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How does net official development aid impact international climate ambition for developing states?

Abstract

This study assesses the impact of net official development aid (Net ODA) on international climate ambition within developing states. A quantitative ordinarily least squares regression was conducted to determine the relationship between Net ODA along with a range of factors. These include climate vulnerability, level of democracy, and fossil fuel rent on international climate ambition within a sample of 98 developing countries. The purpose of this study was to determine if the amount of aid a country received would profoundly increase their international climate ambition (Nationally Determined Contributions or NDCs). I hypothesized that an increase in total Net ODA would increase the overall climate ambition for developing states. The results indicate that there is no relationship between the amount of Net ODA a country receives and overall climate ambition. Conversely, other factors, such as states' vulnerability to climate change, were found to increase climate ambition while states' coal rents tended to decrease overall international climate ambition. This conclusion displays how international organizations could assist developing states threatened by climate change through climate adaptation goals and transition from fossil fuel dependence to improve climate ambition.

Introduction

The 2015 Paris Accord demonstrated a bottom-up approach where states could lower their carbon emissions and limit their global temperature increase to 1.5°C (UN Synthesis Report 2021). 195 states committed to NDCs to quantify and attain emission and temperature reduction through the U.N Climate Change Framework (UNCCF). Though a high volume commitment, there is an uncertainty around the climate ambition level of states (Holz et al 2017, Tobin, 2017). In this study, climate ambition is measured as the estimated temperature rise compatibility of NDCs mitigation targets, discussed further in the limitations section.

Scholars such as Pauw and Klein argue that it remains extremely essential to understand the factors that impact climate ambition to increase global NDC commitments. And to create better accountability and transparency standards with developing states (2019). Roser et al emphasizes there is miniscule literature on the NDC preparation process and the factors that influence that process (2020). Climate ambition can lead to implementations of NDC's if those supporting developing states continue to understand the root causes of why countries differentiate in NDC commitments. How does net (ODA) impact international climate ambition for developing states? How do other factors such as level of democracy, fossil fuel rent (coal, oil, and natural gas), or climate vulnerability impact international climate ambition for developing states?

The paper structure will be developed as follows. First I will review relevant literature on current answers to variation in developing nation's climate ambition. Next, I put forward a central hypothesis from these answers along with three alternative hypotheses. Moreover, the next section outlines data sources and methods with a results/discussion section following the

methodology. Finally, the paper discusses possible implications of this research and provides conclusions to the study.

Literature Review

Variables influencing developing states' climate policy ambition capture a wide net. Political party affiliation, whether left-wing or right-wing, has been found to impact climate policy (Kim, & Son, 2017). Other authors have claimed that this variation among developing states can be explained by environmental policy prioritization (Knill, Debus and Heichel, 2010). Some scholars argue that civil society and petroleum lobby organizations have a significant impact on climate ambition. These theories offer weaker links to climate ambition in developing states as 2010 studies such as Knill, Debus and Heichel only review 18 OECD countries (Van Coppenolle, 2020). Other factors offer much stronger linkages. For example, studies on a state's democracy have been linked to developing nations' climate ambition.

Critics of the democracy hypothesis reference the theory of 'authoritarian environmentalism', highlighting that democracies are too weak to make substantial gains in changing markets to protect the environment (Clulow, 2019). Authors such as Bang, Underdal, & Andresen discuss how there are multiple variables to consider when assessing democracy. These include influence of interest groups, fragmentation of political institutions, and multi-level governance (2015). Clulow argues that authoritarian systems can make firm decisions on climate policy (Clulow, 2019). Giley stresses how elites in authoritarian regimes have more control on corruption and can make general policy decisions on the environment without pushback (2012). Elitism and leadership have also been argued in support of democracy. A central argument to the democracy theory is that leaders in democratic states tend to focus on environmental protection more than non-democratic leaders (Battig & Bernauer, 2009). The reasoning is an elite-based

argument, as democratic elites have less overall control over politically elected representatives. In democracy, having greater representation of public needs would provide an emphasis on public goods (Battig & Bernauer, 2009). Torstad et al's 2020 study found that democracy is linked with climate ambition at a global scale. Developing nations tend to lead to more hybrid models of democracy or choose authoritarian regimes. Other scholars point out it is not just institutions that influence climate policy, but also the resources a state contains.

No current literature suggests that having existing fossil fuel infrastructure is helpful in achieving climate ambition. Scholars have stated the time frame over which states have industrialized may have an impact on how their climate ambition policies have developed (Gyamfi et al, 2021). States that were able to industrialize early with fossil fuels, the majority of developed nations, will most likely have more ambitious climate policy (Gyamfi et al, 2021). This leaves developing states pondering why they are asked to develop a green economy when existing global economic powerhouses such as China or the United States completed industrialization with fossil fuels. The literature suggests that those with higher dependence on fossil fuels have a lower climate ambition (World Bank 2022). Developing countries often have dependence through long term subsidies and state support of fossil fuels (Lazurus & Asselt, 2018) The three fossil fuels that developing nations have the highest dependence on include coal, rent, and oil (United Nations 2022). A key way to measure fossil fuel dependence is fossil fuel rents, or the % of GDP generated from a specific fossil fuel resource (World Bank, 2022).

There is disagreement in which type of fossil fuel rent is worse for climate ambition (Gyamfi et al, 2021). Utilizing regression modeling, Gyamfi et al argues that decreasing coal rents will not impact emission reduction. Reducing oil and natural gas rents will help climate sustainability within the top 7 emerging economies (2021). For developing states with high

populations and existing profitable fossil fuel infrastructure, identifying climate policy becomes strenuous. Developing countries such as India have locally produced coal at $6 a ton, a much more competitive rate than the current market price (Sinha, 2016). Within the Kyoto Protocol, fossil fuel industries have been found to negatively impact climate ambition (Levy and Egan 2003). The International Monetary Fund (IMF) has publicly stated how it is difficult for developing states to diversify their assets and move their fossil fuels to renewable energy (2022). Because of this, resources and geographic location plays a role in climate ambition.

Moreover, states who have high climate vulnerability will have higher climate ambition (Sprinz and Vaahtoranta 1994, Heggelund 2007, Betzold & Weiler 2017). According to the World Resources Institute, assessing the climate vulnerability in states has not been an indicator for climate ambition until recently (2015). Sea level rise, tornadoes, and hurricanes all influence whether states decide to pursue climate policy. Countries attempt to avoid these natural disasters by promoting climate policy and participation in the Paris Accord (Torstad et al, 2020). Scholars such as Betzold and Weiler emphasize how climate vulnerability impacts the amount of climate ambition (2017). The authors' found that high vulnerability risks, such as sea level rise or heat waves, allow states to receive a greater percentage of climate adaptation-aid and ambition (Betzold & Weiler, 2017). This could be because developing nations often receive the harshest impacts from climate change.

According to the U.S Geological Survey (USGS), rising temperatures increases water vapor density in the air, creating harsher and more intense storms globally. The USGS also estimates greater drought periods in semi-arid regions, more frequent heat waves and rising sea levels in the next 100 years. Ethiopia, a representation of African countries that suffer from extreme drought and rising temperatures and have enhanced their NDC commitments

accordingly (Reuters, 2022). The Small Island Developing State (SIDS) offers a great example of how climate vulnerability impacts climate ambition. SIDS are 38 U.N members that face environmental, social, and economic challenges but lead discussion on climate globally (United Nations, 2022). A recent example of a climate change actor that suffers from rising sea levels is Tuvalu, an developing island nation in the pacific. Tuvalu is projected to be underwater by 2100 and recently strengthened their NDC commitment (GFMAG, 2022). A major challenge for these groups are rising sea levels which has become a major climate vulnerability (Reuters, 2022) .

Another considerable factor that impacts climate ambition in developing states is climate finance. If developing states received more climate finance, would they increase their climate ambition? The 2009 Copenhagen UN Climate Conference was a breakthrough for international climate commitments as a global pledge to invest $100 billion towards climate investment occurred (Mitchell et al, 2021). There is not complete consensus on the role of climate aid. Though there are less specific critics on climate aid, there are many on foreign aid. William Easterly, a prominent development scholar, highlights when aid is given to large scale projects like poverty there is no accountability for that money to be used effectively (2003). This could be equated to climate assistance as there may be developing countries with climate ambition as corruption or institutional hierarchy (Easterly, 2003). Mungai et al would agree with Easterling that there are policy barriers to climate finance but estimate that these barriers can be overcome by treating climate aid as a development gap that supports current climate policies (2021).

The U.N Department for Trade and Development has stated that there is a $ 2.5 trillion dollar “financing gap” to address the sustainable development goals which are heavily linked to climate change (2014). Climate scientists and economists aim to increase capacity and close the gap for developing nations to resolve climate issues (Fankhauser, 2015). The OECD

development assistance committee estimates that over $80.4 billion was allocated to climate aid in 2019 (Bhandary 2022). For example, 25% of loans and technical support to developing countries go to renewable energy (World Bank 2021). Net ODA is a common way to measure total aid received by states reported by the Development Assistance Committee within OECD (OECD 2022). ODA does not focus solely on climate mitigation and adaptation, but supports sustainable development holistically with developing states. Overseeing aid, the Development Assistance Committee created three objectives for climate ODA: climate change adaptation, assisting with energy supply, and meeting energy demands (Wang & Dong, 2021).

How would Net Official Development Aid be specifically tied to climate ambition? Net ODA has been measured to assess its impact on U.N Sustainable Development Goals (SDGs) within the literature. A key study by Iacobuta et al assesses how net ODA supports SDG 7 Clean Energy and SDG 11 (Sustainable Cities) and found massive potential for climate ODA to specifically address climate change and sustainable development (Iacobuta, 2022). Within this field, authors have noted that contributing climate aid to meet NDC's supports climate ambition (Gomez-Echeverri, 2018). No current study has specifically looked at the variation in developing states' climate ambitions with a regression analysis at the global level.

Hypothesis

With this research, I hypothesize that the greater amount of total net official development assistance, the greater international climate ambition. I argue that increasing total net ODA towards a developing country creates an increase in financing capacity, identifying an overall prioritization of climate policy, thus increasing overall climate ambition through NDC commitments. There are a number of studies in the literature review that display how if states

have greater funds, this leads to greater capacity, thus allowing those states to improve progress toward climate action (Hedger and Nakhooda, 2015, Zimm and Nakicenovic, 2020). It is an unfair advantage to some. 61% of Least Developed Countries (LDCs) andSIDS say they can only implement their NDC adaptation strategy with partial or whole financing and 80% of LDCs and SIDS countries state they also need partial or whole financing for NDC mitigation strategy (Pauw et al ,2019). In 2016, Zhang and Pan estimated that total climate financial need for developing states could exceed US $474 billion. It will be extremely important for policy makers to consider the multiple factors that could possibly improve state climate ambition and limit their global temperature increase to 1.5°C.There is not complete consensus as developing states have been found to have higher NDC commitments even with less climate finance (Iacobuta, 2022). This hypothesis allows this study to test the literature at a global scale. Alternative hypotheses of why states are more successful with climate action include democracy, vulnerability to climate change, and fossil fuel rent (seen in Table 1).

The results will be compared to the Torstad et al study to see the differentiation in the variables between a sample size of all countries and a sample size of only developing countries in this study. I estimate that independent variables such as climate vulnerability and democracy will have a stronger positive relationship; developing states tend to be more affected by climate risks along with struggling with democracy implementation (Bhandary, 2022). I estimate fossil fuel rent (oil, natural gas, coal) will decrease climate ambition as the majority of developing states are still highly dependent on fossil fuels, limiting movement to renewable energy (U.N). I expect net ODA to have a moderate impact on climate ambition, as there are other confounding factors such as GDP per capita and distribution of climate aid that might block efforts to pursue climate policy.

Table 1: *List of all relevant hypotheses from the study*

Hypothesis

H: Receiving more net official development (ODA) aid has a positive effect on on developing states climate ambition

Alternative H1: Vulnerability to climate change has a positive effect on developing states climate ambition

Alternative H2: Democracy has a positive effect on developing states climate ambition

Alternative H3: Fossil fuels rent has a negative effect on developing states climate ambition

Methods

To determine the impact of domestic climate politics on developing states international climate ambition, I conduct a quantitative ordinary least squares (OLS) linear regression analysis on a sample of 98 developing countries. The least squares regression model was chosen because of the ability to find relationships between numerous independent variables and a dependent variable in a large sample (Uyanik & Guler 2013). To estimate the cross variation in international climate ambition for developing nations, it's important to identify the variables that may impact climate ambition. Supplementary text 3 provides a more detailed explanation on each variable and related source.

The analysis replicates the 2020 Torstad et al regression analysis in R studio with data in excel form from Harvard Dataverse. Please see attached excel and R-studio files for more details on the replication process. 2015 data will be used in both independent and dependent variables. 2015 data was chosen to keep consistency among variables and control for variability and current

events that may impact each variable. The regression analysis calculates the coefficient R. This relays the positive or negative relationship between the independent and dependent variable. The next value calculated is the standard error, or the estimate of the standard deviation of the values . The higher the standard error, the weaker the model in examining the relationship between the two variables (Franco et al, 2020). Moreover, the confidence levels were calculated at 90%, 95%, and 99% confidence levels. R-squared and Adjusted R-squared were calculated to assess the strength of the model and to interpret whether the number of independent variables impact the model. Descriptive statistics, such as mean and standard deviation, are calculated to give a better understanding of the size and trends within each variable.

The independent variable is net official development aid (ODA). Climate vulnerability, democracy, and fossil fuel rent (% of GDP per capita) will be studied as alternative variables. The control variable is GDP per capita, because GDP has been found to influence other variables (Torstad et al 2020). GDP can also be found in the way our dependent variable, climate ambition is calculated so I did not include it as an independent variable. This statistical analysis was inspired by the Torstad et al 2020 study who utilized the three alternative independent variables mentioned above and chose the Robiou du Pont and Meinshausen (2018) global temperature impact as their dependent variable. 2020 Net ODA data will be retrieved from the Organization for Economic Co-operation and Development Creditor Reporting System. The three alternative variables are from the 2020 Notre Dame Global Adaptation Initiative, 2020 V-Dem index , 2020 World Bank dataset. Total ODA was chosen because of its great coverage of developing countries receiving aid and contains high credibility from international actors (OECD, 2022). A central issue with choosing total ODA becomes reporting accuracy. It is a voluntary system for

states to use, not all numbers may be representative for certain countries that want to hide donations.

The dependent variable is climate ambition. To measure climate ambition, I will use the temperature impact assessment from Robiu du Pont and Meinshausen (2018). The authors use a hybrid approach to estimate how countries' NDC pledges will impact global temperatures. Scores are calculated through three principles: capability to pay (GDP per capita), historic responsibility (convergence to equal per capita emissions), and equality (convergence to equal per capita emissions). The warming assessment contains low, average, and high warming potentials, ranging from 1.2 degrees celsius (most ambitious) to 5.1 degrees celsius (least ambitious). The average warming potential will be used for this study for consistency. For greater understanding within the statistical analysis, scales for this metric will be inverted where higher scores are defined as more ambitious, and vice versa.

This dependent variable was chosen to reflect climate ambition because of its coverage of developing states, emphasis on testable climate policy within an equity framework, and it was utilized in the Torstad et al 2020 study. Other climate index alternatives such as the Climate Change Performance Index (CCPI) and Climate Action Tracker (CAT) offer detailed analysis on climate ambition and action but unfortunately measure a small sample of developing states compared to the Pont and Meinshausen (2018).

The issue with quantifying climate ambition in a scoring framework is that there is little agreement on how to measure the differences in climate action and ambition (Klock et al, 2018). It is important to have a climate index that contains IPCC climate principles such as Pont and Meinshuasen's index but the analysis makes specific choices not all can agree on. For example, the study only reviews historical emissions until 1990, leaving out numerous emissions put forth

by developing states (Torstad et al, 2020). Another limitation is there is not consensus among scholars that having net ODA representing climate finance is the best way to measure climate aid (Bhandary, 2022)

Limitations

Another issue with the dependent variable is that climate ambition is only that what states say they are going to accomplish rather than the effectiveness of their NDC policy. The 2018 Dupont and Meinshausen study only evaluates the warming potential but not does not evaluate the climate performance or create accountability with NDC commitments. An indicator such as the Climate Change Performance Index (CCPI) offers alternatives for the dependent variable with a peer reviewed framework but does have the sample size of developing countries to run a regression analysis. See supplementary text 5 for more details on the CCPI.

Furthermore, a central issue with the independent variable is that Net ODA is not the best representation of climate aid. Discussed early in the method, looking at the relationship between total ODA for developing states and climate ambition greatly hinders the conclusion of this study. Other studies such as Iacobuta et al 2022 were able to solely assess climate ODA's impact on the UN SDG goals by country with data cleaning practices. I recommend running a linear regression on climate mitigation and climate adaptation aid if there is a large enough sample of developing countries.

A limitation of the overall method was that one regression model was run. The current method was replicated from the Torstad et al 2020 study but contained only subjective factors and simplified the statistical analysis. For additional accuracy in this data, it is important to run multiple models of regression. Only one model of regression analysis offers weaker analysis on the impact that variables have on each other (Uyanik & Guler 2013). Finally, 2015 data was used

for all variables. This means that data is not updated for 2020 NDC updates required by the Paris Agreement.

Results

Completing a regression analysis, with four independent variables and one dependent variable, helped compare the strength of relationship between those variables and climate ambition. The results are presented in Table 2.

Table 2: *Hypothesis, Results and Findings Table*

Hypothesis	Results	Findings
H: Receiving more net official development (ODA) aid has a positive effect on developing states climate ambition	Not supported	Receiving more net official development (ODA) aid has no effect on developing states' climate ambition
Alternative H1: Vulnerability to climate change has a positive effect on developing states climate ambition	Supported	Vulnerability to climate change has a positive effect on developing states' climate ambition
Alternative H2: Democracy has a positive effect on developing states climate ambition	Not supported	Democracy has no effect on developing states' climate ambition
Alternative H3: Fossil fuels rent has a negative effect on developing states climate ambition	Partially Supported	Fossil Fuel rent has a partial effect on developing states' climate ambition (only coal rent has a negative effect)

First democracy has a very weak negative correlation with international climate ambition within developing states (Pearson's r = -.03, p = .75) seen in supplementary data 2. This impact is significant in an OLS regression controlling for other factors seen in table 3. This remains on par with the Torstad et al, 2020 study (seein in supplementary text 4) that also provided a weak

democracy correlation in all global states (Pearson's r = -.12, p = .13). These results reject the hypothesis that democracy positively impacts a developing state's climate ambition.

Table 3: *Regression model on Climate Ambition*

Regression Model on Climate Ambition

	Dependent variable:
	Du_Pont_Ambition
Constant	5.205* (2.951)
Democracy_index	0.634 (0.568)
coal_rents_2015	-0.714* (0.389)
natural_gas_rents_2015	-0.078 (0.060)
oil_rents_2015	0.040 (0.028)
net_ODA	0.00005 (0.0001)
gdp_pc	-0.727*** (0.225)
vulnerability_2015	7.048*** (2.474)
Observations	98
R^2	0.567
Adjusted R^2	0.533
F Statistic	16.807*** (df = 7; 90)
Note:	*p<0.1; **p<0.05; ***p<0.01

Note. This regression model was created in R studio by Reed Walker Details about its creation can be found in the R studio file.

Next coal rents had a statistically significant negative relationship with international climate ambition (Pearson's r = -.22, p < .75). This can also be seen in the ordinary least squares regression analysis seen in table 3. Natural gas rents and oil rents contained weak correlations and weak statistical significance (Pearson's r = -.16, p = .1; Pearson's r = -.09, p = .3477). This is

consistent with the Torstad et al 2020 study. With this quantitative analysis, this data partially supports my hypothesis that fossil fuel rents have a negative effect on developing states' climate ambition. This is because coal rents were deemed statistically significant, but not natural gas or oil rents. No relationship was found between net ODA and international climate ambition (Pearson's $r = .13$, $p < .17$). Within the OLS regression, this relationship was even less with a r coefficient of .00005 seen in table 3. With this data we reject our central hypothesis that receiving more net official development (ODA) aid has a positive effect on developing states climate ambition.

The strongest relationships within the quantitative analysis became GDP per capita and vulnerability to climate change. Within GDP per capita (logarithmic model), a negative relationship was found (Pearson's $r = -.66$, $p < .01$). Climate vulnerability contained a strong positive relationship with international climate ambition (Pearson's $r = .7$, $p < .01$), The OLS regression model confirmed the statistical significance of both variables seen in figure 2. Considering the strength of this relationship, we accept this hypothesis that vulnerability to climate change has a positive effect on developing states climate ambition. No hypothesis was made for GDP per capita and is explained in more detail in the hypothesis section.

Discussion

What best explains the nominal relationship between net official development aid and climate ambition for developing states? I argue that increasing total net ODA towards a developing country creates an increase in financing capacity, identifying an overall prioritization of climate policy, thus increasing overall climate ambition through NDC commitments. This hypothesis was not supported. As mentioned in the methods and limitations section, a key aspect

not considered in this type of aid is that Net ODA both supports and negates climate policy. Net ODA does contain a significant impact toward climate adaptation - such as conservation, sea level infrastructure, or natural disaster warning systems - and climate mitigation - such as renewable energy funding, energy efficiency upgrades, and food systems education . Though true, this aid also encapsulates industries such as infrastructure, agriculture, and logging: all areas which can be often environmentally harmful and carbon intensive. Another possible explanation to no relationship is that the state does not have the capacity to structure climate aid towards climate policy. A key aspect in climate policy is having the mechanisms in place to allow the flow of aid to reach the institutions that work on climate policy. These offices could include the executive branch, Department of Energy, Department of the Environment, or the Department of the Interior, or equivalent, depending on the given country. Without case study analysis, the relationships remain highly correlational and need further evaluation to understand the flow of climate aid within developing states. Oftentimes developing countries misuse or mishandle aid funds. This could be due to corruption, mis-identifying the problem or misallocation of funds to the wrong institution. Within development aid there is not a balanced allocation of climate aid. Before the Paris Accord, 73% of climate aid was targeted for climate mitigation while the remaining percentage was targeted at climate adaptation (Iacobuta, 2022). If donors were to target climate adaptation aid more within ODA, this could possibly lead to greater climate ambition as it addresses an additional root cause: vulnerability to climate change.

Other factors had stronger relationships with overall climate ambition for developing states. When isolating developing states, climate vulnerability contained a stronger relationship than the original Torstad et al 2020 study. Within a realistic perspective, states may be less concerned about the welfare of other nations but see climate changes' impacts within their own

country. This analysis points to the fact that if states see rising sea levels or natural disasters from climate change impacting their resident populations, they are more likely to assist with improving their climate ambition. Contrarily, states who do not have frequent threats do not feel the need to protect the global population. It is not surprising that climate vulnerability was a slightly stronger factor for climate ambition in developing countries. As seen in the literature, these states are impacted the most by variation in climate.

Coal rents offered a negative impact towards climate ambition. Natural gas and oil rents offered less impact and statistical significance. Countries with high coal rents also tend to have been less developed. It is one of the dirtiest fossil fuels for energy. With coal being a significant part of GDP, it becomes extremely difficult to remove the natural resource for the economy. Coal also requires more intensive mining practices than natural gas or oil which may be the reason that it created more of a negative climate ambition scenario. Natural gas and oil rents could better represent more balanced economies that are able to make the transition to a green economy.

An additional factor that was deemed as negligible or slightly negative relationship with climate ambition is democracy. An explanation for this is that the stability of democracies in developing states is not usually strong. Confounding variables such as institutions, leadership, and public support could alter the level of democracy and overall climate ambition. Developing countries that had a higher GDP per capita tended to have a lower climate ambition. GDP per capita was included as a control variable because of its confounding variable capability, included in the ambition metric. Capability of states is directly tied to their climate ambition.

Conclusion

These findings specifically address climate ambition, the efficacy of the NDC's and the future of the Paris Accord agenda. As more data becomes available, future research could review solely climate aid and international climate ambition. OECD did not have easily accessible records for climate aid and that data needed extensive data cleaning that was not available in this study's time frame. There was also a much smaller sample of developing states that received solely climate aid rather than Net ODA, which the majority of developing countries receive from the international community (Iacobuta, 2022).

A major goal for international institutions is to focus on climate vulnerability when identifying points of diplomacy for international climate ambition. States may only want to focus on addressing climate when it is at their front door (wildfires, rising sea levels, cyclones, tornadoes, drought, floods). It is extremely important for countries to conduct climate vulnerability assessments to understand the risks that they may encounter in the next 100 years. If states have this mentality of prolonged sustainability for their populations, they may consider increasing their climate ambition immediately thus decreasing their individual warming potential (Iacobuta, 2022).

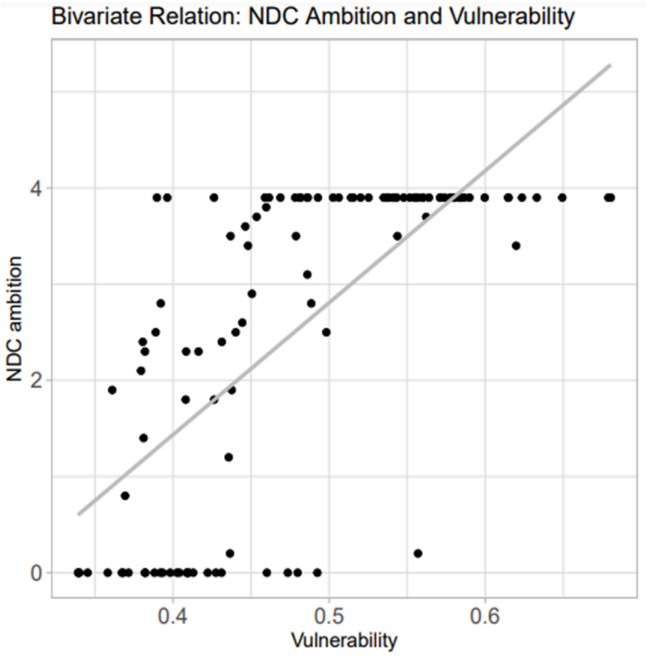
Future research could evaluate NDCs over time through a lag study to better estimate climate ambition and performance. Case studies analyzing weaker relationships could also be a method to gain more in depth analysis of these weaker factors (ODA., democracy, fossil fuel rents. Understanding climate aid pathways, along with other factors that impact climate ambition for developing states, offers international actors, climate leaders, and science diplomats the opportunity to decrease warming potentials for developing states globally.

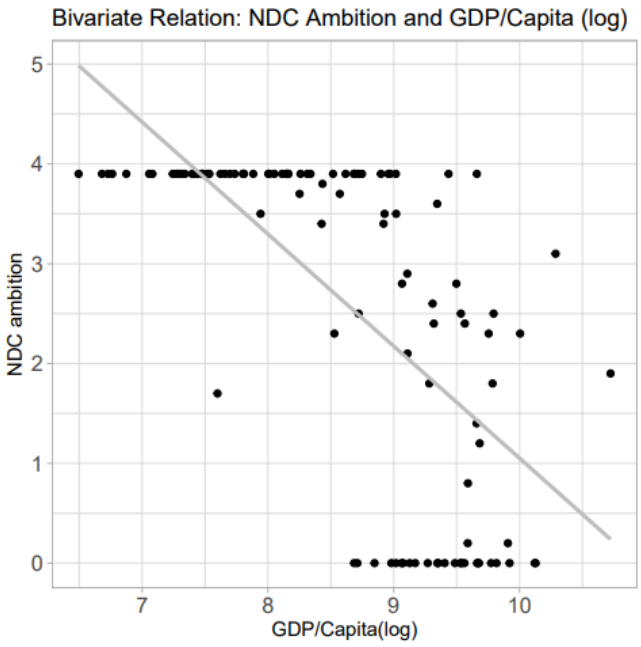
Supplementary Data

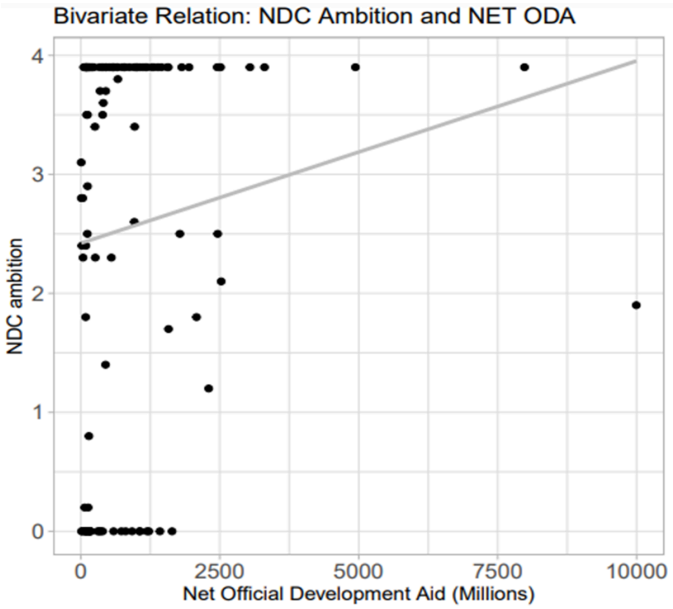
Supplementary text 1. List of variables with descriptive data

Statistic	N	Mean	St. Dev.	Min	Max
Democracy_index	117	0.275	0.229	0.000	0.840
oil_rents_2015	122	1.698	4.678	0.000	32.802
coal_rents_2015	120	0.079	0.281	0.000	2.212
natural_gas_rents_2015	122	0.464	1.929	0.000	15.026
vulnerability_2015	122	0.482	0.084	0.339	0.680
Du_Pont_Ambition	114	2.554	1.641	0.000	3.900
net_ODA	130	843.496	1,339.487	6.720	9,994.630
gdp_pc	124	8.671	0.938	6.495	10.724
NA.	1	1,000,000.000		1,000,000	1,000,000

Supplementary text 2. Bivariate Relationships






Bivariate Relation: NDC Ambition and NET ODA
NDC ambition
Net Official Development Aid (Millions)
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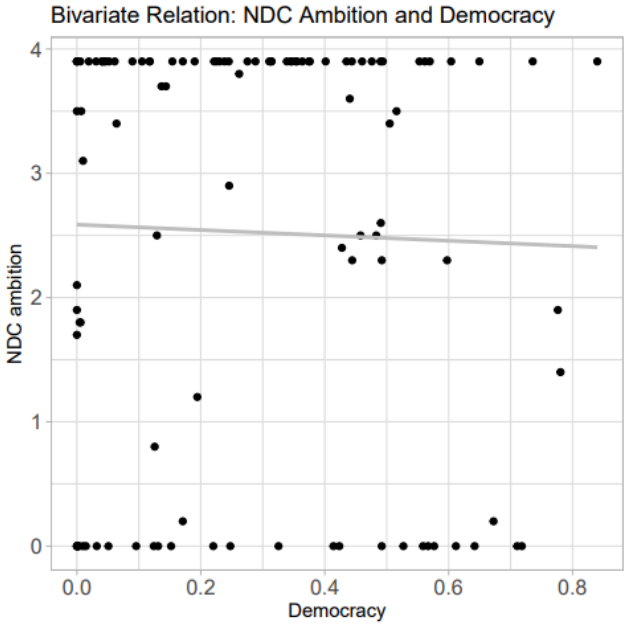
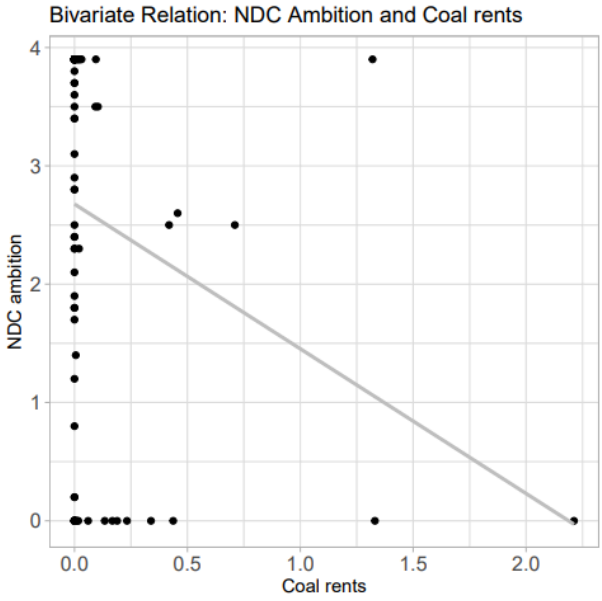
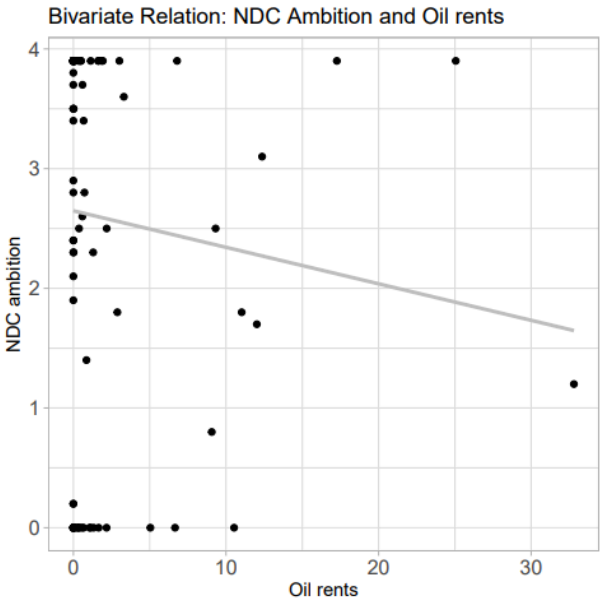
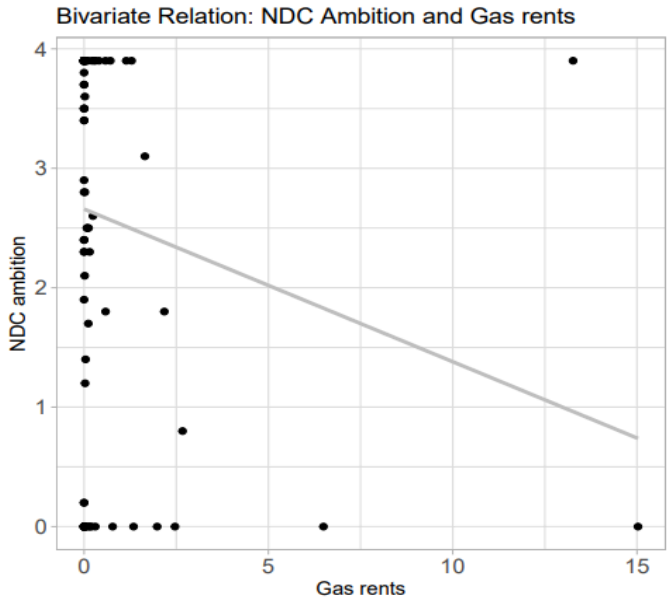
2
3
4
0
2500
5000
7500
10000


Bivariate Relation: NDC Ambition and Democracy
NDC ambition
Democracy
0
1
2
3
4
0.0
0.2
0.4
0.6
0.8


Bivariate Relation: NDC Ambition and Coal rents
NDC ambition
Coal rents
0
1
2
3
4
0.0
0.5
1.0
1.5
2.0


Bivariate Relation: NDC Ambition and Oil rents
NDC ambition
Oil rents
0
1
2
3
4
0
10
20
30


Bivariate Relation: NDC Ambition and Gas rents
NDC ambition
Gas rents
0
1
2
3
4
0
5
10
15

Supplementary text 3. Variables with attributed definitions and sources

Variable	Definition	Source
Net official development (ODA) Aid	NET ODA is the official amount of aid received by a recipient country that is tracked by the Organisation for Economic Co-operation and Development	OECD Creditor Reporting System (2015)
Vulnerability to climate change	ND-GAIN Vulnerability index. Higher scores=higher vulnerability to climate change	ND-GAIN (2015)
Democracy	Country scores on the 2015 V-Dem multiplicative polyarchy index. The index measures a country's degree of freedom of association, clean elections, freedom of expression, elected executives and suffrage. Higher scores=higher level of democracy	Coppedge et al. (2017)
Coal Rent	The difference between the value of both hard and soft coal production at world prices and their total costs of production. Measured as % of GDP. Higher scores=higher coal rents.	World Bank (2015)
Natural Gas Rent	The difference between the value of natural gas production at regional prices and total costs of production. Measured as % of GDP. Higher scores=higher natural gas rents	World Bank (2015)
Oil Rent	The difference between the value of crude oil production at regional prices and total costs of production. Measured as % of GDP. Higher scores=higher oil rents	World Bank (2015)
Climate Ambition	Estimated temperature rise compatibility of NDCs mitigation targets (the variable is inverted so that higher values=higher ambition) (conversion =Max(x)-x).	Robiou Du Pont and Meinshausen (2018)
GDP per capita	Logarithm of PPP-adjusted GDP per capita (int'l dollars, 2015). Higher scores=higher GDP per capita.	World Bank (2015)

Supplementary text 4. Torstade et al regression analysis

Data from Torstad et al 2020 study

https://doi.org/10.7910/DVN/ZPDOYT.

Table 2. Ordinary least squares regressions explaining NDC ambition as a function of objective and subjective domestic factors.

	Dependent variable:			
	NDC ambition			
	(1)	(2)	(3)	(4)
Constant	7.102*** (2.431)	12.388 (8.775)	−3.109 (2.186)	3.342 (4.499)
GDP/Capita (log)	−0.803*** (0.178)	−0.991* (0.545)		−0.873*** (0.313)
Democracy index	1.574*** (0.417)	2.856*** (0.817)		1.128 (0.730)
Coal rent	−0.963** (0.370)	−1.988*** (0.719)		−1.252* (0.677)
Natural gas rent	−0.068 (0.054)	−0.126 (0.557)		−0.218* (0.126)
Oil rent	0.022 (0.021)	0.129 (0.259)		0.020 (0.034)
Vulnerability index	4.169* (2.111)	4.912 (6.148)		5.552 (4.245)
Paris agreement support		−1.626 (1.282)		
Postmaterialism			−0.267 (0.521)	0.692 (0.580)
Cosmopolitanism			1.815*** (0.596)	0.575 (0.588)
Observations	149	38	53	51
R^2	0.532	0.682	0.158	0.517
Adjusted R^2	0.512	0.608	0.124	0.425
F statistic	26.887*** (df = 6; 142)	9.193*** (df = 7; 30)	4.681** (df = 2; 50)	5.616*** (df = 8; 42)

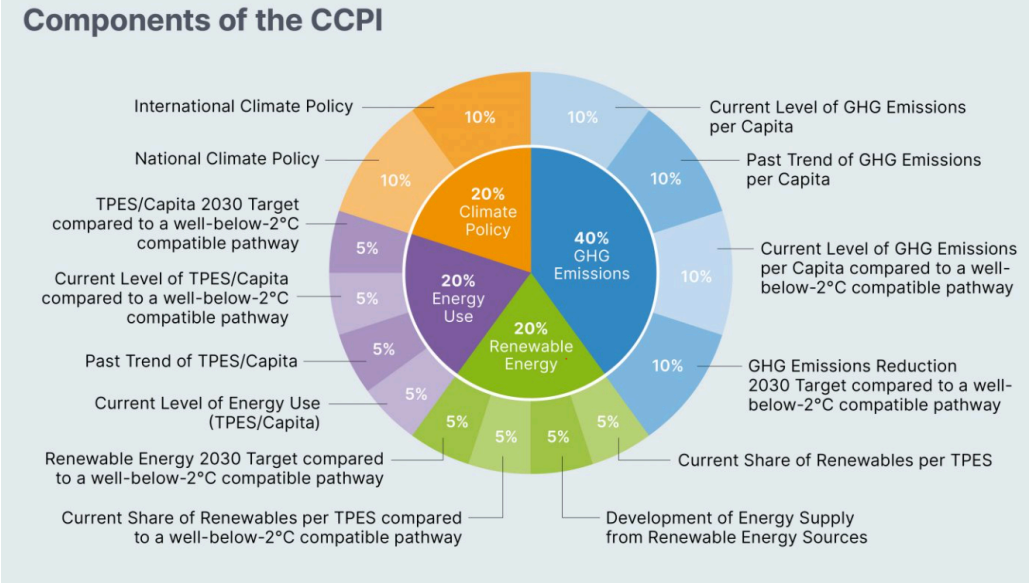
Note: *p < 0.1; **p < 0.05; ***p < 0.01.

Supplementary text 5. Climate Ambition Alternatives

The Climate Change Performance Index (CCPI), updated annually, measures the climate action performance of 60 countries and the European Union. The CCPI specifically measures

states' climate ambition and pursuit of the Paris Accord's Nationally Determined Contributions. This group of countries comprises 90% of the world's greenhouse gas emissions (GHG). Each country receives a score based on four categories, GHG emissions (40% of overall score) , Renewable Energy (20% of overall score), Energy Use (20% of overall score), and Climate Policy (20% of overall score). 80% of the data is quantitatively based on 2019 data from the International Energy Agency (IEA), PRIMAP (Paris Reality Check), the Food and Agricultural Organization (FAO), and UNFCCC national GHG inventories which make up the first 3 categories.The final 20% of the CCPI's score comes from a qualitative assessment of national and international climate policy from the specified country. Figure 1 below details the breakdown on how the CCPI is scored. Each category has detailed indicators to help determine the score breakdown shown in Figure 1. With chosen indicators there are also limitations to the CCPI (CCPI 2022 Report).

Scoring methodology for the 2022 Climate Change Performance Index (CCPI)



Note. TPES (Total Primary Energy Supply) ("CCPI Impact Page 2022").

Note: R studio file and Microsoft Excel file containing method and variable values are included as external files

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