



ENERGY AND CLIMATE
PANORAMA

WASTE MANAGEMENT

IN METROPOLITAN CITIES OF
PAKISTAN

Challenges and Opportunities

ABOUT US

Who we are

We are a dedicated team of researchers and experts who recognize the urgent need for action in addressing climate resilience and energy transition in Pakistan. Our mission is to develop and implement effective policies for cleaner, renewable energy sources like solar and wind, aligning with Pakistan's 2030 goal of 30% renewable energy in its electricity mix. As a multidisciplinary team, we leverage expertise in three key disciplines of study—Energy Systems Engineering, Thermal Energy Engineering, and Electrical Power Engineering—to drive our mission forward. We are united by a shared vision of creating a sustainable and resilient future for Pakistan, where cleaner energy sources play a pivotal role in reducing the nation's vulnerability to climate-related challenges.

What we do

We conduct in-depth, evidence-based research to analyze and improve energy policies in Pakistan. Our focus is on advancing renewable energy solutions and engaging stakeholders to ensure effective policy implementation. Our methodology involves a critical examination of current energy policies to pinpoint areas of improvement and formulate strategies for the widespread adoption of renewable energy sources across various levels.

In line with our commitment to fostering sustainable practices, we have established a fellowship program as part of our broader initiatives that aims to facilitate evidence-based research for promoting energy transition in Pakistan. Through research studies, surveys, and forecasting, we plan to assess various aspects of energy transition, including the adoption of renewable energy technologies and their impact on climate change. Our approach involves active engagement with stakeholders to address their concerns and facilitate the effective implementation of policies, fostering the growth of renewable energy manufacturing and marketing facilities.

CONTACT US

Industry Liaison & Outreach Office

Bilal Mehmood Bhutta

Phone: +92-51-90855274

Fax: +92-51-90851302

Email: ilo@uspcase.nust.edu.pk

USPCAS-E Building, National University of
Sciences & Technology, H-12, Islamabad.



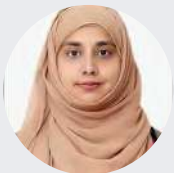
Primary Contributors



DR. MUHAMMAD HASSAN

PRINCIPAL INVESTIGATOR

Associate Professor



DR. ABEERA AYAZ ANSARI

CO-PRINCIPAL INVESTIGATOR

Assistant Professor



MUHAMMAD USMAN KHAN

RESEARCH ASSISTANT

MS in Energy Systems
Engineering

Layout Design



SAAD NADEEM

RESEARCH ASSISTANT

MS in Energy Systems
Engineering

SANA MEHMOOD

RESEARCH ASSISTANT

MS in Energy Systems
Engineering





Table Of Content

Executive Summary	01
1. Introduction	02
2. Approach and Methodology	06
2.1. Data Collection	06
2.2. Data Analysis	07
2.3. Recommendations Based on Data Analysis	07
2.4. Summary	08
3. Major Findings	09
3.1. Municipal Solid Waste (MSW) Characterization in Different Metropolitan Cities of Pakistan	09
3.2. Solid Waste Management Challenges in Pakistan	16
3.3. Municipal Solid Waste through Public Eyes: Perception and Management	18
4. Socio-Economic Significance of the Study	24
4.1. Environmental Impact Mitigation	24
4.2. Resource Optimization	24
4.3. Waste to Energy Opportunities	25
4.4. Economic Growth and Job Creation	25
4.5. Public Health Improvement	25
4.6. Tourism and Aesthetic Value	25
4.7. Climate Change Mitigation	26
4.8. Public Awareness and Education	26
4.9. Policy Development and Investment	26
5. Conclusions	27
5.1 Value Addition/ Impactful Outcomes	27
5.2. Recommendations for Policy Makers for Effective Municipal Solid Waste Management	27
6. References	30



Executive Summary

This study explores the waste management practices in urban areas of Pakistan, with focus on sustainable waste management and disposal strategies, especially Waste-to-Energy (WtE) facilities as a transformative solution. The study discusses WtE facilities such as incineration to convert municipal solid waste into energy resources. It also highlights the global issue of plastic waste and the importance of gasification, pyrolysis, recycling, and reuse methods to minimize its environmental impact. The study also examines the anaerobic digestion pathway to convert organic waste, sewage, and agricultural residues into methane and carbon dioxide, thereby creating an economical energy resource for rural communities. The study also investigates how urban communities in Pakistan view and manage municipal solid waste. The exploration starts by looking at city cleanliness, waste collection frequency, waste handling improvements, and the health impacts of inadequate waste management. This examination explores the connection between public expectations and urban sanitation, highlighting the negative impact of poor waste management on public health. Public awareness of waste management is investigated, including child labor, community involvement, and knowledge of new technologies. The challenges and recommendations or policymakers to enhance municipal solid waste management are explored in this study. Our findings indicate that the public consider investing in advanced waste-to-energy technologies to be crucial.

They also emphasize the need for collaboration between the government and private sector, along with incentives for research in this area. The Surveys also reflect the need for a robust, standardized regulatory framework for successful operation of WtE projects in Pakistan. The study concludes that current waste management system requires improved waste segregation, collection, and processing as well as enhanced Public-Private Partnerships (PPPs) to accelerate WtE projects through collaboration and shared resources. Moreover, incorporation of WtE facilities into urban planning is needed along with integration with city energy grids to alleviate energy crisis. Promotion of public awareness campaigns, waste recycling programs, composting initiatives, and WtE projects are expected to reduce landfill reliance and conserve valuable materials. Similarly, continuous monitoring and evaluation, driven by data insights, will drive the management system towards sustainability. Finally, the study calls for action to stop child labor in waste handling and emphasizes the importance of climate-resilient waste management strategies to address climate change issues.



OUR PARTNERS



Pakistan Renewable Energy Coalition
Together for a Renewables Powered Pakistan.



SDPI
Sustainable Development Policy Institute



RE
RENEWABLES FIRST



PRIED
Policy Research Institute
for Equitable Development



Indus Consortium
Humanitarian Environment and
Development Initiatives



PAKISTAN
ENVIRONMENT TRUST



Private Power & Infrastructure Board
Ministry of Energy (Power Division)
Government of Pakistan



<https://uspcase.nust.edu.pk>



ilo@uspcase.nust.edu.pk



USPCAS-E Building, NUST Sector H-12,
Islamabad, 44000 Pakistan