Sustainable Energy Policy Blueprint

USAID Energy Secure Philippines (ESP) Activity:
Enabling a Sustainable Energy Transition in Dumaguete City (ESETD)

ACKNOWLEDGEMENTS

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List of Abbreviations

BPO	Business process outsourcing
CCC	Climate Change Commission
CREVI	Comprehensive Roadmap for the Electric Vehicle Industry
DENR	Department of Environment and Natural Resources
DES	Decentralized energy systems
DOE	Department of Energy
DOTr	Department of Transportation
DSM	Demand-side management
EDC	Electric Development Corporation
EECO	Energy Efficiency and Conservation Office
EEE	Energy Efficiency Excellence
EPIRA	Electric Power Industry Reform Act
ESCO	Energy service company
EVIDA	Electric Vehicle Industry Development Act
FiT	Feed-in tariff
GEMP	Government Energy Management Program
GEOP	Green Energy Option Program
GHG	Greenhouse gas
ICT	Information and communication technology
IoT	Internet-of-Things
IT	Information technology
LED	Light-emitting diode
LEECP	Local Energy Efficiency and Conservation Plan
LGU	Local government unit
LTO	Land Transportation Office
NEECD	National Energy Efficiency and Conservation Database
NEECP	National Energy Efficiency and Conservation Plan
NGCP	National Grid Corporation of the Philippines
NGO	Non-governmental organizations
NORECO II	Negros Oriental II Electric Cooperative

OPCC	One Planet City Challenge
PUV	Public utility vehicle
PV	Photovoltaic
RA	Republic Act
RE	Renewable energy
RPS	Renewable portfolio standards
STEM	Science, Technology, Engineering, and Mathematics
TWG	Technical working group
WtE	Waste-to-Energy

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Introduction

Urban areas house more than half of the world's population and are responsible for over 70% of energy-related CO2 emissions worldwide. With cities expanding and their economies growing, these statistics are expected to increase by 2050 (Yazdanie & Orehounig, 2021). Cities and urban regions are thus becoming increasingly important in catalyzing large-scale sustainable transformations. Local governments play a key role in achieving national climate objectives through local policies and initiatives that go alongside increasingly decentralized energy systems.

In the Philippines, energy production and delivery were highly regulated and centralized until the early 2000s, when the country's energy sector began its fragmentation and deregulation. The liberalization of the Philippine power sector began in 2001 with the Electric Power Industry Reform Act (EPIRA) which unbundled the sector into four autonomous parts: generation, transmission, distribution, and supply. Most state-owned generation assets are now privatized, with only transmission handled by the central government. Power distribution is now controlled by private distribution utilities and electric co-operatives. As the energy sector became more deregulated, regions, municipalities, and cities have followed suit in establishing policies that provide autonomy for its energy distribution and use.

Local governments in the Philippines are now increasingly pivotal in contributing to the energy transition by enacting and implementing renewable energy (RE) policies. We now see increased action from civil society and public institutions at the local level ranging from climate-related community projects to municipality mandates that aim to reduce the dependence on fossil fuels and shift to clean energy. Negros Oriental provides a case in point, with executive orders banning coal-fired plants, promoting the use of renewable energy, and increasing awareness about the benefits of clean energy (Executive Order No. 22-18, 2018; Ordinance No. 17-2021, Series of 2021, 2021). The region is also the first to enact a clean, renewable energy ordinance that not only institutionalizes RE-oriented policymaking but also provides incentives and regulations for clean energy investors.

With more decentralized energy systems, not only do cities need to be equipped with technical know-how, but social, economic, and political arrangements must also evolve. This policy blueprint is built on an extensive literature review, participatory forums, and interviews with key energy stakeholders in the city, and provides key areas and pathways Dumaguete City can utilize to transition to a sustainable energy system.

Background

The Project

The project aims to enable the city of Dumaguete to become more sustainable and efficient in its energy usage. The project is in line with Dumaguete City's 'Lupad Dumaguete' framework and its vision to transition into a smart, sustainable city. In light of the EEC Act or Republic Act (RA) 11285, it is becoming more important for local government units (LGUs) to adhere to sustainable energy usage, specifically to the Government Energy Management Program (GEMP) which calls for the local government's reduction in monthly consumption of electricity and petroleum products through electricity efficiency and conservation, and efficiency and conservation in the fuel usage of government vehicles, among other means.

Through this project, the Dumaguete city government will be able to better comply with the GEMP through proper analysis, baselining, monitoring, and tracking, implementation, and communication. Moreover, the LGU can also stand to win an Energy Efficiency Excellence (EEE) award through its compliance to the GEMP and gain various incentives. Part of the project is to conduct an investment-grade energy audit. Energy audits reinforce the need for formalized renewable energy policies. In a study across 322 municipalities in Northern Italy, it was found that energy audits have a positive and significant effect on the likelihood of enacting and implementing demand-side management (DSM) policies (Annunziata et al., 2014). The rationale is that once users and cities see the results of energy audits, they are further motivated to implement DSM measures.

The project shall also set the ground for future RE investments in the city. RE projects have been proven to be economically viable. The economic viability of RE projects can also further propel RE in both national and local policies, as evidenced in countries like China, South Korea, and Denmark (Izutsu et al., 2012; Jank, 2017; Mah, 2019; Sperling & Arler, 2020; Wu et al., 2022a). Tax revenues generated from local generation projects serve as a strong driver in several German municipalities (Engelken et al., 2016). One standard approach in this respect is contracting energy service companies (ESCO), which provide services for planning and installing sustainable energy facilities over a mutually agreed cooperation period, including the maintenance of these facilities once operational. ESCO services generally offset initial investments and provide energy savings and returns in the long run (Izutsu et al., 2012).

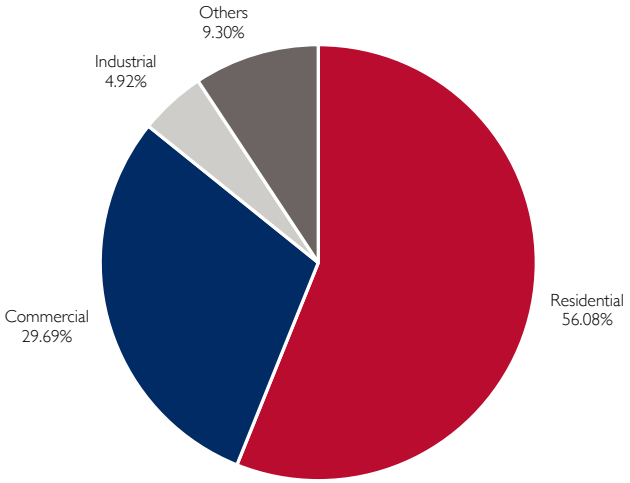
One of the phases of the project is the Multi-Level Policy Integration and Analysis which incorporates vertical and horizontal coordination strategies in developing a sustainable energy policy blueprint for Dumaguete. This policy blueprint can serve as a case study to allow other LGUs in the country to learn and scale up similar policy developments in their respective locales.

Dumaguete City

Dumaguete City is the capital of the province of Negros Oriental located in the Central Visayas Region. The city is divided into 30 barangays, all of which are urban, and is inhabited by a total of 134,103 people as of 2020. The city's economy relies on tourism, the academe (as a university city), retail industries, business process outsourcing companies (BPOs), and information technology (IT) firms. Data extrapolated from NORECO II's Power Supply Procurement Plan indicate that Dumaguete City's energy demand occurs primarily from the residential sector, followed by commercial entities.

Situated as the provincial capital of the RE capital of the Philippines, Dumaguete is endowed with an abundance of resources and opportunities that can aid them in their transition towards a climate-resilient Smart City. The city is already completely powered by renewable energy, primarily from the Palinpinon Geothermal Plant built by the Electric Development Corporation (EDC) in Valencia, Negros Oriental. Several establishments in Dumaguete, such as Silliman University and Foundation University, currently utilize solar rooftop photovoltaics (PV) as well.

NORECO II Share of Energy Sales (2020)



Under Executive Order No. 9 series 2018, enacted by the Negros Oriental Provincial Government, Dumaguete is mandated to use clean and renewable energy, along with the rest of the municipalities and cities in Negros Oriental, imposing a moratorium on coal. The province also celebrates Renewable Energy Day every fifth of March under Executive Order No. 22-18. The province of Negros Oriental launched, on January 28, 2022, the country's first local Clean, RE ordinance. Applicable to "all power generation, transmission and distribution projects" in the province, the RE Code provides incentives for clean energy investors. A council formulates and pursues policies that accelerate RE development programs, towards a greener, energy-self-sufficient, and sustainable province.

Dumaguete employs various electricity and fuel conservation measures in the city hall's day-to-day operations such as the use of LEDs or efficient lighting fixtures and the use of daylight instead of electric lighting whenever possible. In terms of cooling, efficient cooling systems or inverter-type air-conditioning are used wherein the temperature is set to no lower than 25°C and is run strictly from 9 a.m. to 5 p.m., while set to "fan mode" during lunch break. Air-conditioned rooms are properly sealed to keep cooling efficiently. Dumaguete also implements a fuel conservation program, performs preventive maintenance of official service vehicles, and avoids idle engines while waiting or parking.

With Dumaguete's growing economy, an increase in energy demand is inevitable. According to Oxfam Philippines (2022), Dumaguete City's current capacity would not be enough in the coming years. To accommodate the growing energy demand, the National Grid Corporation of the Philippines (NGCP) is already set to complete a new substation within Dumaguete City itself, which will be linked to the Amlan Substation via a 138 kV transmission line. Moreover, NORECO II has not met its projected power demand as of 2020. Its current installed capacity (33.2 MW) must adapt to provide 83 MW by 2030.

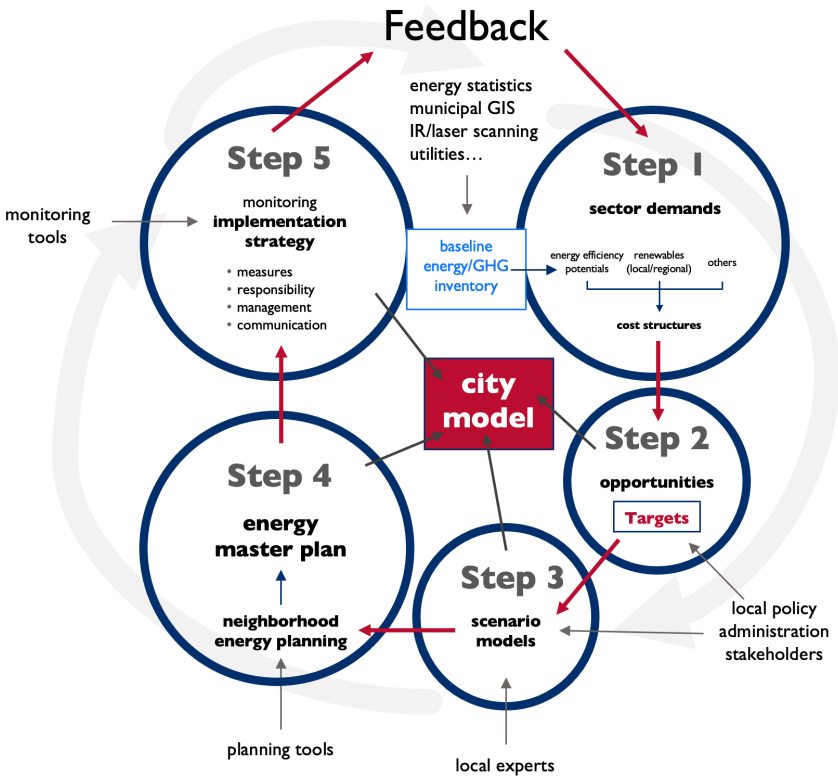
While resources are abundant and energy policies are in place, there is much work that needs to be done for Dumaguete City to accommodate rising energy demand in light of a sustainable energy transition. As of this writing, there are no comprehensive climate and energy initiatives developed by Dumaguete City. This serves as an opportunity for the LGU to innovate and implement policies and mechanisms that foster the wide use of sustainable energy technologies in the city such as residential solar panel systems, DSM, retrofits, and vehicle electrification.

Framework and Methodology

A systemic approach incorporates aspects of both top-down and bottom-up planning simultaneously and integrates a wide range of stakeholders in the energy planning process. The figure below illustrates some iterative steps for energy planning that follow a systemic approach. This figure is adapted from Jank (2017).

Step 1 involves gathering relevant information or energy and emissions inventory that requires the collaboration between government, experts, and energy users. Step 2 entails the engagement of stakeholders on all levels to create energy visions and set targets, using the results from Step 1. Step 3 makes use of information obtained from the previous steps to make scenario models (e.g. business as usual, target scenarios), which are usually configured by experts. Step 4 involves the formulation of an energy master plan using information from sector demands, targets, and scenario models. This step can go side by side with neighborhood planning from communities. The last step entails the implementation of monitoring tools to aid the input of the further evolution of the energy plans.

This policy blueprint is framed within this systemic approach that the City of Dumaguete can adopt for energy planning. Extensive research and data aggregation were conducted. This mainly includes reviewing various sustainable energy policies around the world enacted at the local scale. Most of the collated studies were on cities and municipalities in Europe, North America, and East Asia. Although the context of Dumaguete City varies from the aforementioned localities, their policies may be explored and adapted to suit Dumaguete City. One of the ways this was accomplished was by examining existing Philippine national energy policies and related studies on Philippine localities. These are further substantiated by a series of policy fora with local energy stakeholders and by findings from previous USAID ESP Activities. This blueprint outlines opportunities and policy pathways that could feed into further scenario modeling and an actualized local energy master plan.



Pillars

Four pillars have been identified in developing the sustainable energy policy blueprint. These pillars shall serve as the basis for the policy recommendations that will be introduced later on.

ENFORCING ENERGY POLICIES AND FRAMEWORKS

The development and implementation of local sustainable energy policies are enabled by obligations to comply with national sustainable energy laws and policies. In Los Angeles, for example, its "Green L.A. Plan" was in part a result of the state of California's aggressive climate agenda which put Los Angeles' coal-based energy regime under a considerable amount of pressure (Monstadt & Wolff, 2015). Similarly, China's 2020 national emission reduction target of 40-45% compared to 2005 levels resulted in provincial governments restructuring provincial energy policy to realize the state target (Wang et al., 2011).

Numerous opportunities are awaiting Dumaguete City with the proper integration of existing national and regional policies, codes, and frameworks into the LGU's frameworks and development plans. Firm top-down integration ensures that Dumaguete City is institutionally prepared to transition toward a sustainable energy system. Dumaguete City can also innovate policies that will be more tailored to their own context.

CREATING AN ENABLING ENVIRONMENT FOR END USERS

The demand for clean energy by consumers bolsters the sustainable energy market. For example, in the United States of America, a study covering multiple cities that underwent energy transitions through decentralized energy systems (DES) operators found that independent energy users and real estate developers prefer their energy supply to be cheap, reliable, and environmentally sustainable. These revealed preferences underlie the ongoing willingness of users to work with DES operators for sustainable energy transitions within their local areas (Tong et al., 2020). Similarly, some universities had carbon mitigation goals, which influenced local energy policy.

As seen in NORECO II's share of 2020 energy sales, Dumaguete City's energy demand occurs primarily from the residential sector, followed by commercial entities. Focusing local sustainable energy policy therefore on these two sectors would yield significant results.

GREENING MOBILITY

Sustainable mobility in cities is essential to stimulating the local economy. This means providing the ability for citizens to access basic needs– education, work, culture, and leisure– via safe, affordable, and green transport modes.

Recent initiatives to develop Dumaguete's boardwalk as a major attraction and center of activity have been highly successful, although has similarly highlighted issues of transportation and increasing congestion. These issues are likely to significantly worsen if Dumaguete continues on its path toward developing into a Smart City. Greening Dumaguete's transport sector by shifting away from fossil fuel transport dependence should be a priority towards transitioning to sustainable energy.

DEVELOPING SMART AND DIGITAL CAPABILITIES

Information and Communication Technologies (ICT)-based infrastructures have been proven to aid the acceleration of the transition to sustainable energy. The need for data-driven energy management has played a major role in adapting smart and digital technologies. For instance, the collection of local energy data can be done using the Internet of Things (IoT) or smart meters. The transfer of large amounts of data also entails reliable connectivity solutions such as optical fiber and 5G.

Dumaguete is already a center for communication technologies due to being well-equipped with fiber optic lines. It is considered the landing point for fiber optic cables linking it to the whole Visayas, Metro Manila, and other cities in Luzon and Mindanao. With the city's plans of developing into a smart city, it is only imperative that Dumaguete includes the development of its smart and digital capabilities in its agenda.

Policy Recommendations

POL 1. Imposing more stringent mandates

Below are national and local energy policies that are relevant to city's energy transition, with respective areas that Dumaguete City can focus on:

Republic Act No. 9513 (RE Act)

DUs are mandated to supply affordable and reliable electricity to consumers, which limits the DUs into supplying coal-sourced electricity. The rules for acquiring energy sources also stipulate that tenders must be technology neutral, thus even if RE players participate, they are often times bested by coal players that have lower prices. The LGU can opt to adopt the following mechanisms set by RA 9513.

1. Green Energy Option Program (GEOP) – The GEOP allows power consumers with a monthly consumption of at least 100 kilowatts to get electricity directly from a renewable energy source of a licensed GEOP provider. In line with a RE target, Dumaguete City can avail of the GEOP to ensure RE supply. The City can help aggregate local RE demand, working with NORECO II to ensure adequate RE supply. Similarly, the City can support contestable customers to contract directly with RE developers and/or suppliers.

2. Renewable portfolio standards (RPS) – RPS are command and control regulations wherein homeowners and building management are required to use a certain amount of renewable power and make this usage transparent to the local government. This is further supported by other energy use regulations like energy intensity benchmarks and DSM targets for buildings and villages. In New York, residential buildings now abide by both energy intensity benchmarks as well as the requirement to burn renewable fuel with reporting done through a renewables portfolio manager (Salimifard et al., 2022). On the opposite coast, electric corporations in California are required to procure renewables for a certain percentage, which increases over time (Monstadt & Wolff, 2015). This is further complemented by a "Green Building Code Ordinance." Usually, these policies go hand in hand with building retrofits and energy assessments with the help of ESCO services.

3. Carbon credits – One of the suggestions of the stakeholders is to explore carbon market instruments. One of the incentives under this law is the tax exemption of all proceeds from the sale of carbon emission credits.

4. Waste-to-Energy (WtE) – Under Section 30, the DOE shall, where practicable, encourage the adoption of waste-to-energy facilities such as, but not limited to, biogas systems. The Department of Energy (DOE) shall, in coordination with the Department of Environment and Natural Resources (DENR), ensure compliance with this provision. As used in this Act, WtE technologies shall refer to systems that convert biodegradable materials into useful energy through processes such as anaerobic digestion, fermentation and gasification, among others. According to the LGU, Dumaguete generates 100 tons of garbage daily and is also keen on exploring WtE as a means to address solid waste management problems while providing alternative sources of energy. The LGU recently developed a new site for a sanitary landfill and materials recovery facility, while acquiring technology for pyrolysis. Opportunities to further develop the waste site are present, such as biogas extraction, which is more economically feasible with cross-cutting benefits for the environment. Private-public partnerships can be explored to develop this sector.

Republic Act No. 11285 (EEC Act)

DSM should remain an integral part of Dumaguete's energy agenda. Compliance with national mandates, particularly the GEMP, should be a priority for the city government. While RA 11285 established mandates at the national level, enforcing these at a local level will significantly affect implementation.

1. Energy audits – The LGU can enforce Other Establishments to undergo energy audits every three years.

2. Energy Efficiency and Conservation Office (EECO) – Under Section 7, the LGUs shall establish their respective EECOs headed by an EEC Officer. The LGUs through their respective EECOs and planning and development offices shall develop and implement their respective local energy policies and incorporate these in their local development plans.

3. Local Energy Efficiency and Conservation Plan (LEECP) – The LGUs are mandated to develop a collaborative and multi-stakeholder comprehensive framework, governance structure, and programs for local energy efficiency and conservation with defined targets, feasible strategies, and regular monitoring and evaluation, which will be aligned with the framework and targets set by the National Energy Efficiency and Conservation Plan (NEECP). Recent examples of LEECP development include Batangas City, and Cadiz City's Energy Code (Ordinance No. 17-2021, Series of 2021, 2021; Philippine League of Local Environment and Natural Resources Officers, Inc., 2022)

4. National Energy Efficiency and Conservation Database (NEECD) – The LGUs are also mandated to assist the DOE in monitoring compliance with the obligations of designated establishments for input in the NEECD.

Republic Act No. 11697 (Electric Vehicle Industry Development Act or EVIDA)

Greening Dumaguete's transport sector by shifting away from fossil fuel transport dependence should be a priority towards transitioning to sustainable energy. While the Comprehensive Roadmap for the Electric Vehicle Industry (CREVI) is yet to be released by the DOE, here are relevant areas that the LGU can prioritize in the meantime:

1. Green routes – Under Section 11, one of the roles of the LGU is to include green routes in their respective Local Public Transport Route Plans consistent with the National Transport Policy. Green routes refer to public transportation routes identified and designated by provinces, cities, and municipalities and approved by the Department of Transportation (DOTr) to be exclusively traversed by electric public utility vehicles (PUVs).

2. Mandatory electric vehicle (EV) share – Under Section 16, LGUs, industrial and commercial companies, and public transport operators and transport network vehicle services shall ensure that at least five percent (5%) of their fleet, whether owned or leased, shall be EVs within the timeframe indicated in the CREVI. Dumaguete City can take this a step further by targeting 100% electrification of public utility vehicles by 2030.

RE Code of Negros Oriental

Aside from banning the construction of fossil-fuel power plants in Negros Oriental, the RE Code is the first ordinance that provides incentives for clean energy investors. It encourages all eligible institutions and companies to avail of the GEOP, which is lodged under RA 9513. The code encourages RE developers to create a tourism component and offers a one-year tax holiday for these projects. It also requires all tourism-related businesses to participate in the GEOP and announce their adherence through announcements on traditional and social media. The Code gives priority to RE projects in terms of land use and right-of-way processes. It provides that all carbon credits earned by the developer shall be shared equally with the province and the host local government. An RE council will also be formed to pursue policy-making that will accelerate RE development programs for a greener, energy-self-sufficient, and sustainable province. The RE Code is a great example of a command and control instrument that has been proven to produce favorable results in the energy transition. Anti-fossil fuel mandates, which can range from complete bans of coal plant developments to complex permitting procedures for fossil fuel developers can discourage fossil fuel production and enable RE developers to enter the market instead (Talandier, 2018; Wu et al., 2022a). In conjunction with this policy, streamlined permitting procedures in favor of RE projects can support the deployment of RE (Wu et al., 2022b). While Negros Oriental has already adopted a regional RE code, Dumaguete City can further strengthen and institutionalize this through localization of the code, adopting the listed incentives at the city level.

POL 2. City-wide adoption of RE and DSM technologies for end-users

Dumaguete is in a unique location in terms of renewable energy: the region of Negros Island is the renewable energy capital of the Philippines, with many generation assets producing solar, geothermal, hydropower, and biomass energy.

1. Rooftop solar PV – Particularly for residential constituents, rooftop solar offers a highly accessible option while presenting long-term financial benefits. Dumaguete City can opt for an aggressive command and control regulation mandating new residential developments to have bi-directional meters and/or rooftop solar installations. One barrier to this is the current high investment costs for end users who endeavor to be self-sufficient using solar PV.

2. Smart meters – Smart energy metering is one popular solution that makes it easier for individual users to track energy consumption and make decisions on energy usage (Fuentes González et al., 2019; Lemon et al., 2015; Sperling & Arler, 2020; Zhang et al., 2016).

POL 3. Utilizing and developing financial support mechanisms

Among the identified challenges to implementing local sustainable energy policies were identified to be political and economic in nature at the same time. Several studies have highlighted that while most local authorities are keen on implementing local energy initiatives, they face limitations due to a lack of financial support or mechanisms (Acciaro et al., 2014; Tong et al., 2020; Wu et al., 2022b; Yazdanie & Orehounig, 2021). This is especially true in Torino and several municipalities in northern Italy wherein uncertainties regarding cost-effectiveness, bad financial circumstances, long pay-back periods, and public budgeting practices not prioritizing energy issues are encountered in the implementation of DSM measures in Italian public buildings (Annunziata et al., 2014; Vergerio et al., 2018). It was suggested that DSM policies in the residential sector that aim to foster citizens and the private sector to invest in DSM measures are much easier to implement than DSM measures on public buildings as the former would not entail a huge budget for the local government unlike the latter. Consequently, local authorities would tend to prioritize low budget and short pay-back time as factors in local sustainable energy policy implementation thus hindering a holistic and systemic approach to DSM implementation (Annunziata et al., 2014). While in some localities where mechanisms are already in place, e.g. national subsidies, the distribution of these funds to local authorities is often delayed such as in the case of Guangzhou, China (Celata & Coletti, 2018; Wu et al., 2022a).

One of the suggestions made by stakeholders was to consider a Municipality Utility Development Tax to fund renewable energy initiatives. Other funding mechanisms include the People's Survival Fund under the Climate Change Commission (CCC), a special fund intended to finance climate change adaptation programs and projects that will better equip LGUs to deal with the impacts of climate change.

POL 4. Developing local fiscal incentives

Market-based policies incentivize both producers and consumers to voluntarily adopt RE technologies. Financial incentives, which range from feed-in tariffs, tax incentives, subsidies for project development, credit guarantees, and risk mitigation schemes were found essential to mobilize RE projects (Aste et al., 2014; Monstadt & Wolff, 2015; Neij & Heiskanen, 2021; Takao, 2020; van der Schoor et al., 2016; Wu et al., 2022a). Given the competitive prices associated with conventional sources of energy, these financial incentives provide the necessary support for the off-take of RE projects until operations. Competitive tenders for the procurement of renewables for government energy projects may also provide the needed funding for RE developers (Izutsu et al., 2012).

Developing a local reward system for green development may also incentivize stakeholders in adopting sustainable energy. This involves recognizing and giving rewards for "model" villages, citizens, or industries that showcase low-carbon pathways and promote sustainable energy technologies (Keirstead & Schulz, 2010; Lee et al., 2014). For example, in Seoul, there are designations for "Energy Self-sufficient Villages." Communities can apply for the designation and if approved, will receive subsidies and consulting services for clean energy on the condition that the community implements measures for DSM and conservation (Lee et al., 2014).

Dumaguete City can explore these mechanisms at the city level for smaller scale RE systems such as for households, neighborhoods, and universities.

POL 5. Exploring carbon markets

Carbon market policies like carbon credit schemes, emissions trading, and a carbon tax may provide the market signal sectors within cities that are fossil fuel-intensive to make the transition towards renewable energy (Izutsu et al., 2012). This may depend, however, on the size of industries within cities and the country's carbon market development.

This was suggested by stakeholders during the second policy forum.

POL 6. Setting green building targets and regulations

Retrofitting buildings was a highly common policy tool discussed in literature (Takao, 2020). Based on energy assessments that reveal any inefficient aspects of buildings that lead to energy waste and unnecessary costs, several solutions related to their hardware and software are undertaken with the aim of making the infrastructure more efficient, resilient, and sustainable (Acciaro et al., 2014; Brandoni et al., 2014; Jank, 2017; Neij & Heiskanen, 2021; Salimifard et al., 2022).

POL 7. Reducing red tape for end-users

Dumaguete City and NORECO II can co-develop a more streamlined permitting process. Both can also explore developing an online platform for easier access, especially for smaller scale RE systems. This can significantly help the adoption of rooftop solar PV.

POL 8. Prioritizing pedestrian mobility

Dumaguete can prioritize developing dedicated and protected bike lanes and sidewalks. Increasing mobility within the city has been shown to drastically reduce fuel consumption and transport-related emissions. Iloilo City's developments in this regard can be used as the best example.

POL 9. Promoting personal use EVs

Dumaguete City has been touted as the "motorcycle capital of the Philippines", with the highest number of motorcycles per capita in the country. This provides a strong opportunity for Dumaguete to transition to electric vehicles, particularly electric two-wheelers. Fiscal incentives such as tax holidays may be granted to suppliers of electric vehicles in the city. Permitting processes can be streamlined in partnership with national bodies such as the Land Transportation Office (LTO) to facilitate adoption from end-users.

POL 10. Setting energy targets

Target-setting has been a key driver for sustainable energy adoption worldwide. While not self-sufficient, a target serves as a critical indicator for future development. The Palawan government announced its ambition for a 100% RE future for the island. This long-term future target was linked to benefits such as the minimization of environmental harm and the creation of more jobs (Marquardt & Delina, 2019).

Dumaguete City can formally adopt energy targets through legislation, adding certainty for investors, developers, and local constituents. A target for Dumaguete City should cover short, medium, and long-term targets and be integrated into any local development plans, particularly the vision to become a smart city. An indicative recommended target in line with a Net-Zero climate scenario is 100% RE and 20% energy and fuel savings for government facilities and services by 2027, 100% public vehicle electrification by 2035, and 100% RE for Dumaguete City by 2035. Further, this target could be expanded into a wider climate target, tackling climate mitigation and adaptation targets rather than just energy. Possible frameworks for wider climate and energy targets include the One Planet City Challenge (OPCC) which focuses on climate targets for cities.

POL 11. Ensuring proper climate and energy documentation

Lack of data, which can be due to (1) limited resources and infrastructure, (2) lack of standardized framework for data collection, management, and organization, (3) privacy and licensing issues, as well as (4) lack of transparency from relevant institutions, hinder making effective and efficient decisions on the implementation local sustainable energy policies (Tong et al., 2020; Vergerio et al., 2018; Wu et al., 2022a; Yazdanie & Orehounig, 2021). This can pose an even more difficult challenge concerning decentralized energy systems (Wu et al., 2022b; Yazdanie & Orehounig, 2021).

Dumaguete City can start developing a local digital repository of climate and energy information to make it more accessible to the LGU, especially with complying with RA 11285, particularly on the NEECD. Conducting a city-wide greenhouse gas (GHG) inventory will help establish climate goals and targets, such as those outlined in POL 10.

POL 12. Adopting new digital technologies

The energy audit that will be conducted on select government buildings in the Dumaguete City Hall Complex will include the process of creating a digital twin. With digital twin software, the city can monitor resource consumption, boost production efficiencies, and plan green energy production upgrades in due course, as well as make more informed emissions reduction decisions and accelerate the energy transition. This can go side by side with the development of a local digital repository of the city's climate and energy information.

POL 13. Implementing organizational and capacity-building mechanisms

Organizational barriers refer to the factors which stifle the capacity of government authorities. It also includes governance procedures and practices in place that hinder the effective implementation of local sustainable energy policies. Several studies emphasize the lack of institutional and technical capacity as a barrier to local energy policy implementation in cities, municipalities, and provinces worldwide such as in the cases of Friesland, Yangzhou, and Torino located in the Netherlands, China, and Italy respectively (van der Schoor et al., 2016; Vergerio et al., 2018; Wu et al., 2022a; Yazdanie & Orehounig, 2021). In the ports of Hamburg and Genoa, most local actors assumed, brought by a lack of awareness, preparation, and education in energy matters, that the simple option of placing photovoltaic equipment on their roofs was enough to conduct efficiency performance assessments (Acciaro et al., 2014). In some US cities, technical capacity was found to be lacking in terms of dealing with emerging technology (Tong et al., 2020). Similarly in some municipalities of Northern Italy, local authorities tend to choose easier solutions despite the existence of numerous advanced technical options, as this would not entail a high level of expertise in the planning phase while easily achieving DSM targets (Annunziata et al., 2014). Furthermore, it is important to emphasize the significance of having the appropriate tools and mechanisms in place to foster a more empowered working environment for local authorities. This includes capacity-building workshops and having the ability to hire external expertise when needed (Wu et al., 2022a; Yazdanie & Orehounig, 2021). In the municipal government of Yangzhou, meeting energy targets are delegated to various departments that may be related to energy. This act is said to be merely seen as additional work with no clear benefits for the government workers which then makes it hard for some departments to take the project implementation seriously (Wu et al., 2022a). Meanwhile, port authorities in Genoa and Hamburg were found to be hesitant to take an active role in energy management, as it might be perceived as not an integral part of their function (Acciaro et al., 2014).

It should be noted that technical capacity is not limited to energy-related know-how, but also encompasses the ability to integrate multiple disciplines in implementation, as well as having the skills to effectively communicate with others (Wu et al., 2022a). The lack of said skills leads to weak institutional coordination between and among relevant government authorities, which is likewise considered a barrier in some cities (Jank, 2017; Lemon et al., 2015; Neij & Heiskanen, 2021; Yazdanie & Orehounig, 2021). In China, departments are not used to working together and instead tend to focus solely on their own departmental interests and on complying with targets set by the central government (Wu et al., 2022b). This is also connected to another barrier, inflexible organizational norms wherein there is difficulty in changing existing knowledge, assumptions, and practices among authorities in order to effectively implement local energy policies. In some US cities, regulators are reluctant to revise existing policies to promote DES (Tong et al., 2020). The China Southern Power Grid and State Grid Corporation of China seem to be disinclined towards structural change in the electricity sector (Wu et al., 2022b). Administrative-wise, the rest of the Chengdu and Yangzhou municipal governments' departments think that energy issues are strictly under the Development and Reform Commission and not strongly related to theirs (Wu et al., 2022a). This may be attributed to how the energy sector is seen primarily and strictly as a domain under Science, Technology, Engineering, and Mathematics, simply known as STEM. This closes opportunities for multiple stakeholders such as those in the social sciences and humanities to participate in policy development (Takao, 2020). The lack of recognition of the national government for local governments as energy planners seems to be the case as well in some cities around the world (Yazdanie & Orehounig, 2021).

Hence, it is important for Dumaguete City to build the capacity of their staff, as well as technical experts and individual users in RE and DSM. This can involve learning proven policy frameworks and best practices for city-level energy transitions, project management and monitoring tools for RE and DSM, modeling and scenario-building tools for clean energy futures, as well as other technologies aforementioned in the previous section. This is further complemented by research and development by local energy experts, which can produce the necessary information to advance municipal energy planning and provide better solutions over time. Gaining experience and know-how within a locality, instead of relying solely on external experts, will benefit the city in the long run in sustaining new energy systems put in place (Lee et al., 2014; Neij & Heiskanen, 2021; Yazdanie & Orehounig, 2021).

POL 14. Creating a transdisciplinary local energy council

While LGUs are only mandated to form an EECO, Dumaguete City can pave the way for the creation of a transdisciplinary local council focusing on sustainable energy, similar to the Energy Sector Committee of Cadiz City, Negros Occidental for the enactment of their local energy code, the Batangas City Technical Working Group (TWG) for the formulation and development of LEECP, and the Palawan Council for Sustainable Development (PCSD) (RA 7611, 1992; Ordinance No. 17-2021, Series of 2021, 2021; Marquardt & Delina, 2019; Philippine League of Local Environment and Natural Resources Officers, Inc., 2022)

Dumaguete City's transdisciplinary local energy council shall include city government officials and advisors and members from different sectors, e.g. academe, commercial sector. This will also ensure more holistic and informed decision-making on matters relating to sustainable energy. The council can also participate in the development of a technical working group (TWG) between Negros Oriental and Negros Occidental to collaborate on a framework of energy laws for the transition.

POL 15. Establishing a long-term local campaign project on sustainable energy transition

Similar to tourism campaigns, Dumaguete City, through the local energy council, can launch a sustainable energy campaign geared towards raising awareness and establishing Dumaguete City's image as a smart, sustainable city. When a city has certain expectations to uphold, such as an existing green image, this tends to reinforce RE policy. The municipality of Samsø, for example, prioritized its 'green image' within Denmark to pursue renewable investments for a wind power farm over its average income in the medium term (Sperling & Arler, 2020).

Such campaign can also address policy barriers relating to civic participation. Celata and Coletti (2018) highlighted in their review of various municipalities across the world that local administrations struggle to engage citizens due to the prevailing skepticism on the value of civic participation. In the case of some Dutch neighborhoods, local authorities face challenges in making DSM retrofits compulsory due to the cultural and legal element of 'my home is my castle' (Hoppe et al., 2011).

Energy education programs and campaigns involving topics such as energy savings, the importance of clean and efficient energy, possible technologies like smart metering, and so on can be implemented as well (Adil & Ko, 2016; Monstadt & Wolff, 2015; Vergerio et al., 2018; Zhang et al., 2016). As a behavioral intervention, the empowerment of users and their expanded knowledge of RE can help support the wider RE initiatives of the city government as well as foster accountability. To keep communities engaged, creative programs can produce the desired behavioral outcomes. For example, in Hamburg, Germany, the port authority prioritizes DSM awareness among employees and has established competitions where employees can put forth ideas for energy and climate measures. Reportedly, most of the ideas have actually been implemented, such as the recovery of energy used in operating elevators in the Elbtunnel (Acciaro et al., 2014). The celebration of Negros Oriental's Renewable Energy Day every fifth of March can be one of the primary activities of the campaign.

Conclusion

Increasing climate commitments worldwide have prompted transitions to low-carbon economies. In response to this, USAID's Energy Secure Philippines Activity is supporting Manila Observatory's project entitled "Enabling a Sustainable Energy Transition in Dumaguete City" (ESETD).

Urban areas house more than half of the world's population and are responsible for over 70% of energy-related CO2 emissions worldwide. With cities expanding and their economies growing, these statistics are expected to increase by 2050. Cities and urban regions are thus becoming increasingly important in catalyzing large-scale sustainable transformations. We now see increased action from civil society and public institutions at the local level ranging from climate-related community projects to municipality mandates that aim to reduce the dependence on fossil fuels and shift to clean energy. Negros Oriental provides a case in point, with executive orders banning coal-fired plants, promoting the use of renewable energy, and increasing awareness about the benefits of clean energy. The region is also the first to enact a clean, renewable energy ordinance that not only institutionalizes RE-oriented policymaking, but also provides incentives and regulations for clean energy investors. Through this project, the city government of Dumaguete will be able to better comply with RA 11285 and the GEMP through proper analysis, baselining, monitoring, and tracking, implementation, and communication.

Informed by a comprehensive review of best practices in sustainable energy policy implementation and results from participatory forums and interviews with key energy stakeholders in the city, four pillars have been identified in developing the sustainable energy policy blueprint. These pillars serve as the basis for the fifteen policy reforms and innovations that the Dumaguete city government can utilize in transitioning to a smart and sustainable city. The policy blueprint will also be published later on as a case study to allow other LGUs in the country to learn and scale up similar policy developments in their respective locales.

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