

# Localising the Grand Transition: Enabling Citizen Participation and Encompassing Local Government

## Future Energy Leader Position Paper | 2019



## BRIDGING THE GAP BETWEEN NATIONAL AND LOCAL ENERGY POLICIES

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## **ABOUT FUTURE ENERGY LEADERS**

The World Energy Council's Future Energy Leaders' Programme – the FEL-100 – is a global and diverse network of young energy professionals. The programme serves as a platform for engaging one hundred ambitious young professionals globally in national, regional and international activities and events. The FEL-100 represents diverse players within the energy sector including government, academia, civil society, and industry as well as social entrepreneurs. The objective of the programme is to inspire participants to become the next generation of energy leaders capable of solving the world's most pressing challenges regarding energy and sustainability. FEL Projects form an integral part of the programme, as they shape the development of the FEL community and provide unique opportunities for international cooperation. Through a flexible and interactive system, the programme enables FELs to design projects with valuable and interactive outputs – webinars, events, online tools, case studies, practical projects etc. Further details at: [@WECFELS](https://www.worldenergy.org/impact-communities/future-energy-leaders)

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## **ABOUT 'LOCALISING THE GRAND TRANSITION: ENABLING CITIZEN PARTICIPATION AND ENCOMPASSING LOCAL GOVERNMENT'**

The grand transition – a low carbon energy transition – has become a priority agenda for the governments across the world, irrespective of their country's economic status. For decades, the energy sector has been running a centralised approach with a very low level of active involvement from citizens and local governments, resulting in a considerable gap between national and local energy policy standards. To truly fulfil the potential of an effective low carbon energy transition, we urgently need to involve local and regional authorities in this process; this will enable active participation from citizens who can take ownership of the production and use of efficient low carbon energy. This report appraises the current challenges and provides recommendations for developing local low carbon energy transition frameworks and bringing the individual citizen's and local stakeholders' perspective into the formation of a global solution. This study is the result of 133 focused surveys collected from Asia, Oceania, Africa, Europe, Latin America and North America.

## **ABOUT THE WORLD ENERGY COUNCIL**

The World Energy Council is the principal global impartial network of energy leaders and practitioners promoting an affordable, stable and environmentally sensitive energy system for the greatest benefit of all. Formed in 1923, the Council is the UN-accredited global energy body, representing the entire energy spectrum, with over 3,000 member organisations in over 90 countries, drawn from governments, private and state corporations, academia, NGOs and energy stakeholders. We inform global, regional and national energy strategies by hosting high-level events including the World Energy Congress and publishing authoritative studies, and work through our extensive member network to facilitate the world's energy policy dialogue.

Further details at [www.worldenergy.org](http://www.worldenergy.org) and [@WECouncil](https://twitter.com/WECouncil)

## FOREWORD

The issue of climate change is a global priority that countries around the world have in recent years begun addressing at an international level irrespective of their political, economic and social status. One of the key solutions that has been identified internationally as a pathway to transforming the global energy sector from fossil-based to renewable-based fuels is 'zero carbon energy transition'; the transformation of energy ecosystems to a state of zero carbon. This transition presents serious logistical and financial challenges as the transformation must occur whilst simultaneously maintaining an accessible, secure and reliable energy system – something which the Future Energy Leaders are at the forefront of dealing with by providing innovative solutions through a combination of technology, business and policy plans.

There is no single solution available to decarbonise the global energy system, and the solution offered by a state of zero carbon energy is not something that one organisation or even country can be responsible for alone. A collective effort from stakeholders at all levels is required in order to mobilise the technological, financial and policy resources that zero carbon energy demands in order to be successful. If we are to achieve a state of zero carbon energy by the end of the first half of this century, then a truly synergistic effort is all the more important. This means that whilst national governments facilitate energy transition policies and strategies at a national and international level, we also need to account for the importance of the local level; we must consider the importance of taking a bottom-up approach to that same issue being dealt with internationally by addressing how local energy transition can happen at a community level.

Aside from speeding up the world's energy transition journey, this will also begin to close the recognised gap between energy policy at a national level and energy policy at a local, day-to-day, person-to-person level. If the world is truly to achieve a state of zero carbon energy within the next three decades, then it is realistic to say that the role of each individual person and citizen in each community on the surface of the planet forms an integral part of this journey. On a very simple level, local authorities need to be in a position to act on energy policy at their own level rather than waiting on international or national policy resolutions.

In order to do this, communities and local authorities and their stakeholders need a clear vision and clear guidelines on how to enable local energy transition. That is the purpose of this report, which brings together the views of citizens, local authorities, NGOs and private sector organisations on how these stakeholders feel they can engage with, contribute and commit to sustainable local energy systems. The report presents a diverse view of these issues from more than 23 countries with the aim of providing an exhaustive list of recommendations scalable according to the needs of a variety of countries and locations. The report also considers how digital innovations can best facilitate local energy transition, and further discusses financial schemes that be of use in order to enable local energy transition in a more efficient and affordable manner.

On a very basic level, the outcome and recommendations of this report are designed to help stakeholders set and achieve local energy transition goals in a way that works across the globe. This report is in essence a product of the realisation that in order to create an economically and environmentally stable future we must work together as citizens, governments and stakeholders at local and national levels to accelerate our transition into a state of zero carbon energy and, ultimately, into a better future.

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# Grand Energy Transition – The Bottom up Approach

## Achieving SDG 7 through bottom up approach



## Key Actors for Local Energy Transition



### Key Barriers – Citizens’ Voice

- Sense of irrelevance
- Lack of awareness, information & empowerment
- Lack of time, interest & motivation
- Lack of finance & incentives
- Ignoring citizens’ voice
- No structured platform to engage
- Lack of political leadership

## Citizens Engagement Level



### Citizens’ Survey Snapshot

- 97% believe citizen engagement is critical
- 80% believe they lack required knowledge
- 43% believe local government role is crucial
- 67% have no/low confidence in government actions
- 81% believe new partnership model is required

“There is no clarity of where, with whom, or when to act.”

“What difference my little effort will make if no one else does anything.”

“Lack of knowledge about new technologies in an understandable language is a primary barrier.”

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## EXECUTIVE SUMMARY

Global GHG emissions are reaching record levels and producing visible climate change around the world. As a consequence, we are witnessing unexpected weather patterns across different parts of the globe that are becoming impossible to ignore. In our everyday lives, we are also experiencing the life-threatening impact of GHG emissions on our health through air pollution, heat waves and risks to nutrition security. The energy transition has become a key agenda item for nations all over the planet, with pledges by almost every country around the globe to address the current mounting increase in carbon emissions and their unintended consequences. A consensus has formed around the idea that renewables and energy efficiency are the two pillars of any successful energy transition. While renewables could supply more than 80% of world's electricity by 2050, energy efficiency could allow the world to double the economic value of the energy utilised, compared to today, by 2040. There is a significant need to speed up our actions in moving towards renewable energy and energy efficiency by adopting innovative technologies, business models and policy options.

Further to this, there exists a growing realisation amongst energy transition experts that the achievement of a successful decarbonised energy future – particularly when it comes to energy efficiency – relies on the active engagement of local governments and citizens at a grassroots level. The ability of local government to play a strong role in energy transition processes is crucial to the distributed deployment of transition initiatives that are capable of achieving timely success. Local governments are well positioned to localise the grand transition by demonstrating sustainable technologies at the ground-level and creating opportunities for local investments to develop local-level solutions. They can also play a vital part in empowering individual citizens to become actors of change. This said, questions of how to do this and what to do it with are significant amongst local governments on this issue. To address this, we formed the task force "Role of Local Governments and Active Citizenship for 100% Energy Transition" as part of the Future Energy Leaders (FEL) programme of the World Energy Council. In addition to identify ways to empower citizens, local governments, and other agencies to scale their impact on transition trajectories to an appropriate and efficient local level, we aspire to identify the role of digital technologies in the local energy value chain and explore some of the interesting and scalable financial models available to accelerate energy transition in this context.

The project is not only a key vehicle in better representing different stakeholders' perspectives in a transformation of great importance, but also in making their efforts more visible and synergistic. To achieve this goal, we interviewed 133 selected individuals and organisations from six different regions – Asia, Africa, Europe, Latin America, North America and Oceania. We surveyed individual citizens not directly working within the energy sector, local authorities, non-governmental organisations and private sector companies for their opinions. We believe the role of non-governmental organisations and the private sector will also be of great importance in driving an effective local energy transition agenda. Surveys incorporated a set of questions to test awareness of the importance of energy transition and the concept of active energy citizenship, to understand barriers experienced by stakeholders, as well as understanding existing local energy transition models and future plans. By analysing the results, we managed to understand the challenges from the standpoints of different stakeholders and developed a set of recommendations for delivering on current local energy transition ambitions.

## KEY FINDINGS AND RECOMMENDATIONS

The importance of local energy transition to the achievement of our wider energy decarbonisation and climate change commitments was recognised by all the survey participants from different countries. Although the complexities of the challenge were acknowledged, a number of solutions were proposed. The key findings and recommendations to be considered when enabling the Grand Transition through local energy transition comprise of:

- 1. Framework to empower local governments:** National governments should develop frameworks to empower local governments and provide the necessary resources for localisation of a national low-

carbon energy transition plan. There is a need for a bottom-up approach. Local governments should be recognised as key stakeholders in energy transition policy decision-making and implementation. Creating a local energy agency in every city or county under the appropriate local authority is necessary.

2. **Supportive regulations for local authorities:** Energy transition is not a priority for the majority of local authorities, and the absence of a clear and supportive regulatory framework below anything at the national level doesn't help. It is recommended that the necessary capacity and regulatory support should be provided to local authorities in order to develop and implement local sustainable solutions, i.e. utilisation of renewable energy in different sectors such as heating, transport etc. in their local area. Rules and administrative procedures have to be simplified in order to allow the uptake of decentralised renewable energy projects.
3. **Proactive local political leadership:** A lack of enthusiasm from local councillors and other local politicians, especially on energy matters, was also mentioned by several survey respondents. Because of the complexity of energy transition themes, not many local politicians want to get engaged in issues surrounding local transition, preferring the achievement of easier targets. This in turn has a negative spillover effect on the level of active citizenship concerned with such topics. There is a need for proactive local political leadership through a transparent and participatory process to drive local energy transition.
4. **Strong action-focused local partnership:** Uniting local private companies and civil society organisations – by envisaging development through a multi-sectoral approach – will play a crucial role in implementing any local energy transition plan. Local governments need to develop a strong cross-entity collaboration on the energy agenda in order to facilitate local energy transition through negotiations and consultations with all stakeholders. Partnership with cooperatives, community foundations, housing associations, and municipal ownerships will accelerate local energy initiatives.
5. **Bringing awareness at all levels:** Lack of awareness on importance, urgency and opportunities of energy transition were raised by almost all survey respondents. Access to information in a language which citizens can understand and getting legal and financial support were the key barriers in developing local energy projects. Creative and intensive advertising campaigns about new technologies need to be run by local authorities and utilities companies. It is recommended that local mechanism and support services should be established to make the processes more efficient, and to facilitate better communication and the building of trust between different key local players.
6. **Boosting financial support:** For more than 90% of the citizens surveyed, low income was the key barrier to energy transition despite their willingness to install renewable energy and energy efficient solutions into their homes. The financial support for local energy projects is also significantly lower as compared to large-scale (grid-level) energy projects. There must be financial provisions and structures that can support the initial capital investment requirements of citizens and other local energy projects in the context of transition. A significant increase in financial support to local authorities, businesses, schools, hospitals, and other public buildings needs to be provided to help them install renewable energy solutions and take up other energy transition initiatives.
7. **Developing innovative business models:** Bottom up investments, along with innovative business models, are recognised as key driver for local energy transition. Sole public funding will be largely insufficient to enable low carbon technology deployment at the pace needed for it to be effective in making a difference. Public-Private Partnership arrangements or other innovative arrangements to

leverage off economies of scale and overcome the initial investment costs, especially for local energy projects, need to be rigorously explored. Business models that can provide direct monetary benefit to citizens, provide ownership to citizens and to communities, and facilitate the concept of demand aggregation and collective purchasing in local projects and other such initiatives also need to be promoted.

- 8. Leveraging digitalisation and open data potential:** Digitalisation enables the creation of platforms to interface with physical assets, information, planning, and real-time communication between stakeholders. The pace of digitalisation in the energy sector is still very slow if compared to other sectors. Digitalisation provides huge opportunities to enable greater deployment of decentralised renewable energy solutions and to take energy efficiency to the next level. Sensors, real-time advanced data analytics, artificial intelligence, blockchain, internet-of-things, web-based and BIM-based participatory planning are key innovations that can enable sustainable local generation and consumption. Open data increases the transparency and accountability of stakeholders, and also provides an opportunity for unprecedented collaboration between different stakeholders to promote progress and innovation in energy transition terms as well as elsewhere.

## IMPLICATIONS FOR THE ENERGY SECTOR

The role of local governments is pivotal in making the energy transition we need in order to live sustainably happen faster. While national governments are at the forefront of bringing new policies into the current energy discussion, local governments and regional policymakers can take on the challenge of developing local action plans to implement ambitious policies, and to bridge the gap between local and national policies on this topic. Informed citizens need to be put at the core of energy transition policies if they are to have any success. For a local energy transition to take place, cross-sectoral collaboration, especially between local governments, NGOs, and the private sector is clearly vital. There is a substantial need for empowerment of all local stakeholders with adequate means and support to enable their active participation in achieving low carbon energy and climate objectives. Local policymakers, experts and other practitioners need to sit together – both literally and metaphorically – to discuss innovative approaches for local energy decarbonisation and supporting the creation of new jobs and growth in a new era.

# Chapter 1

## Grand energy transition: bottom up approach



As for the challenges of the energy transition, and its meaning and impact at the level of everyday life, there are also differences between industrialised countries, countries with emerging economies, and slow growing countries. For instance, the rapid increase of renewable energy shares in industrialised countries has induced technical challenges related to the sustainability of grid infrastructure and its operation. For these countries, innovation, end user costs (i.e. equitability of transition support schemes) and consensus over behaviours are a key concern of energy leaders. However, in emerging economies, existing problems of energy access, supply shortage and subsidised energy prices hamper the development of structural changes in the energy system (World Energy Council, 2014). Finally, for developing economies, the theme of energy transition is part of a more complex nexus including water and food security (Wakeford et al., 2016) as well as economic and gender empowerment (IEA, 2018).

From the FEL-100 perspective, as shown in their Issues Monitor (Fig 1.1)<sup>1</sup>, the shows that renewable energy, energy efficiency and market design are the three areas that could potentially offer the greatest impact to the energy sector of any nations interested in achieving grand energy transition objectives.

## 2. ACHIEVING SDG 7 THROUGH BOTTOM UP APPROACH

In 2015, the United Nations (UN) committed to Sustainable Development Goal 7 (SDG7) which aims to “Ensure access to affordable, reliable, sustainable and modern energy for all” by the year 2030. The five target areas for Goal 7 are shown in Fig. 1.2. The four key indicators which are regularly tracked by the UN are access to electricity, access to clean fuels for cooking, renewable energy, and energy efficiency<sup>2</sup>. As mentioned during the Sustainable Energy for All Forum held in Lisbon in May 2018 and further at the High Level Political Forum in New York in July 2018, many countries have been making considerable progress, but this is not sufficient to achieve SDG7 by 2030. This is due to obstacles in renewable energy and energy efficiency financing, the untapped potential of private finances under existing policy frameworks, and the continuing subsidisation of fossil fuels (UNESCAP, 2018). The goals encompassed by SDG7 cannot be met until all stakeholders are actively engaged and motivated to ensure energy transition, which means that there is also a need to take a bottom up approach to accelerate our energy transition journey.

Figure 1.2: Key targets under SDG 7

Access to energy	• By 2030, ensure universal access to affordable, reliable and modern energy services
Renewable Energy	• Double the global share of renewable energy by 2030
Energy Efficiency	• Double the global rate of improvement in energy efficiency
Investment	• Enhanced international cooperation and promote investment in clean energy technology
Technology	• Expanding infrastructure and upgrade technology

<sup>1</sup> The World Energy Council’s Issues Monitor gathers the perspectives of more than 2000 energy leaders from public and private sectors and tracks the issues that affect the evolution of global energy (World Energy Council, 2019).

<sup>2</sup> SDG 7 Tracking Website: <https://sdg-tracker.org/energy>

## Electricity Access and clean cooking

There is an expansion in electricity access and renewable energy integration in electricity sector since the SDGs were set. Currently, over 1 billion people or 14% of the world's population have no access to electricity with children and women being the most vulnerable (IEA, IRENA, UNSD, WBG, WHO, 2018). Around 60% of these people live in the least developed countries and about 10% in other developing countries in Latin America, North Africa and Asia (UNCTAD, 2017). Like access to electricity, access to clean cooking is also a major issue due to fast growth of population, low attention from policy-makers, lack of consumer awareness, slow progress in technologies and financing for producers (IEA, IRENA, UNSD, WBG, WHO, 2018). Currently, around 2.8 million people do not have access to clean cooking facilities (IEA, 2019). Many women around the globe spend large part of their day collecting firewood to provide energy for cooking that eventually pollutes their indoor environment and create severe health risks.

To meet both electricity access and clean-cooking targets, off-grid solutions have emerged as an important driver for many policymakers. Off-grid solutions also offer great examples of a bottom-up-approach which, so far, often develop as a by-product of either local economy (i.e. through SMEs, small utilities or community entrepreneurs) or international start-ups operating locally. Where local governments are not able to nurture similar initiatives and their derived development, they often partner or rely on international organisations to pick up the (financial and political) challenge, like with the UN Renewable Energy and Energy Efficiency Partnership (REEEP) and its supported Small-Scale Sustainable Infrastructure Development Fund (S3IDF).

## Renewable Energy

Rapidly falling costs and enabling policy frameworks have allowed renewable energy technologies such as solar and wind to compete with conventional power sources but still have a long way to go to achieve SDG 7 goals by 2030. Initial conversations around bottom-up approaches, such as community micro-grid, renewable energy cooperatives and peer-to-peer renewable energy trading have been booming recently in developed markets. New EU renewable energy legislation is focused on boosting local energy transition initiatives allowing communities and individuals to generate, store, consume and sell their own energy which is yet to be transcribed into national law in many countries. According to a Community Energy Coalition study, half of EU citizens – including local communities, schools and hospitals – could be producing their own renewable electricity by 2050, meeting 45% of their energy demand. Similar aggregation of knowledge and best practice cases need to be developed and supported outside Europe as well. In order to prevent any fall in the growth of renewable energy during the energy transition journey, institutional attention is also required to solve technical problems related to grid integration and/or grid development along with significant financial boost and relevant regulatory support to facilitate local renewable generations (IEA, IRENA, UNSD, WBG, WHO, 2018). Citizens' awareness around new renewable technologies need to be built and governance and administration of new business models need to be simplified.

## Energy Efficiency

The pace needed to meet the target of doubling the rate of improvement in energy efficiency by 2030 has to be significantly increased. Coordinated bottom-up initiatives are very important because energy efficiency<sup>3</sup> demands a tailored approach based on technological, normative and even cultural context. It is important to engage all stakeholders and promote strategic public-private partnerships as energy efficiency policies are most effective when private sector investments are stimulated (UNECE, 2017). At present, main barriers to the mass deployment of energy efficiency are the lack of organised platforms for participated planning, information sharing among stakeholders, lack of suitable financial instruments, lack of knowledge around existing financial instruments, high upfront investment cost for individuals and small consortia (often short of equity), and the lack of capacity around monitoring and verification of energy savings at the level of both

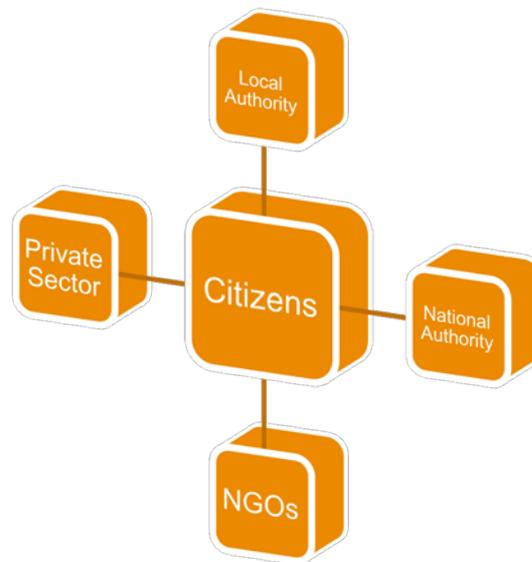
<sup>3</sup> Particularly energy efficiency of buildings which is complicated, with many variables including building fabric, materials, aspect and occupancy all impacting the building physics. This along with a skill shortage creates uncertainty, high costs and long term pay backs, leading to a poor uptake in upgrading energy efficiency in buildings to date.

practitioners and final users. Platforms such as the European Commission's Energy Efficiency Financial Institutions Group (EEFIG) have created an open dialogue to bring all stakeholders to identify and overcome barriers to the long-term financing of energy efficiency projects, with significant potential for replication in other regions. In EU, support mechanisms are also in place to allow local governments to draw funds to improve energy efficiency and sustainable transport<sup>4</sup>.

### 3. LOCALISATION: WHO ARE THE KEY STAKEHOLDERS?

Governments have the ultimate responsibility in setting and achieving the national energy transition objectives and the broader Sustainable Development Agenda. However, it is important to note that all stakeholders must commit and contribute to ensure rapid and effective progress. Localising the ambition and implementation would be crucial in achieving national energy transition objectives. A resilient local energy ecosystem must have five key players (as shown in Fig. 1.3): Citizens, national government, local government, NGOs and private sector. These are essential players to drive the local energy transition ambition. The world is already experiencing the move from a vertically integrated energy system to a decentralised energy system, where citizens want to be an active participant. The recent EU Energy Union strategy has put citizens at the core of the energy transition being producers of renewable energy and adopting innovative local Energy Ownership models (EU Committee of the Regions, 2018). In order to initiate and implement bottom-up initiatives, citizens and end-users need to be made aware about innovative technology solutions, policies and business models.

**Figure 1.3: Key actors for local energy transition**



Active energy citizenship is not only limited to individuals but also covers the important role of non-profit organisations and private sectors. NGOs can act as facilitators of public private partnerships, stakeholder engagement and consensus building, give visibility to issues that might have received insufficient attention, and deliver capacity building initiatives to enhance the prosumers knowledge base. Private sector can be a prominent actor in delivering the urgent energy transition issue by offering locally integrated solutions on energy efficiency, renewable energy and storage technologies, and unlocking new sources of finance and business models for ambitious projects.

There is a need to coordinate all these players and the local authorities or local energy agencies are at the centre of understanding local objectives to achieve local energy targets that are set. Local authorities can

<sup>4</sup> European Investment Fund to support investments in energy efficiency and sustainable transport  
<https://www.eib.org/en/products/advising/elena/index.htm>

develop implementation strategies to better contribute to meet local energy goals and establish mechanisms for regular monitoring and evaluation of their progress. These relevant mechanisms can be generated at a higher level, may be at national level, to create standardisation.

## 4. REPORT STRUCTURE

This report is divided into following two parts:

- Chapter 2 and 3 analyse the data collected from 2 surveys. Chapter 2 offers an overview of citizens' perspective in terms of challenges and possible solutions on local energy transition matters. Chapter 3 refers to the second survey conducted for local governments, NGOs and private sectors and provides an overview on developing roadmap for local energy transition and how key local stakeholders could be engaged. In total, 133 surveys were collected where 73 responses were from citizens and 60 responses were from the other key local stakeholders - local governments, NGOs and private sectors.
- Chapter 4 and 5 is based on review of academic literatures, government papers, case studies, and success stories published by intergovernmental organisations and other agencies. Chapter 4 explores the concept of digitalisation to facilitate local energy transition and looked at different areas – generation, consumption, storage, and waste management for potential opportunities. Chapter 5 highlights the key obstacles in bringing finance for local energy transition and examines some of the financial model from Asia, Europe, Middle East and Gulf regions which have been successful in enabling local energy transition.

# **Chapter 2**

## **Engaging citizens and developing citizen-centric policies**

## 1. BACKGROUND AND METHODOLOGY

There is a consensus among the international experts that achieving low or zero carbon energy transition will not be possible without the active engagement of citizens. For many decades, we have seen, in general, the lack of interest among citizens and societies on energy and climate change matters (Gigler S. , 2019). Now, while a higher proportion of citizens have become climate-aware and they have a better understanding on the energy-climate interactions than ever before, there is a greater level of willingness to participate to transform the energy future is evident. But on the other hand, multiple barriers inhibit a full-scale engagement.

Citizens reported that they lack understanding on how they can contribute and there is still a proportion of citizens who are, hesitant to engage in any relevant discussions. We started this project with the primary objective of getting an understanding of the level of implication and knowledge citizens have about the energy transition and what barriers they face when they engage in energy related matters in their communities, cities or countries. We also wanted to collect citizens' perceptions on how they would like to take part and make their effort to solve this critical issue which our world is facing. Written responses on these 3 major questions (A copy of the survey template is attached in Annex A) were collected from 73 citizens from 23 countries. The survey collated quantitative and qualitative data, the questions we built were specifically designed to address deep rooted issues and discrepancies in engagement. The members of this taskforce reached out to citizens in different countries and collected these informations.

## 2. BARRIERS IN ENGAGING CITIZENS

Several barriers and concerns were discussed by citizens when they wanted to engage on energy transition related matters locally or nationally. It has been summarised in six key points as shown in Fig. 2.1 and discussed in this section.

**Figure 2.1: Key barriers faced by citizens**



### **Sense of irrelevance:**

A sense of irrelevance and hopelessness seems to be an issue that was highlighted frequently in our survey. According to a citizen's response "What difference will my little effort make if no one else does anything?". There is a perception that individuals' attitudes and measures would not make any difference and citizens do not understand the impact they can make. For some citizens, climate change is a problem, but it is not the biggest problem around when people are still struggling with basic infrastructure in their day-to-day lives.

Citizens usually fail to associate the harmful impacts of their energy choices and the key role they can play in larger clean energy deployments on the local and national level.

### **Lack of awareness, information and empowerment**

Lack of general awareness on the prospects of energy transition was the key issue for survey respondents. Compared to food and water, citizens downplay the importance of clean energy and its impact on human life. Citizens are also not aware of their national/local initiatives or what kind of schemes are available and how they can be involved, which leads to a reluctance in taking any kind of action on their part. In most situations, initiatives are never explained in layman-friendly terms. For several governments, there exists a paradox halting energy transition: on one hand, energy is the most pressing issue in every political and electoral agenda at present; but on the other, there is no correct political will to take these promises to action. Citizens feel that media (through television, radio, daily newspaper) are not conveying the right messages and are failing to improve the general awareness of these problems in society. Citizens also highlighted in our surveys that schoolchildren are not being provided with any useful information through structured curricular design towards these ends<sup>5</sup>. There is a general lack of knowledge amongst the public about the existing organisations or structures concerned with citizen engagement, and very little information on energy issues available at the local level. There is no consultation between local leadership and citizens or communities. Transparency of energy policymaking was also a concern for some citizens. Available digital tools are underexploited and underused for improving awareness and providing the right information to citizens and societies.

**More than 80% respondents believe that they don't have the required knowledge for taking impactful actions although they would like to make efforts towards protecting the planet. "There is no clarity of where, with whom, or when to act", according to a citizen. A respondent from Bangladesh, where majority of the people are illiterate and under the poverty line, said, "Lack of knowledge about new technologies in understandable language is a primary barrier". There was also an argument made by another respondent, that "We are saturated with information yet ignorant on the finer details, when it comes to very concrete and impactful measures one can take".**

### **Lack of time, interest and motivation**

Less than 1% of respondents were not very interested on this subject because they thought that the link between the energy choices they make and the climate crisis is not palpable enough. According to a citizen: "We cannot see or touch energy and we can only feel (clean or unclean) energy's effect in the long term. So, we are motivated to be engaged as for things that we perceive in a short term. It is all about short term vs long term benefits". According to another citizen, "If we have energy for our house, car etc. necessary for our everyday life why do we think about it?" Around 5% of survey respondents think that, in general, appropriate culture, interest and willingness to take any action is lacking, especially when it comes to energy issues. Scarcity of time was also the issue for some citizens while they are already aware of actions they need to take.

### **Lack of finance and incentives**

'Finance' was highlighted as one of the most important barriers. Government incentives are sorely underfunded and even with maximum allowances a large private injection of cash is required, especially in the case one wants to invest in long-term saving solutions. According to a survey respondent, for example, "There is no public transport in my area, and I want to buy an electric car which is out of my budget – what should I do?". Low income and high-priced technologies that are not accessible to the mainstream do not facilitate the process either, like in Germany, where the high cost of renewables is a significant barrier.

<sup>5</sup> EU green schools programme have been very successful in some of the Member States <https://greenschoolsireland.org/wp-content/uploads/2016/09/General-Handbook.pdf>

According to a survey respondent from this country – “We are taxed on green energy. The higher the percentage of green energy in your region, the higher is your tax (e.g. electricity is cheaper in cities with CHP plants)”. Also, in many developing countries, for example, Malawi, a significant population is suffering from poverty issues and the community is reluctant to shift to low carbon solutions. On the other hand, according to another survey respondent, “Potential benefits towards moving to renewable energy options are weighted towards those with greater resources. There must be a social justice element for change. Those who have more resources can rely on the most energy efficient fuels – tax incentives will not work in such sectors of society. Direct subsidies are needed. Incentives that are currently available are not enough to drive change”.

### **Overlooking citizens’ opinions and lack of an engagement platform**

Some citizens also feel that people who are concerned about local energy matters are high society elites and constitute a minority that is not representative of the majority, or of people who defy agendas backed by large corporations – in consequence they are either oppressed or silenced. In many jurisdictions, citizens face hostility if they try to create a local energy project or get involved in discussions. According to a survey respondent, “Community projects have to struggle through many barriers erected in their way. Communities are not encouraged for greater local involvement and ownership”. “Commercial energy generation only engages with local communities in a tokenistic way and there is no necessity to have buy in from the local community”. It was also mentioned that setting up an energy community or cooperative is very complex and daunting. There is no platform for exchange between citizens and local authorities. Lack of support and resources available for community energy projects and lack of proper channels of communication are important barriers.

**According to a citizen from Ireland, “The governments should act to ensure the greatest possible levels of community ownership in all future renewable energy projects and also enable, through legislation, the selling back to the grid of electricity from micro-generation by private citizens at a price which is at least equivalent to the wholesale price”.**

### **Lack of political leadership**

Political corruption, unwillingness and instability were also raised by some of the survey respondents. Most politicians do not want to engage on energy matters because of the complexity of low-carbon energy transition and potential for failure to deliver on their promises. In many countries, citizens believe that there is no clear strategy adopted for energy transition, or there is a public media blackout about the subject. Local authorities are not proactive and usually not empowered in centralised political systems to take on strategic public agendas like the energy portfolio. In decentralised political systems, local authorities still lack the financial autonomy and the technical expertise to negotiate and implement projects on a bigger scale. According to a survey respondent, “Local authorities are not involved in energy matters like in other policies as they do not have capacity (financial, competencies) to solicit our opinions”. According to another respondent “State authorities are still seeking to limit citizen engagement on energy generation as there is no feed in tariff available while, state authorities are still supporting and subsidising new fossil fuel infrastructures”.

## **3. ENGAGING CITIZENS - CITIZEN’S VOICE**

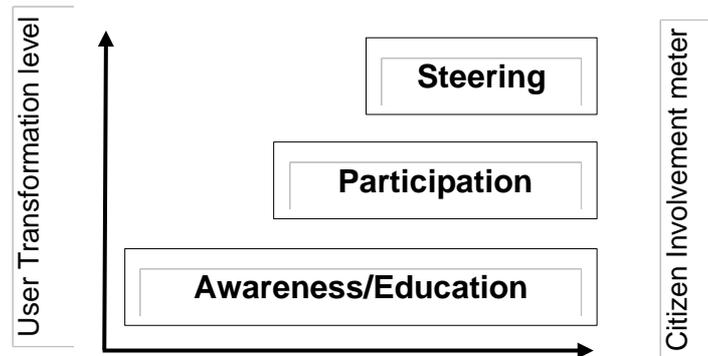
We asked the question of how citizens would like to engage and contribute to driving a local energy transition ambition. There is a wide stress on a hybrid citizenship model - between citizens and the energy future, and there are different roles to take on: as users, consumers, trendsetters (such as prosumers) protesters, supporters, and decision makers. Opinions vary but the majority agree on the necessity of and the urgency

to create change from the local level and accelerate upwards. The reflection on citizen participation in the future of energy transition is centred mainly on participative schemes and the benefits of being in local energy communities, where this participation urge is stimulated by a large sense of awareness and the rise of information about energy and climate. Local energy transition requires immense public support and a communal sense of proprietorship to move beyond deficit perceptions of the public.

**Voicing energy: sharing information and campaigning**

Energy citizenship emphasises energy literacy, participation in engaging discussions, and steering sustainable energy practices at the local level as shown in Fig. 2.2. People respond to progress driven by individuals from their respective neighbourhoods or cities. There is a common understanding that highlighting case studies of how citizens in different countries have led similar movements to raise awareness and educate their peers about energy technologies and best practices resonates very well with individuals from their respective communities. According to a citizen: “Highlighting case studies of how others have done things would be great”. Moreover, information should be made available easily, and communal institutions like schools, churches, and local organisations should use their platforms to educate people about the value chain of electricity production and distribution. Public events and consistent campaigning through social media, local news outlets like newspapers, television and radio, local dialogues between constituents and their representatives would also inform a broader range of people and decentralise the understanding of energy needs at the grassroots level.

**Figure 2.2: Citizen Engagement Level**



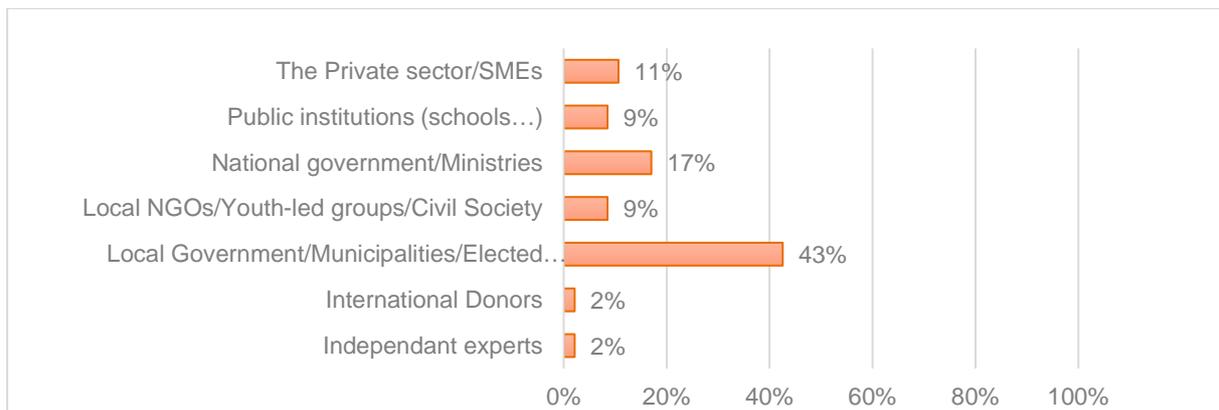
The word “awareness” and “information” were mentioned 49 times in 73 responses to our survey; this indicates that citizens want to have more awareness about the problem and are seeking easily understandable information on ‘what’ and ‘how’ they can take initiatives.

**The power of Lobbying**

Citizens hold the voting power over their local and national political scene. According to a citizen, “Change must be driven from the local level. The role I can envision for citizens is in applying pressure on policy makers for the system to change. That is to say: advocacy, preferably at the national level so change happens at a grander scale”. Survey respondents also highlighted the importance of a local political focal point to push for plans and laws that put the interest of the community ahead of big corporations with regards to energy investments and capital equity. Citizens’ roles are instrumental to the energy future and the lack of their engagement and understanding can be significantly detrimental to new energy projects in their cities. Positive interactions between local representatives and citizens through deliberative public dialogues need to happen to shift citizens’ perceptions and levels of acceptance to new technologies. Around 43% of citizens (Fig. 2.3) reported that a local authority’s role is crucial for engaging citizens on a local energy transition agenda.

Ireland established a citizen assembly in 2016 to deliberate on pressing national matters from abortion to population ageing to climate change. It was an initiative to place the citizens at the heart of important legal and policy issues which Ireland is facing. The assembly is a body comprising the chairperson and 99 citizens randomly selected to broadly represent the Irish Society. Assembly makes recommendations on the important national matters and Expert Advisory Group is established to assist the work of the assembly. These recommendations submitted to the House of Oireachtas for further debate by the elected representatives. The Ireland model of citizen assembly to provide citizens a unique learning environment and opportunity to contribute in national decision making has been recognised internationally.

**Figure 2.3: Responsible and accountable actors to citizens**



**Empowerment to participate and steer local energy matters**

Citizens are the most important element in the user value chain. They strive to be encouraged and empowered to find sustainable energy solutions for their own communities and deploy projects that also create wealth and economic activity. User transformation in energy systems can be achieved through providing information, choice, and engaging users to provide flexibility to manage demand as well as supply. Local communities need to be transformed by challenging their traditional identity as passive consumers to active prosumers. In most communities, citizens are constrained by financial resources and long payback periods and therefore, there is a noticeable resistance against new technologies. Creating the right incentives and projects for citizens would dramatically change how projects are being accepted, implemented and accelerated. Setting up local energy communities or cooperatives can be instrumental in channelling citizens’ ideas. According to several survey respondents, ‘the local leadership should proactively seek citizens’ opinion and understand how citizens wish to engage.

# **Chapter 3**

## **Empowering local governments and other local entities**

## 1. BACKGROUND AND METHODOLOGY

The objectives of the UN 2030 Agenda and SDG7 cannot be met until all stakeholders are actively engaged and motivated to ensure 100% low-carbon energy transition. National governments have the ultimate responsibility in leading the energy transition implementation, however, it is important to note that localisation of the energy transition objectives and its implementation is crucial. In the previous chapter, we discussed how important the role of citizens is and how they can be empowered to facilitate local energy transition. This chapter discusses the role of local governments and other important stakeholders, such as private sectors and NGOs, to ensure rapid and effective progress.

A separate survey for local governments, the private sector and NGOs was prepared, and selected organisations were contacted via emails during August-September 2018. We also contacted selected academic organisations, intergovernmental organisations and think tanks for their perspectives. Given the diversity in group members and FEL community, people were reached out to from all around the world with different positions, sectors, and fields of work. Total 60 responses were collected. The questions mainly covered the following topics (A copy of survey questionnaire is attached in Annex B):

- Awareness on national energy transition initiatives
- Barriers in engaging with main stakeholders on energy transition matters
- Organisation's impact on energy transition and ongoing work
- Private Sector-NGO-Government partnership model
- Citizens' role in energy transition and engagement opportunities

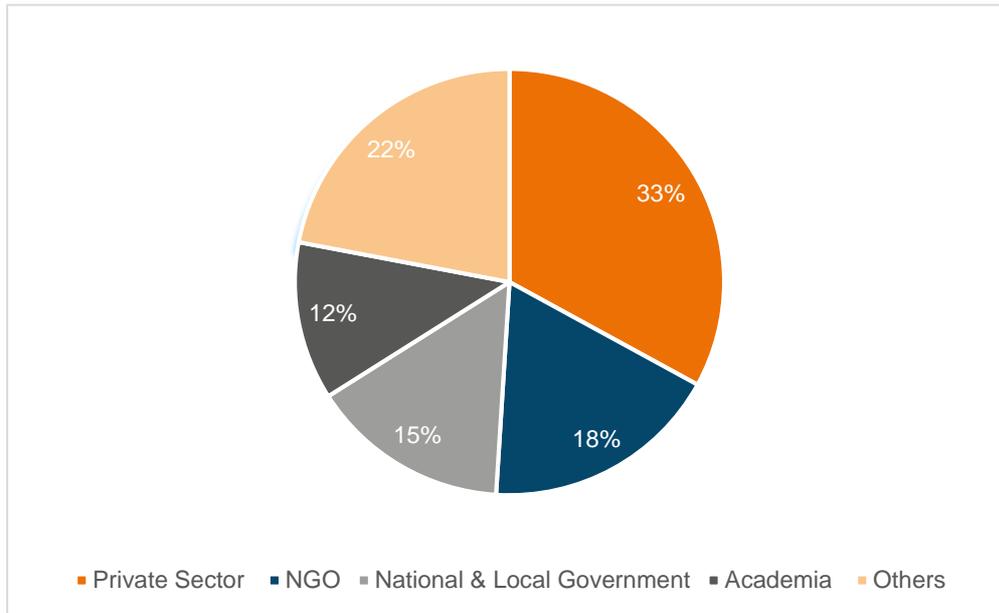
Based on the survey results we seek to gain some key insights and develop the roadmap for local energy transition by engaging key local stakeholders.

## 2. SURVEY RESULTS AND DISCUSSION

We received a total of 60 responses on this focused survey. Figure 3.1 shows the segmentation of survey participants. Around 66% of responses were from the private sector, NGOs and government organisations, and 34% of responses came from academia and other sectors, such as intergovernmental organisations, think tanks, and organisations either operating in the international market or private owned consultancies. All the respondents work in relevant fields, such as energy efficiency or renewable energy, and some of them work in water, health, and environment where they additionally manage energy-related work as well. They considered their work has a direct impact on SDG7 (92%). Around 82% of respondents believe that their organisations have made a direct or indirect impact on the energy transition process in their countries and more than 95% respondents see themselves as being impactful in the next five years. The self-identified impact ranged from renewable energy implementation, such as the case of Lebanon's first onshore wind farms, to commercial/industrial scale solar in East Africa, solar in North Mexico, a second offshore wind farm in the US, and pilot rural electrification, to the provision of expertise for the drafting of performance standards, national plans and policies, and resource mapping. On the citizenship and local stakeholder engagement front, survey respondents believe that there has been very limited impact, and in many cases, it is still non-existent. Surprisingly, more than 98% of respondents reported that they are well aware of national energy transition plans. More than 81% of survey participants think that a new partnership model is required to achieve the goal of energy transition, and that there is an essential need for enabling stakeholder engagement and collaboration through procedures, capacity building, and communication initiatives.

**Many visions and initiatives are trying to break awareness and set targets, but still on the early way on, lots of work still needs to be done and lot of stakeholders still need to be involved.**

- A survey respondent

**Figure 3.1: Survey participants – segmentation**

## 2.1 DEVELOPING INFRASTRUCTURE TO ALLOW LOCAL ENERGY TRANSITION

The survey shows that trust in government capabilities on low-carbon energy transition remains predominantly low despite the high level of awareness amongst governments and their actors. Only 20% of responses showed a level of confidence in governments' actions as shown in Fig. 3.2.

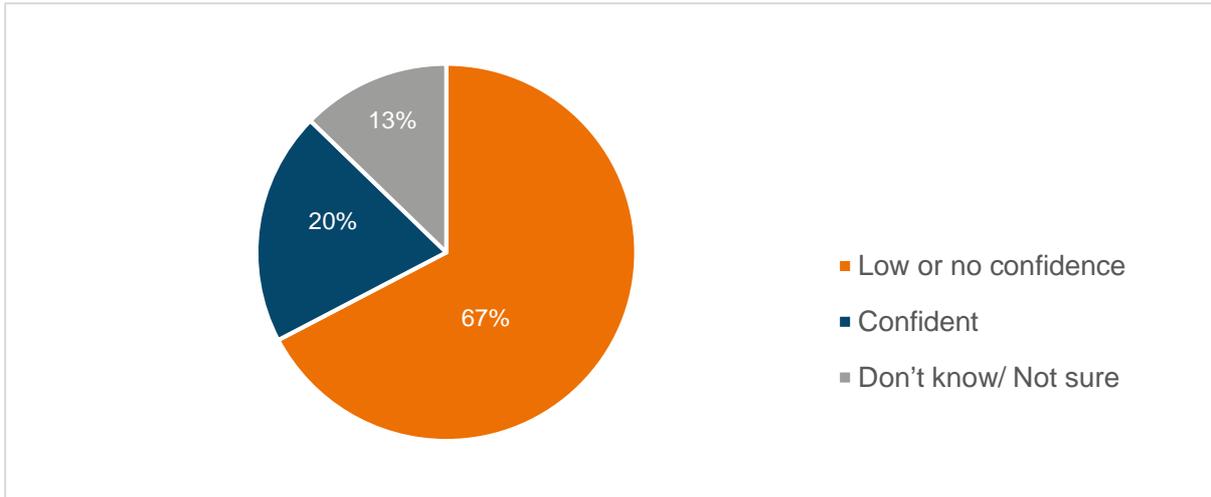
According to the survey, what is needed to move forward in terms of energy transition, particularly in countries that are dominated by fossil fuels, is to have a scenario whereby renewable energy is more affordable than fossil fuels and whereby the infrastructure to support Electric Vehicles is well developed. However, this is not highly relevant to most developing nations. In continents such as Africa, for example, priorities are energy equity, access and energy security; due to the underdevelopment of the grid networks in these areas, transitioning to renewable energy is already a business played locally, mainly through micro-entrepreneurship and albeit a non-homogeneous level of involvement of (and support by) local governments. At the policy and regulatory level, stakeholders acknowledge the need for two strategies being played in parallel: on one side discouraging the use of fossil fuels by introducing constraints (e.g. a carbon tax, production caps, minimum performance standards) and on the other side incentivising the deployment of decentralised renewables, to decrease the carbon footprint of the overall system.

**Developing a scenario where renewable energy is more affordable than fossil fuels is crucial for the energy transition as per majority of the survey participants.**

To enable these activities quickly and efficiently, there is a pressing need to bring more awareness around the concept of local energy transition and providing necessary local infrastructure to make it happen. We need to create a local energy market that can enable new local players and provide benefits to local citizens, communities and businesses through innovative business models, technological tools and policy supports. Greater levels of decentralisation of the energy sector will make the energy sector more secure, clean, resilient and affordable. Naturally, there is also a need to unlock significant investments in order to ensure that the local energy transition strategies are implemented at the ground-level. In addition to increasing investments in energy efficiency and renewable energy technologies and bringing awareness about these

into day to day life, it was found that access to information, capacity building, and legal and financial support are crucial elements to prompt and manage local energy transition actions.

**Figure 3. 2: Confidence in the governments’ ability to implement the energy transition**



To highlight a few examples with regards to this, in Europe, a series of international initiatives aim to work as local facilitators in this respect. The Urban Innovative Action Initiative for cities, for instance, also finances projects managed by consortia of public, private and citizen stakeholders (such as the Vilawatt project in Spain), or underpinned by IT decision management platforms allowing stakeholders to simulate transition scenarios based on existing datasets (such as the E-co-Housing project in Hungary). The EU-financed URBACT initiative<sup>6</sup> has developed networks of cities sharing best practices on specific aspects, including energy transition and energy efficiency.

In the US, information often assumes the aspect of activism. Emerging narratives around transition as a vehicle for energy democracy at the state level (Burke & Stephens, 2018) and proposals of a one-trillion-dollar Green New Deal investment plan (Hockenos, 2019) are providing ideological support to a series of centrally coordinated local initiatives such as the Fossil Free movement ([www.gofossilfree.org](http://www.gofossilfree.org)) or the Ready-for-100 Sierra Club initiative ([www.sierraclub.org/ready-for-100](http://www.sierraclub.org/ready-for-100)).

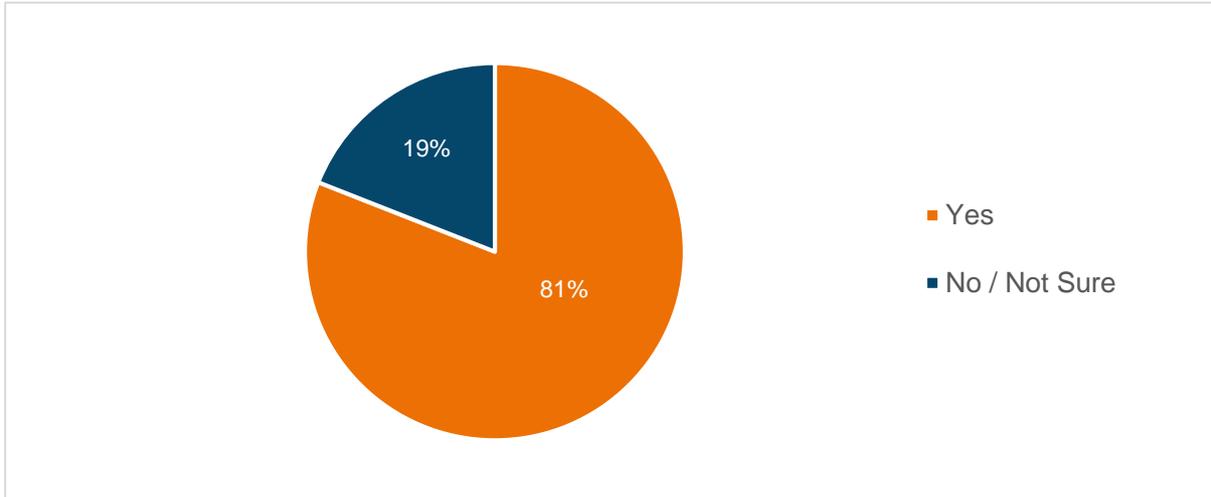
In slow growing countries, but also in some middle-income countries, information and capacity building are primarily used to win resistance to change and to dispel false myths over technologies still relatively unknown to non-practitioners.

## 2.2 ENCOURAGING INCLUSIVE MULTI-STAKEHOLDER MODEL

Current stakeholder engagement models appear to have limited to no success and more than 81% of participants think that new partnership models are required as shown in Fig. 3.3.

<sup>6</sup> <https://urbact.eu/>

**Figure 3.3: Does local energy transition require new partnership models?**

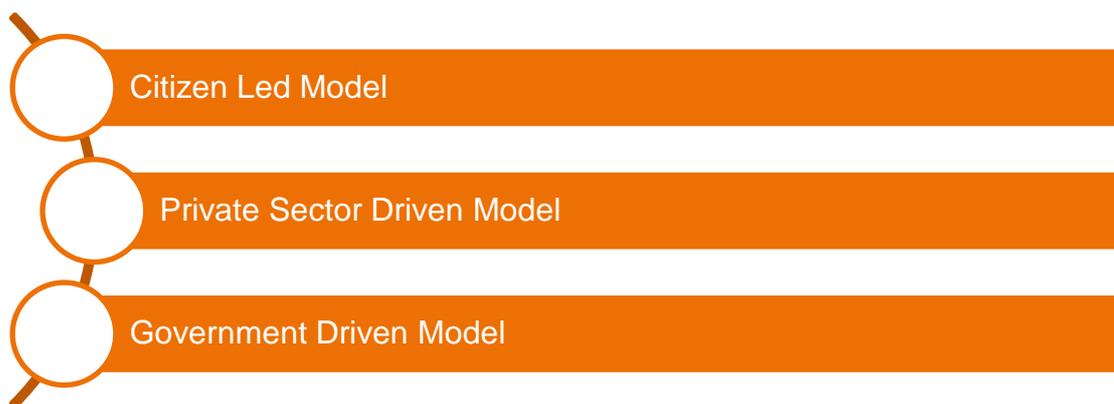


As for stakeholders' engagement, this is recognised as still being in its early days, facilitated by NGOs in many cases, but needing optimisation, funding, and clear targets/focus. It is still a dialogue which has winners, losers, silos, factions (e.g. NGO vs private subject, private subject vs government) and in general involves a low level of mutual trust. This dialogue is also strongly influenced by governments' attitude towards renewables: in many cases governments are perceived as reactionary and tending, at best, to follow pioneers rather than to lead innovations. Stakeholders' engagement is even more relevant as citizens' engagement was perceived as critical to the energy transition by more than 97% of the survey participants.

**81% of participants said that a new partnership model is required and 97% of participants agreed that citizen engagement is critical to the energy transition.**

When it comes to proposing new public/private/NGO partnership models, ideas vary, whereby every stakeholder would like to either lead or be at the centre of the partnership configuration. Through responses, three different models emerge as shown in Fig. 3.4:

**Figure 3.4: Partnership Model for Local Energy Transition**



- A bottom-up, citizens-led model, whereby communities propose and influence policies. In this model, policymakers and experts act as facilitators and evaluators, private stakeholders and investors or implementers and civil society organisations as impact assessors and capacity/awareness builders. This could also be seen as an enhanced model of social enterprise.
- A private sector driven model, whereby private companies propose business models and solutions (e.g. ESCOs, PPAs) which are then adopted by the public, regulated by the government and with the NGOs facilitating citizenship debate within pilot projects. One example of such a model is the Schneider Electric Foundation financing NGOs to develop pilots addressing energy poverty and complementing governmental action on that specific front.
- A government-driven model (particularly supported within emerging markets such as India) whereby the government sets regulations and MOUs with private implementers for the sharing of data, and NGOs evaluate performance and make available both results and those data to the public.

According to the surveyed stakeholders, new models should also be agile (i.e. without too many intermediate validations), promote knowledge/information sharing, support opening of local markets and engagement of citizens, introduce an appropriate set of behavioral incentives, and provide benefits to local communities.

### **4Cs fundamentals to local energy transition - Collaboration, Communication, Community and Cash.**

- A Survey respondent

The first way to increase stakeholder engagement, based on 46% of survey respondents, is via education and knowledge sharing, so as to debunk myths and to create an understanding of the products and benefits of energy transition. Any interested group with a dedicated budget or team (e.g. consumer organisation, working groups, public forums, industry groups, local dedicated one-stop-shops for citizenship advice) could be a catalyst for the information and mindset change. Collaboration with local and national media on local energy transition matters and creating awareness through innovative methodologies could also help increase citizens' participation and lobbying towards political elites.

Participants also attribute value to local projects supported by industry players (e.g. SELCO, Husk Power, Schneider Foundation, Best Exchange in California) or NGOs (e.g. the solar kits supported by IBEKA, EIB, ADB, JICA, AUSAID and Solar Without Frontiers in Africa). In their structuring, these projects should ideally use Transformation Change Methodologies and participated planning and should reconnect, via the respective local authorities, to the SDG Development Committee, to integrate into the global discourse.

A number of participants (5.1%) also believe in the need for self-empowerment, whereby citizens increase their active participation in local politics, their research for information and, most importantly, start voting with their daily consumer choices. This could be further facilitated if governments devised energy transition plans and mechanisms at a scale that citizens can identify with, for example, by promoting decentralisation of renewables (like in Switzerland, whereby small associations of local renewable energy generators can negotiate electricity sale tariffs directly with utilities, with the government only regulating minimum prices).

Best practices of public/private/NGO/citizens partnerships for the energy transition are many but often unknown to participants. Nonetheless, participants agree that there is no one-size-fits-all approach, to the point that, for example, incentives can turn out to be a benefit as much as a distortion mechanism and a barrier to development, depending on how (and in the interest of whom) they are crafted.

## 2.3 ADDRESSING AND OVERCOMING KEY BARRIERS

The respondents recorded a number of barriers when engaging with stakeholders on local energy transition matters. Leadership and management of energy transition were of concern to a majority of the survey participants. Although a number of barriers were highlighted, we have tried to summarise them as below:

- Political willingness and competence
- Lack of national and local strategy
- Misalignment of action plans
- Conservative regulatory environment
- Access to information and decision makers
- Low return on clean energy projects
- Lack of knowledge and awareness
- Lack of funding to support micro-projects
- No monitoring & evaluation mechanism

The main barrier in energy transition is the misalignment of stakeholders' targets and action plans, as in both developing and developed countries, interest in fossil fuels and related political and financial activities are still present and impeding progress of the transition. In emerging markets, additionally, corruption and lack of equitability threaten the basic energy needed for everyday use, such as access to electricity, cooking, and water heating.

**Often policy direction is sudden, and the importance of time and necessity to deliver through political cycles can impact negatively on the process and achieving optimum outcomes. Stakeholder engagement is crucial, while it takes time, patience, and a desire to achieve realistic collective ownership of policy development and consequential implementation; inclusion from the ground up, with positive clear leadership, clarity of purpose and communication of same from the top down.**

- A Survey respondent

Another barrier is the lack of a national strategy, vision or policy/regulatory supports. In some cases, governments appear to determine policies disregarding the experts' recommendations and inter-ministerial coordination. Frequently (according to 14% survey respondents) the barrier might lie downstream in the administrative structure: bureaucracy, silo-mentality and inertia. The problem is that often, either leadership is missing or processes are inefficient, to the point that sometimes it becomes difficult to identify competences and accountabilities.

An equally strong barrier is the lack of awareness about the importance, urgency, and opportunities of transitioning to low carbon generation technologies. A case in point is the US, where despite a developed market, energy literacy<sup>7</sup> remains low (<12%). Parallel to this result is the fact that more than 12% of the survey respondents consider stakeholder engagement not inclusive, lacking clarity of vision and failing to catalyse stakeholder communication.

Finally, monitoring and evaluation mechanisms are often weak, leading to poor implementation. NGOs seem to lack long term vision, thorough analysis, and instruments to develop partnership for projects (such as renewable energy ones) that often have high upfront costs and long return on investments. In emerging markets, private stakeholders also face hurdles in accessing finance, as renewable energy investments are still perceived as risky and stakeholders are directly liable for non-performing assets.

<sup>7</sup> Energy Literacy is an understanding of the nature and role of energy in the world and daily lives accompanied by the ability to apply this understanding to answer questions and solve problems. Access at: <https://www.energy.gov/eere/education/energy-literacy-essential-principles-energy-education>

# Chapter 4

# Digitalisation-An Enabler to Local Transition

## 1. BACKGROUND

Innovative and flexible policy as well as business models are recognised as key to facilitate energy transition. New business models will enable lower carbon applications, increase energy efficiency and offer higher levels of participation for customers. Digital technology integration into the energy system is a prerequisite for energy transition and modernisation of the energy system. Furthermore, it is the key to delivering new innovative business models. Digitalisation offers a platform for interfacing between physical assets and the digital world. Overall, it has enhanced discussions around data analytics by providing better quality data, decentralised data storage, enhancing computing capacity and therefore efficiency, and enabling greater participation of customers. In addition, digitalisation has effectively enhanced connectivity and the ease of transferring data across the globe in many sectors, and it is expected that these trends have the capacity to significantly impact the energy ecosystem as well. In 2016, half of the global population had access to the internet, up from 500 million in 2001, showing that the digital platform is expanding much faster and providing substantial opportunity to advancing energy infrastructure locally as well as nationally.

**“The pace of digitalisation in energy is increasing. Investment in digital technologies by energy companies has risen sharply over the last few years. For example, global investment in digital electricity infrastructure and software has grown by over 20% annually since 2014, reaching USD 47 billion in 2016. This digital investment in 2016 was almost 40% higher than investment in gas-fired power generation worldwide (USD 34 billion) and almost equal to total investment in India’s electricity sector (USD 55 billion)”.**

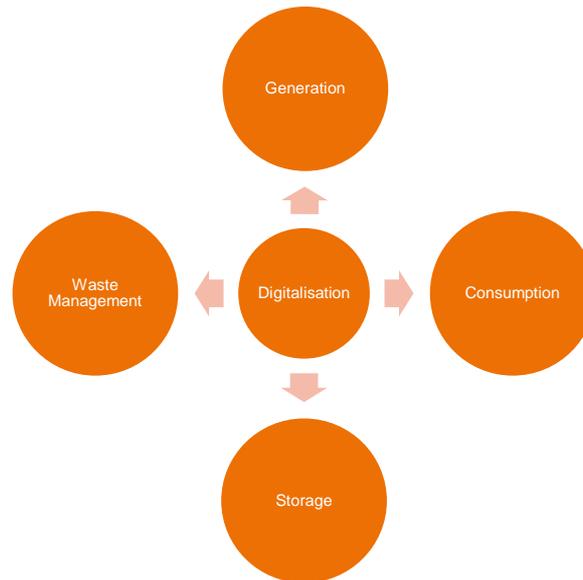
- IEA Energy & Digitalisation Report, p. 25, OECD/IEA 2017,

Ongoing innovation and digitalisation of the energy system is creating new market structures and giving enormous power to consumers. For example, in electricity markets we are seeing the development of “prosumers” – customers that have invested or are willing to invest in power generation to meet their own energy demand as well as trade the excess energy with power utilities and other consumers connected with the grid. Further encouraging policy support and significant R&D funding has allowed the cost curve for the newer renewable technologies and storage solutions (e.g. batteries) to come down exponentially, allowing more informed consumers to take control of their energy profiles. These shifts in consumer trends have led to electricity distribution companies having to re-evaluate their market models to include consumer requirements in order to effectively sustain payback on their capital investment and operational costs.

## 2. DIGITALISATION IN THE LOCAL ENERGY ECOSYSTEM

A range of digital technologies and tools are already being used in the current energy eco-system. Frontier digital innovations such as artificial intelligence (AI), blockchain, machine learning, advance data analytics, Internet-of-Things (IOT), big data, 5G, cloud computing, etc. are also emerging and being explored for addressing the energy transition challenges. Digitalisation is breaking the silos among different stakeholders, increasing their flexibility, and enabling better integration at all levels. Furthermore, it provides better prediction, real-time monitoring, control, engagement, and improves overall efficiency. At the local level, using digital technologies will significantly help to speed up our efforts towards creating a locally inclusive energy market. This can be achieved through the digitalisation of power generation, energy consumption, energy storage and waste management (see Fig. 4.1.)

Figure 4.1: Digitalisation at the heart of local energy eco-system



## 2.1 POWER GENERATION

The local energy transition is driven by opportunities surrounding renewables, such as solar, wind, biomass among others, and the availability of relevant technologies to extract the energy from these renewable sources. Digitalisation can play a crucial role in developing local energy systems and local energy trading opportunities, bringing flexibility, security, and resilience to the ecosystem. Innovative renewable power generation technologies have recently triggered discussions on the creation of more decentralised energy networks in both developed and developing countries. The need for people to have more control over their energy production and consumption coupled with the steep decline in costs of solar and wind technologies has led to the adoption of renewable energy at the local level in many cases. Whilst wind power still remains out of reach for most private citizens due to its complexity in installation, maintenance protocols, and higher capital cost; crashing prices of solar PV have been the key to bringing power to local people in the majority of rural areas without grid energy access worldwide.

**Digitalisation will enable renewable based local energy generation and trading opportunities by bringing active citizens and creating local partnerships for local benefits.**

Distributed power generation has allowed end-users and local communities to make their homes and communities energy independent, reducing peak power requirements, increasing system reliability, improving power quality and efficiency, and reducing vulnerability to improvements in infrastructure resilience. As more users gain access to the internet, new generation systems will need to be imbedded with IOT and AI capabilities to allow for controlled production of power in newly decentralised ecosystems. The use of predictive software to understand weather based renewable energy generation patterns can be exploited to enhance conversion output of local generation units. In addition, IOT & AI systems can also be used to deal with or overcome the intermittency of Solar and Wind energy and to support the stability of systems.

## 2.2 CONSUMPTION

On the consumption front, a major stress has been placed recently on leveraging digitalisation opportunities for reducing energy consumption and improving energy efficiency in our homes, industries, transport and other sectors. For example, according to IEA, digitalising residential and commercial buildings will generate 65 PWh<sup>8</sup> of energy savings by 2040, which would be equal to the total final energy consumed in non-OECD countries in 2015. Digitalisation can help improve energy efficiency in four different ways as shown in in Fig. 4.2

**Figure 4.2: Application of digital tools different stages of energy management**



Bringing energy-efficient appliances and further improving the operational efficiency of our residential and non-residential buildings will play a crucial role in local energy transition ambitions. Operational efficiency could be significantly improved by utilising digital technologies, tools and algorithms for prediction of energy consumption based on building profiles and individuals' behaviour, measurements in real time, monitoring patterns over a certain period of time, and recommending opportunities to control energy consumption. We need to allow each individual, in the context of citizens and communities, to actively shape energy transition and to do this the necessary support and capabilities need to be provided. Digital tools can offer immense potential for citizens to visualise their energy consumption and take necessary actions to manage their energy profile. ICT platforms utilising mainstream and social media can be used to create more informed energy users. Big data analytics can be used to segment customers based on their specific needs and specialised marketing strategies can be developed to gain customer support for the use of higher efficiency, low carbon emitting technologies. Through the localised marketing strategies drawn from big data analysis, information about high efficiency products and their prices at local supermarkets can also be made available to consumers, and the impact of such campaigns monitored over time through smart grid systems.

**Digitalisation is the 'lifeblood' of energy management and we need to utilise its potential in making energy consumption more visible and manageable.**

**-Mike Hughes, President UK & Ireland, Schneider Electric  
(Speech at IEA 4<sup>th</sup> Annual Global Conference on Energy Efficiency)**

Apart from infrastructure and customer acceptance preconditions, suitable regulatory frameworks, financial supports, and technical standards that support implementation of new business models and innovative digital technologies need to be developed.

<sup>8</sup> Petawatt (PW) is a derived metric measurement unit of power. The petawatt is equal to one billion million watts (1015W)

## 2.3 STORAGE

Changing patterns in electricity generation and consumption raise tremendous challenges for transmission and distribution infrastructure. Non-traditional end-users are canceling out traditional utilities on the back of new disruptive technologies. New generation of energy consumers want not just to generate their own energy, but also want to store it for future consumption. Battery storage technologies are providing innovative solutions for storage of electricity as well as the efficient transportation to consumers. Short-term energy storage (i.e. lithium-ion batteries) have limited capacity and life cycles, which are affected by the environmental conditions in which the technology is utilised but also the pattern of usage. Most battery additions are expected to be paired with solar PV and wind power as they increase their dispatchability. In spite of the relatively high cost and capacity constraints, battery storage systems are changing the mobility landscape as well, allowing consumers to gradually switch to fully electric vehicles (EV) from transitional hybrid (combustion engine/battery) vehicles. According to a McKinsey report on EV-battery manufacturing outlook for Europe, it is anticipated that by mid-2020 passenger EVs will reach parity with internal combustion engine cars (Eddy, Pfeiffer, & Staajj, 2019). Bloomberg NEF's annual price survey shows that the volume-weighted average battery pack price fell by 85% from 2010-2018 (Goldie-Scot L. , 2019).

**Digitalisation will enable us to group the energy storage units from one community and operate them either in coordination with the central grid, or other community grids to fulfil the energy demands of their consumers.**

Storage technologies will significantly influence energy consumption in new local energy ecosystems. Apart from providing consumers with the capacity to regulate their demand-response and to sell excess power to other consumers, these interconnected decentralised systems will enhance energy security and the resilience of local energy systems. Digital technology can support efforts in the development of storage systems, where energy storage is not restricted to geographically local sites but includes other parts of integrated power pools which can also serve as temporary storage. The simultaneous monitoring of the performance of multiple storage systems under various environmental, generation and consumption conditions in a local energy system can allow for more optimised usage of current storage technologies. ICT and other digital technologies can facilitate the grouping of energy storage units and develop a better understanding of storage patterns from one community to another, as well as provide an opportunity to trade the excess electricity with other local community microgrids, thus fulfilling the demands of their consumers. Fig. 4.3 summarises the key benefits of digitalising the storage system.

**Figure 4.3: Benefits of digitalising storage**



## 2.4 WASTE MANAGEMENT

Solid Waste Management after generation, consumption and storage are critical for long term sustainability of any energy system. According to the World Bank, the world generates 2.01 billion tonnes of municipal solid waste annually and this is expected to grow to 3.4 billion tonnes by 2050 (World Bank, 2019). On the other hand, about 998 million tonnes of agricultural waste is produced annually (Obi, Ugwuishiwu, & Nwakaire). Agricultural and municipal waste, along with other by-products, are typically available at very low cost or even negative cost where disposal in landfill is avoided. These resources could be used as fuel to produce heat and electricity. In coming years, anaerobic digesters will be commonly used to break down biodegradable material in the absence of oxygen and production of biogas which can be used to generate electricity and heat. Even currently, converting biomass to energy anaerobic digestion is one of the most convenient and eco-friendly means of conversion that has been widely adopted by the European countries.

**Digitalisation has the potential to optimise the process from waste collection to energy generation by providing real-time information, better analytics, and engagement of stakeholders across the supply chain.**

This technology has great potential in managing local organic and sewage waste for the generation of energy which can be utilised locally. Community/City AD schemes can produce electricity, heat or renewable natural gas and create local business opportunities. Digital technologies can help the monitoring of waste fraction and the production of relevant analytics at household level or community level. IOT can be used to optimise collection services, whilst sensors can assist in measuring the valorisation of bio-waste into bio-gas (European Commission, 2019). Cloud-based collective platforms can engage all the stakeholders on the supply chain in identifying and providing real time information from waste collection to energy generation. Additionally, there exist a number of applications which need to be explored for improving the waste-to-energy generation process.

# **Chapter 5**

## **Financial Models Enabling Local Transition – An International Overview**

## 1. BACKGROUND

Fostering green growth and remaining below 1.5-degrees Centigrade requires fundamental shifts across the socio-economic and political spectrum: from policy and regulatory change, to behavioural shifts and business model upgrade, a holistic innovation and environmental consciousness would facilitate a fast-forward of the low-carbon transition. This chapter examines the most critical aspect of ensuring sustainable, resilient and prompt energy transformation - notably financing. Financing underpins the introduction of any new technology and without a robust and continuous capital flow redirected to low-carbon technologies in a stable and consistent manner, no social venture or behavioural shift will be sufficient to keep us on track to full decarbonisation. Capital, whether venture capital or public funds or a combination of the two, both catalyse multi-disciplinary and cross-sectoral innovation by convening expertise, forging capacity building and empowering seed initiatives to scale-up and bear impact. There are several challenges faced by local stakeholders, including local or regional authorities when bringing local investments for local energy transition (European Committee of the Regions, 2017) as shown in Fig. 5.1. A few initiatives have proven particularly successful in this domain and this chapter makes an attempt to outline some of them below. The role of government and regulation might best be perceived as providing certainty and underwriting some risky investments, but public funding only will be largely insufficient to foster or accelerate low-carbon technology deployment. An important caveat to our approach thereof, is that a stable regulatory framework is assumed as underpinning any long-term investment flows in low-carbon assets and thereof is considered as critical to facilitating such flows.

**Figure 5.1: Obstacles in bringing finance for local energy transition**



**The role of government and regulation might best be perceived as providing certainty and underwriting some risky investment, but public funding only will be largely insufficient to foster accelerate low-carbon technology deployment.**

We have presented here three models amongst the most interesting, meaningful and scalable financing models currently existent in the identified geographies. Further, the selected examples were chosen because of their assumed replicability across geographies and contexts, thus to a certain extent serving an additional value of building a repository of knowledge and benchmarks on what constitutes a successful financial model for the low-carbon transition.

## 1.1 EUROPEAN CLIMATE-AND ENERGY-KIC

Climate – KIC is a Knowledge and Innovation hub supported by the European Institute of Innovation and Technology with the aim to accelerate the climate innovation across Europe and beyond<sup>9</sup>. The Climate-KIC has more than 270 global partners spanning universities, businesses, cities and NGOs. The mission of the organisation is to identify and support innovation that helps society mitigate and adapt to climate change. The organisation places public funds to stimulate break-through technologies and leverage those grants with private seed funding, facilitating private investors, venture capital and angel investors to make the highest ROI decisions for maximum impact. The Climate-KIC also works with trusts, foundations, city municipalities and businesses to provide a range of services that address real world challenges and innovation needs. The organisation has in-house clean tech incubator, runs educational programmes across Europe on best practices and up-to-date knowledge on the energy transition. It regularly organises Climathons, ideas competitions, Climate Launchpads and business incubation programmes - Greenhouse and Accelerator, to seek fresh new thinking. Those instruments have proven to be a powerful accelerator of new and implementable clean technology ideas. For instance, some of the key initiatives are:

- Climathon: Cities identify their climate challenges and call on citizens to come up with innovative solutions. In a global 24-hour climate change hackathon citizens, start-ups, civil society, co-create innovative, multidisciplinary solutions to these climate challenges.
- ClimateLaunchpad: This is the world's largest green business idea competition for clean technologies. The competition attracts more than 1,000 ideas from 25+ countries and offers coaching and financial support to the most successful ideas.
- The Greenhouse: A pre-incubation programme, hosted in 12 EU cities, for clean technologies with access to mentoring and seed funding.
- Accelerator: Structured business and commercial support for established cleantech start-ups, offering technology validation, office space in 14 EU countries and access to seed funding for selected start-ups with no equity taken.
- Education: Climate-KIC offers Master and PhD clean-tech entrepreneurship labels for selected programmes in the EU as well as professional competency and skills development focused on climate innovation and entrepreneurship through entrepreneurship summer schools, cross sectoral academic exchange and mobility programmes, climate thought-leaders' and practitioners' exchange, focused courses on specific innovation or transition challenge and professional placements for technology commercialisation.
- Investor marketplace: the Climate-KIC Marketplace highlights top start-ups and allows investors to search by technology readiness, capital requirement and profile data rating, among other indicators and make informed business decisions on where to invest.

The focus of climate-KIC is clearly on finding and funding the best way to accelerate clean technology innovation and solve critical climate challenges across Europe. The emphasis is on urban transitions, sustainable production systems, sustainable land use, and decision metrics and finance through creating bankable green assets and redirect finance to scale-up climate action. Climate-KIC has significant focus on subnational ecosystem where partnership of cities and regions with climate innovation hubs is encouraged. Some locally targeted projects are, for example, ConnectedClusters and Smart Sustainable Districts Programme which are stimulating climate innovation clusters to make cities, sustainable, low carbon and resilient.

<sup>9</sup> The stated objective of the EIT Research and Innovation Scheme is to stimulate low-carbon innovation in countries, regions and cities across Europe and significantly boost local capacity to implement the highest impact ideas, while reinforcing synergies and complementarities with EU, national and regional initiatives. Please examine the website of the organisation for a detailed overview.

**Noteworthy feature and achievements:**

The Climate-KIC has developed an innovation model of knowledge exchange and technology transfer amongst different stakeholders called the knowledge helix. This model helps sectors overcome information silos and gaps in knowledge and information and reduces the risk associated with innovation by being the first to invest and support. An in-house lab unit for knowledge development called the Transition Hub was established in Brussels in 2015 to embrace the complexity of applying system innovation to climate change and make it accessible and useful for practitioners and policy-making processes, thereof, enabling science-policy-practice interface on system thinking and transitions. The hub co-creates new tools and develops cooperation with regions and cities, academic, services and industry sectors, as well as produces insights for policy discussion and academic forums while contributing to EU policy shaping through the systemic perspective required to face Climate Change. An example of recent work is the Visual Toolbox for System Innovation, a resource book for practitioners to map, analyse and facilitate sustainability transitions.

The organisation leverages collective knowledge and expertise for systemic change, builds climate action movements, and transforms ideas into climate-positive businesses. At the time of writing, start-ups part of the Climate-KIC have raised more than 550 million EUR on external funding, more than 1,000 climate-positive companies were incubated and above 2,000 jobs created across the KIC start-up community with urban challenges tackled through the process.

**Smart Sustainable District Programme supports municipalities, cities and other local key stakeholders with the capacity and expertise to develop complex sustainable projects, accesses appropriate finances and bringing benefits to the communities.**

## 1.2 GULF COOPERATING COUNTRIES INDEPENDENT POWER PRODUCER SCHEME

A very peculiar Business Model emerged in the late 1990s in the Gulf countries, characterising a successful acceleration of large-scale centralised energy infrastructure development, wealth and normalising access to thermal first, now renewable power generation (El-Katiri, 2011)<sup>10</sup>. The Gulf Cooperation Countries (GCC) have decided to implement, through their state authorities, infrastructure tendering schemes to develop their energy infrastructure (power generation, potable water production through desalination) by international expertise firms. The Independent Power Producer (IPP) scheme also demonstrated an embedded aspiration for “value sharing” with local citizens using various elements. International developers progressively rallied to take part in UAE, Saudi, Qatar, Oman, Kuwait or Bahrain’s IPP or WIPP (Water and Power) schemes, bringing expertise and knowledge in complex power generation units to the Gulf countries and supporting strong economic growth through large-scale access to energy (industry, services, residential housing, digital expansion) in countries of high thermic pressure and enormous energy intensity for cooling and humidity-relieving purposes (Qatar Financial Centre Authority, 2012)<sup>11</sup>.

With the support of international advisors (banks, legal advisors) independent developers have put in place new “templates” adapted to local context and strengthening attractiveness of Gulf countries for international renowned financing institutions. The newly developed GCC IPP project schemes de-risked projects through adequate risk allocation between developers, EPC construction firms, banks, and state authorities providing

<sup>10</sup> “Investments into the power sector has also been encouraged through the promotion of private ownership over parts of the sector, though independent (Water and) Power Projects (IPPs and IWPPs respectively). Oman became the first GCC country to embark upon the privatisation of its utility sector in the mid-1990s, a policy since adopted in most GCC countries [...]”

<sup>11</sup> “Appendix A: Public Private Partnerships – Philosophy and Operating Frameworks [...]. By definition, PPP is a “partnership” option where dependency on private sector’s delivery and risk taking capabilities is tested on a very wide spectrum. PPP as a concept typically gets a buy-in at the policy level. However, it is the operative term of “partnership” which must be coupled with respective willingness and capabilities of the public and the private sectors. It is in its implementation where the concept is tested via economic and fiscal structures, public sector dominance, degree of transparency and accountability, political will of the government, and strength of the underlying business.”

long-term, Power Purchase Agreements at attractive pricing conditions and backed by strong economic fundamentals. Project Finance has thus been flourishing, nurturing also a solid local financing market. Further, in some countries, notably Kuwait or Oman the state shares have been tendered through Initial Public Offerings (IPO). Power Plant companies are therefore listed on local financial markets, enabling access to capital ownership of local strategic energy infrastructure (Oxford Business Group, 2019)<sup>12</sup>. The GCC IPP also include local content clauses that foster knowledge transfer to local industry and people (Willis Towers Watson, 2019)<sup>13</sup>.

**The newly developed GCC IPP project schemes de-risked projects through adequate risk allocation between developers, EPC construction firms, banks, and state authorities providing long-term, Power Purchase Agreements at attractive pricing conditions and backed by strong economic fundamentals.**

While traditional IPP “templates” had been developed on thermal power assets, their implementation in the RES industry led to a rapid uptake in the GCC region. The IPP scheme, in combination with the attractive climatic conditions (high insulation, large empty and flat landscapes, high wind factors), record low tariffs set in the PPAs (i.e. USD 30 /MWh large-scale centralised solar farms in the UAE) and have attracted en masse developers and banks to the region. This has nurtured a widespread acceptance and promotion of low-carbon options by both national institutions and the publics, with the notable creation of heavyweight bodies such as the MASDAR institute from Abu Dhabi, DEWA (Dubai Energy and Water Authority), ACWA Power in Saudi Arabia are more and more often winners of renewable energy tenders. Harnessing the fruits of renewable energies in the Gulf, countries are now further empowering citizens through flagship projects supporting local population pride in their local state and business models, and now turning to decentralised generation (e.g. solar panels on residential homes, rooftop PV) and electric transportation (Electric Vehicles) to reduce local gasoline dependency keeping oil for exportation.

The GCC IPP business models have thus been very effective and successful in 1) accelerating energy access and intensity of local countries to the benefit of economic acceleration and population growing wealth, and 2) standardising and democratising Renewable Energy Sources utilisation throughout the economy and the citizens’ usages.

### 1.3 GREEN FINANCE INNOVATION IN THE MIDDLE EAST AND SOUTH EAST ASIA

Many drivers for green energy finance exist including policy frameworks, regulatory incentives, technological innovation, in addition to growing public awareness of the catastrophic consequences of climate change and demands for action. The green finance innovation is a powerful multiplier of public engagement and PPPs to foster more capital growth in the low-carbon transition. In 2010, Lebanon implemented the National Renewable Energy and Energy Efficiency Action (NEEREA) - a green financing mechanism that was initiated by the Central Bank of Lebanon in collaboration with the European Union. It is dedicated to the financing of green energy projects by providing interest-free (around 2.5% as of March 2019) long-term loans (up to 14 years) for different types of facilities (LCEC, 2019). The initiative has been extremely successful - more than 150 private companies have been involved either in preparing the technical studies or performing consultancy or contracting works. In total, more than 800 projects and around USD 550 million have been invested in renewable energy and energy efficiency in the period 2013-2018, with the highest share going for the commercial sector, followed by the residential and industrial sectors. NEEREA helped the generation of more than 10,000 direct and indirect jobs in the sustainable energy sector in Lebanon (Gebrayel, 2018). The number of SWH companies has increased from 25 in 2010 to more than 170 in 2018 and that of PV companies

<sup>12</sup> “The decision to offer its citizens an opportunity to buy shares in its newest water and electricity generating plant is, in a sense, a case of transferring power to the people.”

<sup>13</sup> “A cornerstone of GCC nationalisation programmes is the implementation of administrative measures, which are usually quotas. In these programs, the state requires employers to hire some minimum percentage of nationals and implements a host of carrots and sticks (incentives and penalties) to ensure that the quota is met.”

from 7 in 2010 to more than 70 in 2018 (Gebrayel, 2018). Following the great success of NEEREA, two new financing mechanisms have been introduced providing soft loans with slightly different technical/financial conditions: LEEREFF (Lebanon Energy Efficiency and Renewable Energy Finance Facility, developed by EIB and AFD), and GEFF (Green Economy Financing Facility, developed by EBRD).

Similar initiative - KAFALAT Energy was initiated in 2013 to facilitate the access to loans by providing guarantees for SMEs willing to invest in renewable energy and energy efficiency with provisions such as increasing loan duration to 10 and 15 years for Energy Efficiency and renewable energy investments respectively; and 5% grant made available by the EU through the Central Bank of Lebanon (KAFALAT, 2019).

Similarly, in Turkey there is the TUREEFF, TurSEFF, and Mid-EFF credit lines in Turkey, providing soft loans for residential, commercial SME, and commercial mid-size projects (GEFF Turkey, 2019). The country has another ongoing EUR 100 million credit line called SUNREF aimed at providing technical and financial support for green and social investments in industries developed by AFD in 2017.

**Labanon's NEEREA - green financing mechanism has been extremely successful in engaging private companies to deliver local energy transition through more than 800 projects and beneficiaries, where more than USD 550 millions have been invested.**

The credit line vehicles have disseminated to North Africa and Maghreb via the MORSEFF in Morocco in 2015 with its EUR 110 million credit facility dedicated to financing energy efficiency and small-scale renewable energy investments of private companies, developed by EBRD, EIB, AFD, and KfW. More than 199 projects have been financed, equivalent to EUR 81.2 million as of December 2018 (MORSEFF, 2019). In Egypt, a model called EGYSOL was implemented to build a sustainable long-term framework for solar water heater market in the country. It is a public-private partnership jointly implemented by UNEP and Egypt's New and Renewable Energy Authority (NREA). The project aims at replacing conventional means of heating water by SWH systems in the Egyptian hotel sector.

**Demand aggregation, collective purchasing, real time implementation tracking, transparency, bringing more manufacturers, and building trust among consumers are the key strategies behind the world's most successful India's zero-subsidy domestic LED Lighting Programme.**

Ending up with an innovative financial model from India, the Unnat Jyoti by Affordable LEDs for All (UJALA) initiative was launched in 2015 and turned out to be the world's largest domestic lighting programme. This initiative was implemented by Energy Efficiency Service Limited (EESL) that conducted a mass awareness and bulk procurement which pushed the distribution companies to invest in the capital cost of LED lamps. EESL then sold the lamps to the consumers at a preferential rate. The initiative led to a ten-fold increase of the LED market in India within 5 years, making the country the second largest LED market in the world. The UJALA scheme was expected to result in 100 billion of kWh per year and 790 million tons of CO<sub>2</sub> emissions reduction by March 2019 (EESL, 2019). UJALA has made energy efficiency affordable to common people and has induced a social change, as everyone now is more aware of the financial and environmental benefits of switching to efficient LED lighting.

# Conclusions

## CONCLUSION

The energy transition is a precondition for climate change mitigation. Through national determined commitments (NDCs) governments are making efforts towards setting energy transition action plans and strategies into motion to accelerate the implementation of clean energy policies and technologies. However, global energy transition will not be reached successfully and in a timely manner unless we also take a bottom-up approach and involve local actors in driving local energy transition agendas. This study aimed at presenting the local stakeholders' perspectives and recommendations to speed up their efforts towards local energy transition. Over 143 survey respondents - that included local authorities, NGOs, private sector companies, and citizens provided interesting insights and recommendations for the way forward.

It was stressed that confidence in government ability to drive forward the low carbon transition is poor all across the spectrum. A high level of awareness of the energy transition is wide-spread but does not translate into awareness of national/regional visions, targets or concrete examples of initiatives around the issue. Important catalysts and emerging initiatives that promote citizen engagement and trans-border, supra-state platforms. For example, in the EU, the covenants of mayors, renewable energy cooperatives, prosumer movements, do not seem to be identified in the surveys, which implies that a lack of trust may be based on low awareness rather than knowledge of deficient initiatives at a certain level. For the majority of the citizens there was also a lack of clarity on what type of action on their part would be impactful and what were the right technologies or measures available to adopt.

Survey respondents flagged compartmentalised work and a lack of coordination on the partnership between governments, NGOs and the private sector as a problem. Enhanced funding, innovative business models, stable and supportive regulatory frameworks, more transparency, the sharing of best practices and success stories and harnessing the potential of digital innovations were key recommendations. There was a disturbing indication reported that academic thinkers do not see their research making a difference on low carbon energy transition challenges. A call for the development of regional/local councils on energy transition issues, and boosting candidates in elections who understand and advocate for environmental sustainability were also very pertinent reflections from the survey.

Overall this report presents the citizens and other key local stakeholders' views and provides key recommendations for consideration. In addition, the report also discussed how digital innovations can facilitate and accelerate cross-entity collaboration and deepen engagement of citizens to achieve local energy transition objectives. A review of different regions and countries' financial models concerning local energy transition has also been discussed, as these have potential to be replicated in other constituencies. Green energy finance requires diversity in financial instruments to guarantee a continuous growth towards greener energy options. Along with the requirement of significant government funding for developing the local energy markets, more initiatives have yet to come to mobilise private sector resources and talents to drive local energy transition agendas, and to assist governments in achieving national objectives.

## Appendix A (Survey question for Citizens)

### Q.1 To get an understanding about how much you know

Hint questions:

Do you know where you get your electricity from and what is the per unit charge you are paying?

Do you know how you can reduce your electricity bill?

Do you know what clean energy is and why everybody is talking about energy transition?

Are you aware of any efforts to promote clean energy in your neighborhood, city, and state?

### Q.2 To get an understanding of the current barrier

Hint questions:

As of now citizens are not engaged enough in energy policy decisions or implementing energy activities in their locality. What do you think as a key barrier? Can you provide 3-4 key barriers?

### Q.3 To get an understanding of how you would like to engage

Hint questions:

How do you think citizens should be involved? Can you provide 3-4 key activities how you would like to get engaged to support a clean energy community?

And who in your opinion should be the focal contact for citizen's engagement for this clean energy journey.

## Appendix B (Survey questions for Private Sector)

Q1. Are you aware about energy transition, its importance and activities at the national level, e.g., vision or any specific targets, initiatives to achieve that target, etc.? Do you think the government has been successful in demonstrating the energy transition leadership in your country? Can you rate your confidence with the government on a scale of 1-5? (1-Very low, 2-Low, 3-Neutral, 4-High, 5-Very high)

Q2. What are the main barriers you see in engaging with the government and what are your specific needs?

Q3. What are the main barriers you see in engaging with the civil societies and what are your expectations on this engagement?

Q4. The involvement of private sector industries in the energy sector has been growing in over the past decade, and their role has also become increasingly important. What is your role and what impact have you made in the local energy community until now?

Q5. What additional roles do you think the private sector can play in the next five years? What barriers would you like the government to address to provide a better platform for private sector's active involvement in the energy transition.

Q6. Do you think private sector role will be crucial in national and local energy transition? What do you think about NGO-private sector-government relationship? Do you think a new way of the partnership is required to achieve the goal of energy transition?

Q7. How would you as a private sector like to be involved in local energy transition?

Q8. Do you think citizen engagement is critical for energy transition? If yes, how we can form a group of active citizens from the local society (to work as an employee or to work as an active customer) who can work with the local private sectors and NGOs in close collaboration to ensure and achieve the local energy transition goals?

Q9. How can we go bottom up? What is your thought on empowering local authorities, NGOs, and private sectors to decide and design their local energy transition plan and informing it to the national government?

Q10. Are you aware of any best practices about private sectors' engagement for local or regional energy transition? What do you think should be an immediate step for the private sector which has not been involved in the local energy transition yet?

*## Questions were accordingly revised for local authorities and non-governmental organisations.*

## Appendix C: FEL Team - Active Citizenship Taskforce

	<p><b>Piyush Verma, Ireland</b></p> <p>Piyush works as Senior Energy Market Analyst at the International Energy Research Centre in Ireland. He specialises in energy transition policy and developing pioneering ways to bridge the gap between technology and regulatory innovation. He has previously worked in India, Vanuatu, and New Zealand on researching, developing and implementing energy transition policies. He is passionate about the integration of technology, society, environment and governance, and further developing an enhanced international collaboration to achieve global energy transition objectives. He has published more than 25 journal/conference articles, reports and opinion pieces on energy and climate change issues. Piyush is an Electrical Engineer, a postgraduate in Power Systems and has a PhD in Energy Efficiency Technology and Policy from The University of Auckland, New Zealand. He has also completed a Mini MBA in Strategy &amp; Leadership from the Irish Management Institute, Ireland.</p>
	<p><b>Lucia Fuselli, Luxemburg</b></p> <p>As an energy investment specialist at the European Investment Bank (EIB), Lucia Fuselli coordinates the due diligence of some of the largest investment projects focusing on energy and sustainable infrastructure in emerging markets as well as in Europe. In this capacity, she is also involved in the Bank's advisory activities and energy lending policy development. Lucia has also been a research consultant for London Business School, focusing on innovative financing for energy efficiency and, as a subject matter expert, on the Urban Innovative Actions initiative for cities. Previously, she was an external consultant for an EU MP in Brussels, advising on energy, sustainable urban development and innovation. Lucia developed her early career internationally in project development, corporate (Trina Solar), asset management and consulting (RINA). She holds a Master's in Finance from London Business School and a Master's degree in Civil and Environmental Engineering.</p>
	<p><b>Iva Brkic, Croatia</b></p> <p>Iva is an energy analyst pursuing a dedicated career in the international energy industry. She has worked for the UN's International Atomic Energy Agency (IAEA) in Vienna, PetroChina in Beijing and oil &amp; gas consultancy Westwood Global Energy Group (WGEG) in London. Currently, Iva is working in the Sustainable Energy Division at the United Nations Economic Commission for Europe (UNECE) in Geneva. Iva has extensive international public private sector energy industry experience. As an energy consultant, Iva has worked internationally on a range of bespoke research and advisory projects, for major investment banks and private equity firms. Prior to WGEG, she worked at PetroChina where she tailored the company's new markets' entry strategies focusing on upstream oil &amp; gas assets overseas. At the UN Iva is working closely with the Member States on sustainable</p>

	<p>energy topics and achieving SDG 7. Iva holds a BSc degree in Economics and MA in East Asian Economy and Society from the University of Vienna. She is fluent in English, German and Croatian with advanced knowledge of Mandarin, French and Russian.</p>
	<p><b>Reem Irany, Lebanon</b></p> <p>Reem holds a Bachelor’s Degree in Electrical and Computer Engineering. After graduation, she explored the lighting industry and the latest advancements in the field to design and implementing innovative lightning solutions. Aspiring to expand her expertise to a societal level and have access to decision and policy making, Reem moved to LCEC, which is the national energy agency for Lebanon. LCEC provides her with a great deal of experience in the development of national strategies and implementation of action plans. She contributed to the preparation of the National Energy Efficiency Action Plan for Lebanon, the Energy Sector Response Plan, and the Energy Efficiency law. Furthermore, she was part of the technical support unit to the Central Bank of Lebanon in charge of the technical evaluation of green projects under the NEEREA national financing mechanism. She assisted in drafting solar thermal ordinance for local authorities with Italian partners, and she is currently involved in the implementation of solar farms under Power Purchase Agreement and rooftop PV with local and international partners. In addition to her work at LCEC, Reem assisted the Energy Policy and Security Program at the American University of Beirut in cutting-edge research and strategy on the latest trends and policies in renewable energy. Reem joined the Future Energy Leader Programme in 2018 and is now taking part in shaping the local FEL programme in Lebanon.</p>
	<p><b>Charles Chibambo, Malawi</b></p> <p>Charles has over 11 years of experience in the electricity generation, transmission and distribution sectors in both on and off grid systems. He is a member of the World Energy Council’s FEL-100 Program, a representative member of the Council on Large Electric Systems (Cigre B3.43), an alumni of the U.S. State Department’s International Visitors Leadership Program (IVLP) Energy Security Programme and NEPAD’s Infrastructure Skills for Development Program. Charles is a registered member of the Malawi Board of Engineers. He holds a BSC in Electrical Engineering from the University of Malawi – The Polytechnic, a Master’s Degree in Leadership and Change Management from Leeds Metropolitan University and has trained in Power Systems, Project Management, Strategic Planning, Contract Management, Risk Management and Project Finance.</p>
	<p><b>Arwa Guesmi, Tunisia</b></p> <p>Arwa Works as a Senior Consultant at Deloitte Afrique and advises on public sector reform and energy projects. She is currently working as the Public lighting technical specialist for a 50M\$ USAID project on decentralisation and improving municipal services in 33 Tunisian municipalities. Before joining Deloitte, Arwa worked for the fastest growing energy tech company in North America where she led the efforts of the innovation labs designing low cost, smart energy solutions for their product launches. She also conducted market research on clean energy</p>

	<p>emerging technologies, notably lithium ion batteries, blockchain, electric vehicles and energy infrastructure fleets. She developed technical proposals for US government energy agencies like NYSERDA and DOE. Prior to joining the Clean energy sector, Arwa worked for the Oil and Gas industry for 5 years developing detailed engineering studies for onshore and offshore platforms and advising on use of technologies. Arwa has a Bsc in Electrical Engineering and a track record of engaging in leadership forums and international networks of social change makers.</p>
	<p><b>Yana Popkostova, Bulgaria</b></p> <p>Yana Popkostova is the founder of the European Centre for Energy and Geopolitical Analysis - an innovative fusion between an energy think-dotank and a consulting firm aiming to catalyse meaningful leadership and cross-sectoral engagement for a sustainable, inclusive and resilient energy transition. ECEGA explores the changing geopolitics of energy and empowers policy and business leaders to manage the risks and capitalise on the opportunities created by the changing energy and geopolitical landscape. We work to ensure that a better future is a certainty, not an aspiration. Yana's policy work explores the wide spectrum of EU Energy and Climate Policies, the Geopolitical Impact of the Energy Transition, as well as energy-related aspects of the Belt and Road Initiative. She is equally an all-around passionate advocate for women's empowerment and diversity in energy. Her background is in the EU Energy policy incubator, spanning institutional and not-for-profit service. She has previously worked on energy policy and strategy for the European Climate Foundation and before that within the cabinet of the Vice-president of the Alliance of Liberals and Democrats for Europe, and DG Presidency in the European Parliament. She served as an expert reviewer of the IPCC special report on global warming of 1.5 degree and sat at the advisory board for France of the Women's Entrepreneurship Day. In 2017, she was designated as one of the 35-under-35 Future Energy Leaders by the World Energy Council and as an inaugural EUI Policy Leaders Fellow on Transnational Energy Governance. Yana holds a post-graduate degree in European Politics with distinction from the London School of Economics.</p>
	<p><b>Lolita Carry, France</b></p> <p>Lolita Carry is a Financial Advisor currently supporting the executive management of ENGIE, a leading company in low-carbon energy and services responding to the huge climate challenge. In the past years she has been steering strategic M&amp;A projects for the Group and its operational entities, rolling-out the company transformative strategy and repositioning it towards green and renewable energy generation and integrated services towards a low and even no-carbon transition for industrial, corporates and public authorities. Through her active mobility she has been working across geographies and activities, from the Middle-East to Latin America, from Central Asia to Western Europe, and has gathered deep knowledge of the multiple impacts of energy transition on industry and various economies (be it financial, societal, social wise). She is strategic-minded, combining strong financial experience with entrepreneurial sense. Thanks to her enthusiasm, humour and team-spirit while enjoying intercultural exchanges of views, she is able to navigate in complex organisations and participate in international and</p>

	national networks (WEC-Future Energy Leaders and FEL France Committee).
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## Glossary

AD: Anaerobic Digestion  
 ADB: Asian Development Bank  
 AFD: Agence Francaise De Developpement  
 AI: Artificial Intelligence  
 AUSAID: Australian Aid  
 BIM: Building Information Modeling  
 DEWA: Dubai Energy & Water Authority  
 EC: European Commission  
 EESL: Energy Efficiency Services Limited  
 EIB: European Investment Bank  
 EPC: Enginnering, Procurement and Construction  
 ESCO: Energy Service Company  
 EU: European Union  
 EUR: Euro Currency  
 FEL Future Energy Leader  
 GCC: Gulf Cooperation Council  
 GEF: Green Economy Financing Facility  
 GHG: Greenhouse Gas  
 IBEKA: Institute of Public Business and Economic Indonesia  
 ICT: Information and Communications and Technology  
 IEA: International Energy Agency  
 IOT: Internet of Things  
 IPO: Initial Public Offering  
 IPP: Independent Power Producer  
 IRENA: International Renewable Energy Agency  
 IT: Information Technology  
 JICA: Japan International Cooperation Agency  
 KIC: Knowledge and Innovation Community  
 kWh: Kilo-Watt Hour  
 LCEC: Labanese Centre for Energy Conservation  
 LED: Light Emitting Diode  
 LEEREFF: Lebanon Energy Efficiency and Renewable Energy Finance Facility  
 Masdar Institute: Masdar Institute of Science and Technology, Abu Dhabi  
 MORSEFF: Morocco Sustainable Energy Financing Facility  
 MoU: Memorandum of Understanding  
 MWh: Mega Watt Hour  
 NEEREA: National Energy Efficiency and Renewable Energy Action  
 NGO: Non-Governmental Organisation or Civil Society Organisation  
 NREA: New and Renewable Energy Authority  
 OECD: Organisation for Economic Cooperation and Development  
 PhD: Doctor of Philosophy  
 PPA: Power Purchase Agreement  
 PPP: Public Private Partenrship  
 PV: Photovoltaic  
 R&D: Research and Development  
 REEEP: Renewable Energy and Energy Efficiency Partnership  
 REN: Renewable Energy  
 RES: Renewable Energy Sources  
 ROI: Return on Investments

S3IDF: Small-Scale Sustainable Infrastructure Development Fund  
SDG: Sustainable Development Goals  
SME: Small and Medium Enterprise  
SWH: Solar Water Heater  
TurEEFF: Turkey Residential Energy Efficiency Financing Facility  
TurSEFF: Turkey Sustainable Energy Financing Facility  
UAE: United Arab Emirates  
UJALA: Unnat Jyoti by Affordable LEDs for All  
UN: United Nations  
UNEP: United Nations Environment Programme  
UNECE: United Nations for Economic Commission for Europe  
UNESCAP: United Nations Economic and Social Commission for Asia and the Pacific  
UNSD: United Nations Statistics Division  
USD: United States Dollar  
WEC: World Energy Council  
WHO: World Health Organisation

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## Acknowledgements

We would like to thank the following mentors for their guidance and support throughout the duration of this project:

- Sue Stevenson, Director of Strategic Partnership and International Development, Barefoot College
- Shirley Gallagher, Managing Director, System for Progress Limited
- Priam Judith, FEL-100 Alumni, World Energy Council

We would also like to give our special thanks to 73 citizens and 60 representatives from national/local authorities, non-governmental organisations and private sector companies. Without their comprehensive response to our survey, this study would not have been possible. As majority of survey respondents wanted to be anonymous, we have not mentioned any organisations and individuals' details.

The project team would like to thank the World Energy Council, FEL Board, and all the other organisations and individuals who informed the project's approach, supplied information, provided ideas, and reviewed drafts. Their support and insights have made a major contribution to the development of this report.