Clean Energy Development Strategies Workshop:

Developing a Local Strategy to Transition to Clean and 100% Renewable Energy

17-19 October 2017

Workshop report

Prepared by: Ana Marques Leandro and Arthur Hinsch

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International Cooperation and Development Fund

(TaiwanICDF)

ICLEI – Local Governments for Sustainability (ICLEI)
World Secretariat (WS) and Kaohsiung Capacity Center (KCC)

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Global 100% Renewable Energy Platform

(Global 100% RE Platform)

1. The Clean and 100% Renewable Energy Workshop

The workshop "Developing a Local Strategy to Transition to Clean and 100% Renewable Energy" was hosted by the International Cooperation and Development Fund (TaiwanICDF) as part of the annual Clean Energy Development Strategies Workshop series, in cooperation with ICLEI Kaohsiung Capacity Center, ICLEI World Secretariat, the Global 100% RE Platform and Pingtung County.

The objectives of the workshop were to:

- Raise awareness to the potential benefits of the transition to 100% renewable energy (RE)
- Enable experience sharing and peer-learning between Global North and South on the promotion of renewable energy and energy efficiency in the different sectors of the economy
- Share good practices, methodologies and tools for mobilizing local stakeholders and communities for the transition to 100% RE
- Promote energy whole-system thinking
- Identify key barriers and leverages for the transition to 100% RE
- Identify key steps to define local roadmaps to transition to 100% RE
- Discuss possible pathways for the transition to 100% RE.

2. About this report

This report summarizes the highlights of the workshop's presentations and discussions to support further sharing and networking among participants as well as to support dissemination of the key messages and findings regarding clean and 100% renewable energy. This report was prepared for ICLEI by Ana Marques Leandro with Arthur Hinsch's contribution on Module 3. The draft was available for review by organizers and participants.

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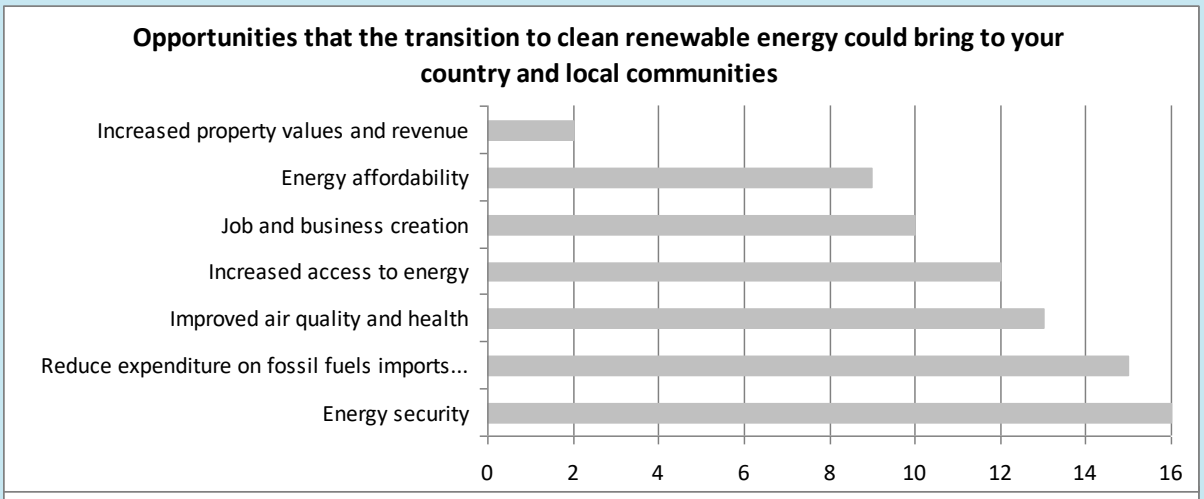
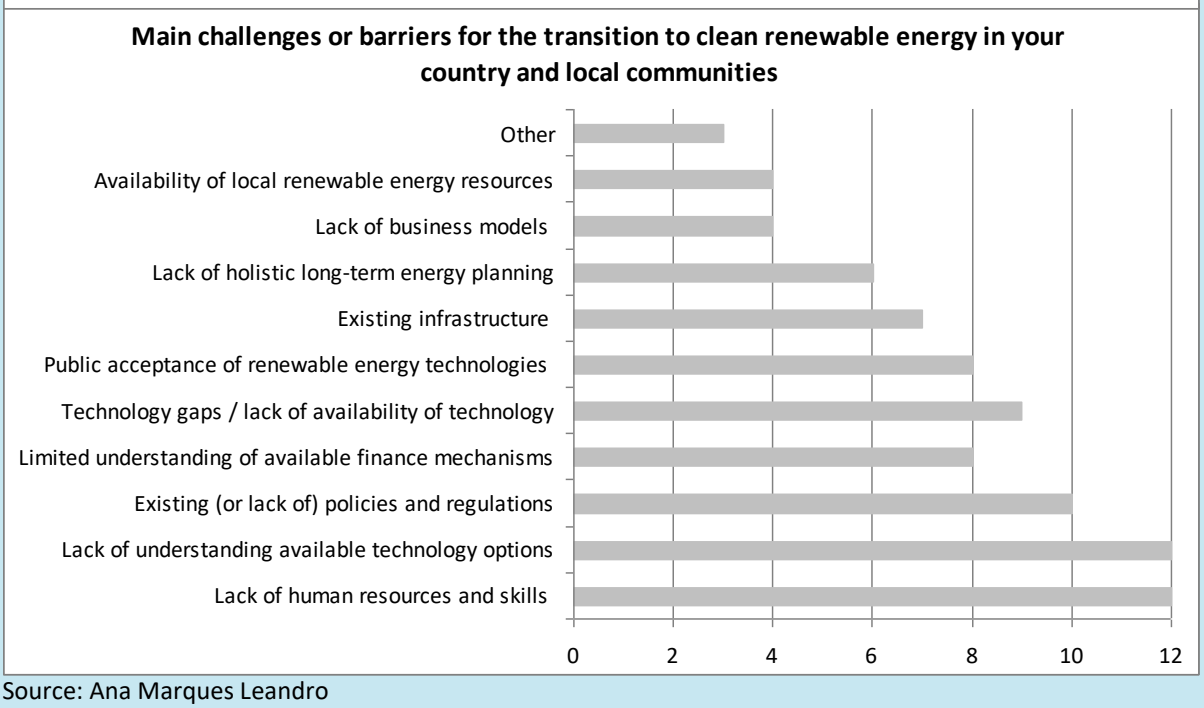
3. Participant's interests and expectations

Most participants indicated interest to learn about renewable energy technologies as well as about supporting policies, strategies and programs. Some of the workshop participants also indicated interest in learning about the options to further use local renewable resources, explore pathways to the transition to 100% RE, and existing tools to help manage the transition. There was also interest to learn more about the potential benefits to health and human activities.

A survey developed prior to the workshop in which 22 out of the 33 trainees participated, shows that participants find that the main opportunities the transition to clean renewable energy could bring to their country and local community are energy security, reduced expenditure on fossil fuel imports and reduced exposure to price volatility. The participants indicated as main existing barriers to the transition the lack of human resources with skills and understanding of available technologies and finance mechanisms, as well as the existing (and lack of) policies and regulations.





Source: Ana Marques Leandro

4. Workshop participants

The workshop counted with thirty three international participants, mostly from public administration (27 participants) as well as from the education sector and non-governmental organizations (6). Public administration was mostly represented at national level, plus two representatives from local government (Ho Chi Minh City, Vietnam and Montevideo, Uruguay). The large majority of public administration representatives present at the workshop work with the Ministry / Department / Secretariat of Energy, although other Ministries were also represented (e.g.: Infrastructure, Transport, Industry and Environment). Other local stakeholders, including business and academia, were also present.

The participants originated from different regions, namely Latin America and the Caribbean (13 participants), Europe (7), Asia (6), Oceania (5), Africa and Middle East (2) to a total of 24 countries, including 8 countries of the Climate Vulnerable Forum: Bangladesh, Colombia, Ethiopia, Fiji, Kiribati, Marshall Islands, Vietnam and Tuvalu. The complete list of participants is available in Annex 2.

In addition to the 33 international participants, the workshop had the engagement of several representatives from Pingtung County, including the head of government Magistrate Pan and the General Director Lu of the Environmental Protection Bureau.

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5. Workshop development

The following sections summarize of the workshop's presentations and discussions. The full program can be consulted in Annex 1. Highlights boxes showcase information shared or prompted by the participants.

Module 1 - Welcome and introductions

Although there is still a long way to go to reach 100% share of renewable energy in the different sectors (in 2016 the RE share was 25% in electricity, 9% in heating and cooling and 4% in road transport – REN21, 2017), there are some very positive signs that suggest that the transition to clean and renewable energy is already happening:

- In 2016, renewables accounted for 62% of new power generating capacity
- In 2016, the levelized cost of electricity for most RE technologies had reached the cost range of fossil fuel power (e.g.: biomass, geothermal, hydropower, wind and solar PV)
- In 2014, 6 Countries got 100% of their electricity from renewable sources and 44 Countries got more than half of their electricity from RE sources, including Austria, Canada, Denmark, Norway, New Zealand, Portugal, Sweden, Switzerland, etc..
- New 100% RE commitments are being made at country and subnational levels:
    - Denmark committed to reach economy-wide 100% RE by 2050 (REN21, 2017).
    - 48 countries in the Climate Vulnerable Forum (CVF) committed to meet 100% of their domestic electricity production with renewable resources as rapidly as possible (UNFCCC COP22, Marrakech 2016)
    - 150 U.S.A. mayors pledged to reach 100% renewable electricity at community-scale

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Why is local & subnational engagement relevant for the energy transition at national level?

Urban areas account for between 67 – 76 % of global energy use. Most investments for mitigation (50 to 80%) take place at the sub-national and local levels. Typical local government mandates include direct control over their transit system, roads, waste collection, building codes, procurement, etc.. Local governments are in an excellent position to identify local opportunities and resources and to mobilize the local community and stakeholder groups to the clean energy transition. Working at local scale also offers an opportunity for in-country testing of new technologies and practices, minimizing risks and potentially increasing the basis of support for new national policies before approval.

Module 2 – Sharing inspiring cases and good practices

The sharing of existing cases is of crucial importance to showcase opportunities and demonstrate potential benefits of the transition to clean and 100% renewable energy. Although each city / country /region is unique considering its local, national and regional context, resources and strengths, there are commonalities and lessons learned that can be extracted and hopefully inspire us to take action.

- **In Germany** at least 74 regions and municipalities have already reached 100% renewable energy targets (Global 100% RE Platform, 2016).

- **Examples from the Global 100% RE Cities and Regions Network** include the City of Aspen, USA with 100% renewable electricity at community-scale since 2015, City of Växjö, Sweden with 96% RE share in District Heating since 2015 and the Australian Capital Territory, which signed contracts that will ensure 100% renewable electricity by 2020 (ICLEI, 2016).

Why are local governments making such ambitious targets? Because they experience the multiple benefits of RE such as reduced fossil fuel imports and exposure to price fluctuations, keep money in the local economy, reduced air pollution, generate revenue and local jobs, etc. – concrete examples were provided.

To support peer-learning, networking and potential cooperation among workshop participants based on their common interests, participants were invited to share an example of a successful project, initiative or enabling framework from their own experience or country / region / city.

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Table 1 - Success cases on shared by workshop participants - renewable energy and energy efficiency

Country	Renewable Energy success cases shared
Argentina	• 2 MW wind turbine installed at a gold mine supplies 20% of the energy requirements of the facility • Implementation of renewable energy law, N 27191, which engages great consumers to achieve 8% of their energy needs with renewable energies by 2018. As a result of this requirement many clean energy facilities are now under development. Programa Renovar: legislated goal for RE (including hydro<50 MW), 8% by 2017, 20% by 2025 (currently 1.8%) • PREMER project (since 2002): funding to implement RE in local communities in homes and public services off-grid (e.g.: there are park rangers, indigenous peoples and local communities living outside the national electricity grid range that benefit from a project for installing solar panels in outposts and houses). • Billing process for commercial and residential sectors
Bangladesh	• Use of biomass fuels • Very successful implementation of program for distribution of Solar Home Systems in rural areas through the creation of microcredit lines via local financing institutions with support from international donors.
Brazil	• Brazil expanded its wind power installed capacity by 2,014 Megawatts in 2016, placing it 5th in the world ranking of installed capacity growth for the year. Wind energy expected to reach 15% share in electricity generation in 2025 (<2% in 2005, 10% in 2016) - some legislation enacted and financing programs in place via the national development bank (BNDES) • Brazil's main source of energy continues to be large and small hydroelectric plants (in times of low river flows, those need to be aided by thermal power plants, generating more expensive energy).
Chile	• Hydropower sustainability roundtable
	• 2050 Energy policy (RE and EE)
	• Comunca energetica program: local strategies for energy development; the national government provides funding for local strategy, the local government implements
Colombia	• Law (2014) establishes economic incentives to entrepreneurs (regulation is missing)
	• Electricity generation has 66% share of hydro
	• Solar in remote houses where the cost of connection to the grid is very high
	• two wind power plants in the north of the country
Czech	• New green savings program for households - supports small, decentralized RES for households for the production of electricity and heat and increasing energy efficiency. (RE and EE)
	• Smart energy for businesses: government support for EV in businesses (RE enabling)
Ecuador	• Efficient cooking program (electric)
	• 100%RE for Galapagos islands and electric boat for transports
	• Development of 8 hydroelectric plants
Ethiopia	• Large damn financed by the government and the local community. • There is a Pico-hydropower project located in the south east of the capital , Addis Ababa. numerous stakeholders were engaged prior to implementing the project. The local communities, the local administration and local development association.
Fiji	• Renewable resource potential studies, data analysis and feasibility studies
India	• Thenzawl Town, Mizoram State: Solar PV power plant supplements hydropower
Kiribati	• Law amended to allow to install solar in the urban island of South Taranoa

Country	Renewable Energy success cases shared
Latvia	• Three large hydro (1500MW) • Getliņi EKO Ltd was created in 1997 to run the largest waste treatment project in the Baltic countries – the Getliņi waste landfill. The company aims at reducing air pollution by methane gas and preventing groundwater contamination
Malaysia	• Green technology financing scheme for private financial institutions (soft loan)
Marshal Islands	• Reached 100% RE in Rural Households through use of solar home systems - further work is needed to ensure continued good systems' performance • Tax free policy regulation for RE and EE to increase supply and competitiveness
Nauru	• Solar PV 500kW installed in Nauru
Nicaragua	• Sugar mill uses sugar cane residues in cogeneration
Paraguay	• A national plan for sustainable energy was developed: Paraguay 2030.
St. Kitts - Nevis	• The government has formed a working group to chart the path for geothermal development through a public private partnership (PPP). This group comprises of a number of stakeholders with different skill sets.
Tuvalu	• Target of 100% RE in electricity by 2025 • Solar street lights • Solar PV (68 kWp) • The installation of solar systems and bio-gas has been one of the major successful measures in the country, minimizing the use of gas (LPG) for cooking and the inconveniences of unreliable electricity supply.
Uruguay	• 94% of electricity is generated from 100% RE (wind, hydro, solar); 22% from wind
	• Bill sent to parliament to promote tax incentives to the national production of solar panels (VAT refund)
	• Tax exemption for RE through investment law supports wind projects • Wind Farms country already has 24 operational wind farms and four more in the test phase. Investment in wind power has low risks. In 2014 wind energy was only 6% of the total generated, by 2015 was 15% and this year, 22%. Important tax exemptions fo
Vietnam	• On December 2013 the Government has set policy on support price of solar water heaters. About 50.000 solar water heaters are sold annually. • Possible replication of Solar energy system implemented in Zambia (US embassy): EV, ventilation, cooling, etc.
Country	**Energy Efficiency success cases shared**
Colombia	• LED lighting for households in remote locations
Czech	• Modernization and efficient operation of nuclear power plant (maintained the same consumption of primary energy and increased the final energy output) • Subsidies aimed at replacing old furnaces by modern ones
Ecuador	• The Energy and Environment Partnership (EEP) is a project that benefits 800 families living in the parishes of Guano and Pujilí with the implementation of improved stoves that are built with supplies and materials available in the area
Serbia	• Energy Efficiency in social housing to bring cost of passive house building construction to that of conventional
St. Kitts - Nevis	• LED lamp exchange (replacing incandescent and fluorescent lamps) has resulted in a small reduction in peak consumption during evenings
Tuvalu	• Energy efficiency Act 2016
Vietnam	• Motion sensors (WC, etc.), waterless WC • UNIDO project promotes sustainable production and consumption

Note: this table gathers information provided during the workshop and through survey questionnaire

The success cases on renewable energy and energy efficiency shared show that a wide variety of measures have already been implemented in the countries represented in the workshop. These measures include both off-grid and grid-connected renewable energy projects (e.g.: wind, solar, hydropower, geothermal, waste biomass) as well as comprehensive energy policy and regulatory frameworks, including support and incentive schemes and private sector engagement.

What education efforts are needed to support the energy transition?

To enable and accelerate the transition to clean and renewable energy it is necessary to educate citizens and specific stakeholder groups at different levels:

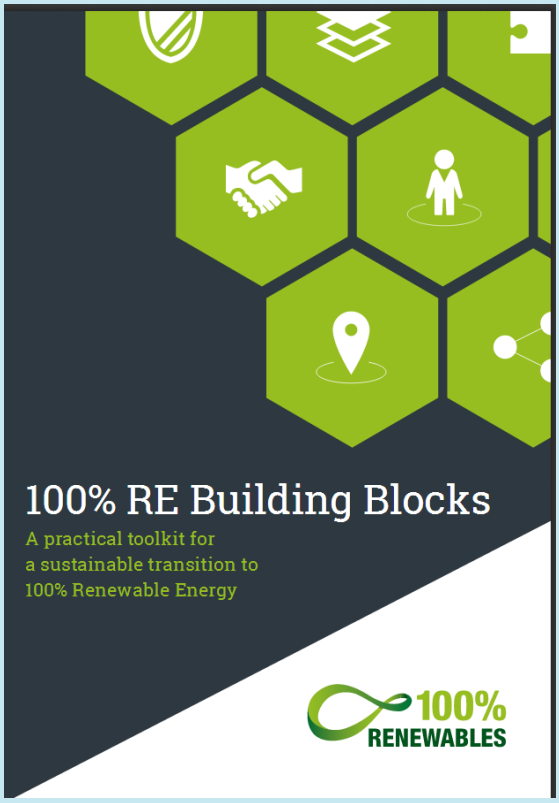
- Raise awareness to the potential benefits of renewable energy;
- Map local renewable energy resource potential and make information available to community and businesses to encourage private sector investment;
- Educate professionals to ensure adequate technical and managerial capabilities throughout the renewable energy industry value chain (project design, suppliers, installers, operation, etc.).

Module 3 – Exploring the 100% RE Building Blocks

Purpose

The purpose of this module was to introduce workshop participants to a methodology toolkit for defining and implementing a strategy towards 100% RE known as the "100% RE Building Blocks". The aim was to familiarize participants with the toolkit and to give them an idea of how this could be used in their respective contexts.

Photo credits: TaiwanICDF and ICLEI KCC



Source: http://www.go100re.net

About the toolkit

The 100% RE Building Blocks toolkit is a product of the concerted effort of members in the Global 100% Renewable Energy Platform including ICLEI-Local Governments for Sustainability. To navigate the complexity inherent in policy planning, these guidelines, which are built on available practices and experiences, can help local decision-makers and stakeholders orient themselves to confront the challenges of achieving 100% RE. While acknowledging that every jurisdiction faces unique challenges and is situated in a distinctive context, this toolkit builds on existing commonalities to create a common and comprehensive set of recommendations to facilitate the building of bridges, overcoming political, cultural and social challenges around the world.

Relevancy to workshop participants

Due to the high diversity in backgrounds of workshop participants, the toolkit proved especially useful as it enables structured dialogue between different sectors and stakeholders. The Building Blocks toolkit has been originally designed to focus on engaging stakeholders within a local context. In this particular workshop, most participants were from national government ministries, civil society and academia, with a few local government representatives.

Participants were asked to sit in five previously planned groups in order to allow for a good representation of different sectors and nationalities. The Building Blocks toolkit lists 10 different parts (the building blocks). Three of those have been addressed in this module for their relevance for national policy frameworks. These were:

- Increase and integrate RE across sectors
- Nurture vertical and horizontal cooperation and integration
- Support decentralization and inclusion

The building blocks contain smaller “sub-blocks” which specify steps on how to achieve the overarching goal of a particular block. Usually, these sub-blocks can be used as a checklist for local stakeholders to identify what has already been achieved in their community. In this workshop, the sub-blocks have been used to give structure to participant’s group discussion.

Photo credit: TaiwanICDF and ICLEI KCC

Following table discussions, the groups communicated the content of their discussions back to the moderator and to all workshop participants.

Discussion

Participants identified policies and ways to support the creation of new RE generation capacity notably by reducing economic support for fossil fuels, introducing feed-in tariffs for electricity from renewable sources, introducing a carbon tax as well as by establishing incentive policies for local business to bring in RE products. The bottom line was that participants perceive a strong need for stable and predictable RE policies.

Intensifying investment in the distribution system has been mentioned as being key to increasing its efficiency by decreasing energy loss due to curtailment of renewable electricity (lack of transmission capacity that would enable carrying surplus electricity to where it is being needed). By moving towards more decentralized generation (closer to consumption centres), energy loss in transmission can be further reduced.

In order to enable cross-sector integration of RE, the creation of energy committees has been proposed. This will enable a more effective integration of energy policy and objectives across the different sectors. Examples of situations where integration is important include the interconnection of the electricity grid and district heating/cooling systems to balance variability and enhance storage capacity (e.g.: Denmark).

The need for adequate capacity building among involved stakeholders has also been addressed. Notably, this is connected to the ability of developing countries to engage in ambitious RE projects and attract RE-related investments from richer countries.

This relates to the discussions among the groups on how to nurture vertical and horizontal cooperation and integration. Compensating the surplus or demand of energy between different countries through international cooperation has been identified as being of great importance. Formal structures such as a memorandum of understanding between different institutions, nationally and internationally, can support this process and enable peer-to-peer

Photo credit: TaiwanICDF and ICLEI KCC

exchange and joint projects. Still, it has also been mentioned that such forms of cooperation can also lack effectiveness and are not always based on an equal negotiation position due to differences in competences. Some participants addressed the increased need for more support from national governments to local governments for deploying renewable energy.

Participants mapped out existing forms of horizontal cooperation in their respective countries. Forms of horizontal cooperation particularly mentioned by participants consist of cooperation between the different government ministries. This was due to the high number of participants from different ministries within the national governments.

Notable forms of vertical cooperation also exist between NGOs, utilities, unions, academia and environmental agencies. It has been mentioned that such forms of cooperation with regard to RE can contribute to peace-building and should also include the shared management of national resources.

Participants have confirmed the increased importance of maintaining transparency of the energy transition by supporting decentralization and inclusion. This is despite the fact that the degree of a decentralized energy system varied strongly between the participant's countries leading to a discussion on what a decentralized energy system means (e.g.: ownership, operation, infrastructure, etc.) and what it would actually entail within the different contexts. As a common denominator, participants stressed the importance of creating transparent legislation to allow citizens to generate their own electricity and to decide where to buy their energy from. Having a liberalized market was emphasized as being crucial for this process. Germany was highlighted by some participants as a primary example on how new actors such as citizens can become active stakeholders in the energy system through cooperative forms of renewable energy deployment. This also highlights the benefits of having discussions with a broad range of stakeholders on how the energy transition is affecting them and should evolve.

In this regard, participants raised the issue of safeguarding a socially just transition and specifically addressing the need for retraining programs for workers from the conventional energy sector.

Photo credit: TaiwanICDF and ICLEI KCC

Conclusions from this module

This module confirms the original ambition of the toolkit to show that its components can be used and freely adapted to suit user's relevant circumstances and context. Its purpose is to enable a structured debate between a wide range of stakeholders without proposing a fixed way of creating a 100% RE plan. Rather, users can choose to focus on a certain set of blocks which they consider to be most relevant and then make connections by addressing the remaining blocks. The module also proved that this toolkit is a great way of simply getting the discussion around 100% RE started within a certain group of stakeholders. Because participants came from several different countries, international exchange of best practices, but also of national frameworks could take place.

This module showed that the toolkit can be adapted freely to fit the needs of stakeholders including, but also going beyond, the local government level.

Interest among the participants for using this toolkit in their respective contexts was very high. While engagement by participants with this toolkit was good during the module, it is most effective when used by stakeholders within one particular community, or jurisdiction. Participants have been encouraged to reach out to Global 100% RE Platform for further advice on how to make use of this toolkit at home. Their feedback and suggestions on the use of the 100% RE Building Blocks is also welcome to further the development of the toolkit.

Module 4.1 – Developing a common vision

Despite the existing success cases, the transition to 100% RE can seem daunting in certain contexts. How to develop a long-term vision for the transition to 100% RE in your own city/ region /country that is supported and shared by staff, local communities and stakeholder groups? To assist workshop participants in this reflection process, a planning methodology known as backcasting was introduced. This approach begins by focusing on a desirable

future or vision and then identifies policies and programs necessary to achieve it. It seeks to identify the key innovations needed to overcome existing constraints (e.g.: policy, technology, markets, business models, etc.) and to achieve the vision, encouraging "outside the box" transformative thinking.

Considering the diverse background and interests of workshop participants, the following discussion topics were proposed for break-out groups, focusing on a 100% RE scenario:

- Policies to develop renewable energy technology industries and supply chain
- RE off-grid systems in remote locations – ensuring maintenance and continued performance
- Impact of climate change on hydroelectric power
- Managing the electricity grid
- Public energy utility business models.

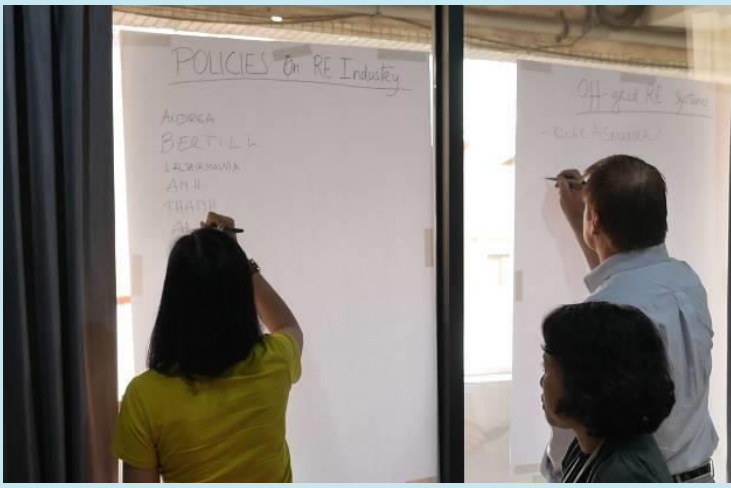


Photo credit: TaiwanICDF and ICLEI KCC

This type of exercise often forces participants to step out of their comfort zone. The workshop participants engaged in a very constructive way and the discussions were very productive – the main findings of each break-out group are presented below.

The importance of stakeholder engagement and consultation

Stakeholder consultation and participation is very important to ensure that the energy transition strategy is adequate to the national/ regional / local contexts, to get "buy-in" from citizens and relevant actors and obtain their collaboration for implementation and to encourage in-country / local ownership, inclusiveness and consensus building. It is also an important mechanism to promote transparency and accountability, demonstrate results and ease access to finance and private sector investment.

Photo credit: TaiwanICDF and ICLEI KCC

Groups 1 and 2 – Renewable energy technology industries and supply chain

Part 1 – Produce equipment locally or import?

There was significant interest in this topic, leading to the creation of two work groups. Both groups were asked to discuss whether, in a scenario of an approved 100% RE target, it might be more favorable to develop RE industry in-country to produce the necessary equipment or to import equipment.

Both groups concluded that it would be more favorable to import the RE equipment now with the option to manufacture in the future, for the reasons described below:

- ***Time*** is necessary to set-up the production and supply chain, including workforce and logistics
- ***Demand*** must first be established to then invest to put production industry in place
- ***Human resources capacity*** to develop workforce for production (technical and managerial), installation and maintenance
- ***Existence of powerful importers*** to compete with
- ***Pollution*** association with production needs to be dealt with
- ***High wages*** in the country will make it difficult to compete with technologies imported from other countries such as China

The groups also identified the disadvantages of RE equipment imports, highlighting the ***missed opportunity to further develop human resources capacity, to attract foreign currency and the creation of less jobs*** (in this case mainly for installation) than in the in-country production scenario. Both groups indicated that the existence of the 100% RE target did not have impact on the result of their evaluation.

Photo credit: TaiwanICDF and ICLEI KCC

Part 2 - Policies to set-up and develop renewable energy technology industries

The two groups were asked to outline adequate policy frameworks to support RE technology deployment under the two alternative scenarios identified: in-country equipment production and import. The following sections combine the outcomes of both groups' discussions.

a) Import RE equipment, with the option to manufacture in the future as demand grows

Table 2 – Policies to support RE equipment imports

Key actions	Key actors
Develop legal framework, with clear and transparent procedures to ensure the different market players are treated fairly	Government (Ministries of Industry, Energy, etc.)
Develop incentives, including:	
Tax program to increase the interest of local businesses to import more (tax reductions/ exemptions)	Government (Ministry of Finance)
Facilitate land access for RE installations (namely cheap land areas)	Government (Ministry of Spatial and Urban Planning)
Access to soft loans financing	Government (Ministry of Finance)
Capacity building to develop workforce and supply chain (suppliers, installers, maintenance staff, etc.)	Training institutes (local and overseas)
Investment in the transmission and distribution systems to alleviate grid congestion and to decrease energy loss	Energy utilities (transmission and distribution)
Research and development of RE products	Research and development institutes (e.g.: universities – local and overseas)

b) In-country production of RE equipment

Scope: the group assumed that the final products would be made in-country (panels, turbines, inverters) but that components will still have to be imported. Although in-country production costs more and requires more effort to set-up than the import of equipment (e.g.: governance, capacity building, stakeholder engagement, finance), it offers the possibility to do Research & Development of new products, create spin-offs, and generate new sources of income. This is the summary of impacts identified:

- Pollution (-),
- Jobs (+),
- Human Resources capacity (+),
- Higher costs of equipment because of high wages in the country (-)
- Takes longer to achieve 100% RE because of need to build the supply chain (-)
- Energy security (+)
- Opportunities for in-country research, spin-offs and new sources of income (+)

The group also considered the possibility of relying on local manufacturers versus foreign investors, and concluded that the best course of action would be to use a hybrid approach:

- **Bring foreign investor with the technical and managerial know-how** – the advantage would be to reduce the time needed to move forward, the disadvantage is that the investor would take a lot of the revenues back overseas.
- **Local manufacturer** – this option would take much longer to build local expertise and structures but would retain in the community/country much more of the wealth generated.

Table 3 – Policies to support in-country RE equipment production

Key actions	Key actors
Political commitment	• Presidency
Legal and regulatory framework with clear and transparent rules	• Ministry of Industry • Ministry of Energy • Ministry of Environment
Definition of special programs (include tax exemptions on components and machinery, increase tax on finished products, good financing lines, resolve land issues, …)	• Ministry of Finance • Banks of development
Training programs (for manufacturing)	• Ministry of Education • Training institutions • Manufacturers associations

Photo credit: TaiwanICDF and ICLEI KCC

Group 3 – Renewable energy off-grid systems in remote locations

Renewable energy based off-grid systems are often the most cost-effective way to provide energy access to the population that lives away from the power grid. However, these remote locations pose a challenge to maintenance and repair of the systems, which may jeopardize the continued operation and good performance of the installations. This work group was tasked with outlining a framework to address these challenges and promote adequate maintenance and continued good performance of off-grid systems. The main outcomes and impacts identified are:

- Less greenhouse gas emissions due to displacement of kerosene and other fossil fuels
- Less environmental degradation (e.g.: deforestation due for fire wood)
- Energy access, independence and improved reliability

Part 1 – Framework for maintenance and continued good performance of off-grid systems

Table 4 - Framework for adequate maintenance of off-grid systems

Key actions	Key actors
• Regulations to ensure minimum standards for required skills (e.g.: installers must be certified)	• Central and local government
• Local capacity building of technicians (degree / certification) • Regulations to ensure minimum standards for quality of products to be installed	• Central and local government • Training institutions • Local people

Key actions	Key actors
• Local committee to take stock and identify good practices in maintenance • Schedule maintenance for each facility, depending on technology, preferably to be carried-out by local people	• Central and local government • Local people
• Different business models may be developed, for example poor communities get support from government and financial institutions via state subsidies and microcredit	• Central and local government • Financial institutions • Local people

Part 2 – Discuss framework and test findings with representatives from small-islands

The workgroup was encouraged to share outputs of the first part of the discussion with some of the workshop participants from small islands and further discuss to determine if their recommendations change based on the colleagues' previous experience. The answer is yes, changes are needed.

From the discussion, the following key points to improve existing systems in Marshall Islands were identified:

- ***Awareness of need for maintenance*** - communication strategy that was used earlier was that the system was for "free" so the citizens feel cheated that they now have to pay for maintenance, not understanding that without it they cannot continue to have a properly operating system.
- ***Effective collection of maintenance fee***: $12 government subsidy, $5 consumer (includes salary of local technicians and replacement of batteries every five years).
- ***Proper maintenance and supply*** – it was found that the best quality assurance would be to have these services centralized from the main island however due to the high number and dispersion of small islands there is no budget to cover all travel needs.

Stakeholder engagement and awareness raising emerge as a possible solution to resolve the existing difficulties.

In Ethiopia (electricity access rate of the population is about 40%), there are three options for providing energy access to people that do not have a connection to the electricity grid:

- Extending the grid to reach the communities (if distance to grid is less than 10 km)
- Providing solar home systems (40,000 units planned for distribution)
- Creation of micro-grids (usually hybrid energy systems)

The systems are relatively new and so there is not yet a track-record regarding maintenance.

Photo credit: TaiwanICDF and ICLEI KCC

Group 4 – Impact of climate change on hydro power under a 100% RE target scenario

Several of the countries represented in the workshop have a high share of hydropower in the electricity mix (e.g.: Paraguay, Uruguay, Brazil, Latvia, etc.). This seems to give participants the sense that most of the work is done in terms of reaching or transitioning to 100% RE in the electricity sector. To what extent are the potential impacts of climate change over hydroelectric resources being considered in their country's long-term energy planning? This workgroup aims identify potential implications.

Part 1 – Hydroelectric power exposure to climate change

The group identified several questions that need to be answered and which will condition the decision-making and priority-setting processes:

- ***What are the services and benefits of hydropower?*** Is it important to identify competing needs such as water supply, irrigation and energy.
- ***What are the social and environmental impacts of hydropower?*** Both positive and negative impacts should be identified, also considering climate change scenarios
- ***How will climate change influence the hydrology and local water availability?*** Will there be less water, more water, uncertainty?
- ***What is the role of hydroelectric power considering the multiple competing uses of water?*** For example in countries such as Austria, Czech and Switzerland, multiple-year water levels are being carefully monitored. The use of water for energy production could mean a water shortage for other uses such as water supply and irrigation.

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- ***What is the contribution of hydroelectric power for achieving a 100% RE target?*** The abundance and uncertainty of the resource have a very important weight on the answer. A holistic perspective and sustainability safeguards should be put in place for moving forward.

The answers to these questions are very context specific. Academia, government, investors and civil society all have a role to play in a process to answer these questions. The level of engagement recommended for each of these stakeholder groups varies depending on the hydrology impacts scenario.

Embedding sustainability criteria in the 100% RE strategy

It is important to define sustainability criteria for the use of renewable energy resources in local strategies such as hydro and biomass. For example in the case of biomass, while the use of wastes from agriculture, forestry and livestock for energy purposes generates additional benefits in terms of waste management and pollution prevention, the sustainability of growing crops just for energy purposes ("energy crops") is very questionable as it competes with food production leading to increase in food prices, makes a very intensive use of soil and water resources, among other detrimental results. Similarly for hydropower, consideration should be given to the sustainability of the multiple uses of water.

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Part 2 – Outlining a process to minimize risks of competing water needs under climate change

Process step	Actors
1. Downscale the climate change model to a regional model and/or a local model • Cooperate with university • Stakeholders for data • Engage civil society	Academia and government, in consultation with private sector and civil society
2. Public policy and regulation assessment • Public policy assessment • Role of hydro reassessed, considering the energy system and competing water needs, including an Environmental and Social Impacts analysis • Roadmap • Regulation assessment	Civil society, academia, government, private sector
3. Develop hydropower plan • The target of 100% RE should again be considered and depending on the decision the next step defined	Civil society, academia, government, private sector
4. Review law and regulations specifically to align with plan • Important to secure stakeholders agreement	Government, civil society and private sector

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Group 5 – Managing the electricity grid in a 100% RE scenario

This workgroup was assigned the role of a grid operator in a future energy scenario of 100% RE. The task included to identify the key actions (and actors) needed to ensure the management of electricity transmission and distribution without curtailment of renewable energy generation.

Part 1 – Mapping key issues and actions needed

The group identified two distinct situations:

- **Not interconnected systems** (e.g.: islands) – the grid operator is responsible for ensuring safe and reliable operation of the grid, which translates into maintaining the supply current's frequency and voltage.
- **Interconnected systems** (e.g.: countries which are part of a regional market such as the European market or the Nordic wholesale electricity market which includes Denmark, Norway, Sweden and Finland) – in these systems, in addition to ensuring safe and reliable operation of the grid, it is also necessary to ensure a functioning electricity market with fair pricing and respecting electricity flows.

The group was asked to focus on an interconnected system. While in islands moving to 100% RE is mostly a technical issue, namely defining how to control frequency and voltage with high penetration of renewable energy sources, in large interconnected systems the issue to resolve is mostly financial (trade). The grid operator monitors the behavior of the grid at each moment and produces or buys electricity from the market as needed.

After extensive reflection and consideration of multiple scenarios (e.g. base-load percentage in the mix), the group highlighted that there is no "one solution fits all". The key issues identified are:

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- Control of intermittent sources (on/off)
- Investment in predicting power generation from intermittent sources
- Develop new market products to deal with oversupply of electricity from variable renewable sources which currently lead to negative prices (a perverse effect which is detrimental for cost-recovery of investment in electricity generation):
    - Energy storage, at different scales
    - “Free electricity” market regulation and operation – for example in 2016 Portugal registered 106 hours of negative electricity prices, where it paid Spain to receive its surplus electricity from wind farms
    - Smart meters
- In addition, it is necessary to further define and clarify responsibilities to address emerging and evolving circumstances:
    - Equal responsibilities for all market participants
    - Conditions for off-grid prosumers – for example through a “scarcity price”, a household with an electric vehicle charging can be paid to receive electricity in case of oversupply
    - Need to respect physical flows

When questioned about “Who should do what?” the group reiterated that there is no “one fits all”.

Part 2 – Communicating findings and identifying key actors

Having carried out a reflection on the technical aspects of grid management and market operation, the group was now tasked to work on the communication of their findings to non-experts, namely by identifying the actors that can/should undertake the key actions listed previously.

The group highlighted the importance of having in place processes that are transparent and inclusive. To illustrate, they described in detail the structure of the European electricity market. These are its key components:

1. **Overarching Energy legislation (Market)**
    - Primary law – National law (transposed from European Union's legislation based on international and regional cooperation)
        - Rules regarding market participation
        - Technical conditions for resources to be connected to the grid
        - Obligations
        - Legal rights of consumers and producers
        - Market participants (TSO, DSO, NEMO – European Market operator, NRA, producers, consumers, traders)
    - Secondary law – Regional Directorate
    - Tertiary law – Network codes

    Stakeholder consultation processes at national/european level include: traders, transmission system operator (TSO), distribution system operator (DSO), Ministries, the Agency for the Cooperation of Energy Regulators (ACER), the European Network of Transmission System Operators for Electricity (Entso-e), among other institutions. At national level, the Energy Ministries prepare the legislation and consult with stakeholders, including non-governmental organizations and relevant institutions.

2. **Overarching Market regulator**

    In Member States (MS), the overarching market regulator is the National Regulation Authority (NRA). It is an independent entity that is responsible for licenses, control, price regulation for natural monopolies (TSO and DSO as these are natural monopolies) to protect consumers and update of national law.

3. **Consumer**

4. **Traders** - They ensure the competitive environment

Renewable energy certificates in the retail market – a consumer's decision

Renewable energy certificates are often used in the North American market. The work group highlighted that in the European electricity market transitions are anonymous (unlike the U.S. market, where each transaction is identified), meaning that renewable energy certificates cannot be traced and therefore it is not possible to verify if the traders are indeed channeling the payments to renewable energy generation. In this regional context, Power Purchase Agreements (PPA) are a much more transparent and potentially more effective mechanism to support investment in renewable electricity generation. Such agreements set a fixed electricity price for a long-term period (e.g. 20 years) giving the project developers the remuneration and confidence needed to invest in renewable energy generation. The example of use of PPA by the Australian Capital Territory is available in the presentation provided.

Group 6 – Public energy utility business models in a 100% RE scenario

Public energy utilities can be an important source of revenue to the state and contribute to ensure the State's capacity to deliver on this and other basic services to the population. However, decentralized renewable energy generation and energy efficiency measures can be perceived as a threat to the viability of public energy utilities. This work group was asked to discuss which new business models public energy utilities should consider for the transition to a 100% RE future.

Part 1 – Identifying business models

The group identified three distinct sectors:

1. Large-scale renewable generation
2. Utility or transmission administration and management
3. Consumers, on-grid and off-grid

To achieve 100% RE the group identified requirements, benefits and disadvantages.

1. Large-scale renewable generation
    a) Needs/ requirements:
        - Financing

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- Guarantees
- Long-term Purchase Power Agreement (PPA) or Feed-In Tariff (FIT)
- Regulation
- Tax incentives

b) Benefits:

- Better environment
- Energy security
- Lower greenhouse emissions
- Contribution to ambitious Nationally Determined Contributions under the Paris Agreement of the United Nations Framework Convention on Climate Change
- Reduce or eliminate oil imports
- Reduced energy generation costs by comparison with fossil fuels

c) Disadvantages:

- Unemployment of fossil fuels and nuclear industries and technologies
- Expensive if the local renewable resources are not good

2. Utility or transmission

a) Needs/ requirements:

- Regulation of electric tariffs

Photo credit: ICLEI KCC

- Storage to control and use excess supply
- Investments in transport networks

b) Benefits

- Continue to ensure safe and reliable supply to connected customers
- Back-up to decentralized generation

c) Disadvantages:

- Dismantle non-renewable generation plant at the end of their useful life, or earlier if required by legislation.
- May have environmental impacts

3. Consumers

a) Needs/ requirements:

- Tax incentives
- Cheap financing (soberane guarantees) for remote and low income areas – not for businesses, just for self-sufficiency
  - Investments in transport networks

b. Benefits

- Energy access and reliability for population in remote location
- Savings in comparison with extending the grid to these remote locations

Part 2 – Holistic comparison of fossil fuel and renewable electricity generation

The work group was asked to consider what costs, benefits and externalities (both positive and negative) should be considered for a holistic comparison between fossil fuel based and renewable energy based electricity generation. The group reformulated the challenge as follows. Currently the cost of import fuel for energy generation is very expensive. Can the use of renewable energy improve this cost? Does the replacement of imported energy with RE generate savings?

In Argentina, currently the marginal import cost of fuel oil is 170 USD/MWh and the cost of wind and solar (in a 20 years Power Purchase Agreement) are respectively, 50 USD/MWh and 55 USD/MWh. With renewables it is possible to save about 120 USD/MWh giving a big push for the expansion of renewables in the country.

Given these prices, why isn't there more renewable energy in the energy mix? Because the investors of existing infrastructure need to recover their investments and because the investors are cautious (as the price in solar has been decreasing so abruptly, they believe it will decrease even more: in 2002 it was around 500 USD/MWh). The need to invest in transmission lines is also a barrier.

Planning for a just transition

The transition to clean and renewable energy may benefit some groups while burdening others such as the workers and owners of nuclear plants and other fossil fuel industries. It is important to plan for the transition well in advance and to have an inclusive and meaningful dialogue in affected communities and countries to ensure a fair transition and to minimize its costs, while honoring the rule of law and finding solutions for the reintegration of workers into the job market through capacity building and support. A transition plan can be developed with the engagement of all relevant ministries and stakeholder groups, ideally seeking consensus.

Module 4.2 – Exploring future energy scenarios and pathways

This section highlighted the importance of assessing local potentials for energy efficiency and conservation as an integral component of any strategy towards 100% RE and particularly of using the opportunity windows offered by the refurbishment or replacement cycles of existing equipment, buildings and infrastructure.

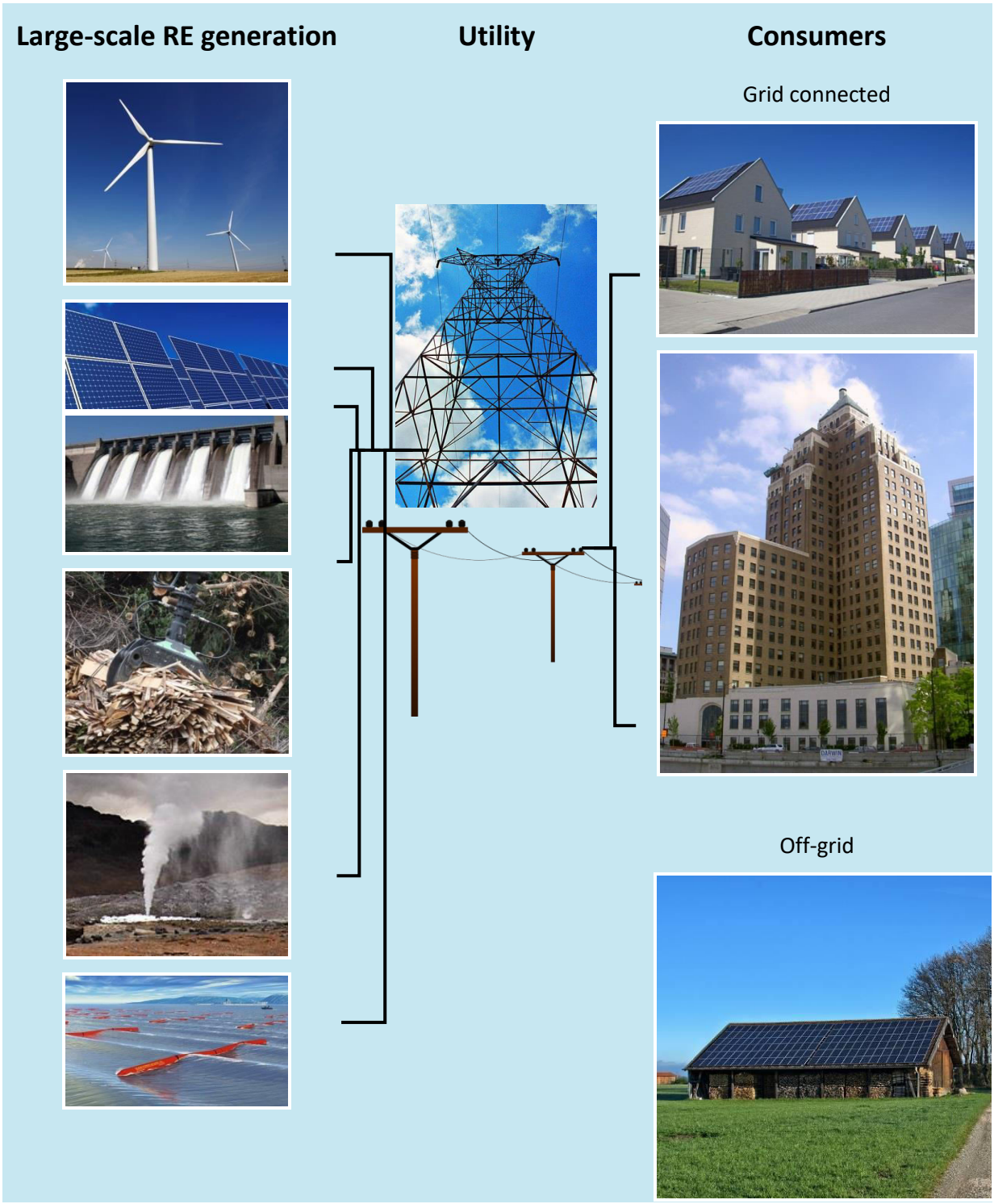

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Figure 1 – Schematic representation of the energy utility model (group 6)

Integrated energy, spatial and urban planning is facilitated when georeferenced data is made available on the local renewable energy potentials, availability of surplus heat and free cooling, energy demand of new developments and other relevant data. This information enables urban planners to identify opportunities for optimizing investments in urban infrastructure at different scales (city, district, building), for example by locating large energy consumers closer to sources of renewable energy or surplus heat.

Local renewable energy sources potentials mapping

Mapping renewable energy resources potentials is essential to support strategic assessment of viability and inform policy development as well as to inform individual project development and design.

"Assessing and mapping renewable energy resources should be seen as a classic public good, where a relatively small up-front investment can leverage very significant and diverse economic, environmental, and social benefits.", ESMAP, World Bank's Energy Sector Management Assistance Program, 2016.

Concepts such as energy cascading, recovery of heat from wastewater and use of free cooling from water bodies (ocean, rivers, lakes, aquifers, etc.) were new to the workshop participants. The question that was left to participants as "food for thought" was to consider if in-country / local resources have been sufficiently characterized and explored to avoid missing out on opportunities.

Two energy modeling programs were briefly mentioned, with country and local level examples. In the case of 100% renewable energy modeling for the United Kingdom, the scenarios have very similar costs and it is only at 90% or 100% renewable shares that there are significant rises, showing the importance that policy makers can have in the direction of the energy transition (Imperial College London, 2017).

Module 5 – Policies and Action Plans for 100% Renewable Energy Cities

The strategies to transition to 100% RE of three local governments were briefly presented:

- East Hampton, USA – targets: 100% renewable electricity by 2020 (community-wide) and 100% renewable energy by 2030 (electricity, heating and transportation)
- Osnabrück, Germany - targets by 2050: 100% renewable electricity, 90% renewable heating & cooling, 60% RE powered transportation
- Vancouver, Canada - 100% renewable energy at community-scale by 2050

Challenges faced and success factors identified by these local governments were briefly discussed. Although each city is unique, they often face similar challenges and opportunities. Local government usual roles and mandates give them several options to promote 100% RE such as local regulatory frameworks, operation of municipal infrastructure, tax relief and other financial support schemes, integrated infrastructure planning, simplified and transparent permitting procedures, awareness raising and technical support. The main action types were briefly described using examples voluntarily reported in the carbonn

Climate Registry, a global database of local climate and energy data – e.g.: Seoul created a fund to enable citizens to invest in large-scale solar photovoltaic plants.

Addressing emerging questions

What are the main limitations for achieving 100% RE in a local community? One of the main challenges that cities which have set 100% RE targets indicate is the lack of jurisdiction over the electricity grid, transit and transport infrastructure, which limits their ability to use local resources and capabilities. Communication and coordination channels with higher levels of government are instrumental for enhancing local governments' ability to mobilize local stakeholders, capabilities and resources to support national energy and climate goals.

Is being part of an interconnected grid against this objective? No. Often the increase of renewable energy share in the energy mix is coupled with more decentralized generation to enable the more widespread use of local resources as observed in Denmark and Germany but this does not diminish the importance of the interconnected grid. The International Energy Agency speaks of the importance of finding a wise balance between centralized and decentralized (IEA, 2009).

How can national government support local communities in transitioning to 100% renewable energy? National government, in addition to having authority to increase the share of renewable energy in the electricity and transport sectors, can also empower local governments to contribute to the energy transition. Examples of such measures include: i) making data available (e.g.: renewable energy potentials, surplus heat, energy consumption, etc.), ii) to strengthen the local mandate, budget and capacity building to conduct integrated energy, urban and transport planning and iii) and mandate to promote investment by citizens and local businesses in renewable energy and energy efficiency projects.

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Module 6 – Inter-sectorial action plans

The purpose of this module was to enable more in-depth discussions on key sectors such as electricity and transport. Regarding transport, an important message is that the motorization of vehicles should not be the exclusive focus of the clean energy transition debate – for example, if a country that relies heavily on dirty coal for electricity generation is moving forward in transport electrification and this is not accompanied with the increase in renewable energy share in the energy mix there may not be an effective improvement in terms of greenhouse gas and air pollutants emissions reduction.

Integrated urban and transport planning, with emphasis on Transit Oriented Development (TOD) was highlighted as a crucial long-term measure to reduce travel demand, enhance economic viability of public transport and promote non-motorized transport modes (e.g.: walking and cycling). This was also an opportunity to introduce the visit to the Ecomobility Festival area.

Regarding electricity, the discussion was centered on the integration of variable renewable energy (VRE) into the grid, namely wind and solar. Several phases for the integration of VRE have been identified in alignment with a manual developed by the International Energy Agency (IEA, 2017):

- Phase 1 - VRE has no noticeable impact on the system
- Phase 2 - VRE has noticeable impact on the grid but it can be managed easily (operation)
- Phase 3 - The impact of VRE is felt by other power plants and calls for enhanced flexibility
- Phase 4 - VRE impact can challenge the stability of the power grid in very short time scales

An important recommendation from IEA to policy makers is to focus on the right issues depending on the phase in which their system is. Here are some of the highlights for the different phases: in phase 1 the main recommendations are geared to enable VRE access to the power grid (solve grid issues and set connection rules); in phase 2 is to work towards a holistic, long-term vision for the energy transition to help market participants and system operators anticipate changes and ease VRE

integration in a secure and least-cost fashion; in phase 3 recommendations are focused on increasing flexibility including through storage, demand-side management (e.g.: industry) and sector coupling.

Several related emerging business models were discussed during the workshop, including electric vehicle charging, pumped hydro (e.g.: Chile and China) and power to heat with the coupling of the electricity and district heating systems (e.g.: Denmark and China).

Photo credit: Ana Marques Leandro

Module 7 – Case Study of Pingtung County

In 2016, Pingtung County joined the Global 100% RE Cities and Regions Network as a learning city – to learn more visit www.iclei.org/lowcarboncity/100re. The Country has been engaging the local community and stakeholders to develop a vision for the transition to 100% RE.

During this workshop, the Director General of the Environmental Protection Bureau outlined a 1.7 GW Renewable Energy plan that would cover all of the County's energy needs. During the field visits on the following day it was possible to learn more about this vision and plan, namely:

- Aquifer recharging system for water purification operating by gravity
- Biogas Demonstration Site at The Central Farm
- Ongoing research and development project to generate electricity from the Kuroshio current
- Microgrid in Guangtsai Wetland

Annex 1 – Workshop Program

Oct 17 (Tue)

Time	Agenda	Facilitator/ speaker
0930-0940	**Opening Remarks**	ICDF / ICLEI KCC
0940-1040	**Module 1** - Welcome and introductions	Consultant / ICLEI
1040-1050	Coffee Break	
1050-1200	**Module 2 – Sharing inspiring cases and good practices**	Consultant / ICLEI
1200-1330	Lunch Break	
1330-1600	**Module 3 – Exploring the 100% RE Building Blocks**	Global 100% RE Platform

Oct 18 (Wed)

Time	Agenda	Facilitator/ speaker
0930-1200	**Module 4-1 – Developing a common vision**	Consultant
1200-1330	Lunch Break	
1330-1600	**Module 4-2 – Exploring future energy scenarios and pathways**	Consultant

Oct 19 (Thu)

Time	Agenda	Facilitator/ speaker
0930-1040	**Module 5 – Policies and Action Plans for 100 RE Cities**	Consultant
1040-1050	Coffee Break	
1050-1200	**Module 6 – Inter-sectorial action plans** a. EcoMobility b. The transformation of electricity systems	Consultant / ICLEI KCC
1200-1330	Lunch break	
1330-1530	**Module 7–Case Study of Pingtung County**	Director Lu, Pingtung County Environmental Protection Bureau
1530-1600	Discussion and Summary	Consultant / ICLEI KCC / Global Platform

Oct 20 (Fri) - Field Trip to Pingtung

Time	Agenda	Location	Speaker/Facilitator
0730-0830	Depart for Pingtung		
0830-0900	Welcome remark from the Magistrate of Pingtung County	Pingtung County Government	Magistrate of Pingtung County, Pan Men-An
0900-0940	Introduction of Climate Adaptation Projects in PT - Chaozhou Artificial Lake	Pingtung County Government	Prof. Cheh-Shyh Ting of National Pingtung University of Science and Technology
1000-1130	**Study Visit 1:** **Biogas Demonstration Site-The Central Farm**	Central Farm	Owner of Central Farm Mr. Su Peng
1200-1330	Lunch		
1340-1420	Kuroshio current energy generation	GuanTsai Wetland Energy Center	Prof. Chen, Yang Yih, Vice Principal of National Sun Yat-sen University
1420-1500	Introduction to Smart Energy System in Guangtsai Wetland		Director Chen of Tatung Co., Smart Solutions Dept.
1500-1550	**Study Visit 2:** **Aqua Solar Farms@ Linbian**	GuanTsai Wetland	Local guide Mr. Cheng
1550-1630	■ Discussion ■ Awarding Certificate	GuanTsai Wetland Energy Center	ICLEI KCC
1630-1730	Return to Kaohsiung		

Oct 21 (Sat) – Ecomobility Festival site

Time	Agenda	Location	Speaker/Facilitator
0930-1130	Guided Tour in Hamasen	Hamasen	ICLEI KCC

Annex 2 – List of workshop participants

Given Name	Last Name	Position	Department of Division/ Organization	Country
An	Dang	Head of Division	Energy Saving and Cleaner Production/Industry promotion and Industry Development Constancy Center	Vietnam
Ana	Martelli	Environmental Professional	National Department of Conservation/National Park Service	Argentina
Ana	Rankovic	Programme Manager	NA/SEE Change Net	Serbia
Andrea	Macera	Director	Department of Industrial Competitiveness/Ministry of Industry, Foreign Trade and Services	Brazil
Anh	Doan	Deputy Head	Research Management & International Cooperation/Electric Power University	Vietnam
Aytan	Maharramova	Lecturer	Hydrometeorology/Baku State University	Azerbaijan
Bandar	Bani sakher	Environmental Engineer	Environment Division/Jordan Industrial Estate Company	Jordan
Benjimen	Wakefield	Assistant Energy Planner	Energy Planning Division/Ministry of Resources & Development	Marshall Islands
Bertill	Browne	Director	Energy Unit/GOVSKN	Saint Christopher and Nevis
César	Echagüe	-	Protocol and Ceremonial/Autoridad Reguladora Radiologica y Nuclear	Paraguay
Deepak	Chand	Senior Scientific Officer	Energy/Ministry of Infrastructure and Transport	Fiji
Esteban	Toha	Coordinator of Biodiversity and Energy Unit	Sustainable Development Division/Ministry of Energy	Chile
Federico	Nores Pondal	Researcher	Institute of Hydrogen and Sustainable Energies Technologies (ITHES)/National Council of Scientific and Technical Research (CONICET)	Argentina
Gabriela	Rijter	Coordinator	National and International Cooperation division / Undersecretariat of Renewable Energy/Ministry of Energy and Mining Argentine Republic (MINEM).	Argentina
Jan	Metzl	National expert on electricity market design	Strategy and International Cooperation in Energy/Ministry of Industry and Trade	Czech

Given Name	Last Name	Position	Department of Division/ Organization	Country
Javier	Fontalvo	Technical Analyst	Energy Prospective/National Institute of Energy Efficiency and Renewable Energy	Ecuador
Julio	Duhalde	Coordinator of strategic planning and mining scenarios	Undersecretariat for Mining Development /MINISTRY OF ENERGY AND MINES	Argentina
K m	Mostofa	Upzilla Rural Development Officer	Upzilla /Bangladesh Rural Development Board	Bangladesh
Kindie	Tagele	Senior Small Hydro and Geothermal Energy Expert	Alternative Energy Technology Development and Promotion Directorate/Ministry of Water, Irrigation and Electricity	Ethiopia
Kristaps	Stepanovs	CEO, Renewable Energy Advisor	Energy consulting/Capital Solutions	Latvia
Lalzirmawia	Chhangte	Secretary	Mizoram Public Service Commission/Govt. of Mizoram	India
Lukas	Minarik	Ministerial counsellor	Department of Energy and Climate Protection/Ministry of the Environment of the Czech Republic	Czech
Miriam	Tikana	Energy Economist	Energy Planning Unit/Ministry of Public Works & Utilities	Kiribati
Nancy	Garzon	University Profesional	Secretary of mines, energy and gas/ Government of Cundinamarca	Colombia
Ondřej	Šumavský	ambassador for sustainable energy	sustainable energy/Alliance for energy self-sufficiency	Czech
Paúl	Melo	Climate Change Mitigation Specialist	Undersecretariat for Climate Change/Ministry of Environment	Ecuador
Puafolau	Malu	Petroleum Specialist	Department of Energy/Tuvalu Government	Tuvalu
Ruben	Urbina	Specialist in Environmental Management	Enviromental Management Unit/Ministry of Energy and Mines	Nicaragua
Sabuhi	Talibov	Lecturer	Economic geography/Baku State University	Azerbaijan
Sankey	Deluckner	Renewable Energy Assistant	Renewable Energy/Nauru Utility Coorperation (NUC)	Nauru
Thanh	Vo	Deputy Manager	Ho Chi Minh City Environmental Protection Agency/Ho Chi Minh city Deparment of Natural Resources and Environment	Vietnam
Virginia	Gómez	Assistant	Municipal government/Government	Uruguay
Zurlinda	Aziz	Assistant Director	Renewable Eenrgy Technology Division/Sustainable Energy Development Authority Malaysia	Malaysia

About the workshop facilitators and organizers

Ana Marques Leandro, Independent Consultant, Energy transition

Environmental Engineer and expert on the transition to sustainable energy, Ana has over 8 years of experience supporting the development of sustainable energy plans, policies and projects. In the last 5 years Ana worked as Senior Officer at ICLEI, where among other tasks she co-chaired the Capacity Building Taskforce of the "Global District Energy in Cities Initiative", led by UN Environment, and facilitated the "Global 100% RE Cities and Regions Network".

Arthur Hinsch, Coordinator of the Global 100%RE Platform

As the Coordinator of the Global 100% RE Platform, Arthur oversees concerted action between member organizations on event organization, joint communication and tools such as the 100% RE Building Blocks. Previously, he worked at the International Cooperation Agency of the Association of Netherlands Municipalities and the Institute for Sustainable Energy Policies in Tokyo. Arthur holds a MA in International Relations and a BA in Japanese Studies from Leiden University in The Netherlands.

International Cooperation and Development Fund (TaiwanICDF) is dedicated to boosting socio-economic development, enhancing human resources and promoting economic relations in a range of developing partner countries with supports on four core operations: lending and investment, technical cooperation, humanitarian assistance, and international education and training.

ICLEI – Local Governments for Sustainability (ICLEI) is the leading global network of more than 1,500 cities, towns and regions committed to building a sustainable future. By helping the ICLEI Network to become sustainable, low-carbon, resilient, ecomobile, biodiverse, resource-efficient and productive, healthy and happy, with a green economy and smart infrastructure, we impact over 25% of the global urban population.

As the only ICLEI-recognized capacity centre in East Asia, **ICLEI KCC** provides training, professional expertise and a variety of information exchanges to help cities in this region move towards sustainable development through action plans, regulations, policies, public environmental education, and international symposiums.

Global 100% Renewable Energy Platform (Global 100% RE Platform) is the first global initiative that advocates for 100% renewable energy. This unique platform builds on projects that are already taking place on national, regional and local levels and steers the global discourse on renewable energy towards 100% RE as the new normal. The goal is to create dialogue platforms for different actors and to inform political decision makers about opportunities, case studies and news from all over the world.

Field trip to Aqua Solar Farms

Photo credit: TaiwanICDF and ICLEI KCC

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