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MEASURING CLIMATE AND CLIMATE POLICY UNCERTAINTY FOR PAKISTAN

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Abstract

This paper measures climate policy uncertainty and climate uncertainty for Pakistan using news from leading English newspapers. Multiple spikes are visible in the indices, which capture catastrophic events due to climate change and climate-related policies. For example, all the indices capture major events such as the floods of 2010 and 2022, the launch of the National Adaptation Plan, National Electric Vehicle Policy Implementation, and the launch of the National Action Plan for Combating Desertification, to name a few. This paper also provides the first-of-its-kind discussion of climate adaptation versus climate mitigation for an emerging market economy. Using a vector autoregressive model for our empirical analysis, we show that an increase in CO_2 emissions increases economy-wide climate uncertainty significantly, while a shock to climate policy uncertainty leads to a significant decrease in CO_2 emissions. The Boston Consulting Group estimated that 80 per cent of Pakistan's climate financing was directed towards mitigation efforts. Although Pakistan has initiated several policies towards climate mitigation, this paper recommends that it still needs to work on measures such as operationalising carbon pricing, public-private partnerships for green infrastructure, and large-scale energy efficiency programs.

Keywords: Climate Uncertainty, Climate policy Uncertainty, CO_2 emissions, Pakistan, Adaptation, Mitigation.
JEL Classification: G12, G18, Q5.

I. Introduction

Policies that might be capable of addressing climate change have attracted significant attention globally and at the national level [Tompkins and Adger (2005)]. As a result, countries worldwide have been compelled to mitigate the effects of climate change and adapt to its disastrous impacts. Pakistan, like many other countries that are vulnerable to climate change, faces challenges in coping with the ramifications of climate change, which have unfolded in various forms, including extreme weather events [Khan, et al., (2016)].

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Two examples of such events in Pakistan are the unprecedented floods in 2010 and 2022. The devastating flash floods affected millions of people and resulted in significant loss of life and destruction of physical infrastructure, highlighting the country's vulnerability to changing climatic conditions. Due to the floods in 2010, almost 20 million people were displaced, physical infrastructure amounted to US Dollars ($) 9.5-10 billion was lost, and the economic growth rate of the country witnessed a decline from 4.5 to 2.5 per cent; in 2022, about 33 million people were displaced, and physical infrastructure worth $11 billion was lost [Kiani (2022)]. After 2010, considering the disastrous effects of such events, forming and implementing policies that can address this issue of climate change, the Government of Pakistan created the Ministry of Climate Change and Environmental Coordination (MOCC) in August 2017.

Although MOCC, like many other institutions across nations, has dedicatedly worked to formulate policies to address climate change-driven events, this has not been a smooth journey for several reasons. First, effective policies to address climate change involve complexity due to the multifaceted nature of the issue, which encompasses not only environmental factors but also social, economic, and political dimensions. Hence, all these interconnected factors must be considered to develop a comprehensive policy framework. Second, it is essential for countries to build an understanding of the current state of uncertainty to develop sound policies for continued and sustained economic growth. This problem stems from the fact that the effects of rising temperatures, extreme weather events, and rising sea levels are well documented, but transforming such information into concrete policy actions poses a formidable challenge to policymakers.

The first index to compute news-driven policy uncertainty of any form is the Economic Policy Uncertainty (EPU) index by [Baker, et al., (2016)]. Their methodology, with and without minor modifications, has resulted in constructing many other indices related to numerous aspects of finance, economics, and energy uncertainty. A recent addition to these indices is the Climate Policy Uncertainty (CPU) index for the United States (US), introduced by Gavriilidis (2021). Motivated by the current state of interest in the subject of climate change, this paper formulates the climate uncertainty (CU) and climate policy uncertainty index (CPU) for Pakistan.

Like Gavriilidis (2021) and Lee and Cho (2023), this paper contributes to multiple strands of literature. First, it constructed the CPU index for an emerging market economy using newspapers. Second, this paper is the first to measure the climate uncertainty (CU) index using the leading newspapers in a country.[1] Third, it contributes to the growing literature of formulating and testing alternative economic indicators for unobservable concepts such as the EPU, CPU, and policymakers' uncertainty [Tumala, et al., (2023) and Cieslak, et al., (2021)].

[1] Such an index is absent for the economy of the United States up till today, that is, February 21, 2024, and authors are in the process of measuring one for the US economy.

The rest of the paper is organised as follows: Section II presents the methodology used for constructing the indices. First, it shows that the information content in these indices explains the climate-related variable of interest using Sims's vector autoregressive (VAR) model (1980). Second, it aims to publicly provide these indices to researchers for further research on climate relations to Pakistan's economy. Section III presents an analysis of adaptation versus mitigation against climate change in Pakistan using information drawn from newspaper methodology. Section IV contains the output from an empirical exercise using these indices, while Section V concludes the paper.

II. Methodology and the Indices

To construct the Cu and CPU indices[2] For Pakistan, following the methodology of Baker, et al. (2016), it has now become standard for indices of policy uncertainty of different types. We search the newspaper articles in two and four leading newspapers in Pakistan to construct CU-2, CPU-2, and CU-4, CPU-4 index, respectively.

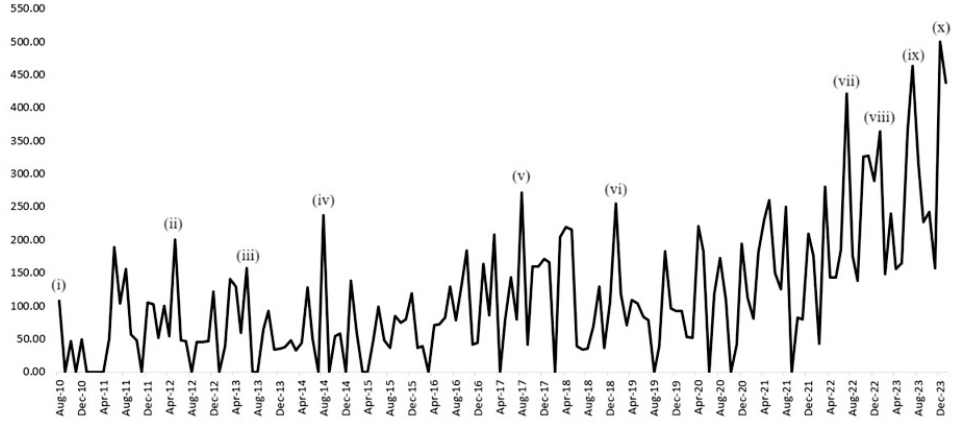
1. Climate Uncertainty Index

Following Lee and Cho (2023), for CU indices, we search the terms {"Pakistan", "Climate", and "Uncertain$"}. For CU-2, we conduct this exercise from August 2010 to January 2024; for CU-4, we perform this exercise from January 2015 to January 2024. As with the standard methodology, we scale the total number of relevant articles in a month for each newspaper by the total number of articles published during the same month. Next, these series are standardised to have a unit standard deviation, which is then averaged each month. Finally, the average series is normalised to have a mean value of 100 for the whole period. The CU-2 and CU-4 are plotted in Figures 1 and 2, respectively.

2. Climate Policy Uncertainty Index:

The Search terms for CPU indices are: {"uncertainty" or "uncertain", or "uncertainties") and {"carbon dioxide" or "climate" or "climate risk" or "greenhouse gas emissions" or "greenhouse" or "greenhouse emissions" or "GHG" or "CO2" or "emissions" or "global warming" or "climate change" or "green energy" or "renewable energy" or "environmental" or "net zero" or "net carbon" or "net-zero" or "net-carbon" or "environmental coordination"} and {"regulation" or "regulatory" or "regulator" or

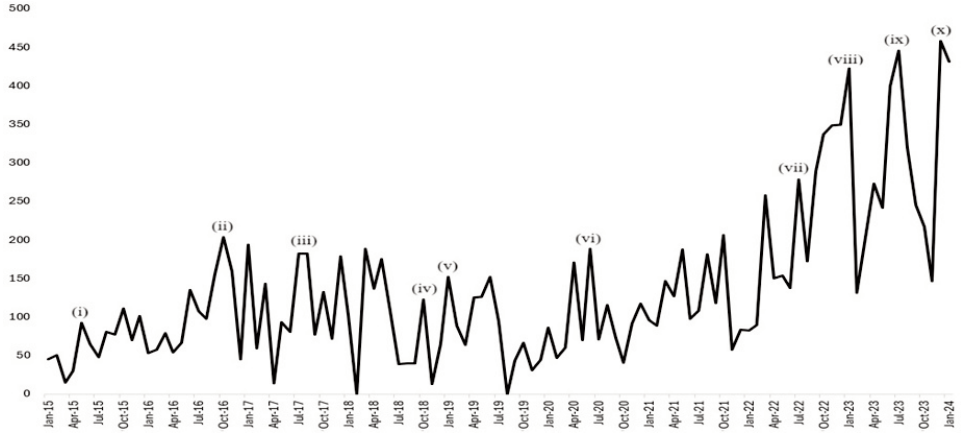
[2] This paper computes two variants of the CPU and CU indices for Pakistan. First, CU-2 and CPU-2 are based on two newspapers. (1) Business Recorder and (2) Express Tribune, available since August 2010. Second, CU-4 and CPU-4, based on four newspapers, (1) Business Recorder, (2) Express Tribune, (3) DAWN, and (4) The NEWS, of which DAWN and The NEWS are available from January 2015. The source of the newspapers is Dow Jones Factiva.



Source: Constructed using two newspapers (CU-2)
Notes: In Figure 1, we mark 10 events, especially covering the ones that can increase climate uncertainty, such as a catastrophe. Events are: (i) Floods hit Pakistan - August 2010, (ii) Pakistan releases its first National Climate Change Policy – July 2012, (iii) The Asian Development Bank (ADB) approves funding for climate resilience projects in Pakistan – June 2013, (iv) Floods in Punjab, Khyber Pakhtunkhwa, and Azad Kashmir provinces – August 2014, (v) Floods in the provinces of Sindh and Balochistan – August 2017, (vi) Government unveiled National Climate Change Policy Implementation Framework – January 2019, (vii) Floods hit Pakistan – August 2022, (viii) National Clean Air Policy, (ix) National Adaptation Plan (NAP) submission to UNFCCC – August 2023, (x) COP28 – December 2023.

FIGURE 1

Climate Uncertainty



Source: Constructed using four newspapers (CU-4)
Notes:In Figure 2, we mark 10 events, especially covering the ones that can increase climate uncertainty, such as a catastrophe. Events are: (i) Sindh Environmental Protection Agency's seminar on "Climate Change and Food Security" – May 2015, (ii) Bonn Climate Change Conference – June 2016, (iii) Floods in the provinces of Sindh and Balochistan – August 2017, (iv) Severe air pollution issue in Major cities– October 2018, (v) Govt Unveiled National Climate Change Policy Implementation Framework – January 2019, (vi) Floods in the provinces of Sindh and Balochistan – July 2020, (vii) Floods hit Pakistan – August 2022, (viii) National Clean Air Policy, (ix) National Adaptation Plan (NAP) submission to UNFCCC – August 2023, (x) COP28 – December 2023.

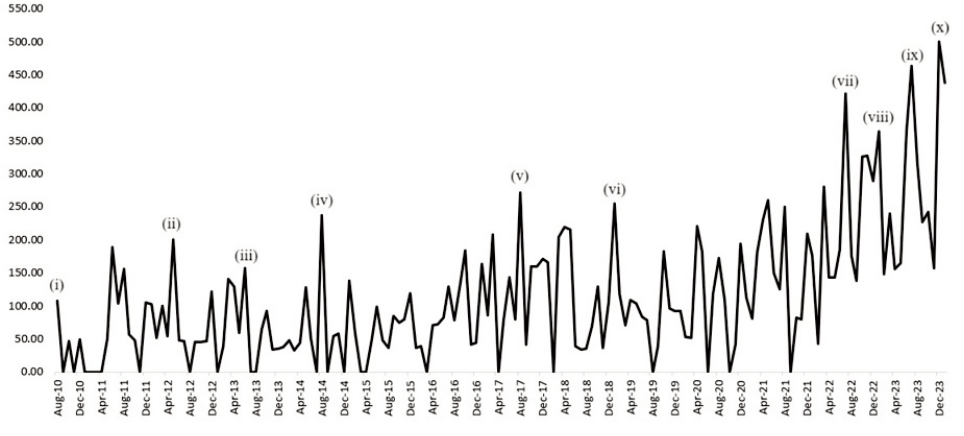
FIGURE 2

Climate Uncertainty

"legislation" or "Parliament" or "Government" or "Senate" or "EPA" or "law" or "policy" or "policies" or "strategy" or "Strategies" or "Framework" or "Plan" or "Action" or "Pak-EPA" or "Pak EPA").

The search terms are different for the construction of CPU-2 and CPU-4, but the methodology after obtaining the article count through the query is the same as the CU-2 and CU-4. Figures 3 and Figure 4 contain the CPU-2 and CPU-4 index. All these indices capture major events that add to climate uncertainty in general, captured by CU indices, as well as events specific to climate-related policy uncertainty. The spikes in both indices show these events, and they are explained with the help of newspaper articles that were searched for during the construction of the indices. Some of the events from these spikes presented in Figures 1 through Figure 4 are discussed in detail below:

After the floods of epic proportions in Pakistan in 2010, the country launched its first-ever National Climate Change Policy. In resonance with the National Climate Change Policy, Sindh Province, which was severely hit by the floods, also circulated a similar policy in 2012 [Mumtaz (2018) and Directorate of Climate Change (2022)].

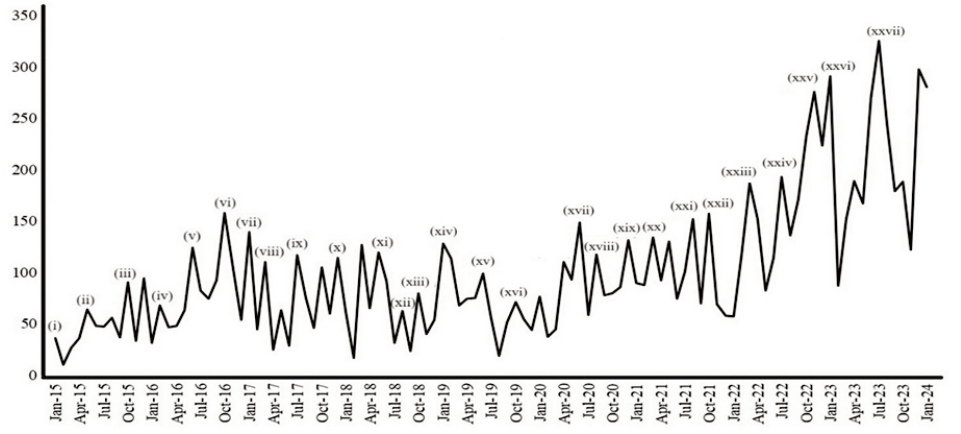


Source: Constructed using two newspapers (CPU-2)

Notes:In Figure 3, we mark 30 events, especially covering the ones that could trigger climate policy uncertainty, such as a catastrophe. Events are: (i) Floods hit Pakistan 2010, (ii) Launch of the National Adaptation Plan, (iii) Pakistan releases its first National Climate Change Policy, (iv) Restructuring of the National Disaster Management Authority, (v) Draft Sindh Climate Change Policy circulated, (vi) Approval of the Pakistan Climate Change Policy Implementation Plan, (vii) Asian Development Bank approves funding for climate resilience projects in Pakistan, (viii) Hydel Power Policy 2013 announced, (ix) Negotiations leading up to the Paris Agreement adoption, (x) Pakistan launches the Green Pakistan Program, (xi) Launch of the Pakistan Green Growth Strategy, (xii) Pakistan submits its Intended Nationally Determined Contributions to the UNFCCC, (xiii) Pakistan Climage Change Act 2017 (draft stage), (xiv) Pakistan Climate Change Act, 2017, (xv) Pre-COP23 Consultative Dialogue, (xvi) Launch of the Billion Tree Tsunami Program, (xvii) Pakistan hosted the Asia-Pacific Climate Week, (xviii) Government Unveiled National Climate Change Policy Implementation Framework, (xix) National Electric Vehicle Policy Implementation, (xx) Continued Implementation of Billion Tree Tsunami, (xxi) Flooding in Sindh and Balochistan provinces (xxii) UN Climate Action Summit, (xxiii) Government unveils the Climate Change Adaptation Policy, (xxiv) Pakistan's active participation in COP26, (xxv) Launch of National Action Plan for Combating Desertification, (xxvi) Floods hit Pakistan 2022, (xxvii) COP27, (xxviii) National Clean Airr Policy, (xxix) National Adaptation Plan submission to UNFCCC, and (xxx) COP28.

FIGURE 3

Climate Policy Uncertainty



Source: Constructed using four newspapers (CPU-4)
Notes:In Figure 4, we mark 27 events, especially covering the ones that could trigger climate policy uncertainty, such as a catastrophe. Events are: (i) Kyoto Protocol, (ii) SEPA's seminar on "Climate Change and Food Security", (iii) COP21, (iv) National Forest Policy, (v) Bonn Climate Change Conference, (vi) Pakistan ratified the Paris Agreement, (vii) Climate Change Act 2017 (draft stage), (viii) Pakistan Climate Change Act, 2017, (ix) Pre-COP23 Consultative Dialogue, (x) COP23, (xi) Bonn Climate Change Conference, (xii) Climate Change and Sustainable Development in Asia - Regional Dialogue, (xiii) 48th Session of the Intergovernmental Panel on Climate Change, (xiv) Government Unveiled National Climate Change Policy Implementation Framework, (xv) Bonn Climate Change Conference, (xvi) National Electric Vehicle Policy Implementation, (xvii) Continued Implementation of Billion Tree Tsunami, (xviii) UN Climate Action Summit, (xix) Government unveils the Climate Change Adaptation Policy, (xx) Govt updated the National Adaptation Plan, (xxi) Climate Ambition Summit, (xxii) Launch of National Action Plan for Combating Desertification, (xxiii) Floods hit Pakistan 2022, (xxiv) COP27, (xxv) International Conference on Climate Resilient Pakistan, (xxvi) National Adaptation Plan submission to UNFCCC, (xxvii) COP28.

FIGURE 4

Climate Policy Uncertainty

In line with the policies mentioned earlier, a Hydel Power Policy was also introduced in 2013 to encourage energy production through renewable energy sources Ministry of Water & Power (2013). Another milestone was achieved in 2014 when Pakistan embraced Paris Agreement commitments to decrease carbon emissions. Subsequently, the country submitted its intended nationally determined contributions to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015 [Finance Division (2018)].

After years of consultative process, a climate change Act was promulgated in 2017 that drew attention to the harrowing impacts of climate change and called for collective actions to cope with these drastic issues. This act called for urgent actions to deal with rising average temperatures in the country [Khan and Irfan (2018)]. A massive countrywide campaign, especially in Khyber Pakhtunkhwa Province, was initiated in 2018 named the 'Billion Tree Project' that was aimed at dealing with global warming and improving the ecosystem that had been spoiled by years of deforestation [Aleem, et al., (2024)].

The policies mentioned earlier paved the way for unveiling the National Climate Change Policy Implementation Framework in 2019 with an ambition to take more pragmatic steps to deal with climate change. An immediate outcome of this framework was the National Electric Vehicle Policy issued in 2019, which stressed the need to go green by adopting electricity-powered vehicles [Ministry of Climate Change (2019)]. Although several mitigation policies had been issued from time to time, less emphasis was given to adaptation policies. A Climate Change Adaptation Policy was introduced in 2021 to fill this gap. This policy culminated in a National Adaptation Plan submitted to UNFCCC in 2023.

III. Mitigation and Adaptation - Rhetoric of Climate Change Overtime

The discussion earlier shows that Pakistan, at greater risk of Climate Change, has continued to pay attention to Climate Change Mitigation and Adaptation strategies after 2010. To that end, numerous initiatives have been undertaken today [Finance Division (2024)]. Furthermore, it is worthwhile to mention that Pakistan's share of global greenhouse gas emissions remains less than 1 per cent. However, several bodies have identified the country as one of the countries at greater risk of climate change [Finance Division (2024)]. According to the World Bank[3], Pakistan, one of the top 40 vulnerable countries to climate change, has worked more towards mitigating the adverse effects than adaptation over time. To find out if this is the case, the paper discusses the evolution of rhetoric about climate adaptation and mitigation in Pakistan over time in the news media.

This information helps to discern the focus of the climate change discourse from January 2015 to December 2023. This paper analyses the situation by constructing two normalised indices for adaptation and mitigation based on four newspapers.

The methodology for constructing these indices is the same as the creation of the CU and CPU. The two distinct indices are based on the following wordlists: For adaptation, the search terms are {"Pakistan" and "Climate" and "Adaptation"} and for mitigation, we search for the terms {"Pakistan" and "Climate" and "Mitigation"}. The presence of these three words in an article shows the orientation of discussion towards adaptation or mitigation. The events related to climate adaptation or mitigation explained by spikes are available in the newspapers searched to construct these indices; some are discussed below.

Figure 5 presents these indices. It is not surprising that there has been a notable increase in both adaptation—and mitigation-related discussions since May 2022, which reached its peak in September 2022 on account of unprecedented floods that caused havoc across the country. These floods ignited discussions on climate change and the remedial measures to be implemented to cope with its harrowing impacts.

[3] The link to World Banks Climate Change Knowledge Portal Pakistan's page is at: Pakistan - Vulnerability | Climate Change Knowledge Portal.

As noted earlier, Pakistan's contributions to the global greenhouse gas (GHG) emissions are less than 1 per cent. However, the country continues to take measures to further decrease these emissions in line with its ratification to the Paris Agreement.

Countries that ratify the Paris Agreement can suggest their own Nationally Determined Contributions (NDCs), which gives them a certain degree of flexibility to choose what measures are most feasible for them. Some of the salient policies in Pakistan along these lines are the National Electric Vehicles Policy (2019), the National Climate Change Policy (2021), and the National Clean Air Policy (2023)

We can also see a rising trend in the discussions on adaptation, which indicates the ever-growing need to mobilise resources to limit damage in the face of climate change shock. A developing country like Pakistan, which ranks amongst the most vulnerable countries to Climate Change despite minuscule emissions, seeks justice through greater Climate Finance flows.

IV. Data Analysis and Discussion of Results

We conduct an empirical analysis using our indices to determine if the CU and CPU indices formed in Section 2 carry information that is useful for economic and climate policy analysis. First, we attempt to find if an increase in carbon emissions leads to an increase in CU. Second, we attempt to determine if CPU affects the CO_2 emissions in Pakistan.

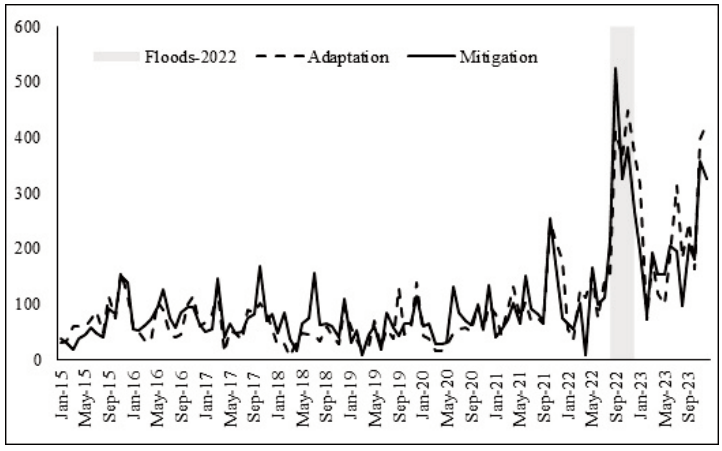
This paper uses Vector Autoregressive (VAR) utilising monthly data for this analysis. A standard VAR model is specified as follows in Equation (1):

$$Y_t = c + \theta_i \sum_{i=1}^{n} Yt\text{-}i + \varepsilon_t \quad (1)$$

Where Y_t is a vector of endogenous variables at time *t, c* is the vector of constants, θ_i's are the parameters, and ε_t is the uncorrelated white noise disturbance terms. In each of the models.

We estimate below the variables contained in vector Y_t are listed according to the Cholesky ordering used in that model.

The data on CO_2 emissions (CO2) for Pakistan is only available at an annual frequency from 1980 to 2021 from the Energy Information Administration. The paper uses CO_2 emissions as a measure of environmental degradation as it has been the leading cause of environmental dilapidation worldwide and in Pakistan [Sun (2023), Ali and Mujahid (2024)]. Our other variables are Electricity Generation (EG), which is used as a proxy for energy consumption, available monthly from July 2012 to January 2024 and the Quantum Index of Large-Scale Manufacturing Industries, commonly known as the Industrial Production (IP), which is used to proxy economic activity, available for the whole time-period covering our indices.



Source: Constructed using four newspapers.

FIGURE 5

Adaptation and Mitigation Rhetoric in the News Media

Data on EG are taken from the National Electric Power Regulatory Authority (NEPRA) website, and data on IP is taken from the Pakistan Bureau of Statistics (PBS) website. Next, the paper generates the monthly series of CO_2 emissions based on EG and IP in the following way:

Step 1: The EG and IP are tested for seasonality and adjusted both using the X-12 method of the US Census of Bureau.[4]

Step 2: Each month's IP is divided by the sum of the IP of the same year, thus getting a fraction of the economic activity that took place in that month of the year. Let us call it $IP_{s,t}$.

Step 3: Each month's EG is divided by the sum of EG of the same year, thus getting a fraction of the electricity generated in that month of the year. Let us call it $EG_{s,t}$.

Step 4: The following formula[5] is then applied to compute the CO_2 emissions due to IP and EG:

$$CO2_t = (½* \ IP_{s,t} + ½* \ EG_{s,t})* \ CO2\_emission_T \quad (2)$$

[4] The United States Bureau of Census is a government body responsible for collecting and analyzing demographic and economic data for the US economy. It pioneered seasonal adjustment methods for time series analysis, including the widely used X-12 ARIMA procedure.

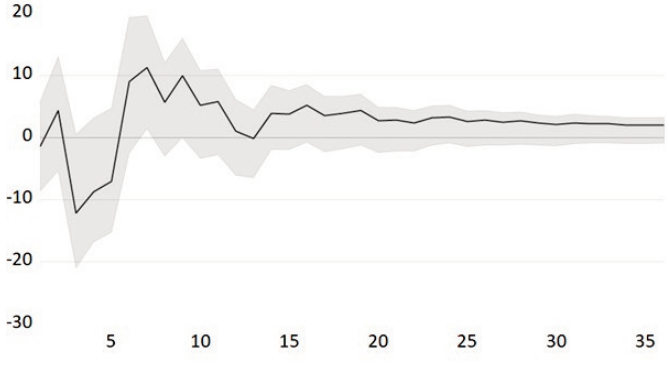
[5] This paper also used the principal component analysis (PCA) to assign weights to IP and EG. However, the results of the VAR models using this index qualitatively remained the same. These results are available from the corresponding author upon a reasonable request.

Where *t* goes from 1 to 12, s is the share from month 1 to 12, while T extends from 2013 to 2021 and represents the year of the CO_2 emissions data. This procedure helped us construct a monthly CO_2 series for Pakistan from January 2013 to December 2021 (9 years * 12 = 108 observations).

1. Analysis Using CU Indices

First, results from the VAR model containing variables log of IP, log of EG, log of CO2 and CU-2 are reported. The sample extends from January 2013 to December 2021. The following Cholesky ordering is used for the analysis: log of IP, log of EG, log of CO2, and CU-2. To give empirical model support from economic theory, we give it an economic structure using the Cholesky decomposition. The Cholesky ordering assumes that a greater level of economic activity will produce a higher level of energy. Thus, more carbon emissions would take place, which will ultimately lead to an increase in climate uncertainty in the economy. The lag length of the VAR is selected through Bayesian Information Criteria (BIC) [Schwarz (1978)]. We expect that a positive one standard deviation shock to CO2 will lead to a significant increase in CU-2.

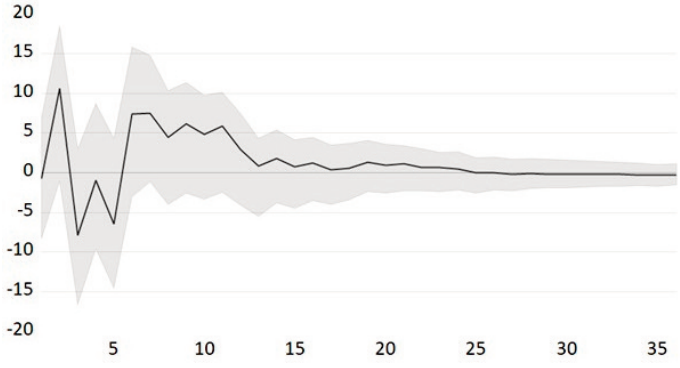
Figure 6 contains the response of CU-2 to a one-standard-deviation shock to CO2. Figure 6 shows that a one standard deviation shock to CO2 emissions produced a significant and positive effect of 1 unit on CU-2 7 months after the shock and remained insignificant otherwise. Second, results from the VAR model containing variables log of IP, log of EG, log of CO2, and CU-4 are reported in Figure 7. The sample ranges from January 2015 to December 2021 (7 * 12 = 84 observations). The following Cholesky ordering is used for this model: log of IP, log of EG, log of CO2 and CU-2. The lag selection and rationale behind the ordering remain the same as with the CU-2 analysis.



Note: The solid black line is the impulse response function of CU-2 to a one standard deviation shock in CO_2 emissions. The grey area represents the 90 per cent confidence level. Impact magnitude on the y-axis and months on the x-axis.

FIGURE 6

Response of CU-2 to a shock in CO_2 emissions



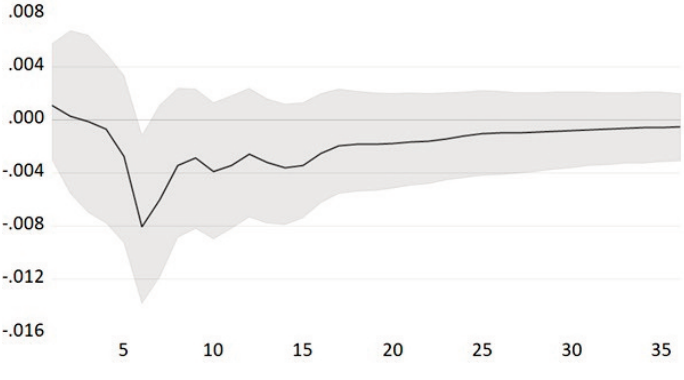
Note: The solid black line is the impulse response function of CU-4 to a one standard deviation shock in CO_2 emissions. The grey area represents the 90 per cent confidence level. Impact magnitude on the y-axis and months on the x-axis.

FIGURE 7

Response of CU-4 to a shock in CO_2 emissions

2. Analysis Using CPU Indices

First, the results of the VAR model containing variables CPU-2, log of IP, log of EG, and log of CO2 are reported. The sample extends from January 2013 to December 2021. Following Gavriilidis (2021), this paper uses the following Cholesky ordering: CPU-2, log of IP, log of EG (a proxy for energy consumption), and log of CO2. The lag length of the VAR is selected through Bayesian Information Criteria (BIC). Like Gavriilidis



Note: The solid black line is the impulse response function of CO_2 to a one standard deviation shock in CPU-2. The grey area represents the 90 per cent confidence level. Impact magnitude on the y-axis and months on the x-axis.

FIGURE 8

Response of CO_2 to a shock in CPU-2

(2021), a positive one standard deviation shock to CPU-2 is expected to lead to a significant decrease in CO2.

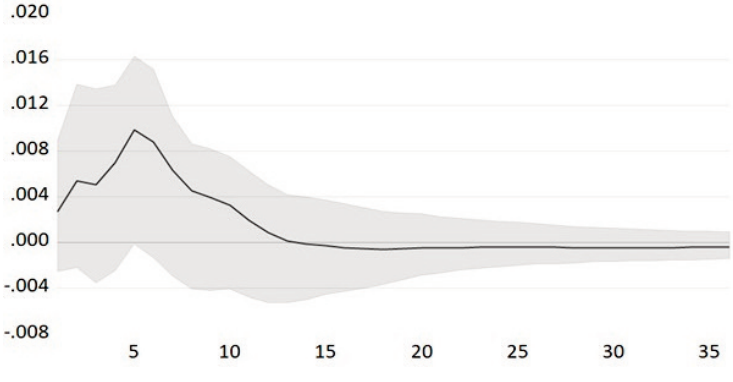
Figure 8 contains the response of CO2 to a one standard deviation shock to CPU-2. Figure 8 shows that a one standard deviation shock to CPU-2 produced a significant and negative effect of 0.11 per cent unit on CO2 in the sixth month after the shock and remained insignificant otherwise.

Second, the results from the VAR model containing variables CPU-4, log of IP, log of EG, and log of CO2 are reported. The sample extends from January 2015 to December 2021. Lags are chosen using the BIC, and the ordering is the same as the case with CPU-4.

Figure 9 contains the response of CO2 to a one standard deviation shock to CPU-4. Figure 9 shows that a one standard deviation shock to CPU-4 does not produce any significant impact on CO2 for 36 months after the shock. Like our finding related to CU indices, the paper shows that, on balance, results reveal that the impact of CPU indices on CO2 is not persistent, and it affects CO2 in Pakistan negatively and significantly only with a lag.

V. Conclusion and Recommendations

This paper has measured climate policy uncertainty and climate uncertainty for an emerging market economy using news from leading English newspapers of the country. Two variants of both these indices are computed depending upon the availability of two against four daily newspapers over time. Both forms of indices capture important events such as the devastating floods of 2010 and 2022, the National Adaptation Policy Formulation and Implementation, the Pakistan Climate Change Act, 2017, and the National Electric Vehicle Policy Implementation.



Note: The solid black line is the impulse response function of CO_2 to a one standard deviation shock in CPU-4. The grey area represents the 90 per cent confidence level. Impact magnitude on the y-axis and months on the x-axis.

FIGURE 9

Response of CO_2 to a shock in CPU-4

Climate uncertainty arises due to an actual climate change-driven event such as a flood or due to an increase in the probability of such an event taking place due to climate change. Therefore, through the empirical exercise, this paper shows that a higher level of electricity generation and economic activity causes CO2 emissions to rise, thus increasing climate uncertainty significantly. On the other hand, like Gavriilidis (2021), we find that climate policy uncertainty decreases CO2 emissions significantly.

Potentially, the climate uncertainty indices can be used by climate-sensitive firms at the time of investment, specifically in the agriculture sector, which, due to the high frequency of floods in Pakistan, is quite vulnerable to climate change. For climate policy uncertainty, one potential area of research could be the impact of this indicator on stocks of climate-sensitive/green business firms.

Pakistan has already initiated several policies aligned with the global best practices in climate mitigation and adaptation, but significant gaps remain in fully implementing a comprehensive set of policy mix. To bridge these gaps, Pakistan must establish a robust institutional framework that integrates climate policies with development planning. For instance, introducing carbon taxes or cap-and-trade systems could incentivise industries to adopt low-carbon technologies while generating revenue for further mitigation and adaptation projects. Finally, both these indices and their variants will be available for academicians, practitioners, and researchers.

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