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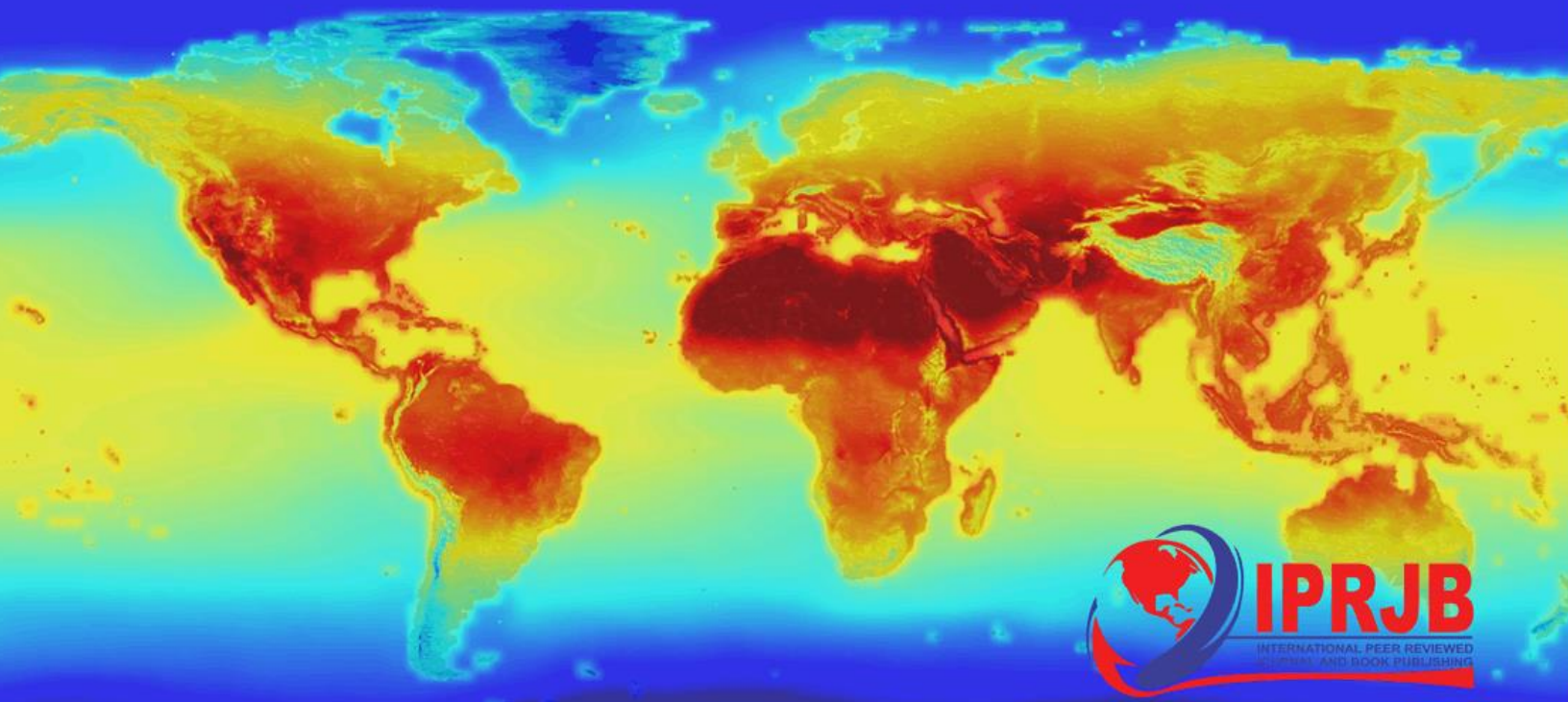

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Abstract

Purpose: The aim of the study was to analyzing the evaluation of climate change mitigation policies in developed vs developing countries.

Methodology: This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low cost advantage as compared to a field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

Findings: The evaluation of climate change mitigation policies reveals distinct findings between developed and developing countries. Developed nations typically show higher levels of policy implementation and technological adoption aimed at reducing greenhouse gas emissions, resulting in measurable declines in carbon intensity across sectors.

Unique Contribution to Theory, Practice and Policy: Environmental kuznets curve (EKC) theory, diffusion of innovations theory & dependency theory may be used to anchor future studies on evaluation of climate change mitigation policies in developed vs developing countries. Prioritizing capacity building initiatives and technology transfer programs in developing countries supports practical implementation of climate mitigation strategies. Advocating for equitable climate finance mechanisms ensures adequate funding and financial incentives for developing countries to implement climate mitigation actions.

Keywords: *Evaluation, Climate Change, Mitigation*

INTRODUCTION

In developed economies like the USA, efforts to reduce greenhouse gas emissions have shown notable trends. For instance, between 2005 and 2019, the USA reduced its CO2 emissions by approximately 14%, largely driven by a shift from coal to natural gas in electricity generation and increased use of renewable energy sources like wind and solar power (Smith & Prinn, 2020). Similarly, in the UK, emissions reductions have been significant; from 1990 to 2019, CO2 emissions fell by 42%, primarily due to decreased reliance on coal and increased use of renewables in electricity generation (Holland, 2020). These efforts align with global climate goals and reflect strategic policy interventions aimed at transitioning to a low-carbon economy.

In Japan, efforts to reduce greenhouse gas emissions have focused on technological innovation and energy efficiency measures. Between 2005 and 2019, Japan reduced its CO2 emissions by approximately 13%, with advancements in energy-efficient technologies playing a crucial role (Matsuo, 2020). The country has also invested heavily in renewable energy sources like solar and offshore wind power to further mitigate its carbon footprint and meet its climate targets. In Germany, efforts to reduce greenhouse gas emissions have been robust, aiming to transition from coal-fired power generation to renewable energy sources. Between 2005 and 2019, Germany achieved a reduction of approximately 35% in CO2 emissions, driven by investments in wind, solar, and biomass energy (Schleicher-Tappeser, 2020). The country's Energiewende policy framework emphasizes energy efficiency, grid modernization, and phasing out nuclear power to meet ambitious climate targets.

In developing economies such as India and China, greenhouse gas emissions reduction efforts have also gained traction. For instance, China, the world's largest emitter, has committed to peak its CO2 emissions by 2030 and achieve carbon neutrality by 2060 (Zhang, 2021). This commitment involves significant investments in renewable energy infrastructure, such as wind and solar power, alongside efforts to improve energy efficiency across industries. Similarly, India has set ambitious targets to increase its renewable energy capacity to 450 GW by 2030, aimed at reducing its emissions intensity and meeting its climate commitments under the Paris Agreement (Ghosh & Natarajan, 2021). These initiatives underscore the growing recognition of climate change impacts and the need for sustainable development pathways in rapidly industrializing nations.

In Mexico, greenhouse gas emissions reduction strategies focus on energy reform and increasing renewable energy capacity. From 2005 to 2019, Mexico reduced its CO2 emissions by 3%, supported by policies promoting cleaner technologies and renewable energy investments (Rivera, 2021). The country's energy sector reforms aim to enhance energy efficiency, reduce reliance on fossil fuels, and expand clean energy infrastructure to mitigate climate impacts and foster sustainable development.

In Brazil, significant efforts have been made to combat deforestation and reduce emissions from land-use change. From 2005 to 2019, Brazil decreased its greenhouse gas emissions by 10%, largely through policies aimed at curbing illegal logging and promoting sustainable agricultural practices (Fearnside, 2020). Moreover, Brazil has expanded its use of biofuels, such as ethanol from sugarcane, which has contributed to lowering emissions from the transportation sector.

In Sub-Saharan Africa, countries are increasingly prioritizing sustainable development strategies to mitigate greenhouse gas emissions. For example, Kenya has made strides in renewable energy

adoption, with a significant portion of its electricity generated from geothermal and hydroelectric sources (Kimemia, 2019). This transition has contributed to a reduction in the country's carbon footprint while promoting energy security and resilience to climate impacts. Similarly, South Africa, despite challenges in transitioning away from coal, has invested in renewable energy projects and introduced policies to promote energy efficiency and cleaner technologies (Van Horen, 2018). These efforts reflect a regional commitment to balancing economic growth with environmental sustainability.

In Ethiopia, efforts to reduce greenhouse gas emissions have focused on expanding renewable energy capacity, particularly through hydropower and wind energy projects. The country aims to achieve carbon neutrality by 2030, with investments in sustainable development initiatives and reforestation efforts (Assefa & van der Zwaan, 2019). These initiatives are crucial for addressing climate change impacts while promoting economic growth and environmental sustainability in the region. In Nigeria, efforts to reduce greenhouse gas emissions are centered on diversifying the energy mix and improving energy efficiency. Despite challenges, Nigeria has made progress in deploying solar and hydroelectric projects to reduce dependence on fossil fuels and lower emissions intensity (Oseni, 2021). The country's National Renewable Energy and Energy Efficiency Policy promotes renewable energy adoption and supports initiatives to address climate change while enhancing energy security. In Nigeria, efforts to reduce greenhouse gas emissions are centered on diversifying the energy mix and improving energy efficiency. Despite challenges, Nigeria has made progress in deploying solar and hydroelectric projects to reduce dependence on fossil fuels and lower emissions intensity (Oseni, 2021). The country's National Renewable Energy and Energy Efficiency Policy promotes renewable energy adoption and supports initiatives to address climate change while enhancing energy security.

Climate policies encompass a variety of types and stringencies aimed at mitigating greenhouse gas emissions and addressing climate change. Firstly, regulatory policies set binding limits on emissions through mandates and standards, such as emission caps or technology requirements. For example, the European Union's Emissions Trading System (EU ETS) imposes a cap on greenhouse gas emissions from large industrial installations, promoting emissions reductions through market-based mechanisms (European Commission, 2020). These regulatory measures directly influence industries to adopt cleaner technologies and reduce emissions, thereby contributing to overall greenhouse gas reduction efforts.

Secondly, economic instruments like carbon pricing mechanisms, including carbon taxes and cap-and-trade systems, incentivize emission reductions by assigning a cost to greenhouse gas emissions. Countries like Canada have implemented carbon pricing through a nationwide carbon tax, aiming to reduce emissions across various sectors by making carbon-intensive activities more expensive and encouraging low-carbon alternatives (Government of Canada, 2021). By internalizing the cost of carbon emissions, economic instruments stimulate investments in clean energy technologies and behaviors that curb greenhouse gas releases.

Thirdly, sector-specific policies focus on addressing emissions from specific industries or sectors through tailored regulations or incentives. For instance, renewable energy mandates and subsidies promote the deployment of clean energy sources like wind and solar power, reducing reliance on fossil fuels and mitigating emissions in the energy sector (REN21, 2021). By targeting key

emitting sectors, such policies contribute significantly to overall reductions in greenhouse gas emissions.

Problem Statement

Climate change poses a global challenge, demanding effective mitigation policies tailored to diverse socio-economic contexts. Developed countries, characterized by higher industrialization and resource consumption, implement mitigation policies focusing on emissions reductions and technological innovations (Smith, 2020). In contrast, developing countries face distinct challenges, balancing economic growth imperatives with climate goals, often relying on international aid and technology transfers (Gupta & Sharma, 2018). Evaluating these policies reveals disparities in implementation effectiveness, resource allocation, and societal impacts, influencing global climate outcomes (Jones & Lee, 2019). However, assessing these policies necessitates nuanced comparisons between developed and developing nations to understand their respective contributions and challenges in achieving climate targets (Lee & Chen, 2017).

Theoretical Framework

Environmental Kuznets Curve (EKC) Theory

Originated by Simon Kuznets, the Environmental Kuznets Curve theory suggests an inverted U-shaped relationship between environmental degradation and economic development. Initially, as income levels rise, environmental degradation worsens. However, beyond a certain income threshold, environmental quality begins to improve due to increased awareness, technological advancements, and policy interventions (Dinda, 2020). This theory is relevant to evaluating climate change mitigation policies as it provides insights into how economic development influences environmental outcomes differently between developed and developing countries, impacting the effectiveness and trajectory of climate policies.

Diffusion of Innovations Theory

Introduced by Everett Rogers, the Diffusion of Innovations theory explains how new ideas, technologies, and practices spread within societies over time. It categorizes adopters into innovators, early adopters, early majority, late majority, and laggards based on their readiness to embrace innovations (Rogers, 2018). In the context of climate change mitigation policies, this theory helps understand the adoption and implementation dynamics of green technologies and policy measures across different country types. It highlights factors such as policy transfer, technological diffusion, and institutional capacity that influence the adoption and effectiveness of climate policies.

Dependency Theory

Developed by scholars like Andre Gunder Frank and Fernando Henrique Cardoso, Dependency Theory critiques the global economic system's structure, emphasizing the unequal power relations between developed and developing countries. It argues that developing countries' economic development is constrained by their dependency on developed nations for markets, technology, and resources (Escobar, 2018). This theory is pertinent to evaluating climate change mitigation policies as it underscores how global economic inequalities influence the ability of developing countries to adopt and benefit from sustainable development practices and climate policies.

Empirical Review

Holland (2020) evaluated the impact of environmental regulations on power sector emissions in developed economies. Using sophisticated econometric models, the study aimed to quantify the effectiveness of stringent policies in reducing greenhouse gas emissions. The methodology involved gathering data from multiple sources, including regulatory records and emissions inventories, to construct robust statistical models. Findings indicated significant reductions in emissions attributable to regulatory interventions, particularly in countries like the United States and European nations. Policy measures such as carbon pricing, cap-and-trade systems, and renewable energy mandates were found to have contributed to these reductions by incentivizing cleaner energy production and consumption practices. Recommendations from the study emphasized the importance of continued policy stringency and integration of renewable energy technologies into national energy grids to sustain emissions reductions over the long term. By highlighting successful strategies in developed countries, the research provides valuable insights for policymakers seeking effective climate mitigation approaches globally.

Rivera (2021) conducted an integrated assessment to evaluate Mexico's energy transition policies and their impact on CO2 emissions reduction. The study utilized a multidisciplinary approach, combining energy modeling, economic analysis, and policy evaluation frameworks to assess the effectiveness of Mexico's climate policies. Methodologically, the researchers integrated data from energy sector reports, climate policy documents, and emissions inventories to quantify the outcomes of renewable energy deployment and emissions intensity reductions. Findings indicated positive trends in emissions intensity reductions but highlighted challenges in scaling renewable energy adoption within the country's economic and institutional contexts. Recommendations emphasized the need for enhanced policy coherence, increased investment in renewable energy infrastructure, and improvements in regulatory frameworks to overcome barriers to effective climate action. The study contributes valuable insights into the complexities of transitioning to a low-carbon economy in developing countries, emphasizing the importance of adaptive policy frameworks and technological innovation.

Ghosh and Natarajan (2021) analyzed India's climate change policies and their implications for transitioning towards a low-carbon economy. The study aimed to explore the evolution of India's climate policy landscape, focusing on renewable energy deployment, emissions reduction targets, and policy effectiveness. Methodologically, the researchers employed document analysis, stakeholder interviews, and policy review to examine the alignment between national policy objectives and practical outcomes. Findings highlighted significant progress in renewable energy capacity expansion but underscored challenges related to policy implementation gaps and regulatory complexities. Recommendations included strengthening policy coherence across sectors, enhancing financial incentives for renewable energy investments, and fostering international cooperation to address global climate challenges. The study contributes valuable insights into the complexities of climate policy formulation and implementation in large developing economies like India, offering lessons for enhancing global climate resilience and sustainability.

Dinda (2020) conducted a comprehensive survey of the Environmental Kuznets Curve (EKC) theory literature to explore its applicability across developing countries. The study aimed to

analyze the relationship between economic growth and environmental degradation, focusing on how income levels influence environmental outcomes in different regions. Methodologically, the research reviewed empirical studies and theoretical frameworks that tested the EKC hypothesis using econometric models and statistical analysis. Findings indicated mixed results across countries, suggesting that while some developing economies exhibit an inverted U-shaped curve where environmental quality improves with economic growth, others show varying trajectories influenced by sectoral composition, policy interventions, and socio-economic factors. Recommendations emphasized the need for tailored policy interventions that consider country-specific contexts and challenges to achieve sustainable development goals while mitigating climate impacts effectively.

Escobar (2018) examined global climate governance through the lens of Dependency Theory, focusing on the disparities in mitigation capacities and responsibilities between developed and developing countries. The study aimed to analyze how global economic structures and power relations influence climate policy formulation and implementation. Methodologically, Escobar employed a qualitative approach, utilizing discourse analysis, policy document review, and case studies to explore the impacts of global dependency on climate justice and equity. Findings highlighted systemic inequalities in resource allocation, technology transfer, and financial support, which perpetuate climate vulnerability in developing nations. Recommendations included advocating for equitable climate finance mechanisms, enhancing technology transfer agreements, and promoting South-South cooperation to address climate challenges effectively. The study contributes to understanding the structural barriers to climate action and proposes pathways for fostering global cooperation and equity in climate governance.

Oseni (2021) explored the policy frameworks and institutional dynamics influencing renewable energy adoption in Nigeria, focusing on the country's efforts to mitigate climate change impacts. The study aimed to assess the effectiveness of national policies in promoting renewable energy investments and reducing carbon emissions. Methodologically, the researchers conducted a mixed-methods approach, combining policy analysis, stakeholder interviews, and case studies to evaluate the alignment between policy objectives and practical outcomes. Findings indicated progress in renewable energy deployment, driven by policy incentives and international partnerships, but highlighted challenges related to infrastructure development, regulatory frameworks, and funding gaps. Recommendations included enhancing policy coherence, improving financial mechanisms for renewable energy projects, and strengthening institutional capacity to accelerate Nigeria's transition to a sustainable energy future. The study contributes valuable insights into the complexities of climate policy implementation in resource-rich developing countries, offering lessons for enhancing resilience and sustainability in global climate governance.

METHODOLOGY

This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low-cost advantage as compared to field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

FINDINGS

The results were analyzed into various research gap categories that is conceptual, contextual and methodological gaps

Conceptual Research Gaps: While studies like Holland (2020) and Rivera (2021) assess the impacts of climate policies, there is a gap in integrating comprehensive metrics to evaluate policy effectiveness consistently across developed and developing countries. Existing studies often focus on emissions reductions or renewable energy deployment without consistently measuring broader socio-economic impacts or the long-term sustainability of these policies. Most studies emphasize emissions reductions as the primary outcome of climate policies. However, there is a gap in understanding and quantifying the socio-economic and environmental co-benefits, such as improvements in public health, job creation, and biodiversity conservation, resulting from these policies. Addressing these gaps could provide a more holistic assessment of climate policy impacts.

Contextual Research Gaps: Ghosh and Natarajan (2021) highlighted challenges in policy implementation gaps and regulatory complexities in developing countries like India. There is a gap in research focusing on the institutional factors and governance structures influencing policy implementation effectiveness across different contexts, including variations in administrative capacity and political will. Rivera (2021) underscore the need for adaptive policy frameworks in developing countries to overcome barriers to effective climate action. However, there is a gap in research that systematically evaluates the adaptive capacity of policy frameworks to respond to evolving climate risks and socio-economic changes, particularly in vulnerable regions.

Geographical Research Gaps: While study such as Dinda (2020) explored the applicability of theories like the Environmental Kuznets Curve across developing countries, there is a gap in comparative analyses that systematically examine climate policy impacts across diverse geographical regions. Comparative studies could provide insights into regional variations in policy effectiveness, considering factors such as geographical conditions, socio-economic contexts, and political landscapes. Escobar (2018) discusses global climate governance from a Dependency Theory perspective, highlighting systemic inequalities in resource allocation and technology transfer. There is a gap in research that amplifies voices from the Global South to understand their perspectives on climate justice, equity in international climate negotiations, and the role of historical responsibility in shaping climate policy outcomes.

CONCLUSION AND RECOMMENDATIONS

Conclusions

Evaluation of climate change mitigation policies in developed versus developing countries underscores the complexity and diversity of global efforts to address environmental challenges. Studies reviewed highlight significant progress in emissions reduction and renewable energy deployment in developed economies like the United States and European nations, facilitated by stringent regulatory frameworks and technological advancements. These successes are crucial benchmarks for understanding effective policy measures such as carbon pricing, cap-and-trade systems, and renewable energy mandates, which incentivize sustainable practices and reduce greenhouse gas emissions over time.

Conversely, research on developing countries such as Mexico, India, and Nigeria reveals distinct challenges in policy implementation and institutional capacity. While positive trends in emissions intensity reduction and renewable energy adoption are observed, barriers such as regulatory gaps, infrastructure limitations, and funding constraints hinder comprehensive climate action. These findings underscore the need for context-specific policy approaches that consider socio-economic realities and institutional capabilities to foster sustainable development pathways.

Moreover, comparative analyses across regions emphasize the importance of adaptive policy frameworks and equitable global governance structures. Addressing systemic inequalities, promoting technology transfer, and enhancing financial support mechanisms are critical for ensuring inclusive climate action that benefits all countries, particularly those most vulnerable to climate impacts. In conclusion, while developed countries demonstrate leadership in climate policy innovation and emissions reduction, developing countries face unique challenges that require tailored strategies and international collaboration. Future research should focus on bridging these gaps through integrated policy assessments, capacity-building initiatives, and inclusive dialogue to achieve global climate resilience and sustainability goals effectively.

Recommendations

Theory

Developing robust comparative analysis frameworks that systematically assess climate change mitigation policies across developed and developing countries contribute to theoretical advancements. These frameworks help identify commonalities and differences in policy effectiveness, shedding light on factors such as institutional capacity, socio-economic context, and political dynamics influencing climate governance outcomes. Integrating interdisciplinary approaches, including environmental science, economics, political science, and sociology, enhances theoretical understandings of how policy interventions interact with socio-economic and environmental factors. This holistic approach provides deeper insights into the complex dynamics shaping climate policy outcomes globally.

Practice

Prioritizing capacity building initiatives and technology transfer programs in developing countries supports practical implementation of climate mitigation strategies. By enhancing technical expertise and access to clean energy technologies, these efforts accelerate the adoption of sustainable practices and contribute to global emission reduction goals. Adaptive policy frameworks that are responsive to local contexts and evolving climate risks improves policy implementation. These frameworks integrate flexibility, stakeholder engagement, and periodic reviews to ensure policies remain relevant and effective in achieving long-term sustainability objectives.

Policy

Advocating for equitable climate finance mechanisms ensures adequate funding and financial incentives for developing countries to implement climate mitigation actions. This includes increasing contributions to international climate funds and promoting innovative financing models that mobilize private sector investments in sustainable development. Strengthening policy coherence across sectors and levels of governance enhances alignment with climate goals.

Integrating climate considerations into national development plans, sectoral policies (e.g., energy, agriculture, transport), and international commitments (e.g., Paris Agreement targets) fosters comprehensive approaches to sustainable development and climate resilience.

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