Inspiring Visions of a Sustainable Energy Future

Lessons from the 100% Renewables Cities and Regions Roadmap project

ICLEI Local Governments for Sustainability

100% RENEWABLES CITIES & REGIONS ROADMAP

Supported by:

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ABOUT THIS DOCUMENT
This report was prepared to document the activities of the 100% Renewables Cities and Regions Roadmap project, particularly those that took place at various international workshops, including special sessions, discussions, and site visits. The purpose of these workshops and visits was to encourage the exchange of ideas and knowledge across the various project cities and regions, as well as learn about innovative ideas from other parts of the world, and spread awareness about cutting-edge technologies that could be considered in an urban or regional context.

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Our thoughts and prayers are with the late Mr. Lalu Adi Gunawan, who peacefully departed in July 2023. His invaluable dedication and significant contributions ever since the establishment of this project in WNT will continue to serve as an inspiration to those who continue their work.

ABOUT THE 100% RENEWABLES CITIES AND REGIONS ROADMAP PROJECT

The 100% Renewables Cities and Regions Roadmap project facilitates the energy transition by raising local awareness on renewable energy sources, showcasing how local and national governments can create coordinated enabling frameworks and policies, exploring access to public and private sector finance, and building local renewable energy projects to address electricity, heating and cooling.

The 100% Renewables Cities and Regions Roadmap is implemented by ICLEI and funded by the German Federal Ministry for the Economic Affairs and Climate Action (BMWK) through the International Climate Initiative (IKI).

ABOUT ICLEI – LOCAL GOVERNMENTS FOR SUSTAINABILITY

ICLEI – Local Governments for Sustainability is a global network working with more than 2,500 local and regional governments committed to sustainable urban development. Active in 125+ countries, ICLEI influences sustainability policy and drives local action for low emission, nature-based, equitable, resilient and circular development. ICLEI's Members and team of experts work together through peer exchange, partnerships and capacity building to create systemic change for urban sustainability.

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BACKGROUND & CONTEXT

The 100% Renewables Cities and Regions Roadmap (100% RE) project facilitates the sustainable energy transition in cities and regions in **Argentina**, **Indonesia**, and **Kenya**. It showcases how local and regional governments (LRGs) can create enabling frameworks, policies and strategies by placing multilevel governance at the heart of its work, take advantage of public and private finance, and implement local renewable energy and energy efficiency projects to address their energy needs (electricity, heating, and cooling) across all sectors.

Study tours formed an essential part of the capacity building and training activities for the 100% RE project. These tours, targeted at representatives from the project cities and regions, served to inspire and guide LRG officials regarding the various RE-based applications that could be applied to their local contexts, by allowing them to see them in action and exchange with those responsible for their implementation. The tours provided a range of in-person exchange and learning opportunities that were quite valuable, particularly in the wake of the COVID-19 pandemic. Successful study tours are sites of critical observation, reflection, and conversation that can inspire local innovations.

To maximize the value of each visit, ICLEI partnered with fellow leading organizations active in the energy space to deliver training, exchanges, and site visit opportunities aligned with major events in Madrid, Spain and Paris, France. ICLEI also leveraged these in-person exchange opportunities to further develop its use of the 'serious gaming' methodology through the Sustainable Energy Transition Strategy game, that each of the 100% RE project deep-dive cities and regions will incorporate into their policy roadmaps towards 100% renewables by 2050.

The 100% Renewables Cities and Regions Roadmap project team, with representatives from project cities and regions at SPIREC 2023 in Madrid, Spain.

OVERVIEW OF STUDY TOURS

The study tours that formed a part of the 100% Renewables Cities and Regions Roadmap project activities took place in 2023.

In February 2023, ICLEI participated in the **International Renewable Energy Conference in Spain** (SPIREC)—co-organized by REN21 and the Spanish government—and the GENERA trade fair in Madrid, Spain. ICLEI joined site visits to innovative energy-related projects and institutions in and around the Community of Madrid that were tailored to participants' interests, allowing representatives to evaluate and apply learnings to their own urban and regional contexts. These visits included an energy community, a 20 MWp solar park, an advanced research institute, two energy control centers, and a waste-to-energy complex.

Representatives from Argentina and Indonesia returned to Europe in April 2023, when ICLEI facilitated their participation in the **International Energy Agency's (IEA) Energy Efficiency in Emerging Economies Training Week** in Paris, France—a weeklong event tailored to a global community of public, private, and other representatives active in the energy sector. Participants joined one of five parallel streams, taking part in sector-focused workshops and group activities aimed at building policy-making capacity and knowledge, particularly related to 'smart cities'. Site visits were part of the training program, with tours to Schneider Electric's headquarters on the outskirts of Paris, showcasing energy efficient building solutions, and the largest urban development project in Paris at the Clichy-Batignolles eco-district.

The cohort for the IEA's Energy Efficiency in Emerging Economies Training Week in April 2023 in Paris, France
Source: International Energy Agency, 2023

Snapshot of project cities and regions in attendance

Argentina's deep-dive project city is rural **Avellaneda**, an ambitious farming and industrial community in the Province of Santa Fe. Via the 100%RE project's participatory frameworks, Avellaneda aims to realize its vision of diversified energy supply and innovation. Non-Structural Officer Ms. Nilce Gregoret represented Avellaneda in Madrid, served as a panelist at SPIREC, and attended the IEA Training in Paris.

Rosario, the Province of Santa Fe's economic and cultural center, is a river port with nearly 1 million residents. Home to ICLEI Argentina, Rosario is actively advancing sustainability and is keen to diversify its energy mix with solar PV, solar thermal and waste-to-energy projects. Ms. Daniela Mastrangelo, Head of the Subdivision of Renewable Energy Development, joined both SPIREC and IEA in Paris.

Indonesia's deep-dive region **West Nusa Tenggara** is home to 5 million residents. WNT's shift from coal and diesel necessitates a whole-of-society approach in its roadmap. Ms. Niken Arumdati, Head of Sub Division of Renewable Energy Development: Energy and Mineral Resources, WNT Office, and Mr. Lalu Adi Paluwan, Non-Structural Officer: at BAPPEDA, represented WNT at SPIREC. Ms. Arumdati also joined in Paris.

From the shores of Lake Victoria, **Kisumu County** serves as Kenya's gateway into Africa's Great Lakes region. Kisumu's vision manifests into partnerships driving rural electrification, clean cooking, solar power and geothermal energy. Mr. Evans Gichana (Director of the Climate Change Unit) and Mr. Laban Okeyo (Acting Director of Renewable Energy Technologies) represented Kisumu at SPIREC.

Home to Africa's largest geothermal plant, **Nakuru County** aims to become a beacon of energy possibilities and curb deforestation with further investment in wind, solar, and biogas. Nakuru's GDP (Kenya's 2nd-highest) solidifies both its business reputation and its energy investment aims. Ms. Grace Karanja (Director of Environment, Energy, Natural Resources, and Climate Change) joined SPIREC.

About SPIREC and GENERA

IRECs are International Renewable Energy Conferences, co-hosted by a national government and REN21. Under the name **SPIREC 2023**, the 2023 IREC was held by Spain from February 20–23, 2023, at the IFEMA Madrid Trade Center within the framework of and in parallel to **GENERA**. GENERA is the International Energy and Environment Fair, Spain's largest commercial platform for the renewables industry, held annually at IFEMA with the support of the Institute for Energy Diversification and Saving (IDAE) and key private sector actors.

SPIREC was an international high-level policy event where decision-makers from across society came together to meet and discuss policies and experiences. It focused on building collective know-how to advance renewables at the international, national and sub-national levels. Spanish Prime Minister Pedro Sánchez opened the conference, followed by three days of panels tackling complex energy issues.

SPIREC proved an excellent forum for ICLEI to cultivate project participation and showcase results. Project staff and city representatives gathered for a serious games launch workshop prior to the start of the conference. Representatives from **Kisumu County, Kenya** and **Avellaneda and Rosario, Argentina**, spoke on panels during the conference. ICLEI also hosted a project-specific community event featuring perspectives from all three project countries on implementing their renewable energy transitions.

With over 10,000 attendees spread across massive convention halls, GENERA made the technologies of the sustainable energy transition tangible and accessible. ICLEI representatives surveyed a range of solutions, seeking appropriate applications to their local contexts, such as identifying the right kind of PV modules in agri-voltaic applications, or inverters used for ground-mounted PV. Companies presented the various business cases for RE projects, important information for a key phase of the 100% RE project.

After three days at the IFEMA conference center, REN21 ensured participants could explore real-world implementation with visits to energy projects scattered in and around the Community of Madrid. ICLEI attendees chose site visits relevant to their expertise and—particularly for visiting government officials— the visions of the project cities and regions. The next section functions as a tour around the five site visits: **a community energy project; a 20 MWp solar park; an energy research institute; two national control panels, and Madrid's waste management complex.**

ManzaEnergía :: Manzanares el Real

The ManzaEnergía project is a municipality-owned energy community in a small, mountainous town 50 km north of central Madrid. Our city representatives and staff were curious to understand how the project was established, both in terms of motivation and institutional arrangements. Community energy, as the project manager from ManzaEnergía reminded our team, requires delicate planning, trust, relationship-building, and institutional backing.

A 100 kWp PV plant adorns the town sports center

The physical infrastructure consists of a 100 kWp photovoltaic plant for shared self-consumption with grid injection, a 50 kWh storage system, monitoring and actuators system (grid analyzers, data logger, etc.), and an electric vehicle charging point. To lower electricity bills while combating the climate emergency, ManzaEnergía shares the energy generated between a sports center, 4 school buildings, and 15 homes in vulnerable situations.

In addition, the project includes an energy office and an energy efficiency project in a public school. The guided walking tour, led by Iván Aranda, addressed technical and social aspects considered for the design of the plant, as well as other factors linked to the operation and associated projects. The visit included three stops across the installation: the PV plant (from the outside), the school building, where a working network analyzer was shown, and the sports center, housing the storage, EV charging point, and monitoring systems.

ManzaEnergía is also a story of community energy barriers. For one, the regulatory framework for energy pricing has made it impossible to begin distribution, despite the infrastructure being in place since 2019. Elsewhere, the funding scheme (tax savings) may prove infeasible. Yet, Ms. Niken Arumdati saw the power of stakeholder engagement, education, and ownership: "In my opinion, what makes it work is the community bond among the people in the village and [their awareness] of the knowledge and importance of the energy transition".

ICLEI's delegation arrives for the guided tour

Poblete Solar Park :: Ciudad Real

Poblete Solar Park is a 20 MWp project about to commence operations. During its first year of production, the solar plant expects to generate around 37.5 GWh of solar energy and to avoid 5,700 tons of CO_2. The sheer scale inspired many of our local government representatives' and project staffers' visits. ICLEI Senior Officer Sastry Akella, an engineer and solar energy expert, wanted to investigate what lessons would be applicable from Poblete in our project contexts based on his experiences in the Global South.

ICLEI's delegation to the solar park posing between two rows of panels

Upon arrival, the natural beauty and integration into the rural community as an 'agro-PV farm' were pleasant surprises. Poblete was also technologically impressive. Its surface of 42 hectares consists of bifacial modules and one single-axis tracker. Its inverters also transmit real-time data to operators, allowing the company to anticipate system failures. The ability to link multiple solar PV projects in different locations together particularly impressed Kisumu County.

Poblete signed a 10-year power purchase agreement (PPA) with Holaluz, a green energy technology company. The PPA marks another milestone for BayWa r.e. on its journey towards grid parity in Europe, as this will be their seventh solar project in Spain developed without any support from subsidies. For Holaluz, this agreement is a new step to 100% RE, allowing BayWa r.e. and Holaluz to supply 9,500 new Holaluz customers.

Similar to Manza, Poblete is encountering administrative hurdles to commence operations. Compounded with issues of scale and finances, this made participants reasonably cautious when attempting to encourage replication in their own contexts. Caution, however, ought not to be interpreted as disinterest; in fact, the visit encouraged participants to consider paths through large-scale solar PV barriers in their own contexts. Among the possibilities emerging from Poblete: Is floating solar on Lake Victoria possible in Kisumu County?

Poblete's 42 hectares from above

IMDEA Energy Institute :: Móstoles

IMDEA Energy Institute is a renewable energy-focused research and development hub created by the Community of Madrid in 2006. Its complex in the suburb of Móstoles houses over 100 researchers, engineers, technicians and managers. IMDEA Energy gathers cutting-edge skills and significant experience in R&D, testing, and assessment of energy technologies. Avellaneda's project technical coordinator, Nilce Gregoret, aims to apply learnings from her visit to IMDEA Energy related to the formation of an innovation center directly upon return to Argentina.

The visit focused on singular R&D facilities in the fields of solar energy, circular economy and smart grids. Participants visited the smart grids simulation laboratory SEIL, followed by a Pyrolysis & HydroDeOxygenation pilot plan and a heliostats solar field. With a wide range of technologies and niche research topics, the research activities were beyond our project contexts' capacities. No level of enthusiasm can account for the financial and technical gaps.

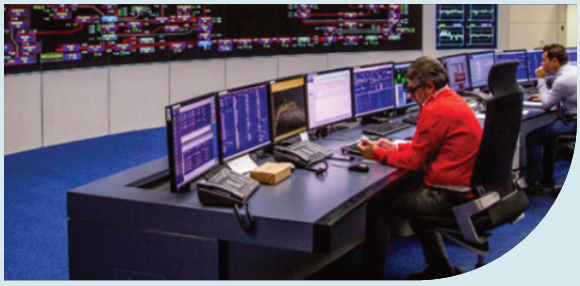
However, IMDEA provided multiple pathways for local replication. IMDEA Energy's management left an impression on West Nusa Tenggara: it is very much an integrated enterprise, both within (synergies across research units) and beyond (with applications into the business sector, and a university). Relationships and dialogue are not necessarily what one would think as key takeaways from pyrolysis, but our participants made newfound connections from this visit.

Project cities and regions benefit from both on-site technical experience and exchange. IMDEA reinforced that strong government support enables a robust research and innovation ecosystem. In Avellaneda, Gregoret is ready to provide the kind of support she witnessed in Madrid, and explore potential exchange between her town's energy supplier and IMDEA.

Site visit participants and IMDEA Energy researchers at the heliostats solar field

Electricity Control Centre (CECOEL) and Renewable Energy Control Centre (CECRE), Redeia :: Alcobendas

Redeia (also known as Red Eléctrica) operates the national electricity grid and the national power transmission system in Spain. It is firmly committed to driving the green and digital transformation, being the backbone of a decarbonised energy system. Local government officials from Kisumu and Nakuru Counties visited Redeia with the intent to better understand control centers' monitoring and tracking capabilities for replication in Kenya.



CECOEL control board on a typical working day

Red Eléctrica's Electricity Control Centre (CECOELI) is responsible for the coordinated operation and real-time monitoring of the generation and transmission facilities of the national electricity system. The Renewable Energy Control Centre (CECRE) is a pioneering center of global reference in the supervision and management of renewable energies. Every 12 seconds, CECRE receives real-time information from the country's renewable generation centers, achieving integration of renewable energy and reducing greenhouse gas emissions.

CECOEL and CECRE were impressive, ranging from the security presence at the facilities to around-the-clock staffing. Perhaps the most compelling feature for our County representatives was the harmonization of data from neighboring countries' electricity networks. From the control panel in Madrid, visitors could peer into renewable energy generation in Morocco, Portugal, and France, building the case for integrated regional energy planning.

Site visit participants at CECRE

Our representatives saw potential to improve Kenya's efforts with more centralized information. Yet, beyond technology is the role everyday citizens must play in the energy transition, and to this effect Spain could learn from Kenya and fellow African peers. A more communal approach to energy, data, participation, and urban planning could raise European innovative capacities. Exchange can, and should be, a two-way street.

Valdemingómez Technology Park, NEDGIA :: Villa de Vallecas

The Valdemingómez Technology Park is a massive complex in the southeastern outskirts of Madrid, with its activities no mystery to anyone able to smell within a 2 km radius. It is an urban solid waste treatment center in which, among other activities, the organic fraction of urban waste is valorized for energy. This involves the generation of biogas, its cleaning, and injection into the Spanish gas system and helps fund the Community of Madrid's waste management.

Valdemingómez was a worthwhile foray into interconnected waste and energy management. For Rosario representative Daniela Mastrangelo, a waste-to-energy expert and engineer, this was a homecoming of sorts, and genuinely became one upon meeting a plant staff member from Rosario. Beyond Mastrangelo's already-considerable interest, she joined this visit to inform Rosario's plans for an urban biodigester plant currently under development.

Mastrangelo joined a contingent of fellow waste enthusiasts for an hour-long lecture at the Visitors' Center, followed by a shuttle to the Las Dehesas biomethanization treatment plant and another to the biogas treatment plant. The lecture proved quite useful in explaining the business models, organic waste processes, and interconnections across the complex institutional arrangements, such as an R&D alliance piloting products made from organic waste.

Many concepts are transferable to Argentina but will take a different shape. Unlike Madrileños, Rosarinos do not separate organic waste at source, both reaffirming everyday citizens' role in the energy transition and the practicalities governments face when prioritizing investments (in Argentina's case, cost-effective waste-to-energy technology). Despite the city's lack of experience and high upfront costs, Mastrangelo is determined to bring waste-to-energy to Rosario.

Left: Rosario and Valdemingómez staffers discussing biogas
Right: Tour in the biomethanization facility

About the IEA Energy Efficiency Training Week 2023

The International Energy Agency (IEA) brought together over 120 policy makers and energy experts from more than 40 countries at its Paris headquarters to develop expertise in energy efficiency policy making and underline the important role it can play in emerging and developing economies.

The IEA has been holding these week-long trainings since 2015, building a community of more than 2,000 energy efficiency professionals from over 120 countries. This year's training week was the first to be held in-person after the outbreak of COVID-19 in 2020.

Like ICLEI's delegation from Avellaneda, Rosario, and West Nusa Tenggara, fellow participants were primarily from government institutions and supporting organizations in emerging economies. The sessions were dedicated to sharing experiences and best practices for planning, implementing, and evaluating energy efficiency policies in emerging economies. This sustained exchange tailored to emerging economies gave participants a common language and the chance to consistently speak that language.

The training consisted of five parallel courses, covering energy efficiency in Appliances & Equipment, Smart Cities, Buildings, Indicators & Evaluation, and Industry. Participants were presented with a detailed introduction to energy efficiency policy packages and took part in a series of sector-focused workshops and group activities aimed at building policy-making capacity.

ICLEI also led an energy efficiency-focused serious games workshop, building off of its experience in Madrid with a tailored product for 40 participants in Paris, aimed at increase awareness of energy efficiency policy options and the differing incentives among different stakeholders.

The serious game session at the IEA EETW, focusing on energy efficiency measures

On Day 3, participants attended one of two site visits. The visits were either to Schneider Electric's headquarters in Hauts-de-Seine on the outskirts of Paris, and the massive Clichy-Batignolles eco-district development project in Paris' 17th *arrondissement*.

Schneider Electric's "The Hive" :: Hauts-de-Seine

The IEA facilitated a visit to the global headquarters of the energy technology and services company, Schneider Electric. "Le Hive", which stands for 'Hall de l'Innovation et Vitrine de l'Energie' ('Hall of Innovation and Energy Showcase'), is located in the greater Paris region, and is the world's first building to receive the ISO 50001 – Energy management certification. The building's energy consumption was brought down from a baseline of 150 kWh/m^2/year in 2009, to 43 kWh/m^2/year by 2019 through a mix of passive (insulation, windows etc.) and active energy efficiency measures.

The group, including project staff and local government representatives, on a tour of Le Hive's rooftop solar installation

The highlights of the visit were a demonstration of Le Hive's building management system (BMS), as well as its rooftop solar panels, a small-scale geothermal plant for heating/cooling the building, and its rooftop apiary.

The visit brought about a number of relevant insights for participants, notably the importance of strong information and communications technology (ICT) infrastructure to enable a truly energy-efficient building. Given the number of sensors and controllers in the building, it was possible to regulate temperatures, workstations and so on, based on energy usage patterns, number of occupants and outside temperatures.

It was also possible to see how new and improved technologies could be deployed for critical uses in buildings. For example, pressurization systems were deployed to reduce the energy consumed by the building's heating, ventilation and air conditioning (HVAC) systems. Decentralized renewable energy technologies, such as geothermal systems and rooftop solar PV, allowed the building to meet its energy needs through clean sources of energy. Le Hive's digital infrastructure and interface also allowed the complex to provide flexibility services to the grid, which could potentially become a revenue stream in electricity markets where such services are compensated.

The visit emphasized the point that buildings themselves are critical energy consumers in any region, and action in this sector is critical for climate and energy targets. Retrofits are necessary to bring down emissions from the current building stock. Le Hive showed to what extent this is possible, and the gains it could bring. Although the initial costs can be high and even prohibitive, the initial investment is recovered in a relatively short period of time due to the energy and cost savings, especially in areas where the high cost of energy could be a concern.

The group, including project staff and local government representatives, learning about Le Hive's underground geothermal plant

Clichy-Batignolles Eco-District :: Paris

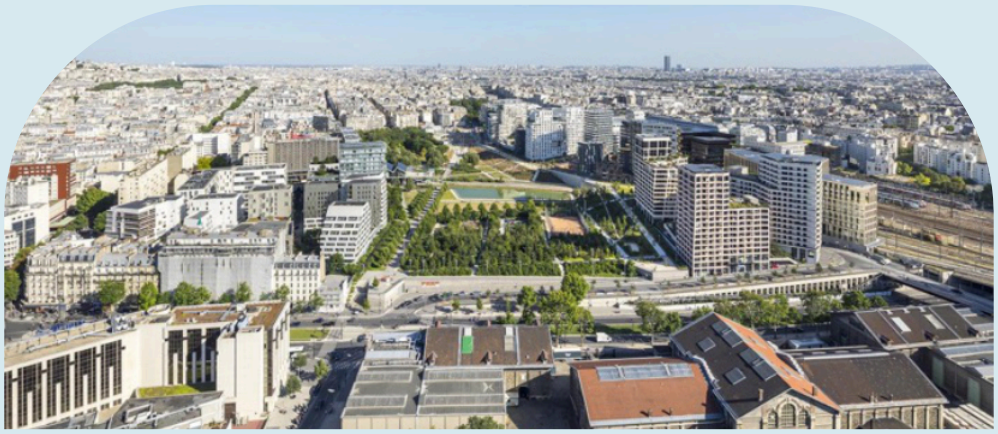
The IEA coordinated an urban planning-focused tour through one of EU's largest urban development projects, the Clichy-Batignolles Eco-District in the northwest of Paris. Built atop a former freight rail yard, city planners spent a decade creating a mixed-use development, encompassing offices, housing, stores, public facilities, and green spaces, built to meet the highest energy and environmental standards. Paris wanted to make Clichy-Batignolles a model for sustainable urban development, bringing to life through this project its ambitions in terms of mixed functions and social diversity, energy efficiency, reduction in greenhouse gas emissions and biodiversity.

The district sits between the ring road, Porte de Clichy, and the Batignolles neighborhood, providing an abundant supply of office space, including various private office buildings with a view of the Saint-Lazare railway tracks, as well as two public structures that house the new courthouse and Paris police headquarters. Additionally, the district hosts numerous shops and services as well as 3,400 housing units, with half reserved for low-income households. Eventually, the district will accommodate 7,500 new residents in Paris's 17th arrondissement.

The eco-district's goal is to ensure that 85% of its heating and domestic hot water is supplied by renewable sources, primarily geothermal. In an open-to-recycle system, heat from hot water pumped from the ground is extracted and used to heat buildings. The used water is then returned to the aquifer. Many rooftops and some facades will be equipped with photovoltaic panels, creating an overall surface of 35,000 m^2, producing nearly 3,500 MWh per year.

This production is the equivalent of roughly 40% of the electricity consumed by buildings in Clichy-Batignolles, primarily for lighting. In tandem, stringent energy consumption and heating requirements relative to other Parisian neighborhoods ensure the eco-district's sustainability.

For many IEA training participants, an integrated project of this scale was novel. Paris is not the only city preparing for a new reality of higher temperatures; there are many lessons to transfer, such as increasing the number of green spaces and moisture content to mitigate the urban heat island effect. Among our attendees' interests were a community model for district heating and cooling. For our participating cities and regions, Clichy-Batignolles serves as inspiration, rather than something to copy-and-paste.



Top: Clichy-Batignolles from above
Source: Paris & Métropole Aménagement

Bottom: The group, including project staff and local government representatives, visiting the Clichy-Batignolles eco-district

KEY TAKEAWAYS FROM THE STUDY TOURS

While having the right ingredients (the right people, projects and places) is essential to a study tour, no experience would be complete without meaningful reflection. This document is a manifestation of many deliberate conversations, where participants contributed to a shared collective understanding with critical reflections from their own contexts. We hope the following lessons and insights will contribute to the success of similar future initiatives:

- **Learning and reflecting together is essential:** Events like SPIREC and the IEA EETW facilitate newfound connections (both interpersonal and intellectual), but opportunities for reflection require further cultivation. In Paris, the IEA's group learning structure helped familiarize participants with the potential for energy efficiency measures in the urban context, featuring exchanges with diverse city officials and experts who spoke about their experiences. Site visits allowed participants to observe practical demonstrations of the concepts being discussed, especially digitalization measures and green building and urban design.

- **In-person engagement is crucial for multi-regional projects:** For the 100% Renewables Cities and Regions Roadmap project, this was the first time all project partners could meet together in-person; for local government representatives from different continents, it was their first opportunity meeting each other. This was of particular importance to government representatives: given a project structure where project cities are typically in contact with only staff in the regional office, in-person engagements allow for organic and far-reaching exchange that otherwise would not exist.

- **Participatory frameworks must form the core of energy projects:** While the 100%RE project is built on stakeholder engagement, community participation was not an essential feature for many projects in site visits. This was apparent to our African delegation, who felt Madrid could learn from Kenyan cultural norms and further emphasize direct benefits around various RE plants under construction. As part of a South African government program (REIPPPP), for example, it was mandatory for developers to support local economic development and socio-economic initiatives for the surrounding communities. To that effect, the community energy project ManzaEnergía was equally intriguing and applicable. Now, conversations with project partners in Madrid are

inspiring potential ICLEI-Manza community energy collaborations in Argentina.

- **The scale of the interconnectedness of projects was novel for many of the 100%RE project cities and regions:** Whether it was Madrid's integrated public transit system or Redeia's control grid extending to Morocco and France, interconnectivity was front and center for ICLEI's participants who spoke to integrated, complex systems executed at scale. Even within individual projects, interconnectivity was striking. To a local government representative from Rosario, waste and energy processes at Madrid's massive Valdemingómez complex feeding into each other was exciting.

- **Learnings ought to be applied to local contexts as an accelerator, making innovative connections that otherwise wouldn't have existed:** Successful study tours should inspire novel approaches that can then be tailored to local contexts, as opposed to the direct application of solutions from elsewhere. This ethos inspired ICLEI participants, be it using ideas from IMDEA to inform a local innovation center in Avellaneda, or those from Poblete to reconsider Kenya's Lake Victoria's floating solar potential. Reflections across participants also supercharge innovation, as connecting ideas from multiple site visits allows better applications to their own project contexts.

- **Fully realized projects make for more impactful site visits:** During SPIREC and the IEA EETW, it was clear that seeing theory turned into practical projects had a huge impact on learning for participants. Whether these were solutions developed by the private sector itself or in partnership with local governments, much of the learning and replicability comes from fully implemented projects and the obstacles they encounter on the way. Pilot and demonstration projects, therefore, are key for local and regional governments to be able to see what is possible, feasible and replicable for their unique energy contexts.

- **Governance and political enablers are essential, although not always easily applicable:** The Redeia control room's pan- and trans-continental energy flows are predicated on cooperation between Spain, Portugal, Morocco, France and the EU. This requires aligned renewable energy priorities, which—as our Kisumu County representatives noted—cannot be considered a given in many regional project contexts. Paraguay and Brazil's current dispute regarding the Itaipu Dam, for example,

will invariably affect Argentina further downstream on the Paraná River. Yet, for cities like Rosario, international relations are beyond their reach.

- **Some European solutions are infeasible in project contexts:** Finances as well as technological limitations can hamper the implementation of certain technologies in different regions globally. The scale and technological investment for Madrid-led projects (like IMDEA) would pose challenges to our local governments. The cost to Rosario for implementing waste separation at source, for example, precludes it from executing waste-to-energy projects like those at Valdemingómez. ICLEI Africa found ManzaEnergía's funding approach (entirely via tax savings) intriguing, but did not consider this replicable in less wealthy cities. Future project proposals could consider study tours to more relatable contexts. Some technologies, such as concentrated solar power, were also deemed to be unfeasible in tropical countries such as Indonesia, necessitating the development of locally-suited technologies and research strategies.

- **Access to learning opportunities needs to be democratized:** Conferences—both in content and accessibility—most often cater to a Global North audience. Administrative hurdles can be considerable for Global South participants. Full participation from our teams and local government officials required extensive effort across newfound partnerships between ICLEI, REN21, the Spanish government, and the IEA. Upon arrival, we strove to make the events as digestible and accessible as possible. ICLEI's Global Events team helped inform briefs for our project staff and city representatives, many of whom had never been to Madrid (let alone Europe). Full Global South participation is climate emergency action. The extra effort is well worth it.

ACKNOWLEDGEMENTS

Guidance from previous projects (Urban-LEDS in particular) inspired ICLEI staff to collect input immediately after of these experiences via surveys, which participants completed in the language of their choosing. Questions encouraged participants to bridge study tour lessons and their local contexts, as well as critically examine applicability and share potential improvements for future experiences.

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APPENDIX

Thematic and side events at SPIREC 2023

The following section showcases the project's engagement and activities at the international workshops in Madrid, including speaking at side and main events.

All project city representatives in attendance at SPIREC 2023, from left to right: Grace Karanja (Nakuru County), Laban Okeyo (Kisumu County), Lalu Adi Gunawan and Niken Arumdati (West Nusa Tenggara), Daniela Mastrangelo (Rosario), Nilce Gregoret (Avellaneda), and Evans Gichana (Kisumu County).

Mr. Lalu Adi Gunawan will be sorely missed.

Speakers from Kisumu County, Nakuru County, West Nusa Tenggara, and Avellaneda at ICLEI's side event at SPIREC, titled "100% Renewable Cities and Regions: Argentina, Indonesia, and Kenya". This was the first time project city and regional representatives were on the same stage to share their experiences.

Serious games in Madrid and Paris

Madrid featured the launch workshop for the Sustainable Energy Transition Strategy game on the sidelines of SPIREC. At the IEA EETW, ICLEI conducted a special energy-efficiency-themed version of the game for a larger audience.

Participants from the launch workshop for the Sustainable Energy Transition Strategy (SETS) game. This interactive session used the example of Avellaneda, Argentina for players to develop their own energy strategies for a sustainable energy future for the city. The serious game methodology will be further deployed for each project city/region to enhance their roadmap development processes.

Discussions in full-swing for the serious game session organized at the IEA EETW in Paris. The Sustainable Energy Transition Strategy game was adapted for an audience of over 30 people, with the goal of spreading awareness of energy efficiency measures and the conflicting (and overlapping) interests of various stakeholders.

GENERA trade fair

A number of innovative designs for renewable technologies, particularly solar photovoltaic panels, were on display at GENERA. These designs allow for more seamless integration of panels in a variety of locations and structures, allowing for multiple uses as well as co-existence with nature.

Flexible solar panels on display, which can reduce space use

A solar panel 'tree' that allows for multiple uses, including lighting, wi-fi, and charging for phones and micro-mobility

Transparent solar panels can allow sunlight to pass through to plants below, or for illumination, increasing the potential uses

Folding solar panels can be deployed in temporary locations, such as during large events

100% RENEWABLES CITIES & REGIONS ROADMAP

The 100% Renewables Cities and Regions Roadmap is implemented by ICLEI and funded by the German Federal Ministry for Economic Affairs and Climate Action (BMWK).

https://renewablesroadmap.iclei.org/

ICLEI Local Governments for Sustainability

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