency activities of consumers
- Equipment standards compliance
- Building standards compliance

III. Quality of Information Provided to Consumers about Electricity Usage
- Reports on electricity usage
- Quality of information in report
- Comparison with other users
- Energy saving information from utilities

IV. Incentives or Mandates for Utilities to Invest in Energy Efficiency
- Mandate for utilities
- Penalties
- Measurement of energy savings
- Third- party validation
- Cost recovery for utilities

V. Incentives or Mandates for Public Entities to Invest in Energy Efficiency
- Obligations for public buildings
- Obligations for other public facilities
- Public procurement of energy efficient products
- Multi-year contracts
- Allowance to retain savings

VI. Incentives or Mandates for Large-scale Users to Invest in Energy Efficiency
- Mandates for large-scale users
- Penalties for non-compliance
- Measurement of savings
- Incentives for large-scale users

VII. Minimum Energy-Efficiency Performance Standards
- Appliance
- Lighting
- Electric motors
- Industrial equipment
- Regular update
- Penalty for non-compliance

VIII. Energy Labeling Systems
- Appliance
- Lighting
- Electric motors
- Industrial equipment

IX. Building Energy Codes
- Residential buildings
- Commercial buildings
- Compliance system
- Renovated buildings
- Building energy information

X. Incentives from Electricity Pricing
- Electricity rate structure
- Charges to large customers

XI. Fossil Fuel Subsidy
XII. Carbon Pricing Mechanism
- Greenhouse gas emission reduction target
- Existence of carbon pricing mechanism

XIII. Retail Price of Electricity
- Average retail price of electricity for residential customers
- Average retail price of electricity for industrial customers

SELECTING THE UNIT OF ANALYSIS FOR DATA COLLECTION

Some policy instruments or regulations are governed not at a national level, but at a municipal level. For example, in the United States, building codes are established and applied by the state government. Since RISE cannot cover all different municipalities in a country yet, one principle is used to resolve this case.

Principle 1. If answers vary by municipality, select the largest business city or the municipality where the largest business city is located.

A list of the largest business cities follows.

Country	Largest business city	Country	Largest business city
Armenia	Yerevan	Chile	Santiago
Denmark	Copenhagen	Ethiopia	Addis Ababa
Honduras	Tegucigalpa	India	Mumbai
Kenya	Nairobi	Liberia	Monrovia
Maldives	Malé	Mali	Bamako
Mongolia	Ulan Bator	Nepal	Kathmandu
Solomon Islands	Honiara	Tanzania	Dar es Salaam
United .States.	New York City	Vanuatu	Port Vila
Yemen, Rep.	Sana'a		

As a result, some indicators for the United States and India were assessed in New York City or State, or and for India in Mumbai or Maharashtra.

For the Utility Performance indicator, if there are is more than one utility company in a country, RISE follows a principle 2 as below.

Principle 2. If there is more than one utility company, select a utility with the largest customer base in the largest business city of the country.

In countries where there are more than one utility, such as the United States, India, Chile, and Denmark among others, one utility was chosen for assessment.

CALCULATING INDICATORS BASED ON RAW DATA

Many of RISE indicators assess policy and regulatory framework based on the survey-type questionnaire. But some of the indicators are quantitatively calculated by authors using various data collected from countries. Here is the list of indicators that have been calculated:

Pillar	Indicator	Sub-indicator
Cross-cutting	Retail Price of Electricity	Residential average price
		Industrial average price
	Fossil Fuel Subsidy	
Energy Access	Affordability of Electricity	
Renewable Energy	Investment Grade Policies	Sustainability – Affordability

Details on how to calculate each of these indicators are as follows:

Cross-cutting—Retail Price of Electricity

Definition: A unit price per kWh at an average consumption level of residential and industrial customers.

Calculation:

Retail price of electricity for residential customers

$$= \frac{\text{(Cost to consume average consumption level per household in the country)}}{\text{(Average consumption level per household in the country)}}$$

Average consumption level

For residential customers, average consumption level per capita is calculated for country groups that the World Bank uses as below:

- East Asia and Pacific
- Europe and Central Asia
- Latin America and the Caribbean
- Middle East and North Africa
- South Asia
- Sub-Saharan Africa
- High-income OECD members
- High-income non-OECD economies

The consumption level is calculated based on the following:

- P: Population (World Development Indicators)
- R: Access to electricity rate (Global Tracking Framework)
- C: Residential electricity consumption (International Energy Agency)
- A: Average household size (household surveys)

Regional average consumption level per capita $= \frac{\Sigma C_i}{\Sigma(P_i x R_i)}$, for all i in the country group.

Then, average consumption level per household is calculated as below:

$$= \text{(Regional average consumption level per capita)} \times A_i$$

Cost to consume average consumption level per household for each country is calculated based on the level calculated above and the tariff schedule for residential customers.

Retail price of electricity for industrial customers

$$= \frac{\text{(Cost to consume 10,000 kWh per month for industrial users in the country)}}{\text{(10,000 kWh)}}$$

For industrial users, the consumption of 10,000 kWh per month is applied across all countries.

Cross-cutting—Fossil Fuel Subsidy

Definition: Percentage of electricity generated by subsidized fossil fuel.

Calculation:

Electricity Fuel Mix

Data on electricity production by fuel type in the year of 2011 is obtained from the International Energy Agency (IEA).

Which type of fossil fuel is subsidized

An International Monetary Fund (IMF) report on "Energy Subsidy Reform: Lessons and Implications" provides data on pre-tax subsidies for petroleum products, natural gas, and coal, in 2011 as percentage of government revenue. Two assumptions are used:

1. If a country has subsidies on petroleum products, natural gas, or coal, there are subsidies on diesel, natural gas, or coal used to generate electricity, respectively.
2. If the percentage indicated in the report is 0.00, the fuel was considered not subsidized.

Combine two different information

P_i: the proportion of electricity production by fuel type (from IEA data),

S_i = if there is subsidy to fuel type , otherwise 0 (from IMF data),

$$\text{(Percentage of electricity generated by subsidized fossil fuel)} = \sum_i (P_i \cdot S_i)$$

Energy Access—Affordability of Electricity

Definition: The relative cost of subsistence consumption (30 kWh/ per month) to GNI gross national income per household.

Calculation:

Calculating the cost of subsistence consumption

Using tariff schedule of the utility, the monthly cost for consuming 30kWh was calculated. All levies and taxes were added. The cost was annualized by simply multiplying 12.

Calculating gross national income per household

Gross national income per capita is obtained from the World Bank Database. Average size of households is found from mainly four different sources:

- OECD Family Database.
- The Demographic and Health Surveys (DHS) Programs.
- Eurostat.
- Country's latest census results if the country is not presented in any of above.

$$\text{(GNI per household)} = \text{(GNI per capita)} \times \text{(Average household size)}$$

Calculating affordability

The ratio of subsistence consumption cost to gross national income per household is calculated:

$$R = \frac{\text{(Annualized cost of subsistence consumption)}}{\text{(GNI per household)}}$$

Affordability is scored:

If R ≤ 5%, score 100;

If R≥10%, score 0;

If 5% < R < 10%, score $\frac{(10\% - R)}{(10\% - 5\%)}$.

Renewable Energy—Investment Grade Policies – Sustainability – Affordability

Definition: Impact of renewable energy subsidy on consumers

Calculation:

The affordability element of the *sustainability sub-indicator* measures the impact of renewable energy subsidies on household income and residential electricity bill.

- This is assessed using the annual generation from renewable energy resources benefitting from subsidies and calculating the overall incremental cost and its impact on both household income and residential electricity bill.
- The incremental cost is defined as the difference between the renewable energy incentive (for example, feed-in tariff) and the average cost of electricity generation.

Step 1. Estimate Total subsidy volume

1. Estimate weighted average cost (AC) of generation mix (present or previous year) excluding the renewable energy technologies/ sources that are subject to the incentive or subsidy (e.g. feed-in tariff (FIT) or other price premium).
2. Compute incremental cost (IC) for each of the renewable energy technologies or sources subject to the incentive or subsidy:

   $IC_{ti} = PI_{ti} - AC$,

   Where:

   IC: incremental cost

   PI: price incentive (such as a FIT, or a premium)[1]

   ti: annual generation technology, *i*.

   AC: Weighted average cost of generation mix

3. Compute total subsidy volume (TSV):

   $TSV = \sum IC_{ti} \times G_{ti}$.

   Where G_{ti}. is total electricity generation from the renewable energy source/technology i

4. Calculate unit subsidy:

$US_{RE} = (TSV/G_{RE})$.

Where:

US_{RE}: Unit subsidy to renewable energy

G_{RE} is the total annual generation of RE technologies subject to incentive or FIT

Step 2. Estimate impact on total residential bill

The impact on residential bill is calculated using the share of the renewable energy incentive (subsidy) paid by residential consumers (assumed to be equal to the share of residential consumption in total electricity consumption), and the annual residential electricity bill.

1. Estimate total residential bill:

TRB= ECR x EPR

Where:

TRB: total residential bill

ECR: Annual electricity consumption residential sector

EPR: Retail electricity price for residential consumers

2. Compute subsidy volume paid by the residential consumer class:

$SV_R = TSV \times [(EC_R)/(TEC)]$.

Where:

SV_R: Subsidy volume transferred to residential bill

TEC: Total electricity consumption

3. Calculate impact on total residential bill (IRB):

IRB= SVR / TRB.

Step 3. Impact on household income

The impact on household income is a function of the renewable energy subsidy burden at the household level (calculated using the consumption of renewable energy per household), and the household income.

4. Estimate share of subsidized renewable energy in total electricity supply (S_{RE})

$S_{RE} = [(T_{SRE}/TES) *100]$

Where:

T_{SRE} : Total Subsidized renewable energy in year i (GWh)
TES: Total electricity supply in year i (GWh)

5. Compute household electricity consumption (EC_{HH}):

$EC_{HH} = EC_R$ / Number of households.

6. Estimate annual renewable energy consumption per household ($EC_{HH\text{-}RE}$):

$EC_{HH\text{-}RE} = EC_{HH} \times S_{RE}$.

7. Calculate renewable energy subsidy burden per household ($RESI_{HH}$):

$RESI_{HH}$: US_{RE}: x $EC_{HH\text{-}RE}$.

Where:

$RESI_{HH}$: Renewable energy subsidy impact per household
US_{RE}: Unit subsidy

8. Calculate gross national income per household (GNI_{HH}):

(GNIHH)= (GNI per capita) * (Average household size)

Where:

Household size: number of people

9. Compute impact of renewable energy subsidy on gross national income per household ($RESI_{GNIHH}$):

$RESI_{GNIHH} = RESI_{HH} / GNI_{HH}$

Source of data

- Retail price of electricity: latest available tariff schedules.
- Cost of electricity:
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ANNEX III

PROPOSAL FOR GLOBAL ROLLOUT

Energy Access

Indicator/Sub-indicator	Question	Change	Details
Planning			
I. Electrification Plan			
National plan	Is there a national electrification plan?	Modify	It is necessary to define "electrification" clearly to ensure it means household use of electricity
Coverage of grid and off-grid	If Yes, does the electrification plan include both grid and off-grid?	Rephrase	The question will be rephrased to check whether the national electrification plan has considered both grid and off-grid options in order to reach every household
Regular update	If yes, was the last update within five years?		
Policies and Regulations			
II. Enabling Environment for RE Developers to Invest in Mini-grids			
Existence of regulations	Are there regulations outlining rights of mini-grid operators?	Modify	- It is necessary to define the term "mini-grid" clearly as it differs by country
		Rephrase	- "Are there regulations explicitly allowing mini-grids to operate and outlining their rights and obligations?"
Regulation attributes	If yes, can mini-grid operators charge tariffs that exceed the national tariff level?	Rephrase	"Do mini-grid operators have legal rights to charge tariffs that exceed the national tariff level?"
	If yes, do mini-grid operators need prior regulatory approval to enter into a power sales contract with consumers?	Rephrase	"Do all mini-grid operators need prior regulatory approval to enter into a power sales contract with businesses and residential consumers and charge tariffs?"
Standards	Are safety, reliability, and voltage and frequency standards for mini-grids made publicly available?		
Protection against expropriation	Is there any general law that deal with expropriation of mini-grids?		
Subsidies or duty exemption	Are there duty exemptions or subsidies for mini-grid renewable energy technology?		
III. Enabling Environment for Standalone Home Systems			
National program	Are there national programs that promote the deployment of standalone home systems (solar photovoltaic systems and lanterns)?		
Standards	Are there minimum quality standards for standalone home systems?		
Subsidies or duty exemption	Are there duty exemptions or subsidies for standalone home systems?		
(New) Enabling environment for grid electrification in peri-urban areas		Add	
Policy framework	Are there any mitigating mechanisms to address illegality of tenure arrangements in urban areas?	Add	As urbanization is envisaged to gain explosive momentum going forward, electrification in peri-urban areas will emerge as a critical issue and will require new approaches by policymakers and service providers. Particularly, policy and regulatory framework needs to be aligned to embrace people who have migrated from rural areas and informally settled in slum areas to provide them with access to electricity. Therefore, an indicator that captures mitigating mechanisms to address illegality of tenure arrangements in urban areas could be considered.
Pricing and Subsidies			
IV. Funding Support to Electrification			
Dedicated funding line	Does the government have a dedicated funding line or budget for electrification (including such as a funded national program, budget item, and rural electrification fund to finance electrification including grid, mini-grid, and standalone home systems)?		
Subsidy to household connection	Does the utility or government cover a portion of the costs for the household connection?		
Subsidy to grid extension	Do capital subsidies exist for utilities to provide distribution lines to villages?		
V. Affordability of Electricity			
Affordability of electricity	What is the relative cost of subsistence consumption as percentage of gross national income per household?		
VI. Utility Performance			
Reporting practice	Are the financial statements of the utility publicly available?		
	If yes, are they audited by an independent third party?		
Financial performance	Current ratio		
	EBITDA margin		
	Debt Service Coverage Ratio		
	Days receivable outstanding		
	Days payable outstanding		

Energy Access (continued)

Indicator/Sub-indicator	Question	Change	Details
Procedural Efficiency			
VII. Establishing a New Connection			
Procedural time	What is the procedural time to establish a new connection? (days)		
Procedural cost	How much is the procedural cost to be paid? ($)		
VIII. Permitting a Mini-grid			
Procedural time	What is the procedural time to permit a mini-grid? (days)		
Procedural cost	How much is the procedural cost to be paid? ($)		
Number of agencies	How many agencies are there to go through?		

Renewable Energy

Indicator/Sub-indicator	Question	Change	Details
Planning			
I. Planning for Renewable Energy expansion			
Renewable energy in expansion planning	Is there a target on renewable energy?	Clarify	Guidance is needed for the consultant to determine what qualifies as an "official target"
	Does the country have a renewable energy action plan to implement the targets?		
Renewable energy in expansion planning	Does your country have an electricity expansion plan that includes renewable energy development?		
Renewable energy in transmission expansion planning	Does the current transmission planning consider renewable energy scale-up?	Clarify	Guidance is needed for the consultant to interpret what qualifies as transmission planning that considers renewable energy scale up.
	Is there an anticipatory planning process or mechanism that allows the least cost expansion of transmission network infrastructure to connect one or more renewable energy plants?	Clarify	Guidance is needed for the consultant to determine what constitutes pro-active planning for least-cost expansion of transmission networks towards renewable energy plants.
Resource potential data	Does the Government publish a high quality validated national atlas on renewable resources potential?	Modify	Attributes that characterize a high quality validated national atlas on renewable resource potential need to be further tailored to each renewable resource type.
	Does the government publish a strategic planning or zoning guidance on existing renewable resources?	Clarify	Guidance is need for the consultant to understand the elements of this question.
	Abundance of renewable energy resources	Add	Renewable energy resource abundance snapshot collected from International Renewable Energy Agency (IRENA) renewable energy country profiles.
Pricing and Subsidies			
II. Fossil Fuel Subsidy			
Fossil fuel subsidy	What is the proportion of electricity generation by subsidized fossil fuel?	Modify	Seek a methodology to capture the volume of fossil fuel subsidy consistently across countries
III. Carbon Pricing Mechanism			
Greenhouse gas emission reduction target	Is there a legally binding greenhouse gas emission reduction target in place?		
Existence of carbon pricing mechanism	Is there any mechanism to price carbon in place? (e.g. carbon tax, auctions, emission trading system)		
IV. Utility Performance			
Reporting practice	Are the financial statements of the utility publicly available?		
	If yes, are they audited by an independent third party?		
Financial performance	Current ratio		
	EBITDA margin		
	Debt Service Coverage Ratio		
	Days receivable outstanding		
	Days payable outstanding		
Policies and Regulations			
V. Legal Framework for Renewable Energy			
Legal framework	Does the country have a legal framework on renewable energy development?	Modify	Based on questionnaire responses it appears necessary to clarify what constitutes a legal framework and specifically noting that regulations and policies are not legal
VI. Regulatory Policies and Procurement			
Incentives to grid-connected renewable energy	Does the country use competitive bidding or auctions to promote renewable energy development?	Clarify	The question needs to specifically mention that the type of promotion of renewable energy that is intended here is that of generation of electricity from renewable sources. This would exclude more general activities that could fall under promotion of renewable energy such as competitive solicitation for contractors to build a wind farm.
	Do price subsidies or premiums exist to support renewable energy generation?		
Incentives for distributed renewable energy generation	Does a net metering program exist?		

Renewable Energy (continued)

Indicator/Sub-indicator	Question	Change	Details
VII. Regulatory Policies – Policy Design Attributes			
Predictability	Do the legal or regulatory frameworks include a formula for price change/adjustment?		
	If yes, is the frequency of allowed renewable energy price level modifications specified in the regulatory framework?		
	If no, is such formula included in standard contractual agreements?		
	If yes, is the frequency of allowed renewable energy price level modifications specified in the contract?		
	Does a renewables purchase obligation exist?		
	Does the design of the auction mechanism or bidding include compliance rules to ensure timely completion and deployment of RE projects?		
Sustainability	Is the renewable energy price subsidy or premium passed through to the consumer tariff?		
	Is the ratio of renewable energy subsidy to total electricity bill less than 2%?		
Accessibility	Is there a prioritized access to the grid for renewable energy?		
	Is there a grid code – or specific operational rules – for managing variable renewable energy?		
	Are there rules defining the sharing of curtailment costs?		
Level and duration of price incentive	To what extent do price and quantity setting regulatory policies lead to offtake prices for electricity produced from renewable energy sources that are sufficient to cover the costs of generation	Add	Feed-in tariffs, feed-in premiums, renewable purchase obligations, and auctions are used to establish incentive (price) levels and terms for electricity generated by renewable resources. In order to stimulate investments, the incentive level and term need to be set such that the benefits they provide exceed incremental costs of renewable electricity generation. This indicator aims to capture this essential component via through a comparison of the remuneration level and the levelized costs of electricity generation.
VIII. Network Connection and Pricing			
Connection cost policy	Is there secondary legislation or regulations for the allocation of connection costs?		
	If yes, what is the cost policy (SS: super-shallow / S: shallow / D: deep)?		
Network usage pricing rule	Are there rules defining who pays for the wheeling charges of transmission and distribution network?		
IX. Public Financial Support Mechanism			
Fiscal incentives	Does the government offer fiscal incentives for renewable energy?	Clarify	Need to distinguish clearly the role of the government in providing such incentives vis-à-vis other organizations.
Public financing	Does the government offer public financial incentives for renewable energy?		
Government backed utility payment	Does the government back utility payments with specific mechanisms?		
Credit enhancement or risk mitigation mechanisms	Does the government offer credit enhancement or risk mitigation mechanisms to renewable energy developers?	Clarify	Need to distinguish clearly the role of the government in providing such incentives vis-à-vis other organizations.
Procedural Efficiency			
X. Starting a New Renewable Energy Project			
Technology	W: wind / S: solar / B: biomass		
Procedural time	What is the procedural time to permit and start operating a new renewable energy project?		
Procedural cost	How much is the procedural cost to be paid? ($)		
Number of agencies	How many agencies are there to go through?		
Technology	Small hydro		
Procedural time	What is the procedural time to permit and start operating a new renewable energy project?		
Procedural cost	How much is the procedural cost to be paid? ($)		
Number of agencies	How many agencies are there to go through?		

Energy Efficiency

Indicator/Sub-indicator	Question	Change	Details
Planning			
I. National Plan for Increasing Energy Efficiency			
National energy- efficiency target	Is there an energy- efficiency target at the national level?	Modify	To capture and credit developments at subnational levels
Energy- efficiency legislation or action plan	Is the national energy- efficiency target supported by legislation and/or an action plan?	Modify	To capture and credit developments at subnational levels
Sub-sectoral target	Does the energy- efficiency plan include supply- side target?	Modify	The relationship among targets given to the utility sector that may be achieved through efficiency measures in end-use sectors subject to their own, separate targets can be considered further.
	Does the energy- efficiency plan include residential target?		
	Does the energy- efficiency plan include commercial target?		
	Does the energy- efficiency plan include industrial target?		
II. Entities for Energy Efficiency Policy, Regulation and Implementation			
Entities for energy-efficiency policy, regulation, and implementation	Are there governmental or independent bodies concerned with the followings?	Modify	To capture and credit developments at subnational levels
	Setting energy efficiency strategy/policy		
	Setting energy efficiency standards		
	Regulating energy efficiency activities of energy suppliers		
	Regulating activities of energy consumers		
	Certifying compliance with equipment energy efficiency standards		
	Certifying compliance with building energy efficiency standards		
Policies and Regulations			
III. Quality of Information Provided to Consumers about Electricity Usage			
Reports on electricity usage	Do consumers receive reports of their electricity usage?	Modify	- To take prepayment services into account in a better way - channels for transmitting and the quality of this information need to be considered
Quality of information in report	At what intervals do they receive these reports (months)?	Modify	- To take prepayment services into account in a better way - channels for transmitting and the quality of this information need to be considered
	Do the reports include price levels?		
	Do customers receive a bill or report that shows their electricity usage over time?		
Comparison with other users	Do customers receive a bill or report which compares them to other users in the same region and/or class?	Modify	- To take prepayment services into account in a better way - channels for transmitting and the quality of this information need to be considered
Energy saving information from utilities	Do utilities provide customers with information on how to use electricity more efficiently, whether through bills or other means?	Modify	Channels for transmitting and the quality of this information need to be considered
IV. Incentives or Mandates for Utilities to Invest in Energy Efficiency			
Mandate for utilities	Are utilities required to carry out energy-efficiency or carbon-reduction activities?		
Penalties	Are there penalties in place for non-compliance with utility energy-efficiency or carbon-reduction mandates?		
Measurement of energy savings	Are energy savings measured to track performance in meeting energy-efficiency or carbon-reduction mandates?		
Third party validation	Are measured energy savings or carbon -reductions validated by an independent third party?		
Cost recovery for utilities	Is there a mechanism for utilities to recover costs associated with or revenue lost from mandated demand-side management activities?		
V. Incentives or Mandates for Public Entities to Invest in Energy Efficiency			
Obligations for public buildings	Are there binding energy savings obligations for public buildings?		
Obligations for other public facilities	Are there binding energy savings obligations for other public facilities (may include water supply, wastewater services, municipal solid waste, street lighting, transportation, and heat supply)?		
Public procurement of energy efficient products	Is there a policy in place for public procurement of energy-efficient products and services at national level?		
	Is there a policy in place for public procurement of energy-efficient products and services at municipal level?		
Multi-year contracts with service providers	Do public entities engage in multi-year contracts with service providers?		
Allowance to retain energy savings	Do public budgeting regulations and practices allow public entities to retain energy savings at national level?		
	Do public budgeting regulations and practices allow public entities to retain energy savings at municipal level?		
VI. Incentives or Mandates for Large-scale Users to Invest in Energy Efficiency			
Mandates for large users	Are there energy-efficiency mandates for large energy users? If yes, which of the following?		
	Targets		
	Mandatory audits		
	Action plans		
	Progress and tracking reports		
	Energy-management system		

Energy Efficiency (continued)

Indicator/Sub-indicator	Question	Change	Details
Penalties	If yes, are there penalties in place for non-compliance with regulatory obligations for energy efficiency?		
Measurement of energy savings	If yes, is there a measurement and verification program in place?		
	If yes, is it carried out by a third party?		
Incentives for industrial consumers	Are energy efficiency incentives in place for industrial customers?		
VII. Minimum Energy Efficiency Performance Standards			
Appliance	Have minimum energy-efficiency (performance) standards been adopted for appliance?	Modify	- Whether they are voluntary or mandatory will be reflected in an improved way - Whether standards provide higher resolution of the rage of performance by measuring the devices covered by standards
Lighting	Have minimum energy-efficiency (performance) standards been adopted for lighting?		
Electric motors	Have minimum energy-efficiency (performance) standards been adopted for electric motors?		
Industrial equipment	Have minimum energy-efficiency (performance) standards been adopted for industrial equipment?		
Regular update of standards	Is there any provision for regular updates to the energy- efficiency standards?		
Penalty for non-compliance	Is there a penalty for non-compliance with energy- efficiency standards?		
VIII. Energy Labeling Systems			
Appliance	Have energy- efficiency labeling schemes been adopted for appliance?	Modify	- Whether they are voluntary or mandatory will be reflected in an improved way - the types of labels used to assess if the labeling provide higher resolution of the rage of performance
Lighting	Have energy- efficiency labeling schemes been adopted for lighting?		
Electric motors	Have energy -efficiency labeling schemes been adopted for electric motors?		
Industrial equipment	Have energy- efficiency labeling schemes been adopted for industrial equipment?		
IX. Building Energy Codes			
Residential buildings	Are there energy codes for residential buildings?	Modify	To capture significant features of such codes that are associated with greater or lesser effectiveness, as has been done in the American Council for an Energy-Efficient Economy's 2014 International Energy Efficiency Scorecard.
	Is there any provision for regular updates to the energy code?		
Commercial buildings	Are there energy codes for commercial buildings?		
	Is there any provision for regular updates to the energy code?		
System to ensure compliance	Is there a system to ensure compliance with building energy codes?		
Codes for renovated buildings	Are renovated buildings required to meet a building energy code in residential sector?		
	Are renovated buildings required to meet a building energy code in commercial sector?		
Building energy information and labeling	Is there a standardized rating or labeling system for the energy performance of existing buildings?		
	Are commercial and residential buildings required to disclose property energy usage at the point of sale or when leased?		
	Are large commercial and residential buildings required to disclose property energy usage annually?		

Pricing and Subsidies

Indicator/Sub-indicator	Question	Change	Details
X. Incentives from Electricity Pricing			
Electricity rate structure	What types of electricity rate structure do the following customers face (F: flat fee per connection / C: constant block rates / D: declining block rates / I: increasing block rates)?		
	Residential customers		
	Industrial customers		
	Commercial customers		
Charges to large customers	Which of the following charges do large electricity customers in the following sector pay (E: Energy (kWh) / D: Demand (kW) / R: Reactive power (kVAr))?		
	Industrial sector		
	Commercial sector		
XI. Fossil Fuel Subsidy			
Fossil fuel subsidy	What is the proportion of electricity generation by subsidized fossil fuel?	Modify	Seek a methodology to capture the volume of fossil fuel subsidy consistently across countries
XII. Carbon Pricing Mechanism			
Greenhouse gas emission reduction target	Is there a legally binding greenhouse gas emission reduction target in place?		
Existence of carbon pricing mechanism	Is there any mechanism to price carbon in place? (e.g. carbon tax, auctions, emission trading system)		

Energy Efficiency

Indicator/Sub-indicator	Question	Change	Details
XIII. Retail Price of Electricity			
Residential	What is the unit price of electricity for average residential consumption? (US$/kWh)	Modify	Seek a methodology to capture a cost-recovery aspect
Industrial	What is the unit price of electricity for industrial consumption of 10,000kWh? (US$/kWh)		
Indicators under consideration to be added			
Transportation Efficiency Measure		Add	
Fuel economy standards		Add	Fuel economy standard for light- and heavy-duty vehicles
Supply-Side Energy Efficiency		Add	
Combined heat and power generation		Add	To capture aspects that are subject to policy and regulatory influence, both utility- and industry-scale
District energy		Add	To capture aspects that are subject to policy and regulatory influence
Agricultural Energy Efficiency		Add	
Water pumping for irrigation		Add	Important to achieving development goals
Other key agricultural activities		Add	Important to achieving development goals
Financing Mechanisms and Allied Capacity Building		Add	
Availability of financing mechanism		Add	To address difficulties attracting financing to energy efficiency projects
Capacity building		Add	To address difficulties attracting financing to energy efficiency projects
Public financing		Add	Particularly important in the initial stage of market creation
Procedural efficiency		Add	
Procedural efficiency		Add	To measure actual efficiency of policy and regulatory framework, as was done for renewable energy and energy access

ANNEX IV

LIST OF PILOT COUNTRIES

Region	Pilot country	World Bank income	Population	GDP per	SE4ALL Indicators (2010 figures)		
					Access to electricity (% of total population)	Renewable energy installed capacity (GW)	Energy intensity level of primary energy (MJ/$ 2005 PPP)
East Asia & Pacific	Mongolia	Lower middle income	2,796484	3160	86.2	0.0	13.75
	Solomon Islands	Lower middle income	549,598	1130	19.2	0.0	3.00
	Vanuatu	Lower middle income	247,262	3080	23.5	0.0	2.72
Europe & Central Asia	Armenia	Lower middle income	2,969,081	3720	99.8	1.2	6.76
	Denmark	High income	5,590,478	59770	100	5.1	4.51
Latin America & the Caribbean	Chile	High income	17,464,814	14280	99.5	6.2	5.20
	Honduras	Lower middle income	7,935,846	2070	80.9	0.6	7.15
Middle East & North Africa	Yemen, Rep.	Lower middle income	23,852,409	1377	44.8	0.0	5.26
North America	United States	High income	313,914,040	50120	100	133.5	7.13
South Asia	India	Lower middle income	1,236,686,732	1530	75	56.3	7.79
	Maldives	Upper middle income	338,442	5750	99.9	0.0	9.31
	Nepal	Low income	27,474,377	700	76.3	0.7	13.23
Sub-Saharan Africa	Ethiopia	Low income	91,728,849	410	23.0	1.9	17.98
	Kenya	Low income	43,178,141	840	19.2	1.0	13.65
	Liberia	Low income	4,190,435	370	4.1	0.0	59.79
	Mali	Low income	14,853,572	660	16.6	0.2	6.62
	Tanzania	Low income	47,783,107	570	14.8	0.6	14.94

ANNEX V

LIST OF EXISTING SUSTAINABLE ENERGY INDEXES

Acronym	Index Name	Organization	Geographic coverage (number of countries)	Thematic coverage				Time dimension
				General	EA	EE	RE	
AFEX	Arab Future Energy Index	Regional Center for Renewable Energy and Energy Efficiency (RCREEE)	Arab (13)			O	O	One-time (2013)
CCI	Climate Competitiveness Index	AccountAbility / UNEP	Global (95)	O				One-time (2010)
CIRI	Climate Investment Readiness Index	World Bank	South Asia (6)			O	O	One-time (2011)
CREF	CREF RE Islands Index	Castalia	Caribbean (22)				O	One-time (2012)
CS	ClimateScope	IDB / Bloomberg	Global (55)		O		O	Regular
EEGF	Energy Efficiency Governance Framework	IEA / EBRD / IDB	Global (77)			O		One-time (2010)
EDI	Energy Development Index	IEA	Global (80)		O			Regular
EGI	Electricity Governance Initiative	World Resources Institute	Selected (8)	O				One-time
ESI	Energy Sustainability Index	World Energy Council	Global (94)	O				Regular
IEES	International Energy Efficiency Scorecard	American Council for an Energy-Efficient Economy (ACEEE)	Global (16)			O		Regular
NEAP	New Energy Architecture Performance	World Economic Forum	Global (105)	O				Regular
PPEO	Poor Peoples Energy Outlook	Practical Action	Selected (3)		O			Regular
RECAI	RE Country Attractiveness Index	Ernst & Young	Global (40)				O	Regular
RES	RE-Shaping	European Commission	EU (27)				O	Regular
SAGCI	Sustainability-adjusted GCI	World Economic Forum	Global (121)					Regular
SEES	State Energy Efficiency Scorecard	American Council for an Energy-Efficient Economy (ACEEE)	United States (1)			O		Regular
RISE	Readiness for Investment in Sustainable Energy	World Bank Group	Global (200+)	O	O	O	O	Regular

EA is energy access; EE is energy efficiency; RE is renewable energy.

ANNEX VI
LIST OF ADVISORY GROUP MEMBERS

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ANNEX VII

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Nikhil Jaisinghani
Mera Gao Power

KENYA

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Gulf Power

Andrew Amadi
EED Energy Limited

Anthony Mbarine
Marine Power Company

Charles Muchunku
Kenya Renewable Energy Association

Eliud Lolo
Mumias Sugar Company

Fred Kaato
DHCL Power

Humphrey Mulindi
Global Sustainable Limited

Jenny Fletcher
Aeolus Kenya

Joseph Simiyu
Genpro Power Systems

Kihara Mungai
Ministry of Energy and Petroleum

Maina Kanyua
Marco Borero Company

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Practical Action

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Energy Regulatory Commission

LIBERIA

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Rural and Renewable Energy Agency

Gregory Sylvestre
Liberia Electricity Corporation

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MALDIVES

Abdul Malik Thaufeeg
State Electric Company (STELCO)

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Plankton Investment Pvt Ltd (Contractor)

Ibrahim Nashid
Renewable Energy Maldives Pvt Ltd

Mohamed Rasheed
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MALI

Ibrahim Togola
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MONGOLIA

Altai Erdenebaatar
Aydiner Global LLC

Baasankhuu Bayasgalanbaatar
Ministry of Energy

Bat-Erdene Enkhmandal
Ministry of Energy

Bat-Erdene Enkhnasan
Energy Development Center

Bayambasuren Munkhzaya
Ulaanbaatar Electricity Distribution Network State Owned Enterprise

Buyan Munkhbayar
Ministry of Construction and Urban Development

Chadraa Batbayar
Ministry of Energy

Dorj Purevsuren
World Bank Group Consultant

Enkhmend Myagmardorj
Qleantech LLC /Mongolian Wind Energy Association/

Jambaljamts Osgonbaatar
Ulaanbaatar Electricity Distribution Network State Owned Enterprise

Jargal Dorjpurev
EEC LLC

Myagmar Gansukh
Ministry of Energy

Myagmarsuren Mungunbileg
Energy Development Center

Nayanbuu Purevdagva
Clean Energy LLC

Ovgor Bavuudorj
National Renewable Energy Center

NEPAL

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Bhoj Raj Bhattarai
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Bir Bahadur Ghale
Hydro Energy Concern Pvt. Ltd.

Govinda Raj Pokharel
Alternative Energy Promotion Center

Jay Raj Bhandari
Nepal Electricity Authority

Kiran Gautam
Water and energy commission Secretariat

Krishna Bahadur Khadka
Nepal Electricity Authority

Kuber Mani Nepal
Ridi Hydropower Corporation Limited

Nawa Raj Dhakal
Alternative Energy Promotion Center

Raju Maharjan
Ministry of Energy

Ram Chandra Pandey
Nepal Electricity Authority

Ram Hari Bohara
Nepal Electricity Authority

Ram Prasad Dhital
Alternative Energy Promotion Center

Sangita Karki
Nepal Electricity Authority

Suresh Shrestha
Water and energy commission Secretariat

om Lal Subedi
Nepal Electricity Authority

SOLOMON ISLANDS

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Solomon Islands Electricity Authority

David Siriu
Solomon Islands Electricity Authority

Doris Riatako
Solomon Islands Electricity Authority

Jan Sanga
Solomon Islands Electricity Authority

John Gorosi
World Bank Group Consultant

John Korinihona
Ministry of Mines Energy and Rural Electrification

TANZANIA

Amini Kimaro
Africa Power Investment Ltd

Arthur Karomba
Windpower Serengeti -Mpanda

Ayubu Lwilla
Ujangala Mini Hydro Project

Bahati Didace
Didace & Co Advocate

Bashir Ngela
Kitanda Electic cooperatives

Batalia Hargava
NextGenSolawazi -Kigoma

Bengiel Msofe
Rural Energy Agency (REA)

Charity Nyava
Imilinyi Cooperative Society

Elikana Kitahenga

Tandala Diaconical Centre

Erick Rugabera
Ministry Of Energy and Minerals

Francis Songela
Mapembasi Hyropower Project

Gilman Kasiga
EA Power Limited

Justina Uisso
Rural Energy Agency (REA)

Mzumbe Musa
World Bank Group Consultant

N'ganzi Kiboko
Energy and Water Utilities Regulatory Authority (EWURA)

Sophia Mgonja
Tanzania Electricity Supply Company (TANESCO)

UNITED STATES

Ann Miles
Federal Energy Regulatory Commission

Donna Heimiller
National Renewable Energy Laboratory

Fayeann Lawrence
OnForce Solar

Joseph Paolini
OnForce Solar

Joshua Samuel Finn
World Bank Group Consultant

Michael Pagonis
Empower Solar

Peyton Boswell
EnterSolar

VANUATU

Timothy Hewatt
World Bank Group Consultant

YEMEN

Abdo Almakaleh
Sana'a University

Abdulaziz Noman
Public Electricity Corporation

Ahmed Zabarah
Technical Supplies Center Ltd.

Ali Alashwal
Sana'a University

Ali Alramsi
Ministry of Trade and Industry

Hussien Al-Gunaid
Ministry of Water and Environment

Ibrahim Alkadhi
Sheba Center for Stratygic Studies

Mohammed Omar
Watani Taeck Company

Muhammed Ali Muqbel
Aden University

Omar Asakaf
Sana'a University

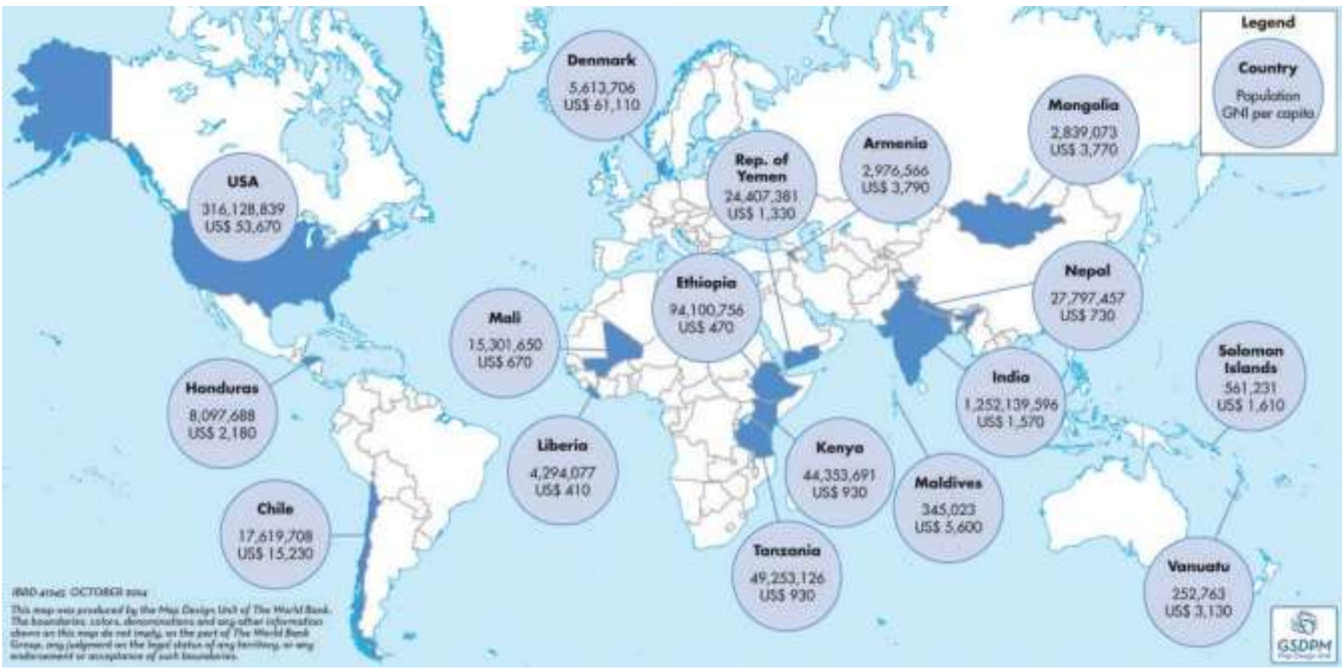
Salem Mohammed Bin Qadhi
World Bank Group Consultant

Taha Alkohlani
Geological Survey Authority

Towfick Sufian
Sana'a University

ANNEX vIII

CouNtRy SPotlight



ARMENIA

Region: Europe & Central Asia **Income:** Lower Middle **Category Population:** 2,976,566 **GNI per capita:** US$ 3,790

SEA4All Global tracking framework (GTF) Outcomes

GTF Indicators	Armenia	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	99.8 (0.3) 0.0 (-16.0)	99.8 (0.1) 0.2 (-15.9)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	1.16 — 39.5 (5.0)	4.64 (11.8) 37.4 (2.0)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector –Industrial sector –Other sectors	6.8 (-7.3) 0.2 2.6 8.9	10.3 (-4.7) 2.6 9.7 8.1	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

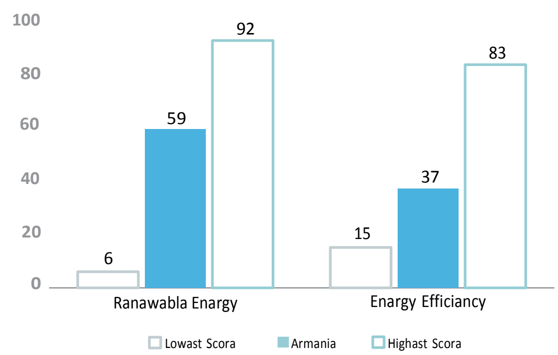
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

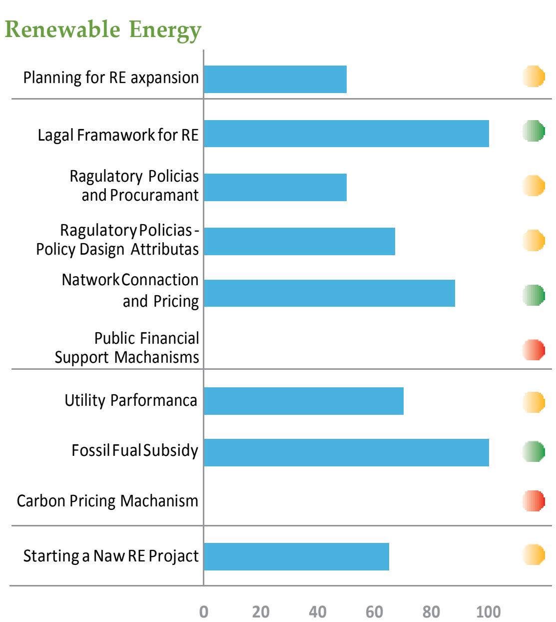
	Energy Access	Renewable Energy	Energy Efficiency
Planning	–	●	●
Policies and Regulations	–	●	●
Pricing and Subsidies	–	●	●
Procedural Efficiency	–	●	–
Total	–	●	●

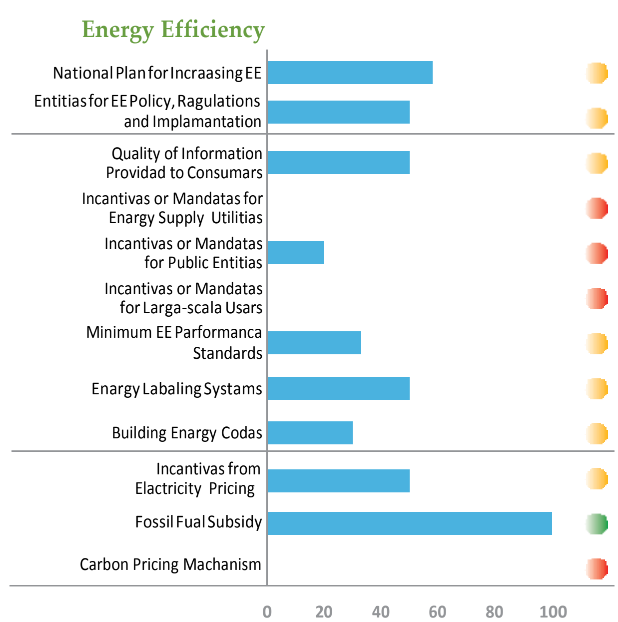
– means that there is no indicator in the category or this country is not assessed for energy access

2. Comparison with other countries by pillar



3. RISE Indicator Scores





CHILE

Region: Latin America & the Caribbean **Income:** High **Category Population:** 17,619,708 **GNI per capita:** US$ 15,230

SEA4All Global tracking framework (GTF) Outcomes

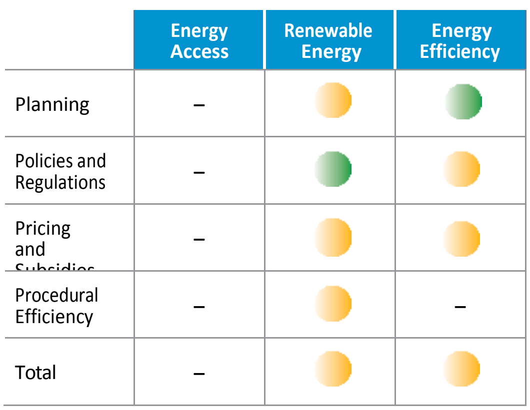
GTF Indicators	Chile	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	99.6 (0.3) 0.1 (-11)	88.8 (0.4) 30 (-2.6)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	6.2 (4.2) 40.2 (-1.4)	5.7 (2.7) 36.5 (-1.9)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector –Industrial sector –Other sectors	5.2 (-1.0) 1.3 5.6 4.0	5.9 (-0.5) 2.6 5.1 5.4	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

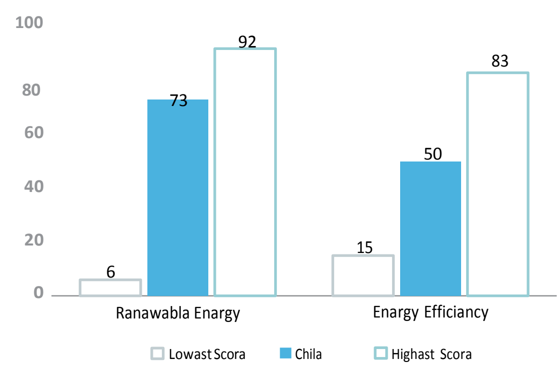
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

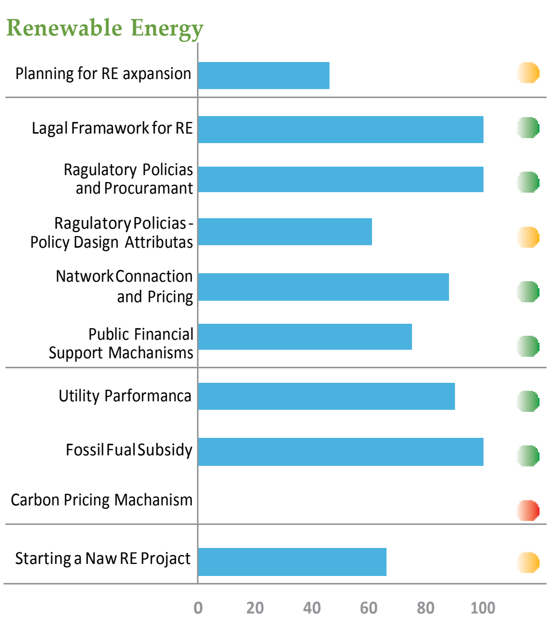


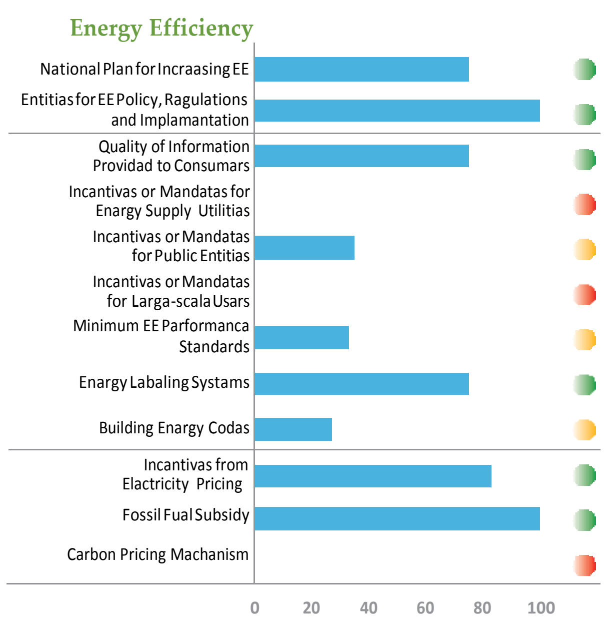
– means that there is no indicator in the category or this country is not assessed for energy access

2. Comparison with other countries by pillar



3. RISE Indicator Scores



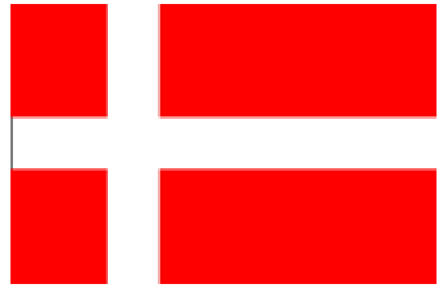


DENMARK

Region: Europe (OECD) **Income:** High **Category Population:** 5,613,706 **GNI per capita:** US$ 61,110

SEA4All Global tracking framework (GTF) Outcomes

GTF Indicators	Denmark	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	100(0.3) (0.0) 0 (0.0)	88.8 (0.4) 30 (-2.6)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	5.1 (13.4) 32.1 (12.3)	5.7 (2.7) 36.5 (-1.9)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector –Industrial sector –Other sectors	4.5 (1.0) 13.9 4.4 4.2	5.9 (-0.5) 2.6 5.1 5.4	7.9 (-1.3) 2.1 6.8 5.5



a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

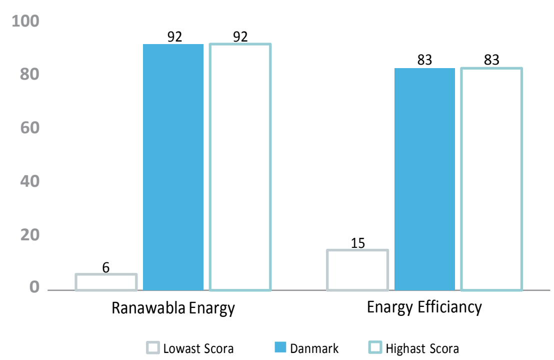
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

	Energy Access	Renewable Energy	Energy Efficiency
Planning	–		
Policies and Regulations	–		
Pricing and Subsidies	–		
Procedural Efficiency	–		–
Total	–		

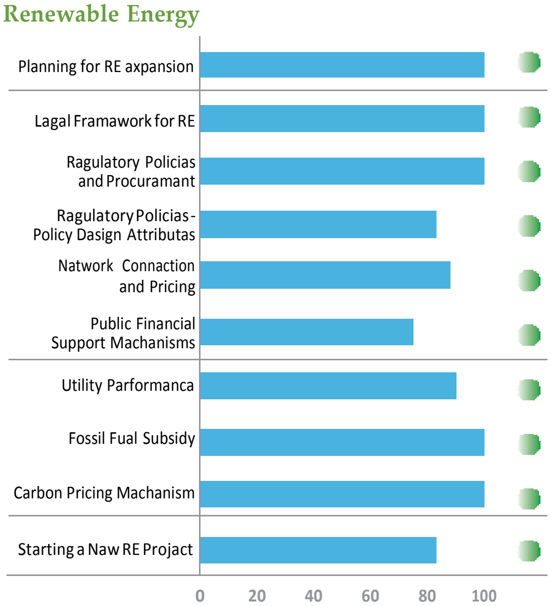
– means that there is no indicator in the category or this country is not assessed for energy access

2. Comparison with other countries by pillar

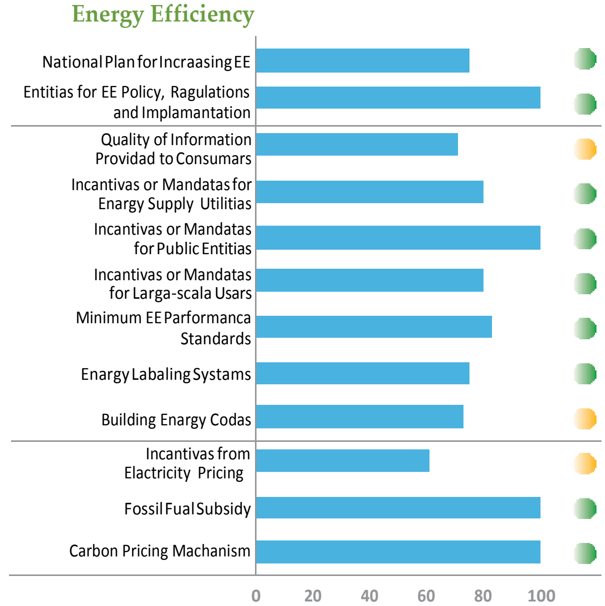


3. RISE Indicator Scores

Renewable Energy



Energy Efficiency



a. Compounded annual growth rate from 1990 to 2010

ETHIOPIA

Region: Sub-Saharan Africa **Income:** Low **Category Population:** 94,100,756 **GNI per capita:** US$ 470

SEA4All Global tracking framework (GTF) Outcomes

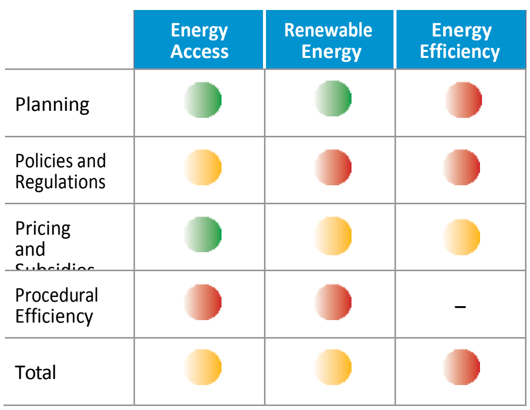
GTF Indicators	Ethiopia	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	23.0 (4.3) 63.9 (1.9)	31.8 (1.7) 589.4 (1.9)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	1.9 (8.0) 99.4 (0.6)	20.4 (1.2) 22.7 (0.7)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector – Industrial sector – Other sectors	18.0 (-1.4) 0.1 2.7 37.1	12.4 (-1.1) 0.5 5.2 17.4	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

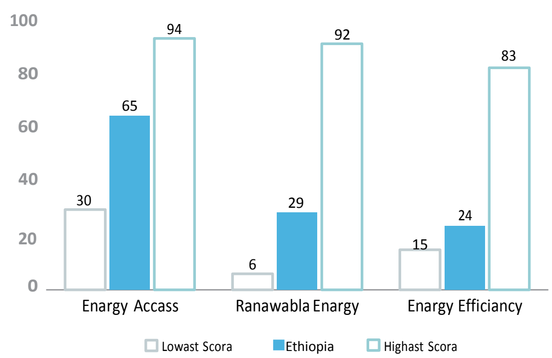
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

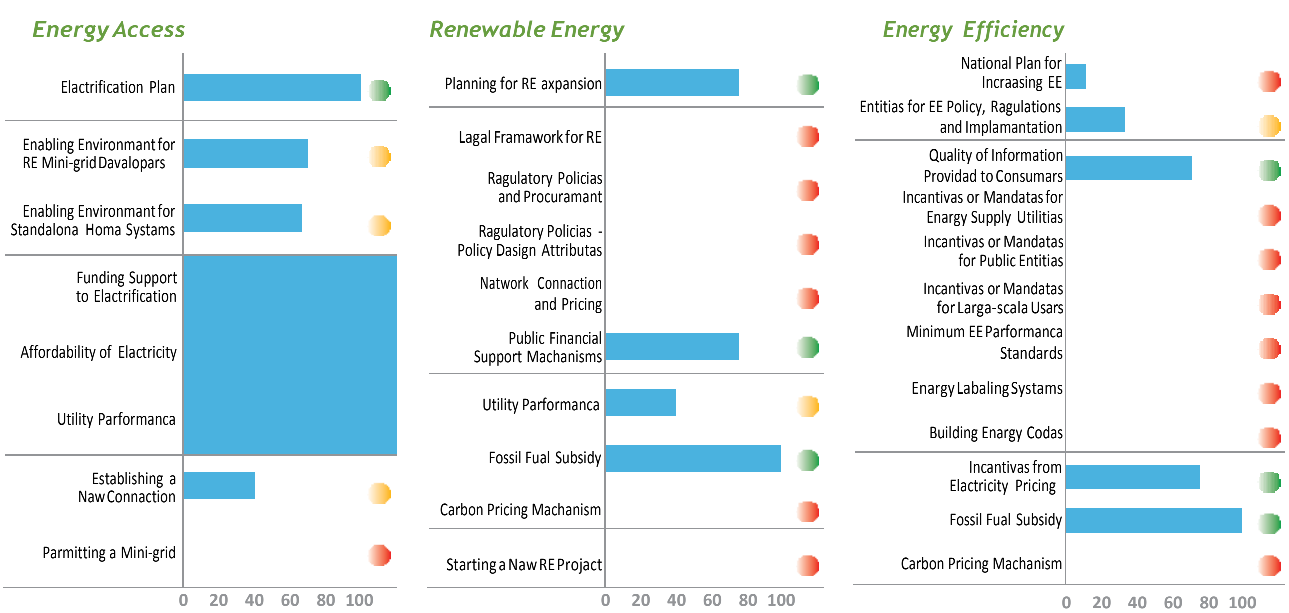


– means that there is no indicator in the category

2. Comparison with other countries by pillar



3. RISE Indicator Scores



HONDURAS

Region: Latin America & the Caribbean **Income:** Lower Middle **Category Population:** 8,097,688 **GNI per capita:** US$ 2,180

SEA4All Global tracking framework (GTF) Outcomes

GTF Indicators	Honduras	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	81.0 (0.4) 1.4 (0.8)	88.8 (0.4) 30 (-2.6)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	0.6 (1.9) 46.1 (-3.7)	5.7 (2.7) 36.5 (-1.9)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector –Industrial sector –Other sectors	7.2 (-0.3) — 3.8 8.3	5.9 (-0.5) 2.6 5.1 5.4	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

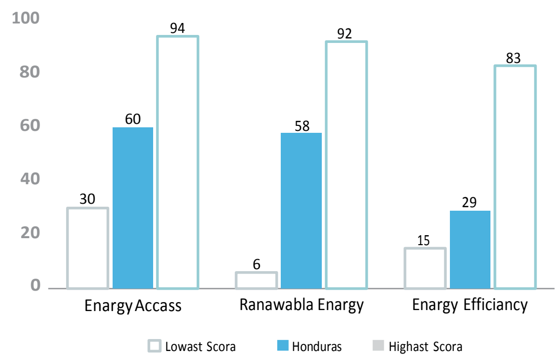
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

	Energy Access	Renewable Energy	Energy Efficiency
Planning			
Policies and Regulations			
Pricing and Subsidies			
Procedural Efficiency			–
Total			

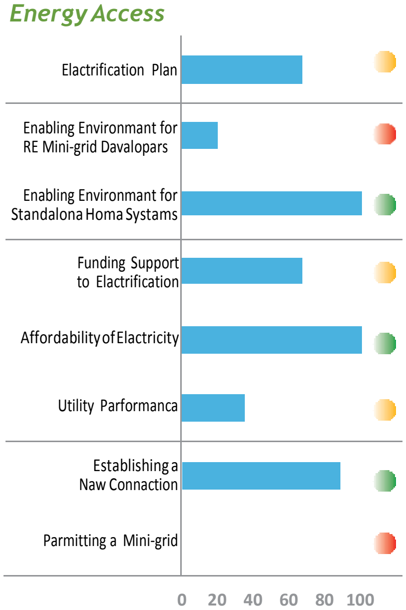
– means that there is no indicator in the category

2. Comparison with other countries by pillar

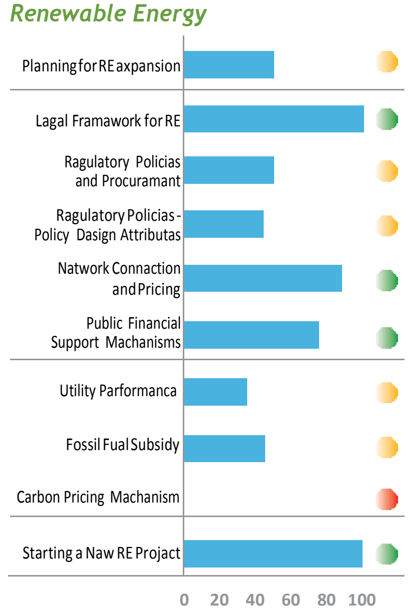


3. RISE Indicator Scores

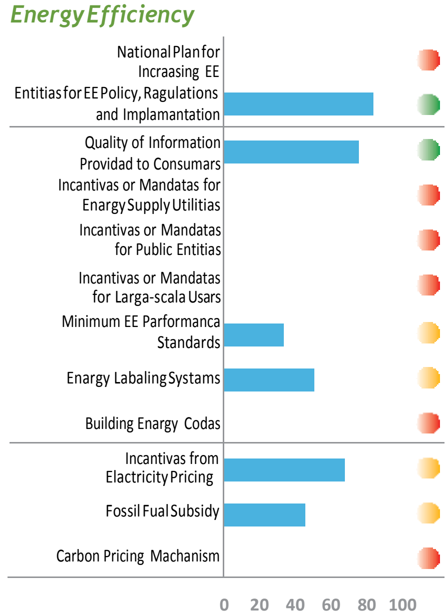
Energy Access



Renewable Energy



Energy Efficiency



INDIA

Region: South Asia **Income:** Lower Middle **Category Population:** 1,252,139,596 **GNI per capita:** US$ 1,570

SEA4All Global tracking framework (GTF) Outcomes

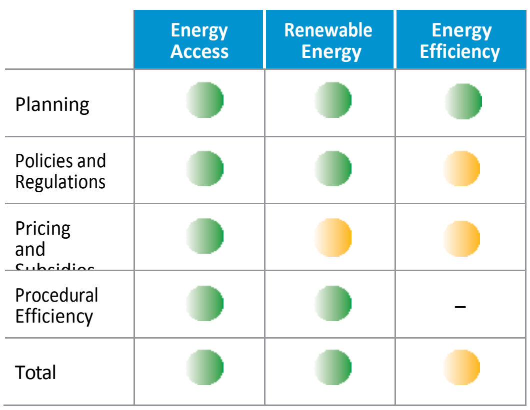
GTF Indicators	India	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	75.0 (2.0) 306.2 (-1.7)	74.5 (1.1) 416.7 (-1.6)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	56.3 (5.6) 14.2 (-2.7)	8.4 (5.3) 25.5 (-3.9)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector – Industrial sector – Other sectors	7.8 (-2.4) 1.1 7.8 5.2	8.5 (-2.2) 0.7 4.9 10.6	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

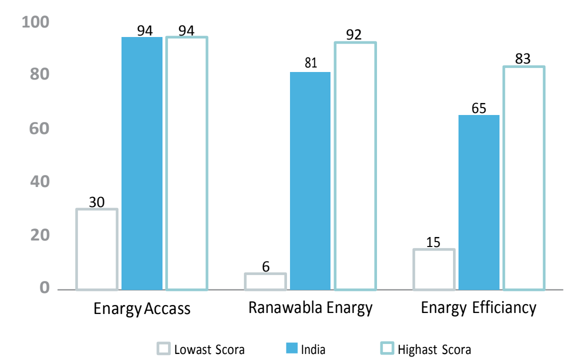
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

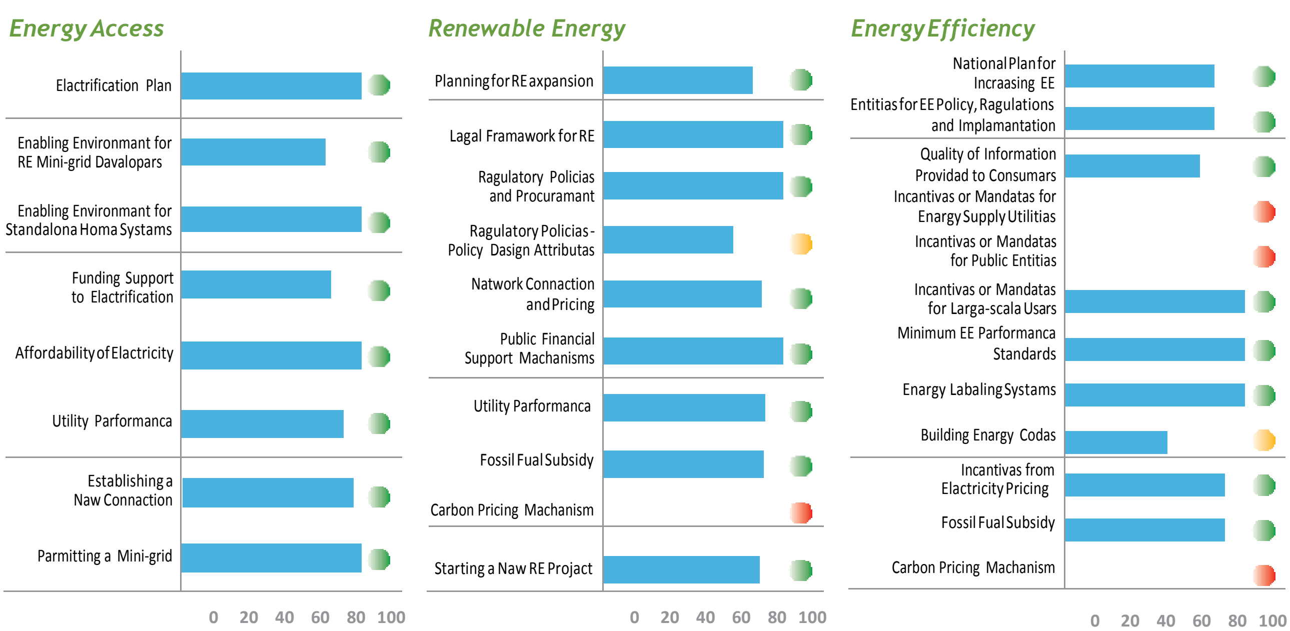


– means that there is no indicator in the category

2. Comparison with other countries by pillar



3. RISE Indicator Scores



KENYA

Region: Sub-Saharan Africa **Income:** Lower Middle **Category Population:** 2,976,566 **GNI per capita:** US$ 3,790

SEA4All Global tracking framework (GTF) Outcomes

GTF Indicators	Kenya	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	19.2 (2.9) 31.2 (2.0)	31.8 (1.7) 589.4 (1.9)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	1.0 (2.1) 69.5 (-1.4)	20.4 (1.2) 22.7 (0.7)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector –Industrial sector –Other sectors	13.6 (0.1) 0.3 4.2 16.0	12.4 (-1.1) 0.5 5.2 17.4	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

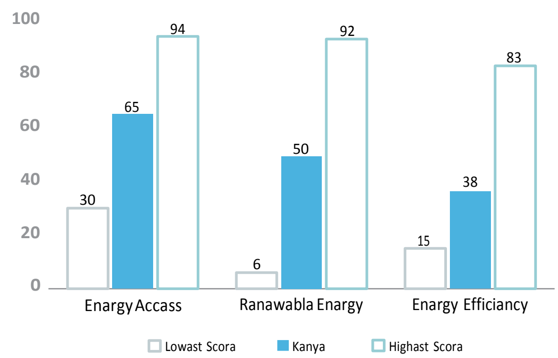
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

	Energy Access	Renewable Energy	Energy Efficiency
Planning			
Policies and Regulations			
Pricing and Subsidies			
Procedural Efficiency			–
Total			

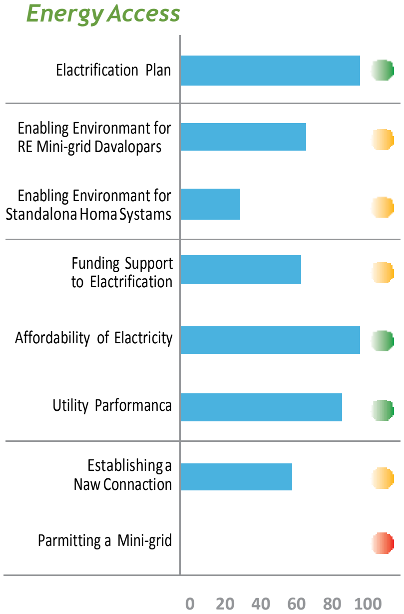
– means that there is no indicator in the category

2. Comparison with other countries by pillar

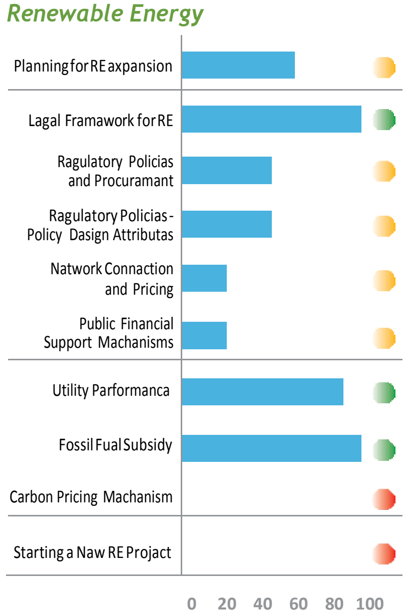


3. RISE Indicator Scores

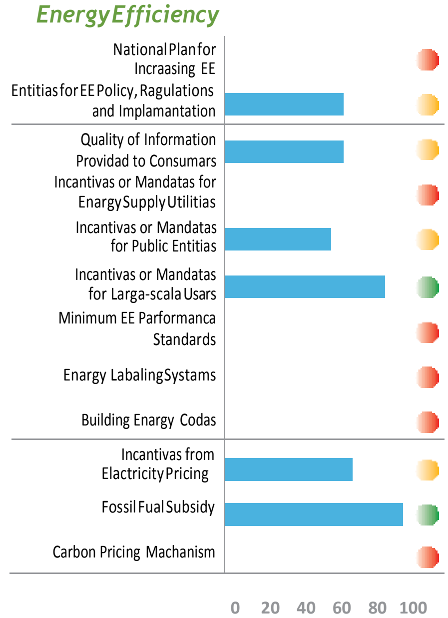
Energy Access



Renewable Energy



Energy Efficiency



LIBERIA

Region: Sub-Saharan Africa **Income:** Low **Category Population:** 4,294,077 **GNI per capita:** US$ 410

SEA4All Global tracking framework (GTF) Outcomes

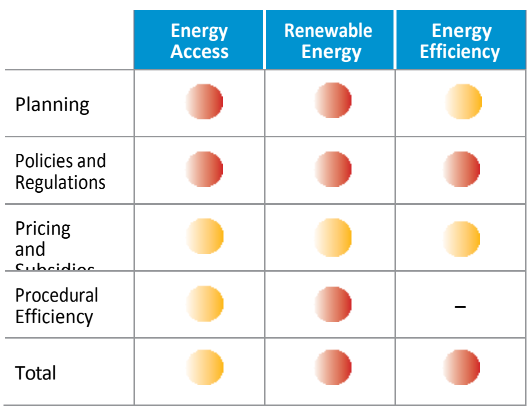
GTF Indicators	Liberia	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	4.1 (20.4) 3.8 (3.0)	31.8 (1.7) 589.4 (1.9)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	0.0 (—) 0.0 (-100.0)	20.4 (1.2) 22.7 (0.7)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector – Industrial sector – Other sectors	— (—) — — —	12.4 (-1.1) 0.5 5.2 17.4	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

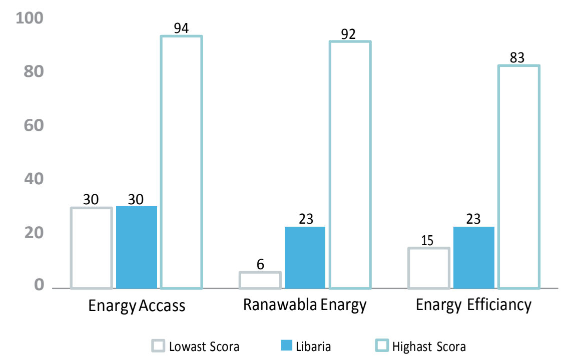
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

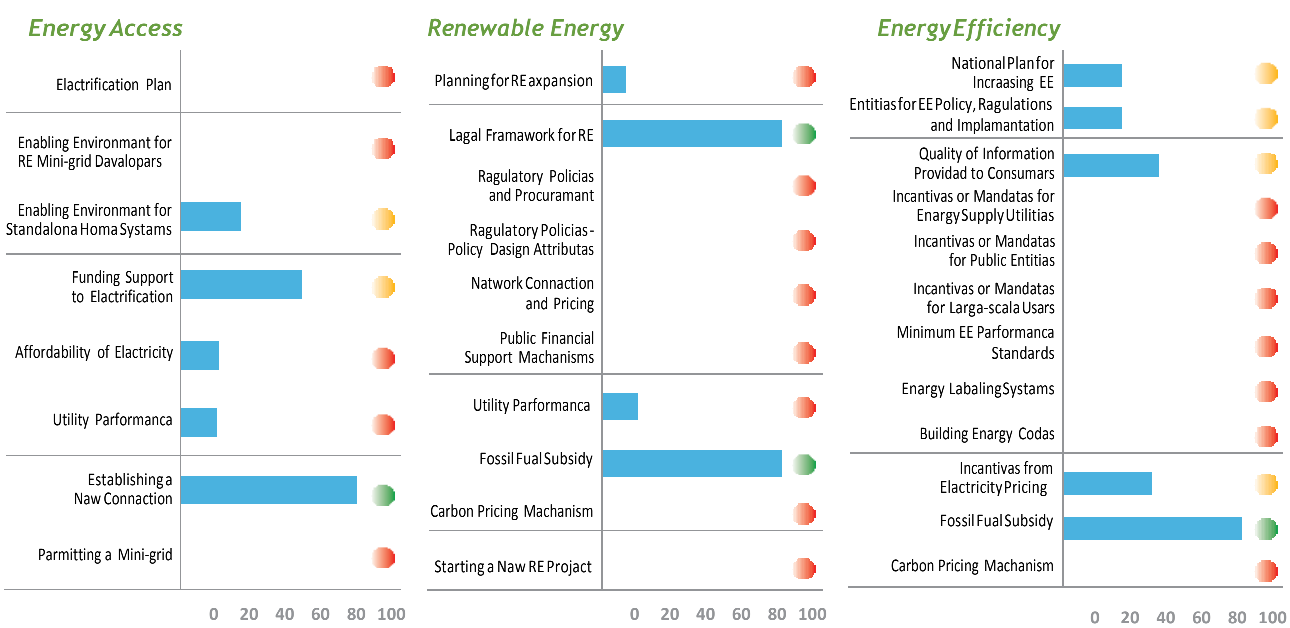


– means that there is no indicator in the category

2. Comparison with other countries by pillar



3. RISE Indicator Scores

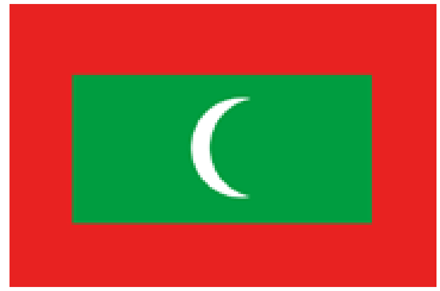


MALDIVES

Region: South Asia **Income:** Upper Middle **Category Population:** 345,023 **GNI per capita:** US$5,600

SEA4All Global tracking framework (GTF) Outcomes

GTF Indicators	Maldives	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	100 (0.3) 0.0 (17.3)	74.5 (1.1) 416.7 (-1.6)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	0.002 – – –	8.4 (5.3) 25.5 (-3.9)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector – Industrial sector – Other sectors	9.3 (6.4) – – –	8.5 (-2.2) 0.7 4.9 10.6	7.9 (-1.3) 2.1 6.8 5.5

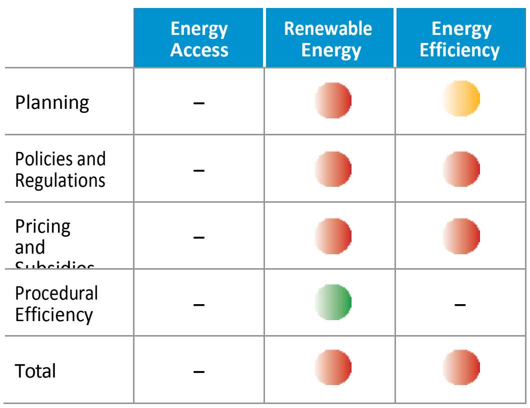


a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

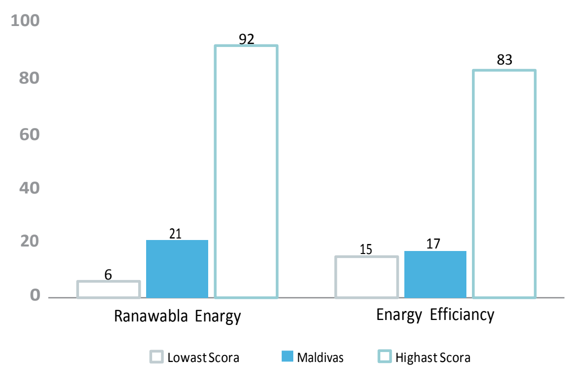
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

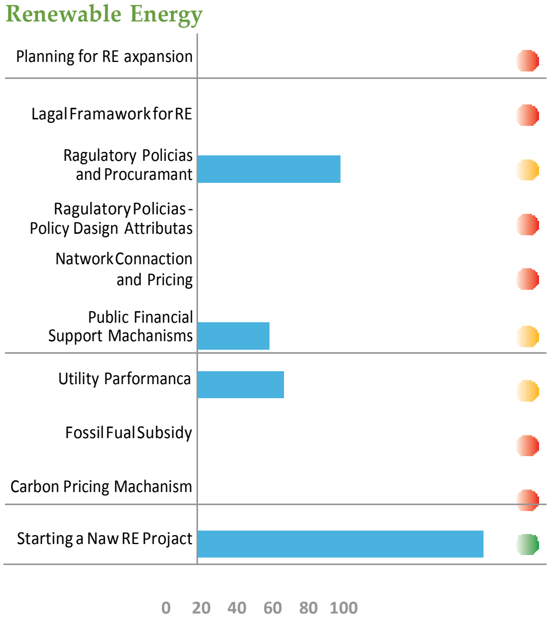


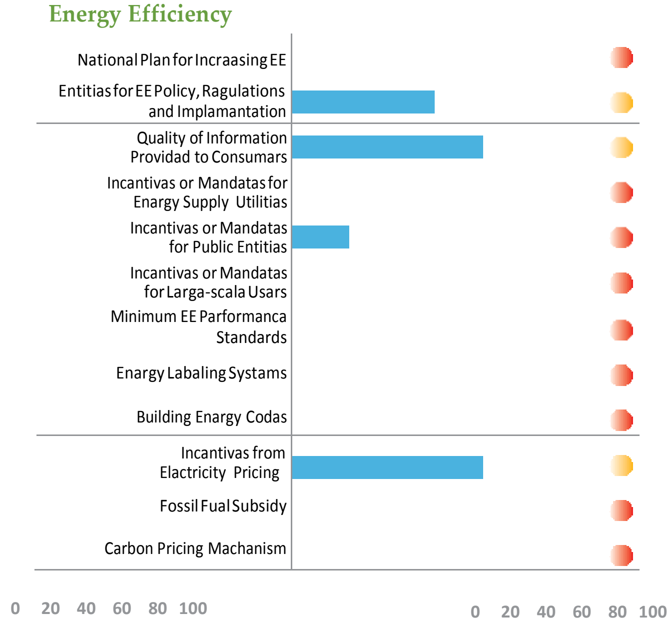
– means that there is no indicator in the category or this country is not assessed for energy access

2. Comparison with other countries by pillar



3. RISE Indicator Scores





MALI

Region: Sub-Saharan Africa **Income:** Low **Category Population:** 15,301,650 **GNI per capita:** US$ 670

SEA4All Global tracking framework (GTF) Outcomes

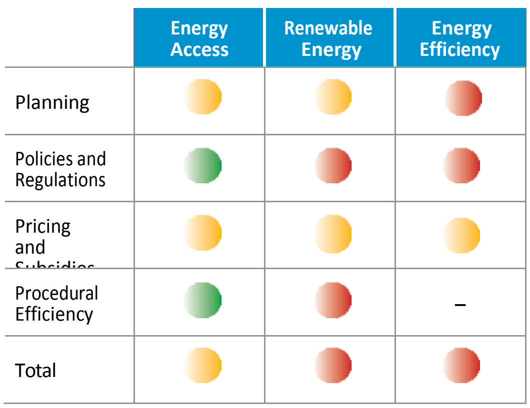
GTF Indicators	Mali	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	27.0 (1.6) 10.8 (2.6)	31.8 (1.7) 589.4 (1.9)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	0.3 (6.4) 45 —	20.4 (1.2) 22.7 (0.7)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector –Industrial sector –Other sectors	6.6 (2.3) — — —	12.4 (-1.1) 0.5 5.2 17.4	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

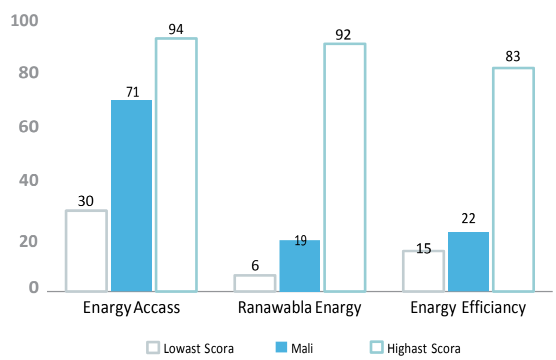
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

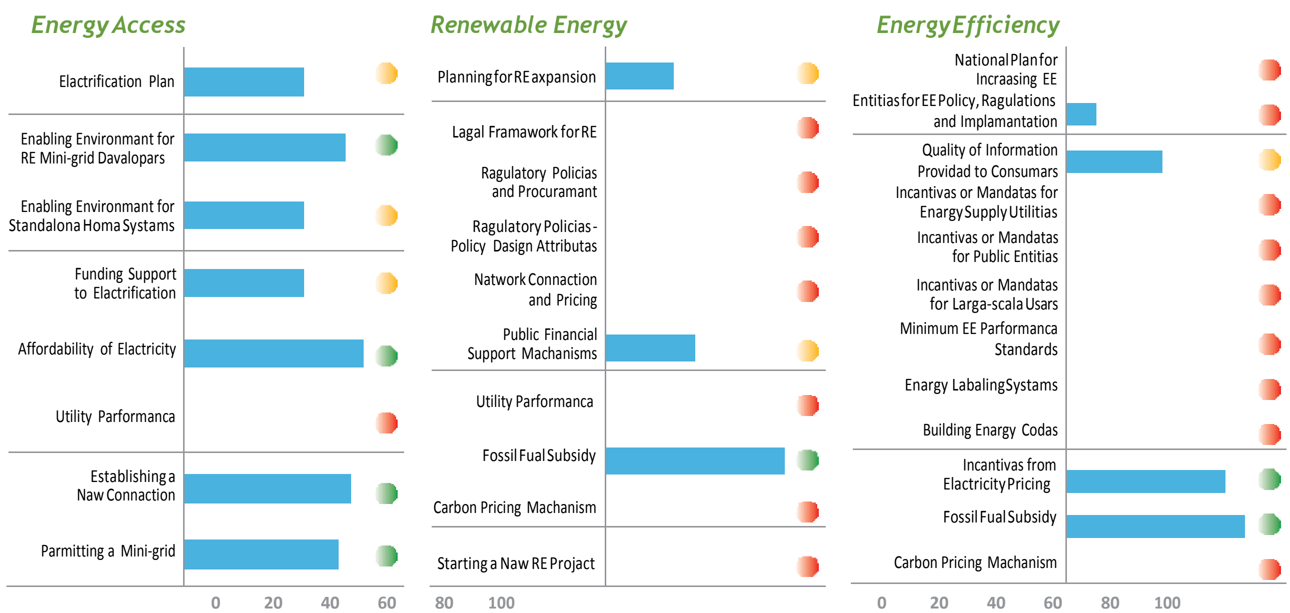


– means that there is no indicator in the category

2. Comparison with other countries by pillar



3. RISE Indicator Scores



MONGOLIA

Region: East Asia & Pacific **Income:** Low Middle **Category Population:** 2,839,073 **GNI per capita:** US$ 3,770

SEA4All Global tracking framework (GTF) Outcomes

GTF Indicators	Mongolia	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	86.2 (0.4) 0.4 (-0.8)	65.6 (0.8) 102.5 (-3.6)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	0 — 0 —	15.3 (8.7) 12.4 (-3.9)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector – Industrial sector – Other sectors	13.7 (-3.3) 1.6 13.4 13.5	7.3 (-1.6) 1.2 6.7 10.3	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

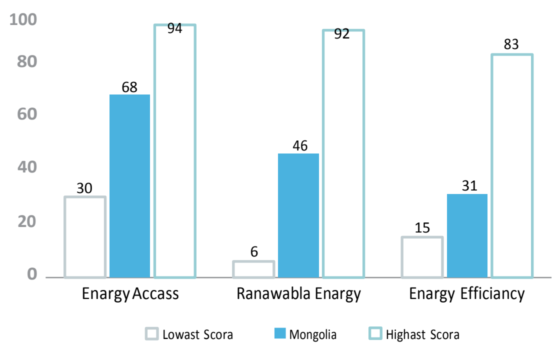
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

	Energy Access	Renewable Energy	Energy Efficiency
Planning			
Policies and Regulations			
Pricing and Subsidies			
Procedural Efficiency			–
Total			

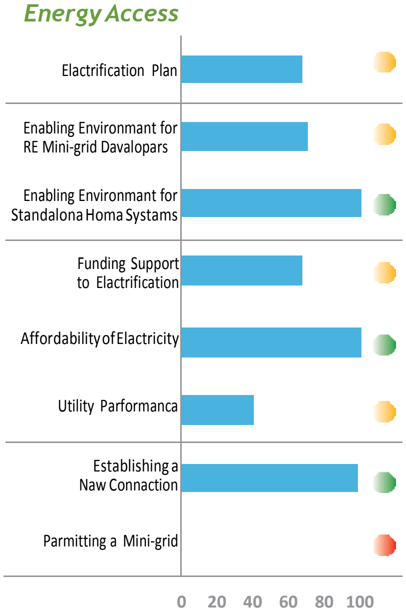
– means that there is no indicator in the category

2. Comparison with other countries by pillar

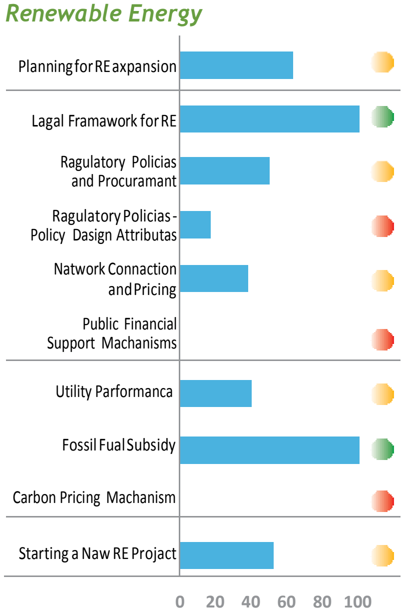


3. RISE Indicator Scores

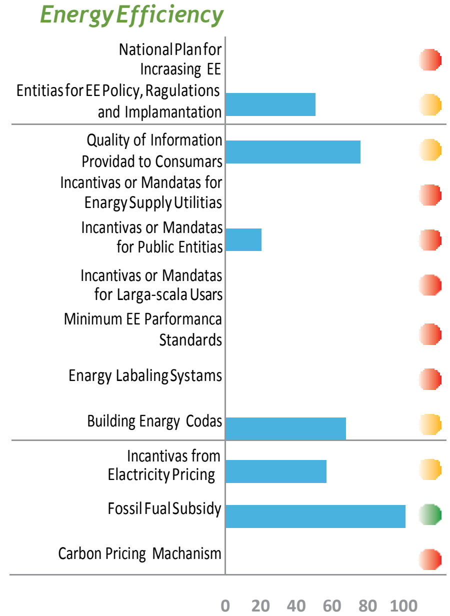
Energy Access



Renewable Energy



Energy Efficiency



NEPAL

Region: South Asia **Income:** Lower **Category Population:** 27,797,457 **GNI per capita:** US$ 730

SEA4All Global tracking framework (GTF) Outcomes

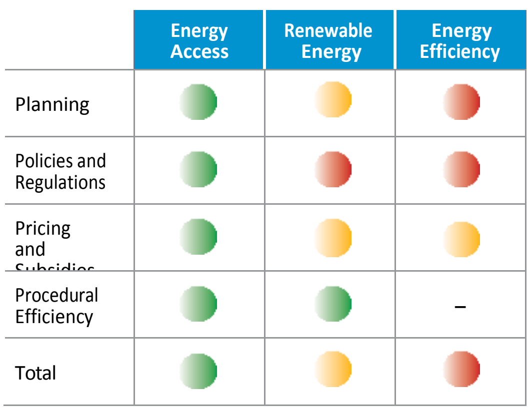
GTF Indicators	Nepal	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	76.3 (0.4) 7.1 (1.1)	74.5 (1.1) 416.7 (-1.6)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	0.7 (5.4) 99.9 (0.0)	8.4 (5.3) 25.5 (-3.9)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector – Industrial sector – Other sectors	13.2 (-1.5) 0.5 3.2 27.4	8.5 (-2.2) 0.7 4.9 10.6	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

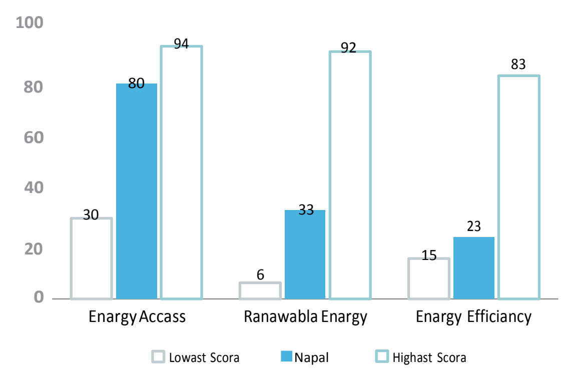
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25



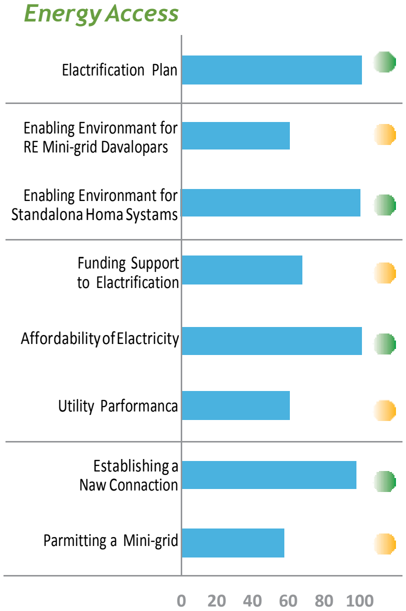
– means that there is no indicator in the category

2. Comparison with other countries by pillar

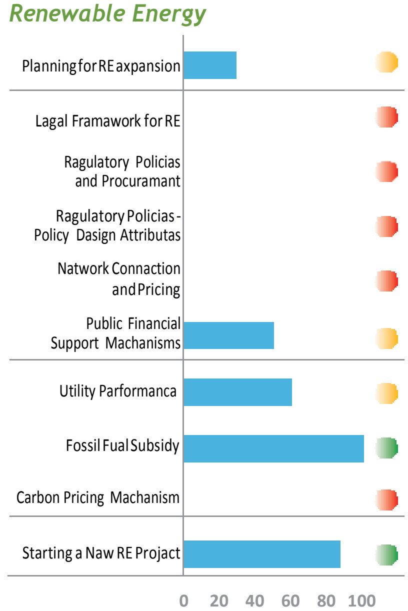


3. RISE Indicator Scores

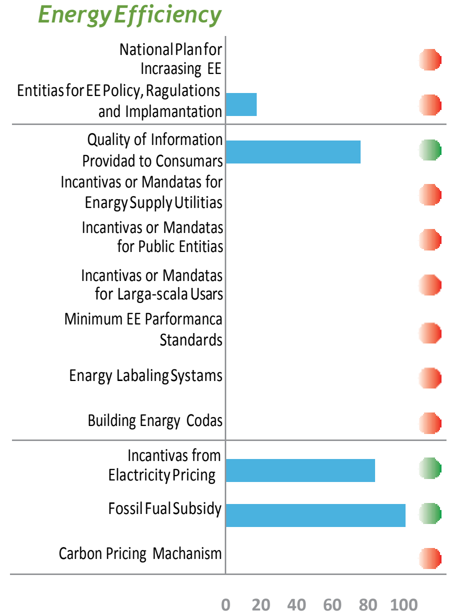
Energy Access



Renewable Energy



Energy Efficiency



SOLOMON ISLANDS

Region: East Asia & Pacific **Income:** Lower Middle **Category Population:** 561,231 **GNI per capita:** US$ 1,610

SEA4All Global tracking framework (GTF) Outcomes

GTF Indicators	Solomon Islands	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	19.2 (2.0) 0.4 (2.4)	65.6 (0.8) 102.5 (-3.6)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	– – – –	15.3 (8.7) 12.4 (-3.9)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector – Industrial sector – Other sectors	6.8 (-7.3) 0.2 2.6 8.9	7.3 (-1.6) 1.2 6.7 10.3	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010

— is not available

Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

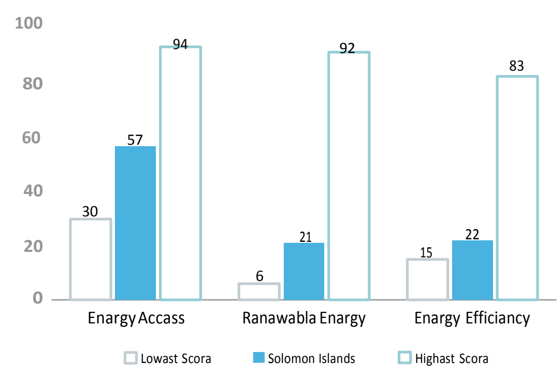
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

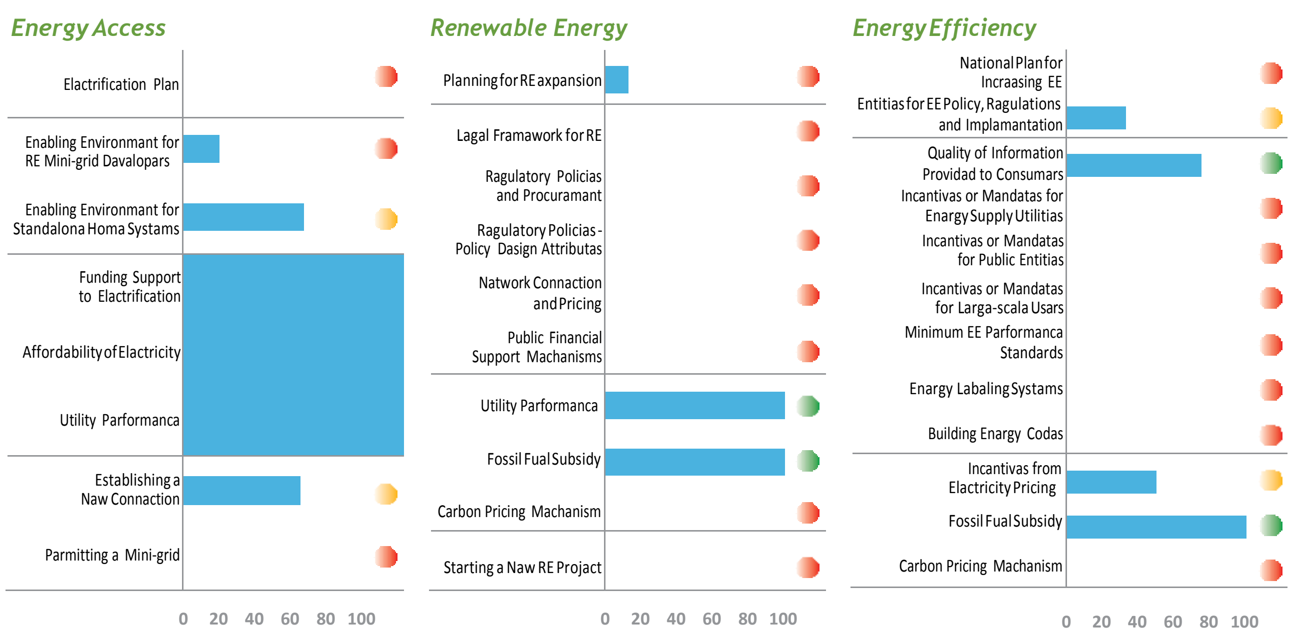
	Energy Access	Renewable Energy	Energy Efficiency
Planning			
Policies and Regulations			
Pricing and Subsidies			
Procedural Efficiency			–
Total			

– means that there is no indicator in the category

2. Comparison with other countries by pillar



3. RISE Indicator Scores



TANZANIA

Region: Sub-Saharan Africa **Income:** Low **Category Population:** 49,253,126 **GNI per capita:** US$ 630

SEA4All Global tracking framework (GTF) Outcomes

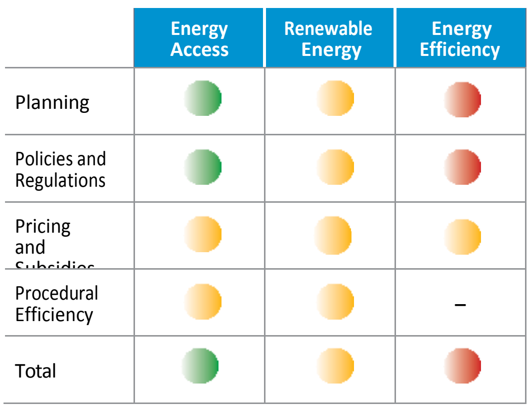
GTF Indicators	Tanzania	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	14.8 (4.0) 38.2 (2.4)	31.8 (1.7) 589.4 (1.9)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	0.6 (2.7) 58.0 (-2.4)	20.4 (1.2) 22.7 (0.7)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector – Industrial sector – Other sectors	14.9 (-1.2) 2.2 8.4 23.2	12.4 (-1.1) 0.5 5.2 17.4	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

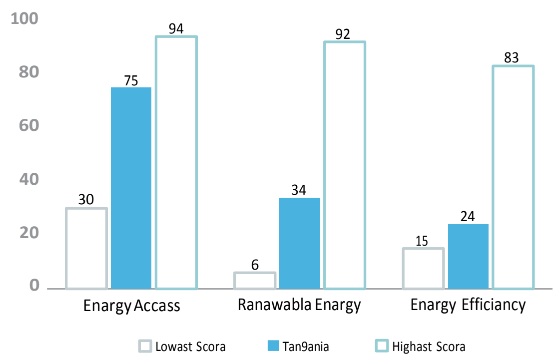
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

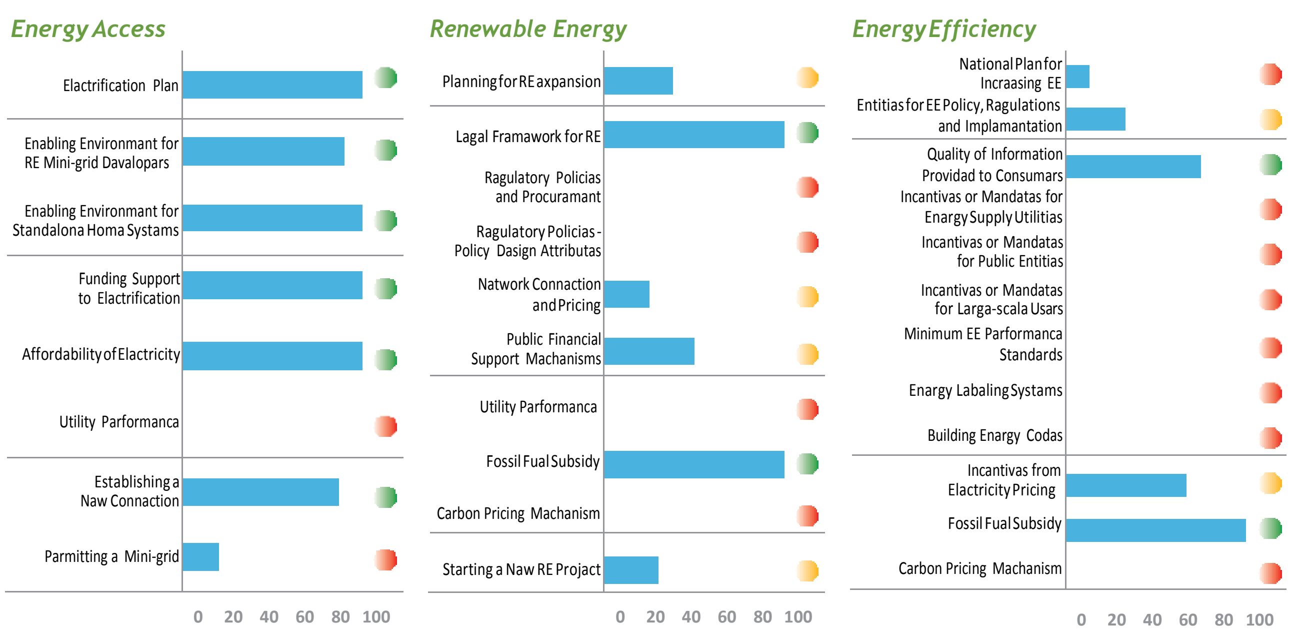


– means that there is no indicator in the category

2. Comparison with other countries by pillar



3. RISE Indicator Scores



UNITED STATES

Region: North America(OECD) **Income:** High **Category Population:** 316,128,839 **GNI per capita:** US$ 53,670

SEA4All Global tracking framework (GTF) Outcomes

GTF Indicators	United States	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	100 (–) – (–)	99.7 (0.0) 8.7 (-1.4)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	133.5 (2.1) 10.1 (-0.6)	549.7 (2.9) 16.6 (0.0)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector –Industrial sector –Other sectors	7.1 (-1.7) 4.8 6.9 4.7	6.3 (-1.1) 4.5 5.8 4.1	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

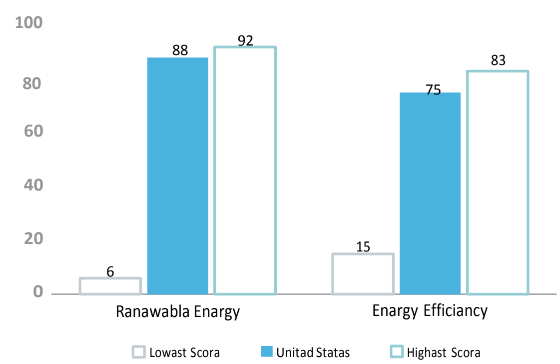
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

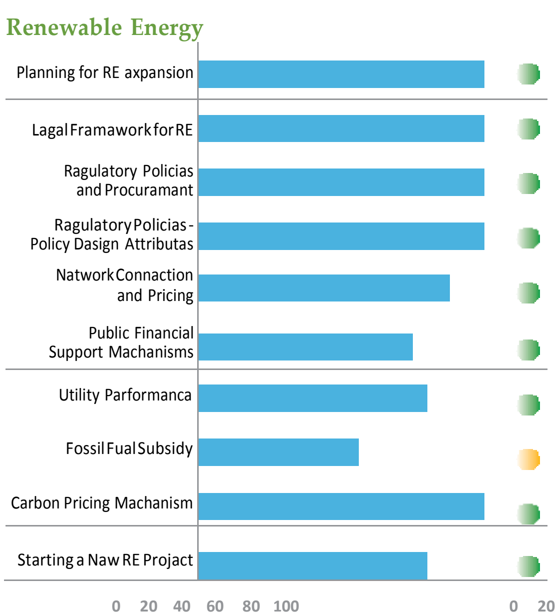
	Energy Access	Renewable Energy	Energy Efficiency
Planning	–		
Policies and Regulations	–		
Pricing and Subsidies	–		
Procedural Efficiency	–		–
Total	–		

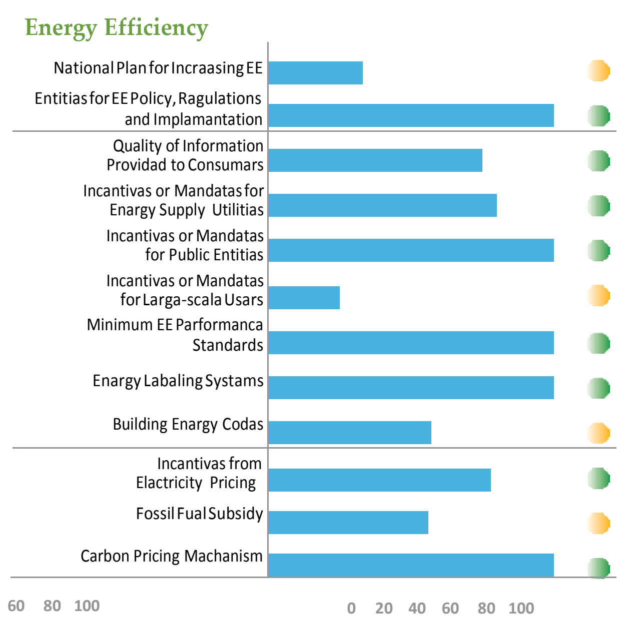
– means that there is no indicator in the category or this country is not assessed for energy access

2. Comparison with other countries by pillar



3. RISE Indicator Scores





VANUATU

Region: East Asia & Pacific **Income:** Lower Middle **Category Population:** 561,231 **GNI per capita:** US$ 1,610

SEA4All Global tracking framework (GTF) Outcomes

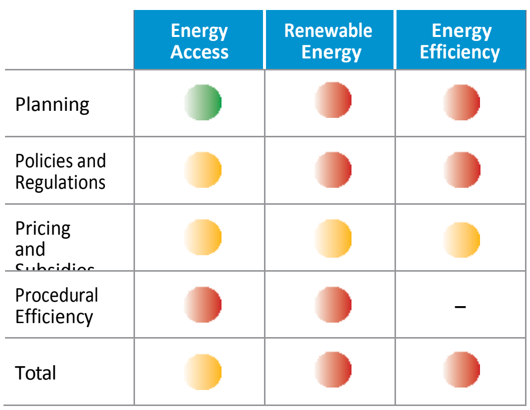
GTF Indicators	Vanuatu	Regional	Global
Electrification rate (%) (CAGR)[a] Access deficit (million) (CAGR)	23.5 (1.3) 0.2 (2.1)	65.6 (0.8) 102.5 (-3.6)	83.1 (0.5) 1,165.7 (-0.5)
RE installed capacity (GW) (CAGR) Renewable electricity mix (%) (CAGR)	– – – –	15.3 (8.7) 12.4 (-3.9)	1,210.8 (3.6) 19.4 (0.0)
Energy intensity of primary energy (MJ/$2005 PPP) (CAGR) – Agricultural sector – Industrial sector – Other sectors	2.7 (0.9) – – –	7.3 (-1.6) 1.2 6.7 10.3	7.9 (-1.3) 2.1 6.8 5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

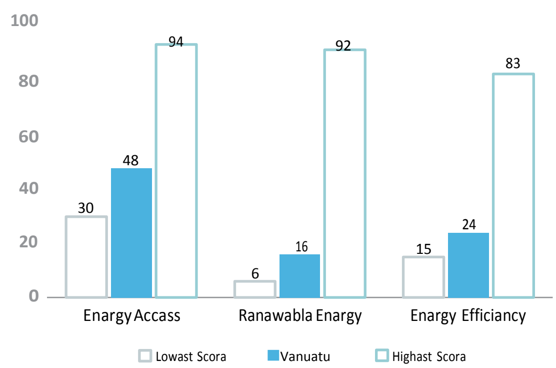
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25

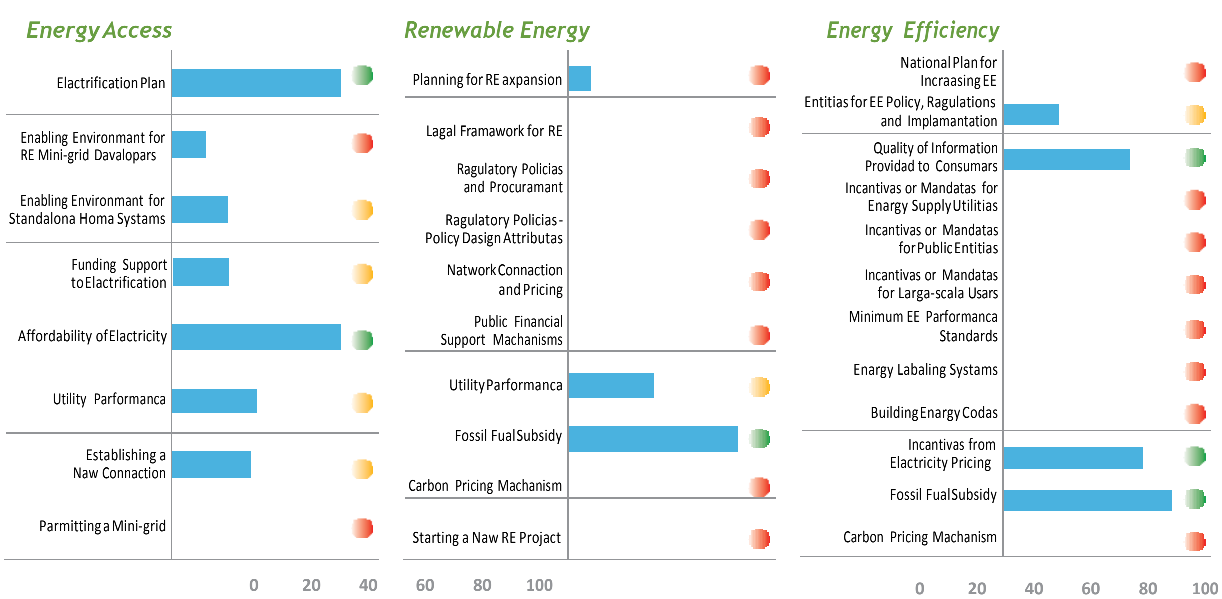


– means that there is no indicator in the category

2. Comparison with other countries by pillar



3. RISE Indicator Scores



YEMEN

Region: Middle East & North Africa **Income:** Lower Middle **Category Population:** 24,407,381 **GNI per capita:** US$ 1,330

SEA4All Global tracking framework (GTF) Outcomes

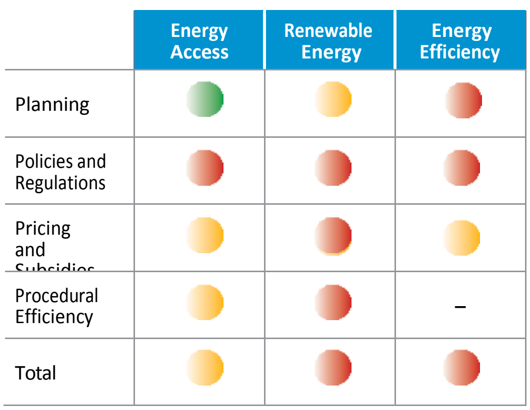
GTF Indicators	Yemen	Regional	Global
Electrification rate (%)	55	90.0	83.1
(CAGR)[a]	(0.8)	(0.6)	(0.5)
Access deficit (million)	13.3	18.3	1,165.7
(CAGR)	(3.0)	(-2.8)	(-0.5)
RE installed capacity (GW)	0.0	1.5	1,210.8
(CAGR)	—	(4.2)	(3.6)
Renewable electricity mix (%)	0.0	4.6	19.4
(CAGR)	—	(-3.7)	(0.0)
Energy intensity of primary energy (MJ/$2005 PPP)	5.3	7.8	7.9
(CAGR)	(0.4)	(-0.8)	(-1.3)
– Agricultural sector	7.3	3.8	2.1
– Industrial sector	2.3	4.1	6.8
– Other sectors	5.7	12.7	5.5

a. Compounded annual growth rate from 1990 to 2010
— is not available
Note: All data come from the Global Tracking Framework (GTF) which was released in 2013 to establish baseline energy data of 2010 and provide regular updates on the output of the three pillars of the Sustainable Energy for All (SE4ALL)

RISE ASSESSMENT RESULTS

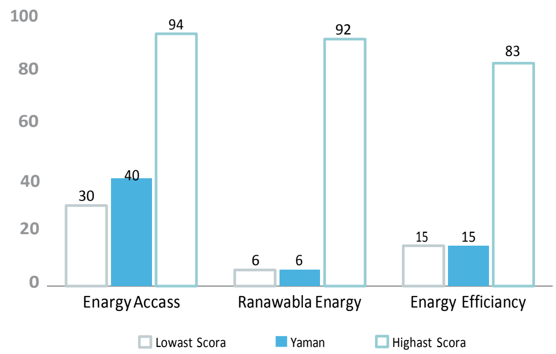
1. Traffic light by pillar and category

Green: score ≥ 75 / Yellow: 25 ≤ score < 75 / Red: score < 25



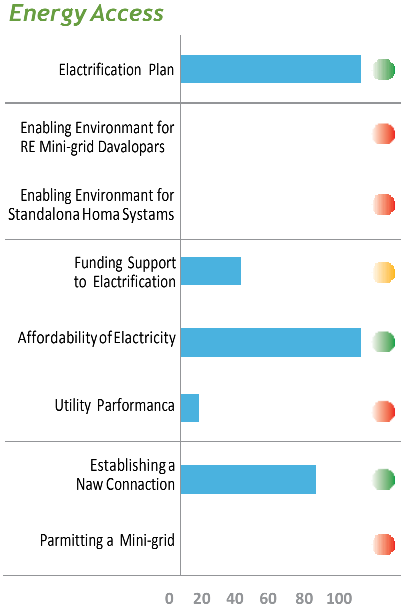
– means that there is no indicator in the category

2. Comparison with other countries by pillar

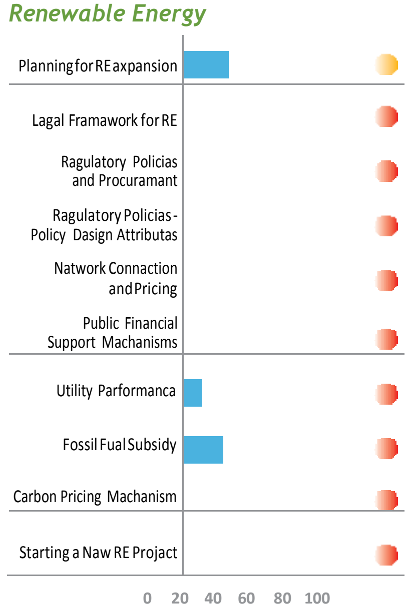


3. RISE Indicator Scores

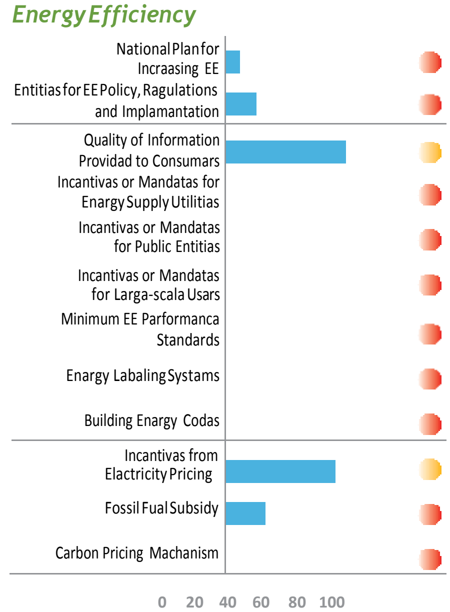
Energy Access



Renewable Energy



Energy Efficiency



0 20 40 60 80 100

0 20 40 60 80 100

0 20 40 60 80 100

Many countries share the vision for a secure energy future for all people. But for most countries, realizing this vision requires massive investment in sustainable energy and a solid enabling environment of policies, regulations, and institutions. The Readiness for Investment in Sustainable Energy (RISE) can help countries get to where they want to be. Through a suite of indicators, RISE will provide a global reference point for countries to see how they are performing in energy access, renewable energy, and energy efficiency—and what policies and other instruments they may need to move toward their sustainable energy vision. RISE highlights good practices across countries that can foster a good enabling environment for sustainable energy and support peer learning.

SUSTAINABLE ENERGY FOR ALL

RISE pilot report and associated datasets can be downloaded from the following website:
http://rise.worldbank.org

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