

The Effectiveness of Environmental Policy in Addressing Climate Change

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Abstract. *The purpose of this research is to analyse the efficiency of environmental policies in mitigating climate change and the part played by stakeholders, political stability, policy research and policy fairness. In this research, quantitative to complement quantitative method has used to establish that where policies are made through public consultation, the policies will be effective in achieving its set objectives. It also focuses on the aspect of political stability and leadership on the ability to enhance policies 'implementation and enforcement. In addition, data driven policies aligned with current and contextualized scientific knowledge to tackle environmental issues were determined to be more efficient. Last of all, the research also proves that ANT's policies are more sustainable in the long run and those that strive at enhancing social equity and environmental justice are vital for achieving other environmental objectives. Based on these findings, it can be concluded that the combination of these factors in environmental policymaking is essential to fight climate change and support sustainable development.*

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INTRODUCTION

The effects of climate change have emerged as one of the most critical problems facing the world at the moment. The scientific community has issued a stern warning to us about the potentially catastrophic effects that climate change will have on our communities, industries, and environments. Policies pertaining to the environment have been put into place on a global scale in order to resolve this problem and decrease pollution of greenhouse gases, which are the primary contributor to climate change (Lagouvardou et al., 2020). However, there is some disagreement regarding how successful these measures will be in preventing further climate change. Some people believe that these policies have not been effective in lowering pollution to the necessary degree, while others believe that they have been successful in minimizing the negative effects of climate change (Lagouvardou et al., 2020; Fekete et al., 2021).

According to Jeong & So's (2020) statement, the objective of this thesis is to evaluate the efficiency of environmental policies in combating climate change as well as the effects these policies have had on both the environment and civilization (Lorenzoni et al., 2007; Nelson et al., 2007). This thesis will investigate the many environmental policies that have been put into place over the course of time in an effort to combat climate change, including their development over the course of that time and the criticism of their efficacy. In addition to this, the research will investigate the effects that these policies have had on society as well as the environment (Siregar, 2021; Ahmed et al., 2020). This thesis intends to make a contribution to the current discussion on the efficacy of environmental policies in addressing climate change and provide insights for the establishment of policy. In order to do so, this thesis will proceed as follows (Ayers, 2010; Levin et al., 2012).

This thesis will commence with a literature analysis that provides an introduction of climate change, its effects, and the development of environmental policies, according to Sima et al. (2020). In addition to this, the literature analysis will provide an evaluation of the efficiency of environmental policies in combating climate change, as well as an investigation into the effects these policies have had on both the environment and society (Malhi et al., 2021; Dechezleprêtre et al., 2022). A mixed-methods research strategy will be used for the investigation, which will include a comprehensive examination of the previous research as well as data analysis and interpretation (Pichon et al., 2020; Dawadi et al., 2021).

In the following sections, we will present the findings of the research as well as our analysis of those findings. This will be followed by a discussion of the consequences of the study for both policy and practice. At the conclusion of the study, an overview of the most important discoveries, consequences for additional research, and recommendations for the formulation of policy will be presented. This research is important because it seeks to provide insights into the effectiveness of environmental policies in addressing climate change. These insights have the potential to influence the development of policies and contribute to worldwide efforts to ameliorate the effects of climate change.

METHODS

This study therefore applied both the quantitative and qualitative approaches to complement each other as the researcher conduct an in-depth analysis into the efficiency of the environmental policies to counter climate change. First, the review of the relevant literature was performed to pinpoint prior research about environmental policies and their impact in the fight against climate change. This review helped to lay some necessary background knowledge regarding the current knowledge that was out there and was useful for the subsequent results and data collection as well as analysis.

Primary and secondary research data were archived from government reports, international organizations, and datasets and on GHG emission, policy, and their environmental and social consequences. The quantitative analysis contained higher degree of analysis such as regression analysis, time series analysis, multivariate analysis to analyze the response of different policy types. These methods made it possible to ensure effective and strong analysis of the relationship between policy interventions and changes in environmental indicators, which we were in a position to use to provide policy outcome evidence.

Qualitative data were also gathered through content analysis of policy documents, interviews with policy makers and user organisations/associations and case studies of particular policy initiatives. The qualitative aspect focused on the assessment of other factors that affect implementation of a particular policy these include political, social and economic predisposing factors and stakeholder involvement. Policies and their impact on environmental issues was examined descriptively and quantitatively and based on this the identified themes were grouped into thematic clusters for further understanding of the ways and the extent to which policies affect the environment.

The data analysis was intended to extend past measures of centrality and dispersion since more complex measures of analysis were used to arrive at a conclusion. To assess the effectiveness of the policy measures (e. g. , market-base mechanisms, regulation) in explaining the trends in emissions of GHG over the years, the regression analysis was conducted. Descriptive analysis provided a breakdown of the magnitude of the policies' long-term impacts and trends in the environmental variables of interest through time-series analysis. Factor analysis was used when examining the moderator relationship between several policies and the interactions between policy components and their moderating effects on the findings' environmental and social aspects.

Also, there was use of interview and policy documents to classify data in a manner that made it easier to determine the themes and patterns. This approach aided in establishing the

antecedent conditions which influence the effectiveness of environmental policies. Qualitative and quantitative research findings made it was possible to capture policy effectiveness as complex construct Peters et al. (2018) which is influenced by context, policy stakeholders and design.

Result and Discussion

Table 1. Regression Analysis Results for the Effectiveness of Environmental Policies

Policy Type	Coefficient (β)	Standard Error	t-Value	p-Value	Significance
Market-Based Policies	0.45	0.08	5.62	0.00003	***
Regulatory Policies	0.32	0.10	3.20	0.0017	**
Voluntary Participation	0.12	0.15	0.80	0.425	NS

The findings of the regression analysis showed that the market-based policies made the largest positive contribution towards minimizing the GHG emissions with coefficient at 0.45, $p = 0.00003$. However, there was no significant difference between the admission acuity level in subgroup 2 and the overall academic emergency medicine cohort, $r = -0$. This shows a very high effectiveness in the case of emissions cut. Sub-regulatory regulations also presented a moderate impact which was significant ($\beta = 0.32$, $p = 0.0017$). On its part, voluntary participation policies were found to have a very weak relationship with emission reductions, which was statistically non-significant ($p = 0.425$).

Table 2. Time-Series Analysis of GHG Emissions Before and After Policy Implementation

Year	GHG Emissions (in MtCO _{2e})	Market-Based Policies Implemented	Regulatory Policies Implemented
2010	9,500	0	0
2012	9,200	2	1
2014	8,800	5	3
2016	8,400	7	4
2018	7,900	10	6
2020	7,500	12	8

From a time, perspective both policies flowchart and time-series indicate that, as more market based and regulatory policies were developed over the time, the emissions of the GHG reduced year by year. Compared with the Reference Scenario, from 2010 to 2020, emission reductions totalled 2,000 MtCO_{2e}, of which 12 are MBPs and 8 are RBPs. These aspirations can be seen to have piled up, thus meaning that the effect of all these policies played a role in decreasing the emissions.

Table 3. Multivariate Analysis of Environmental and Societal Outcomes

Variable	Environmental Impact	Societal Impact	Interaction Effect	Significance
Carbon Pricing	High	Moderate	Strong	0.0004
Emission Trading Schemes	Moderate	Low	Moderate	0.01
Green Subsidies	Low	High	Weak	0.31

In the multivariate analysis, a mastery was established whose results pointed to high influence of carbon pricing on positive environmental changes with moderate overall societal changes whereby the interaction was highly affirmed ($p = 0.0004$). This implies that not only was carbon pricing effective in cutting emission but it also had a positive impact in the society. According to the analysis, emission trading schemes had less on environmental influence while had minimal effects on societal welfare with moderate interaction between the two ($p = 0.01$).

Thus, high over society, green subsidies were rated low over environment with a weak Interaction effect and a poor overall score.

Stakeholder Involvement and Collaboration

"The success of our environmental policies heavily relied on the active participation of local communities and industry players. When they felt excluded from the decision-making process, the policies were met with resistance, which severely hampered their effectiveness."

This quote underscores the relevance of stakeholder engagement who are diverse and multi-disciplinary. This form of resistance noted here is a direct product of exclusion; which means for any policy to be relevant, and implemented it has to be developed through the consultation process involving all the stakeholders. It is advocated that the policy capture of local communities and players in the industry is essential to compliance and policy goal accomplishment.

"Our experience showed that policies developed in isolation by the government often failed to resonate with the on-ground realities. Without input from those directly affected, these policies lacked practicality and often faced implementation challenges."

This quote highlights the issue of lack of participation of the most vulnerable groups in formulation of policies that affect them. Absence of advisory from the end-users in the implementation of the policies makes the policy makers to design policies that cannot be implemented in the actual field hence the implementation challenges. This study underlines the need for an open utilisation of inputs from all the parties concerned in the policy making process.

"Collaborative efforts, where we worked alongside businesses, NGOs, and local governments, proved to be the most successful. Each party brought unique perspectives and resources, which led to more comprehensive and effective policies."

Here, the quote shows the advantages of the shared effort in the policies' creation. An economically feasible and sustainable solution to the environmental problems will be reached since policies developed with input from many individuals and organization will incorporate comprehensive solutions to the challenges. The findings of the research also prove that all groups contribute to the policy implementation positively, thus showing the importance of a policy with multiple actors interested in environmental issues.

Social and Political Context

"In regions where the political climate was unstable, even the most well-intentioned policies failed to make an impact. Without political support, enforcement becomes weak, and policies are often left in limbo."

The result of this quote indicates a relationship that shows political stability as an immense determinant of the effectiveness of environmental policies. Lack of centralized political support and commitment makes it hard to implement policies and hence results to poor implementation. From this finding it could be deduced that for policies to work they must be associated with a stable political setting.

"Policies that were enacted during times of political turmoil were either quickly overturned or never fully implemented. The lack of continuity in governance made it impossible for these policies to achieve their intended goals."

This quote illustrates the issue of policy stability in a political climate that is ever changing. Measures taken in conflict tend to be in practice temporary or lukewarm thus not very effective when testing their probabilities. This suggests that policy gain is acquiescent and constant political will in the long-run is a fundamental element of policy implementation.

"The effectiveness of our environmental policy was largely contingent on the support from local political leaders. When they championed the cause, we saw significant progress; when they didn't, the policy struggled to gain traction."

This quote can be explained by the fact that locally elected political leadership can impact on policy decisions. Blessings of political leaders can go along way in improving the viability of environmental policies as they can guarantee priority as well as efficient implementation is provided. On the other hand, absence of political lobbying slows policy implementation which proves the need for local political engagement in the environment.

Evidence-Based Policy Development

"Policies that were not informed by scientific research tended to be too generic and failed to address the unique environmental issues of our region. In contrast, when policies were based on local data and scientific studies, they were more effective in achieving their goals."

This quote strongly underlines the need to base existing and future policies in scientific findings, especially studies done in the region. Indeed, the general policies produced are not specific enough to address certain environmental issues therefore they tend to be less effective. For this purpose, this study endorses the use of localized scientific study in the formulation of policies.

"We found that evidence-based policies not only performed better but also received greater support from the scientific community and the public. This support was crucial in overcoming opposition and ensuring successful implementation."

This quote goes further in emphasizing on other advantages of EBPM such as the probability of gaining more believability and acceptance among the public. It is vital to reflect that the support of scientific community and informed public opinion can be the key to difficult, but unhampered promotion and realization of the policies. The above discovery makes it clear that there is merit in relying on strong standardized scientific information when making policy choices.

"When we relied on outdated data or ignored recent scientific findings, our policies were quickly rendered obsolete. Environmental issues evolve rapidly, and so must our policies if they are to remain effective."

It is worth illustrating such statement by pointing to the fact that policies should be sensitive to changes in the scientific context as much as possible. Environmental challenges have variabilities hence policies fail to provide solutions as they get out dated. From this analysis it can be concluded that for the various policies to continue to be effective there is need for policy makers to review these policies from time to time using the most current data available.

Commitment to Social Equality and Environmental Justice

"When policies overlook the social dimensions, such as the needs of marginalized communities, they tend to exacerbate existing inequalities rather than alleviate them. This not only undermines the policy goals but also leads to social unrest."

The following quote shows that failure to address social equity in policies will have that effect on the environment. Continued exclusion of these marginalised groups in policies also serve to exacerbate social inequalities, with consequent acts of policy breakdown or subversion. They raise the notion, that for policy to be implemented on environmental conservation, social justice remains core to its formulation.

"Environmental policies that prioritized social equity were not only more successful but also more sustainable in the long term. By addressing the needs of all societal groups, these policies gained broader support and had a lasting impact."

This quote captures the long-term gains which come with bringing social equity when implementing environmentalism policies. When people feel that particular policies are fair and that they are not being discriminated against, then the policies can easily receive the backing of the majority of people and will sustain itself. Consequently, this study re-emphasises the need to consider social justice principles while designing and planning for such environment solutions.

"Ignoring the intersection of environmental and social issues creates a blind spot in policy-making. Policies must be designed to address both environmental outcomes and social justice if they are to be truly effective."

They also showed that environmental and social concerns are closely linked as the following quote will illustrate. Each aspect of the issue must be taken care of to install effective policies that will be of maximum utility. Exclusion of social aspects in environmental problems may result to suboptimal solutions that do not adequately tackle problems. This finding implies that for policy intervention to be effective and sustainable, it has to consider a double-loop learning approach that combines consideration of environmental sustainability as well as social justice.

An argument suggested from the research was that the engagement of the stakeholders including the locals, industry personnel, groups, and NGOs was of significant importance in the successes of the environmental policies. This finding is in line with the theory of collaborative governance which hold that policy is likely to work, if policies are developed and implemented through the participation of different stakeholders, (Newig et al., 2018; Gash, 2022). The resistance that was experienced whenever stakeholders were excluded, as mentioned in this study, is evidence that supports the widespread failure of top-down methods because the intended recipients are not on board.

On the same note, this study also implies that just the involvement matters, the quality of the involvement counts too. Current policies that fail to incorporate advices from stakeholders or policies formulated independently are likely to lack.

Those policies which have been formulated independently or with limited involvement of different stakeholders are usually lacking realistic measures, which are very vital when it comes to implementation. This finding supports the position taken by Blühdorn & Deflorian (2019) in stating that collaborative governance has to involve more than simple involvement of stakeholder but must engage stakeholders in a profound and sustained manner.

Thus the social and the political context was considered to be a significant factor in the implementation of environmental policies. This factor indicated that, policies in politically stable nations were more often implemented and maintained to their optimal. This result is in consonance with Knill et al. (2010) who posit that the political environment has an impact on policies on environment. The issues highlighted in this study including policy inertial in politically instable areas convey the importance in establishing proper governance structures that can sustain meaningful and long term policy delivery.

Local political leadership was also identified by the study as having a key factor when it comes to environmental policies success. If local leaders supported environmental issues, then policies were realized as well as being advocated for vigorously. This observation is in consonance with Goodman (2012) who posited that even though national level policies may be effective, local leadership is central to bringing such changes in the local arena. However, this study contributes to the argument by proposing that local political support has to be supported by general political stability to guarantee the policies' continuity.

One of the most common messages highlighted in this study was an emphasis of the need to base policies on scientifically informed solutions. When the local scientific data was used to come up with the policies it was noted that these had better impacts due to the fact that they had taken into account the current environmental concerns within the region. This discovery is in approving with other research studies that support the application of a knowledge based approach to policy formulation and implementation to improve on the outcomes of the policies made. The study supports Niemeier et al. (2016) assertion that strong and site-specific evidence is essential for forming more adequate and nuanced environmental policies to confront the issues of climate change.

Furthermore, the research also established that, when stakeholders and policymakers were put alongside evidence based policies they preferred them to scientific practices. This applies with the observation of Bozeman & Sarewitz (2011) who posited that, legitimacy and acceptance of policies improves when such policies are scientifically informed. The study concludes that regular revision of the policy driven by recent scientific information is important for policy remained current and effective, an aspect also proposed by Weible et al. (2020) on the issue of adaptive governance.

Finally the study emphasized social equity and environmental justice that should form part of environmental policies. Implementation of policies that failed to foster these dimensions actually compounded existing inequalities thus meeting resistance and negated policy objectives. This is contrary with the emerging trends in Environmental Justice where the authors argue that for policies to have any impacts they need to consider the needs of the minorities. Thus, the study is in support of the contention made by Ciple (2021) that environmental justice should always be a core consideration when developing policies in order to ensure that policies do not impose undue costs on disadvantage groups. It also stated on the fact that, policies promoting equality had higher chances of succeeding as well as those that were more sustainable. This assertion tallies with ideas of just sustainability these preposterous claims affirm that sustainability needs social justice coefficients. It is the study's conclusion that an advocacy of social justice as well as environmental justice is both, moral and pragmatic, in attaining efficient and sustainable environmental policies.

CONCLUSION

This research has aimed at analyzing all the factors that differentiate between the effectiveness of environmental policies in minimizing impacts of climate change. These findings also highlight the best practices, or lack of, in terms of stakeholder engagement, political and social stability, rigorous scientific-informed policy-making, and a sincere and proactive concern for social and environmental justice. challenges are not only crucial to the effective development of policies but also for its sustainability as well as further effectiveness after the policy work has been accomplished. The results of this study show that the effectiveness of the environmental policies is best, when they are adopted after consultation and co-creation by all stakeholders, who will ensure that the policy proposed is implementable and endorsed by the majority. Analysing the preconditions for a successful policy, political stability and local political support are also important since the policy should be implemented and enforced stably. Further, the study also underscores the need for policy formulation that incorporates empirical evidence as well as scientific research findings with respect to the local environmental problems in an effort to enhance the effectiveness of the policies put in place. Also it was established in the study that the policies that give priority to the concerns for social justice and equity and environmental justice are the policies which are more likely to be successful in the long run and to contribute to the creation of the society of the future that would be more fair and sustainable. This finding, therefore, underlined the fact that environmental policies cannot afford to be environmental policies, alone but have to factor in the social issues to be relevant.

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