# P05 / Public policies on energy. Public-Private and Intergovernmental Synergies to Promote Energy Efficiency

**Topic :** ENVIRONMENT, SDGs, ENERGY

**Chair :** Michele Gonzalez Galindo (Secretary of Science, Humanities, Technology and Innovation (SECIHTI))

**Second Chair :** Natalie Ortiz-Guerrero (Secretary of Science, Humanities, Technology and Innovation (SECIHTI))

## GENERAL OBJECTIVES, RESEARCH QUESTIONS AND SCIENTIFIC RELEVANCE

As the world grapples with the urgent need to transition towards a more sustainable energy systems, the role of effective public policies becomes paramount. This proposal seeks to explore innovative strategies to improve energy efficiency through the dynamic interplay of public-private partnerships and intergovernmental collaboration. Through the analysis of successful case studies and best practices, this panel aims to identify actionable policies that can drive energy savings, promote economic development, and mitigate environmental impacts.

The objective of this panel is to address the challenges, changes, and perspectives concerning energy policies influenced both government and private sectors. It will focus on the role of public policies in improving energy efficiency and fostering synergies between public and private sectors, along with different governmental levels. In the context of growing concerns about climate change and the need for diverse energy sources, the discussion will focus on collaborative models that optimize energy resource use and promote sustainability. The objectives include the identification of best practices, evaluation of the current policies' impact, and exploring new strategies to achieve the energy efficiency goals established by international organizations.

Improving energy efficiency is essential for addressing global warming and attaining the Sustainable Development Goals outlined by United Nations. Additionally, it represents economic and social benefits. This involves the utilizing technologies that are more energy-efficient, increasing of renewable energy use, and the mitigation of greenhouse gas emissions (AbdulKarim et al., 2021). Enhancements in energy efficiency can be achieved across various sectors, such as residential, commercial, industrial, transportation, agriculture, and public services (Heshmati, A.,2021).

According to research conducted on the overall factor energy efficiency of ten major energy- consuming countries by Xuan et al. (2023), the United States and Germany occupied the top position in energy efficiency, whereas China and India positioned at the bottom. Considering different sectors, it is evident that industrial sector has experienced a significant improvement in energy efficiency over the past two decades. In contrast, sectors such agriculture, mining and transport have not shown a remarkable change in this regard. The Energy Efficiency 2020 report (IEA, 2023) highlights a significant change in energy efficiency, driven by increased use of clean energy sources. Government policies promoting energy-saving programs are accelerating the development of efficient technologies, thus contributing to the decrease in reliance on fossil fuels within the energy sector.

Policymakers should asses the effectiveness of diverse policy tools to promote the adoption of green technologies. Economic incentives as well as direct regulations can both facilitate the adoption of energy-saving technologies (Jaffe & Stavins, 1994; Caillé, Castro, Bundgaard-Jensen, Fall & Doucet, 2008). An assessment of energy efficiency policies is essential to address elevated oil prices, industrial competitiveness, climate change, and energy security in both the short and long term. Cooperation and information exchange are vital for the successful implementation of efficient measures and advising decision-makers on selection of appropriate strategies.

The panel will focus on two main questions: 1. How can the enhancement of energy efficiency can be facilitated through collaboration among the public, private, and intergovernmental sectors? 2. How can different government levels cooperate to implement effective energy efficiency policies?

Hypothesis to Explore

Regulatory Framework: A well-defined regulatory framework boosts private sector investment in energy efficiency, thereby resulting in improved sustainability outcomes.

Multilateral Collaboration: Collaborative efforts among governments create standards and best practices,

thereby enhancing the adoption of energy-efficient technologies.

Innovation and Investment: Public-private partnerships encourage innovation, leading to accessible energy solutions that narrow the disparity between developed and developing nations.

Education and Awareness: Collaborative initiatives between of governments and businesses raise public awareness regarding energy efficiency, thus stimulating interest and support policies that promote efficiency.

In conclusion, this panel function as an important forum for the discussion of how cross-sector collaborations can enhance a sustainable energy future, providing innovative insights and public policies that benefit to society.

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## CALL FOR PAPERS

The evolving landscape of energy consumption and production requires innovative responses from governments, industries, and civil society alike. In this panel, scholars, practitioners, and policymakers are cordially invited to submit papers that explore the complex dynamics of public policies designed to improve energy efficiency through collaborative initiatives involving both public and private sectors, along with intergovernmental partnerships.

We have a specific interest in researches that examines successful case studies of policy implementation, highlighting synergies among different stakeholders involved in energy efficiency initiatives. Papers may explore into the roles of government regulations, public-private partnerships, and multi-level governance structures that either enable or impede the effectiveness of energy policies. We encourage contributors to analyze the effectiveness of current strategies, suggest innovative frameworks, and assess the outcomes of collaborative efforts.

In addition, submissions critically assessing the impact of socio-economic factors on energy policies, with a specific focus on equity and accessibility to energy-efficient technologies among different demographics and regions, are welcomed. Papers are expected to analyze the implications of climate change and the transition to renewable energy sources, by examining how public policies can be harmonized with sustainable development goals while fostering innovation.

Moreover, we are keen on interdisciplinary approaches that integrate insights from economics, environmental science, sociology, and technology studies to present a comprehensive overview of energy efficiency as a public policy issue.

Contributors are expected for originality and rigor, presenting empirical research, theoretical analyses, or applied case studies that contribute to our understanding of how collaboration between public-private and intergovernmental entities can serve as catalysts for improved energy efficiency.

# P05 / Public policies on energy. Public-Private and Intergovernmental Synergies to Promote Energy Efficiency

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## Session 1Public policies on energy. Public-Private and Intergovernmental Synergies to Promote Energy Efficiency

Wednesday, July 2nd 13:45 to 15:45 (B4)

### Discussants

Mohit Kumar Gautam (Indian Institute of Technology, Kharagpur)

LIZBETH SOTO JIMENEZ (Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional Unidad Zacatenco)

### Solar Energy for Marginalized Groups: Microfinance as a Tool for Financial Inclusion and Sustainability

Mohit Kumar Gautam (Indian Institute of Technology, Kharagpur)

This paper examines the crucial function of microfinance in advancing renewable energy, specifically solar energy, through the enhancement of financial inclusion and the empowerment of marginalised populations. Microfinance institutions (MFIs) offer small loans that empower low-income persons to invest in solar technologies, enhancing access to clean energy and promoting sustainable development. The study examines two principal enquiries: How might collaboration among the public, commercial, and intergovernmental sectors help the increase of energy efficiency? How can various levels of government collaborate to execute effective energy efficiency policies? The hypothesis asserts that a well-articulated legislative framework, alongside microfinance programs, can substantially enhance private sector investment in renewable energy, resulting in better sustainability outcomes and increased electricity access for marginalised populations.

The methodology utilises a mixed-methods approach, combining qualitative and quantitative studies. A literature analysis is initially performed to investigate the influence of microfinance on the uptake of renewable energy, namely solar energy initiatives in poor nations. Secondly, case studies of successful microfinance-driven solar energy initiatives are examined to discern best practices and problems, including resource allocation, institutional obstacles, and financial literacy. A quantitative study is conducted to analyse the socio-economic and environmental implications of solar installations financed by microfinance, utilising data from existing programs and policy reviews.

The findings demonstrate that microfinance can serve as a catalyst for renewable energy adoption in marginalised communities by addressing financial barriers and promoting inclusive growth. This study investigates the relationship between microfinance and regulatory frameworks, emphasising the importance of targeted subsidies and public policies in enhancing the competitiveness of solar energy compared to fossil fuels. This research provides recommendations for policymakers, microfinance institutions (MFIs), and other stakeholders by addressing challenges associated with MFI sustainability, the economic feasibility of solar projects, and equitable resource allocation, thus improving collaborative efforts to achieve sustainable energy goals.

This study contributes to the discussion on sustainable development by highlighting the transformative role of microfinance in facilitating access to renewable energy and improving energy efficiency. The results are expected to inform policy development and implementation strategies, thereby promoting poverty reduction, innovation, and long-term sustainability.

Keywords: Microfinance Institutions (MFI), Renewable Energy, Solar Energy, Financial Inclusion, Clean

### (Virtual) Thailand's Energy Efficiency Policy and Socio-economic Factors: Impact Analysis and Evaluation

Puree Sirasoontorn (Thammasat University)

Monthien Satimanon (Thammasat University)

Thailand has drawn and implemented national energy plans for decades to reduce greenhouse gas emissions in the energy sector. The Thai government aims to increase renewable electricity generation, improve energy efficiency in every industry, and employ new and innovative technology in the energy market and energy-related markets, such as solar panels, automobiles, and electrical appliances.

According to the Energy Efficiency Policy (EEP), mandatory and voluntary measures, rules, and regulations have been strictly imposed to improve energy efficiency in energy-intensive industrial, building, and transport sectors. As a result, energy intensity has declined from 8.96 in 2014 to 7.51 in 2023. However, the evidence showed that the final energy consumption per capita, particularly electricity consumption per capita, has continuously increased because energy systems and sources have shifted from oil and gas to electricity. Therefore, Thailand needs innovative strategies to reduce electricity consumption and collaboratively improve energy efficiency with governments, industries, and civil society.

While the industrial and transport sectors have been central to EEP for decades, policies and measures to promote energy saving in household sectors have been limited. Measures to widen and deepen household participation in energy efficiency programs and ensure equitable access to tools, resources, and technology are urgently needed to enhance their sustainable lifestyles and engagement in just energy transition.

This study employs quantitative and qualitative methodologies to evaluate the effectiveness of energy efficiency policy and assess the impact of socio-economic factors on this policy, particularly in household sectors in Thailand.

This study will employ time-series econometrics for electricity demand estimation by sectors covering the period 2014-2023, together with pooled data analysis of Thailand’s socioeconomic survey household-level data to explore electricity consumption behavior and analyze the impacts of socio-economic factors on energy choices, energy consumption behavior, and expenditures of households with different income levels and demographic characteristics.

The counterfactual analysis will be conducted through scenarios with and without policy interventions in monetary and non-monetary forms, such as direct subsidies for purchasing electric vehicles, energy codes, labels, standards, and energy-saving campaigns.

The qualitative method used is case studies of Thai households with different socioeconomic characteristics, namely high-income, middle-income, and low-income households, in order to explore their energy consumption behavioral dynamics; accessibility and affordability to adopt modern technology; and awareness of energy-saving technology and government programs. Then, the evaluation of the co-benefits from energy demand reduction will be examined.

Preliminary results show that energy efficiency policies positively impact energy-saving behavior and reduce household energy expenditures but disproportionately impact low-income households due to cost pass-through mechanisms. Household income level significantly moderates the relationship between electricity price changes and demand elasticity. Urban households exhibit more significant energy efficiency improvements than rural households due to better accessibility and affordability when adopting modern technology. Awareness and acceptance of energy-saving technology and public-private collaboration programs are prerequisites for equity and accessibility to energy-efficient technologies among different demographics.

### Public-Private and Intergovernmental Collaboration in Mexico: Strategies to Strengthen Energy Efficiency

LIZBETH SOTO JIMENEZ (Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional Unidad Zacatenco)

Energy efficiency has become a vital pillar in Mexico to move towards a sustainable and resilient energy model. Given the growing energy demand, Mexico is under pressure to implement viable energy efficiency strategies, which are established in the National Energy Plan. From this perspective, public-private and

intergovernmental collaboration is key to the design, execution and evaluation of energy efficiency policies. Mexico has established a regulatory framework that includes the Energy Transition Law and the National Program for the Sustainable Use of Energy, with specific goals for emissions reduction and energy efficiency. However, several levels of policy implementation require collaboration. Public-private partnerships are effective ways to finance energy infrastructure projects, including the modernization of electrical networks and the adoption of clean industrial and commercial technologies. Likewise, intergovernmental synergies, both horizontal and vertical, are necessary for the alignment of goals and resources. The private sector has played an important role in the introduction of innovation and new business models aimed at efficient use and energy efficiency. It is an example of companies that have invested in solutions and developed affordable schemes, considering the goal of reaching 35% of electricity from renewable sources by 2024. Although Mexico has made significant progress, challenges remain. Lack of economic incentives, limited resources to train staff on energy efficiency issues, and regulatory barriers represent significant obstacles. As such, an improved governance framework is required. In summary, this paper analyzes strategies for implementing efficiency through collaboration by considering the interaction between actors.

## Enhancing energy efficiency through public-private partnership: A study of India’s micro, small, and medium sector

Manish Sihag (Panjab University)

Manisha Sihag (Panjab University)

Energy efficiency is a critical tool for achieving sustainability and enhancing industrial productivity. It helps to reduce carbon emissions by reducing energy consumption and minimizing greenhouse gas emissions (GHGs). Countries across the globe are prioritizing energy efficiency as a key strategy in transitioning to a low-carbon economy and increasingly integrating public-private partnerships (PPPs) as a mechanism to finance energy efficiency initiatives. This study critically evaluates the role of PPPs in the Bureau of Energy Efficiency - Small & Medium Enterprises (BEE-SME) program, launched by the Government of India in 2009. The initiative aims to promote energy efficiency in Micro, Small, and Medium Enterprises (MSMEs) through technical assistance, financial facilitation, and public-private collaboration. The program assesses energy usage patterns, conducts sector-specific energy audits, and supports MSMEs adopting energy-efficient technologies through cluster-based interventions. The integration of PPPs within the BEE-SME program has been instrumental in driving these improvements. The framework brings together private technology providers, financial institutions, and energy service companies (ESCOs) to facilitate technology transfer and improve financial access and knowledge-sharing. This program has also been crucial in raising MSMEs' awareness of energy efficiency measures and their long-term benefits. Capacity-building initiatives and awareness programs have further enhanced MSMEs’ technical expertise, encouraging wider adoption of energy-efficient practices. The findings of this paper reflect the pivotal role played by the BEE-SME program in improving energy efficiency within India's MSME sector. Energy audits conducted across 25 clusters identified an energy-saving potential of 0.66 million tonnes of oil equivalent (MTOE), while technology interventions led to 10-20% reductions in energy costs. Installing energy-efficient motors, automation systems, and waste heat recovery technologies has resulted in an estimated 1,390-ton reduction in CO? emissions annually. These results highlight the economic and environmental impact of the BEE-SME program, underscoring the need to expand its adoption through enhanced financial support and stronger PPPs. It has also been observed that, despite multiple policy interventions, high upfront costs, limited financial access, and low awareness among MSMEs remain significant barriers to the adoption of energy efficiency practices. Therefore, it is necessary to address the challenges that require strengthening risk-sharing mechanisms, expanding blended finance models, and fostering collaborations through PPPs to scale energy efficiency initiatives and drive widespread adoption in the MSME sector. Expanding financial incentives and simplifying access to credit could further encourage MSMEs to transition to energy-efficient technologies. The paper contributes to India’s broader energy transition strategy by addressing key financial and technical barriers and highlights pathways to enhancing industrial sustainability through energy efficiency.

**Keywords:** *energy efficiency, climate change, MSMEs, public-private partnerships, energy service companies*

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## Session 2Public policies on energy. Public-Private and Intergovernmental Synergies to Promote Energy Efficiency

Thursday, July 3rd 08:00 to 10:00 (B4)

### Discussants

Mamdooh Abdul Fathah (University of Hyderabad)

Ruth Maria Hanau Santini (Università di Napoli L'Orientale)

### (Virtual) Public Policy to Promote Energy Efficiency: Uncovering the Hidden Human Dimension of Energy Use in the Canadian Housing Sector

Alexandra Mallett (Carleton University)

Decarbonizing buildings in the housing sector, including through reducing energy use, is a key component of effective low-carbon transitions. Yet, despite policies aimed at improving design such as through stricter building codes, much literature has noted a performance gap between what is predicted and actual energy use throughout a building's lifecycle.

Studies often point to the role of humans – through occupant behaviour as well as operations and maintenance (O&M) choices - as ways to explain this discrepancy. Hence, they suggest the need for human-centric policies as ways bridge this gap. However, what about the role that other humans involved in the lifecycle of buildings (such as architects and developers) may have on the energy use throughout the building's lifecycle? To what extent can governments and industry work together to make decarbonizing the housing sector more effective?

Using surveys, interviews, and focus groups with various actors from two mid-sized cities in Canada (Vancouver, British Columbia and Ottawa, Ontario), we found that 'hidden human dimensions' and 'inflection points' that alter various building versions are key. Firstly, we found that strategies including the critical role of integrated building design in delivering high performance buildings that serve their occupants' needs are important. Secondly, the importance of professionals of the built environment learning and practicing soft skills, such as communication, affect building energy use. Thirdly, implementing more checks throughout a building's lifecycle to control the various versions of the building as it goes through its lifecycle are important factors that can have major impacts on building energy use. Despite their potential, these practices were atypical rather than the norm. This paper will also highlight the need for policy to focus on these areas given the imperative of scaling up innovations to decarbonize the housing sector.

### Corporate Net Zero Transformation in the UAE: Analysing Motivations, Challenges and Strategic Pathways

Mahmoud Elrefai (Bocconi University)

Climate change is an undeniable reality, reshaping ecosystems, economies, and societies worldwide. Rising global temperatures, ocean acidification, and the accelerated melting of glaciers highlight the urgent need for action. In response, the global push for Net Zero emissions has gained significant momentum, with governments, organizations, and businesses recognizing their role in mitigating climate risks. As key contributors to greenhouse gas (GHG) emissions, businesses are at the heart of this transformation, facing

mounting pressure to integrate sustainability into their long-term strategies. The UAE is demonstrating a growing firm commitment to sustainability through progressive policies such as the Energy Strategy 2050, large-scale clean energy investments, and ambitious carbon reduction goals. These policies seek to driving sustainability across industries by leveraging incentives, regulatory mandates, and strategic partnerships. What began as a voluntary aspect of corporate social responsibility has now evolved into a strategic priority for the private sector, reshaping business models across industries. Companies in the UAE are increasingly aligning their operations with national and global sustainability objectives, recognizing both the risks of inaction and the opportunities presented by a low-carbon future. This research explores the motivations, challenges, and strategies that UAE-based companies encounter as they navigate their journey of transformation towards Net Zero. Using a case study approach, the study examines 6 market-leading companies in different sectors that have made substantial efforts in sustainability and publicly committed to ambitious climate goals. The analysis draws on a combination of qualitative and quantitative data, including questionnaires and semi-structured interviews, to provide an in-depth understanding of how companies formulate and implement their Net Zero strategies and the challenges they face. By exploring the real-world experiences of UAE-based companies, this research contributes valuable insights to the fields of corporate sustainability and Net Zero transformation, particularly for countries with similar economic and regulatory landscapes. The findings offer practical guidance for corporate leaders seeking to design effective Net Zero strategies while also enriching academic discourse on corporate sustainability and the Net Zero transition.

## Boosting Green Hydrogen: Public-Private Synergies for Energy Efficiency in Developed and Emerging Economies

Pablo Eduardo Baltazar Victoria (Instituto Politécnico Nacional)

MARÍA DE LA LUZ ALMEGUA (IPN MÉXICO)

RENE MENDOZA (Instituto Politécnico Nacional)

The world faces a critical challenge in transitioning to a more sustainable energy model. Green hydrogen has emerged as a promising option to decarbonize hard-to-abate sectors, such as heavy industry and transportation, where direct electrification is difficult to implement. However, despite its potential, large-scale adoption remains complex due to high costs, infrastructure limitations, and regulatory challenges that must be addressed.

This research explores how public-private partnerships and multi-level government collaboration can accelerate the adoption of green hydrogen. To this end, it seeks to answer the question: How can public-private partnerships and government regulations foster the adoption of green hydrogen to improve energy efficiency in industry and transportation? Various case studies will be analyzed to identify successful strategies and their adaptability to different economic contexts. The focus will be on practical and feasible proposals with both near-term and mid-term impact.

Examples from Germany and Japan, leaders in hydrogen technology and infrastructure, will be examined, along with cases from Mexico and Chile, emerging economies with significant interest in this sector. Rather than covering all initiatives, the analysis will focus on key aspects such as financing, regulations, infrastructure, and strategic sectors where green hydrogen adoption is viable in both the immediate future and medium-term outlook.

Three main areas will be addressed: how to promote investments and mitigate risks through public-private partnerships, how policies and regulations can facilitate hydrogen pilot projects, and which strategies have been most effective in different economic and technological contexts. Rather than proposing radical reforms, the goal is to identify concrete and scalable actions that generate meaningful impact.

From a methodological perspective, this study adopts a qualitative and comparative approach, relying on documentary analysis of regulatory frameworks, financing strategies, and investment models across different countries. Data will be gathered from government reports, regulatory documents, and studies from international organizations. Additionally, case studies will be evaluated in heavy industry and transportation, where green hydrogen has the greatest potential for application.

This research aligns with the panel’s objectives by examining how collaboration between public and private sectors optimizes energy efficiency, strengthens intergovernmental cooperation, and fosters innovative policies for green hydrogen adoption. Furthermore, it assesses the impact of investment and regulatory strategies on emissions reduction and the development of more sustainable energy models.

Rather than presenting theoretical solutions or long-term plans, this study proposes clear and achievable actions that can serve as a reference for future initiatives. The expected outcome is to effectively leverage green hydrogen while supporting global sustainability goals, particularly Affordable and Clean Energy (SDG 7), Climate Action (SDG 13), and Partnerships for the Goals (SDG 17). Additionally, the study examines the impact of green hydrogen on job creation in the energy sector and its role in industrial development in emerging economies.

The expected results include the identification of best practices, opportunities, and progressive integration strategies for green hydrogen, supported by adequate financing models across different economies. This pragmatic approach aims to optimize existing infrastructure and progressively transition toward a cleaner and more efficient energy future.

### (Virtual) Italy's energy policy in Africa: a difficult balancing act between fossil fuels and renewalbles

Ruth Maria Hanau Santini (Università di Napoli L'Orientale)

Andrea Prontera (University of Macerata)

In January 2024, Italy formally adopted the Piano Mattei, a wide-ranging government-led development and foreign policy initiative for strengthening relations with the African continent. Through selected public-private projects covering different sectors (education, health, agriculture, water, energy and infrastructure), the Plan aims at fostering economic growth and development across Africa. In parallel, it is also directed towards achieving wider and long-term Italian foreign policy objectives such as immigration control and increasing the country’s influence in the larger Mediterranean area. The Plan hence mirrors similar initiatives launched at the EU (i.e. the Global Gateway Strategy) and international levels (i.e. the G7 Partnership for Global Infrastructure and Investment). Like these initiatives, it signals a growing trend towards the ‘geopoliticization’ and ‘financialization’ of development cooperation, as the Plan rests on financial mechanisms for de-risking and leveraging private capital in the pursuit of complex foreign policy objectives.

Through an analysis of the genealogy of the Plan through process-tracing and in-depth interviews with relevant private actors, diplomats and policymakers, this paper investigates the functioning of the Plan’s governance mechanisms, the nature of the engagement of key domestic industrial players (e.g. ENI, ENEL, TERNA, SNAM) and organized interests (e.g. Confindustria, Coldiretti), the limits and potentials of its innovative financial tools and its relations with similar ongoing initiatives, particularly the EU’s Global Gateway Strategy. Moreover, through an in depth analysis of the Plan’s energy-related projects, the paper shows the extent to which this flagship foreign policy initiative of the Meloni government displays at least three paradoxes: the promise of fostering sustainable development while relying on fossil fuel interests, which endanger climate pledges; the expectation of contributing to African countries’ economic growth while financing the Plan’s projects through de-risking mechanisms leading to increasing African countries’ debt levels; and the inability to accomplish large investment projects without multilateral public and private financing institutions at a time when the international private sector is disinvesting from Africa. The latter considerations, and the involvement of several public and private actors in the Plan’s implementation, also expose problems of accountability and effectiveness, which point to the need for a rethinking of its governance mechanisms.

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## Session 3

Thursday, July 3rd 10:15 to 12:15 (B4)

### Discussants

Rizalino Cruz (National College of Public Administration and Governance, University of the Philippines)

Marie DeCock (Hasselt University)

### (Virtual) Examining Renewable Energy Initiatives of Local Governments in the Philippines: Key Challenges and Innovative Solutions

Rizalino Cruz (University of the Philippines Diliman)

Kristoffer Berse (University of the Philippines Diliman)

Harley Deniel Sanchez (University of the Philippines Diliman)

The global push towards sustainable energy has placed increasing pressure on governments around the world to transition away from fossil fuels and embrace renewable alternatives. This shift is particularly important for developing nations like the Philippines, which face unique geographical, economic, and infrastructural challenges in meeting its growing energy demands. As the country works to enhance energy security and reduce its environmental footprint, the role of local government units (LGUs) has become pivotal in driving the adoption of renewable energy technologies. The country’s diverse geography and varying resource availability call for localized strategies to drive renewable energy adoption.

This paper examines the multifaceted landscape of renewable energy adoption by LGUs in the Philippines. It seeks to understand the challenges, strategies, and impacts across various energy sectors. By analyzing the interplay between national policies, local initiatives, and environmental considerations, the study aims to provide insights into the holistic approach to integrate sustainable energy solutions into the Philippines' diverse regional and community contexts.

The study examines the nature of this adoption by utilizing textual analysis in R to identify themes within the renewable energy projects and ordinances of the LGUs. It covers 141 LGUs with existing renewable energy projects and establishments as listed in the Department of Energy's National Renewable Energy Program Report of 2021. Using data analysis methods that combine word frequency analysis, sentiment analysis, and topic modeling, the research investigates the trends, challenges, and opportunities in local renewable energy implementation. The textual analysis is complemented by case studies, which enable the study to explore in more detail the local context, institutional arrangements, and policy innovations.

The findings reveal a notable preference for solar energy among LGUs, despite its tertiary position in the national energy portfolio. The analysis uncovers a significant "Renewable Energy Policy Paradox," where positive policy intentions can be negated by practical implementation barriers. The study identifies three key challenges: high upfront costs, energy source irregularity, and price fluctuations. Additionally, topic modeling reveals five critical areas: agricultural integration, water system development, stakeholder collaboration, multi-level governance, and capacity building. The research emphasizes the crucial role of public-private partnerships and suggests that successful renewable energy implementation requires better alignment between public and private interests, national and local initiatives, enhanced financial mechanisms, and robust capacity-building programs. These findings contribute to the understanding of renewable energy development at the local government level and provide insights for policy reform and implementation

strategies.

### Legal Challenges for Public-Private and Intergovernmental Energy Companies: The Role of Law in Enhancing Energy Efficiency

Marie DeCock (Hasselt University)

Steven Van Garsse (University of Hasselt)

As governments seek to improve energy efficiency through collaborative governance models, **legal frameworks play a crucial role** in shaping public-private and intergovernmental synergies. This paper addresses the two main questions of the panel by examining how the law influences energy efficiency by facilitating or constraining cooperation between public, private, and intergovernmental actors and, therefore, responds directly to the panel's focus on the influence of regulatory frameworks. Specifically, it explores the legal challenges facing **interlocal cooperation (ILC) in the energy sector**, a governance model where municipalities jointly establish interlocal companies (ILCs) to manage public services, including energy distribution and renewable energy projects.

ILCs have emerged as **essential actors in the energy transition**. By pooling resources and expertise, they optimize energy distribution, promote renewable energy sources, and implement circular economy initiatives such as waste-to-energy programs. However, despite their potential to enhance energy efficiency, **ILCs face legal ambiguities** that impact their effectiveness. These challenges arise at the **intersection of public and private law**, affecting governance structures, investment rules, and competition policies – factors that either enable or impede energy efficiency, as highlighted in the call for papers.

A **case study of Belgium** illustrates the complex legal landscape surrounding interlocal energy companies. For example, in the 2000s, a legal ban was imposed on public-private partnerships in the energy sector due to concerns over the lack of municipal control, only to be reversed less than a decade later. Subsequent legal reforms enabled ILCs to invest in private energy firms, fostering market involvement to advance energy efficiency. Additionally, public procurement rules constrain cooperation and limit freedom of choice vis-à-vis private partners. Foreign investment restrictions have shaped the ownership structure of and private influence on strategic energy networks in response to the Chinese State Grid's rejected entry into interlocal energy network operator Eandis. Finally, the legal position of interlocal energy companies raises ambiguity on their (lack of) democratic legitimacy. These **legal frameworks**, while designed to protect public interests, also **create barriers that may limit the agility of ILCs in adopting innovative, energy-efficient solutions**. This case study aligns with the panel's interest in assessing regulatory impacts and identifying best practices for improving energy efficiency through intergovernmental and public-private synergies.

This **paper argues that legal clarity is essential** to unlocking the full potential of interlocal energy companies in driving energy efficiency. By examining how legal frameworks shape **governance models**, **public-private partnerships**, and **investment strategies**, this study highlights both the enabling and restrictive effects of law on sustainable energy policies. Ultimately, it contributes to the broader discussion on how legal reforms, regulatory frameworks, multi-level governance structures, and collaborative public-private initiatives can function as catalysts for improved energy efficiency – directly engaging with the key themes of this panel.

**Methodology-wise**, this paper meets the wish for **interdisciplinary** approaches. Using a **legal method** (desk research of legislation, case law, and legal doctrine) combined with a **case study** and **political sciences and public administration literature**, this paper makes clear that the law plays a not-to-be-ignored role in improving energy efficiency and making – legally sound – energy policies.

### (Virtual) Bus Electrification in Hong Kong: Energy Consumption Prediction and Charging Facility Planning

Pengyu Zhu (Hong Kong University of Science and Technology)

Yuqing GUO (Hong Kong University of Science and Technology)

Jeffrey Chow (The Hong Kong University of Science and Technology, Hong Kong)

Road transportation contributes substantially to pollutant emissions and poor air quality in Hong Kong. The government has launched various initiatives to transition towards greener transportation options, including the Clean Air Plan for Hong Kong 2035 and Hong Kong's Climate Action Plan 2050, which aim to meet the World Health Organization's air quality standards and achieve carbon neutrality by 2050, respectively.

Electric vehicles (EVs), including electric buses (EBs), offer a promising solution to reduce carbon emissions and air pollution. The Hong Kong Roadmap on Popularization of Electric Vehicles aims to phase out fuel-based vehicles and promote different types of EVs. The government has allocated HK$180 million for EB trials and plans to build a comprehensive charging network for both private and public vehicles. Despite these efforts, the adoption of EBs remains limited.

We propose examining the electrification of buses in Hong Kong by estimating the energy demand for all regular bus routes and identifying those with high energy consumption. The project will gather GPS data from 838 regular bus routes, including real-time velocity and gradient profiles of moving buses at one-second intervals that will also record all starts and stops. This data will be incorporated with geospatial road slope data and educated assumptions regarding passenger loads and seasonal air-conditioning usage to predict the electricity demand for each route using an energy calculation model. By combining the energy demand of a single bus trip with bus service timetables, the total energy usage for each route can be calculated. The energy consumption can then be aggregated at the terminus level, as well as for bus depots and nighttime parking facilities. For each of the 309 bus terminuses in Hong Kong, the study will compute the total energy demand of all routes that depart from that terminus.

The results will help policymakers and franchised bus operators prioritize route electrification and allocate resources effectively. Additionally, the study will propose a prioritized list of bus terminuses for deploying charging facilities to enable top-up charges for EBs. This study will be the first to provide a comprehensive estimation of electricity demand for all bus routes in Hong Kong, which will be valuable for planning EB charging facilities and addressing potential performance issues. The findings will contribute to the successful implementation of government policies and ultimately improve air quality in Hong Kong.

**Lithium in Mexico: An Opportunity to Develop and Implement a Public Policy to Mitigate the Local Socio-Environmental Impact and to Achieve a Genuine Global Energy Transition.**

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Amid rising economic and socio-environmental damage from climate change, global leaders have called for decarbonization through an energy transition.To achieve this zero-carbon transition, critical minerals play a key role, as they are the raw materials for the generation of clean technologies. In the state of Sonora, Mexico, a lithium extraction project was recently initiated, with lithium being classified as a highly critical mineral. Mining operations were initially set to begin under foreign investment; however, a modification to the Mining Law halted progress. Currently, lithium exploitation activities are on standby, and the mining concessions have been transferred to the Mexican government. This situation presents an opportunity to propose and implement a public policy aimed at reducing the local socio-environmental impact caused by mining, as well as integrating a plan for the development of the lithium supply chain with the participation of public-private partnerships.

The research question is: Why is it important to implement a public policy to mitigate the socio-environmental impact of local lithium mining, and what opportunities exist for Mexico?

The purpose of this research is to present an overview under which the implementation of a public policy to reduce the local impact of lithium mining in Sonora, Mexico, is both possible and highly relevant, from a socio-environmental analysis perspective. Such a policy would contribute to the Mexican economy, integrating the country into the clean energy supply chain market and avoiding potential future economic risks, such as stranded assets. This work involved an analysis of various local and international actors and institutions related to the lithium supply chain, examining how their involvement is interconnected. Additionally, the current socio-environmental status of the area where the lithium mining project is located was analyzed through the study of the local and state Natural Capital Index and surveys conducted with the local population.

The results indicate that the implementation of a pre-exploitation public policy for lithium mining is essential to safeguard the ecosystems of the mining area and adjacent lands, which are crucial for continuing to provide ecosystem services that sustain a sustainable economy. It was also found that the social variable is relevant for the integration and implementation of this public policy, as surveys conducted with local residents revealed that while they are aware of the potential benefits of mining in the area, they are equally concerned about the socio-environmental damages it may cause. A public policy that safeguards the integrity of mining areas could serve as a pilot for implementation in other mines, especially in countries with low to medium levels of development, in order to avoid cases known as the "resource curse" and to achieve a genuine global energy transition.

The research question and objective align with the chosen panel, as lithium is crucial for clean energy. A comprehensive public policy to reduce local mining impact supports a true energy transition. Given the

current situation of lithium concessions in Sonora, Mexico, there is an opportunity to explore a production chain through public-private partnerships.

### The Power of the Individual: Inter-state Conflict & Individual Energy Supply Choices

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To what extent do the public respond to international events and crises, and how can individual choices shape policy? While the leeway of internationals to influence public policy is rather limited, collective action can turn the public into a relevant actor in the policy-making process. To unravel its role, this paper looks at the public response to a major exogenous external shock to energy supply in Germany: the Russian invasion of Ukraine.

Leveraging common knowledge on Germany's pre-war dependency on Russian gas, the paper analyses district-level data on citizens' decision to switch their power supply to renewable energies. Considering political predisposition in German districts and pre-war trends on individuals' choices regarding renewable power supply, it isolates the change in individual preferences brought about by the invasion of Ukraine. District-level characteristics further supplement the analysis in two ways: first, they allow for the estimation of heterogenous treatment effects, revealing what members of the public are more responsive to current events and, indirectly, take an 'activist' role through their choices; second, they serve as data for validity checks that lend credibility to the analysis by underlining the plausibility of the proposed causal mechanism.

The paper thus contributes to a growing literature on 'indirect' citizen-activism, where – not necessarily political - collective action serves a tool to influence public policy. Its findings a relevant to understanding the role of the public in climate change policy and other politicised issues.