BANCO DE DESARROLLO DE AMÉRICA LATINA

Políticas para la respuesta al cambio climático y la preservación de la biodiversidad

Policy paper Nº 24

Latin America's Climate Mitigation Challenges: Sources of Emission, Regional Goals and Policy Priorities

Latin America's Climate Mitigation Challenges: Sources of Emission, Regional Goals and Policy Priorities

Gustavo Fajardo*   Pilar Toyos†

December 20, 2023

Abstract

We analyze data on greenhouse gas emissions to describe where Latin America stands with respect to the world in terms of the level and composition of those emissions. We then explore several issues related to mitigation in the region and present three main observations. First, the effort-sharing literature suggests that Latin America should do more than currently is doing in terms of mitigation. Second, decoupling in the region might be more challenging than elsewhere given the sectoral composition of emissions. Third, environmental issues are a lower priority to the Latin American electorate than surveys about preferences might suggest.

*CAF-Development Bank of Latin America, gfajardo@caf.com

†CAF-Development Bank of Latin America, mtoyos@caf.com

Contents

1 Introduction

As the evidence of global warming and its consequences has piled up throughout the last decades, awareness about the issue has increased. Significant effort has been put into understanding how human activity affects the concentration of greenhouse gasses (GHG) in the atmosphere, and currently there is consensus about the importance of deploying policies and measures that mitigate GHG emissions. There is no consensus, however, about who should bear the costs of that mitigation.

The response to climate change is complicated by the fact that it is a phenomenon plagued by externalities: emissions generated anywhere by any agent have global effects on the climate. In a world where decisions are made by sovereign countries, this means that those countries have insufficient incentives to enact and enforce strong mitigation policies, which are costly in terms of investments or foregone economic activity. Moreover, there are significant differences in historical responsibilities on this issue. Some countries have emitted much more than others throughout the centuries, and those past emissions strongly correlate with the levels of income and wealth they have achieved. This makes the discussion about who should mitigate even more complex, by adding a layer of concerns about equity and justice to it.

In this context, some instances of international cooperation have been created in order to set goals to limit climate change and coordinate actions, with the United Nations Framework Convention on Climate Change (UNFCCC) being the most significant. These instances have led to important accomplishments, such as the near-universal adoption of the Paris Agreement within the UNFCCC. However, their effectiveness has been limited so far, with global emissions continuing to increase.

This paper focuses on Latin America, trying to describe its contribution to global warming and offering a discussion on what it could do in terms of mitigation. We start by introducing the main sources of data on country level emissions and underlining some of their limitations. With that in mind, we present figures about emissions in the region. The first observation from this analysis is that per capita emissions in Latin America are slightly above the world average. Unsurprisingly, emissions are very concentrated in the largest countries (mainly Brazil, followed by Mexico and Argentina), and although they do not necessarily present the highest emissions per capita of the region, they are extremely important to understand the level and sectoral composition of emissions at the regional level. Regarding the issue of composition, Latin America differs from most of the rest of the world, by having a larger share of emissions coming from land use change and the agricultural sector. This unique composition responds to three main reasons: deforestation in the Amazon, the economic importance of agriculture -and especially cattle-raising-, and the use of clean sources for electricity generation.

We then turn to the issue of historical responsibilities and what the effort-sharing literature suggests about the role that Latin America should play in global mitigation efforts. We compute a measure of accumulated emissions per capita since 1905 and find that Latin America is well-below more industrialized regions like North America (US and Canada) and Oceania (explained largely by Australia), but not that far from Europe and above Asia and Africa. This is consistent with the fact that effort-sharing exercises in the literature tend to demand more mitigation from Latin America than from other developing regions like South Asia and Subsaharan Africa, which is -in short- a consequence of Latin America being on average richer and more responsible in terms of accumulated emissions than those other regions. The specialized literature also suggests that the current climate policies and goals announced by Latin American countries are short of what they should be in order to meet the Paris Agreement objectives.

This opens up an important question: how can Latin America mitigate more? We start from the view that mitigation should be accomplished in a context of economic growth. Given the many material needs that exist in the region, arguments for degrowth or stagnation in the name of climate policy are questionable from a welfare perspective and unlikely to be politically feasible. Thus, we look at cases of decoupling, i.e. countries that have managed to cut emissions while their GDP increases, and find that mitigation there has mostly come from the energy sector, followed by the industrial sector. This suggests that technological breakthroughs in clean power generation and energy efficiency have been key drivers of those changes. The impact of those advances in Latin America, while not null, is more limited because power generation in that region is relatively clean to begin with. In agriculture and land use, which are important sources of emissions in Latin America, the path towards mitigation is less clear and probably depends more on institutional, regulatory and behavioral factors than technological ones. This can be a challenge.

Mitigation measures are usually costly, at least in the short term. That is why they require some societal -and political- support. We explore this issue in the last section of the paper. When asked in surveys, a majority of Latin Americans respond that environmental issues are a higher priority than the economy. However, the contents of political campaigns in the region tell a different story: we analyze the Twitter messages of presidential candidates in recent elections in Brazil, Colombia and Costa Rica, and find that they are much more likely to address economic issues than environmental ones. This suggests that there is social desirability bias behind the self-reported preferences of survey respondents, and that climate policy may not be such a high priority for the electorate. We interpret this as indicating that increasing the ambition in mitigation policies in the region is unlikely in the short term. There is, however, a silver lining for those who want to see more action on this agenda: environmental issues seem not to be politically polarized in Latin America, which leaves room to reach agreements across parties and ideological lines.

2 Data

Throughout this paper, we will use as our main dataset on GHG emissions a combination of data presented in Minx et al. (2021) and data from the Global Carbon Budget (Friedlingstein et al., 2022). From now on, we will refer to this composite database as Minx+GCB. Minx et al. (2021) provides a comprehensive estimate of annual anthropogenic GHG from all sectors and activities since 1970 and covers 228 countries. It is constructed, in turn, by sourcing information from the Emissions Database for Global Atmospheric Research (EDGAR v6). Two reasons that motivate our use of the information in Minx (2021) are its comprehensiveness, and the fact that it is used extensively by the III Working Group of the Intergovernmental Panel on Climate Change (IPCC) to analyze global emission trends. One disadvantage of Minx (2021) is that it does not present emissions for the LULUCF sector at the country level, only at a more aggregate regional level. Thus, our combination consists of using the information in Minx (2021) for all non-LULUCF sectors and complement it with (country-level) emissions for the LULUCF sector from the Global Carbon Budget.

There are many other sources of data on GHG emissions, and they present some differences. In Table 1 we compare the figures from our Minx+GCB data with two alternative datasets: that of the UNFCCC (2023) and that of Climate Watch (2022). The UNFCCC data comes from the reports that countries themselves submit to the convention in order to communicate their annual emissions by sector. These reports, known as national GHG inventories, are meant to adhere to methodological guidelines provided by the IPCC. However, the periodicity of these reports is not homogeneous, especially for developing countries which usually have long gaps in between submissions. Moreover, it is impossible to ensure methodological uniformity between countries in these calculations, which hinders the comparability of these reports. Consequently, most analysis of trends and policies, including the IPCC's assessment reports, are usually not based on those country reports, but on independent estimates of emissions. The Climate Watch data, in turn, is constructed sourcing information from different institutions: the International Energy Agency, the UN Food and Agriculture organization, the US Environmental Protection Agency and the Global Carbon Project.

Panel A of Table 1 uses the 46 countries that report regularly to the UNFCCC to compare emissions between Minx+GCB, UNFCCC and Climate Watch, using a common sample. When making this comparison, we look both at total emissions and at emissions specifically from the LULUCF sector. We do this in order to stress, from the start, the fact that emissions in the LULUCF sector are harder to measure and thus differ more across sources. Two observations stand out from the comparison. First, the estimates for total emissions are very similar in UNFCCC and Climate Watch, while the number in Minx+CGB is about 13% larger at 18.254 $MtCO_2eq$. Second, the differences across dataset are indeed proportionally much larger for the LULUCF sector than for total emissions. All datasets estimate negative emissions via LULUCF (implying that this sector acts as a carbon sink for this set of 46, mostly developed, countries), but there are noticeable differences in the magnitude of the figures: according to UNFCC, their net capture of carbon is 16 times that implied by Minx+GCB. The lack of precision in the estimates for LULUCF is due to the difficulty of tracking the flows of GHG from land-based activities.[1]

Panel B of Table 1 presents the corresponding figures for the full set of countries in each database. The comparison is not so direct now, as the sets of countries are not common, but largely speaking the same observations hold: in Minx+GCB total emissions are about 10% larger than in Climate Watch, and LULUCF emissions in Minx+GCB are triple those in Climate Watch. The share of total emissions that come from LULUCF is 7,6% in Minx and only 2,9% in Climate Watch. Both datasets indicate that, at the global level, the LULUCF sector is a net emitter.

[1]There are several reasons why this is difficult. First, to obtain a measure of anthropogenic emissions, a distinction must be made between the GHG exchanges that occur naturally between all lands and the atmosphere and those which are human-provoked. That distinction is usually done by defining which areas should be considered to compute anthropogenic emissions, and there is discretion in that classification. Second, land-based activities not only emit GHG, but also capture them, and both flows need to be accounted for; in fact, LULUCF is the only sector where net emissions can be positive or negative. Third, while in the energy sector emissions are localized in specific places and processes, land-related flows of GHG are deconcentrated and there is much more uncertainty regarding the parameters of conversion between biomass and GHG.

Table 1: Differences between databases. GHG emissions in 2018 (in MtCO)

	Panel A: Common sample			Panel B: Total sample for each database		
	Total	LULUCF	Number of countries	Total	LULUCF	Number of countries
UNFCCC	16,157	-1,908	46	16,157	-1,908	47
CW	16,074	-1,215	46	49,368	1,388	194
Minx	18,254	-115	46	54,511	4,162	212

Source: Authors based on Minx+GCB, Climate Watch (2022) and UNFCCC (2023) data.

Table 2 presents a similar comparison across datasets, but only for Latin American countries. There are many gaps in the UNFCCC data for these countries. In fact, only six of them have submitted a GHG inventory since 2015. Thus, in Panel A we use that set of six countries as a common sample to compare the datasets. Again, the Minx+CGB shows a noticeably higher level of emissions: 60% and 85% more than Climate Watch and UNFCCC respectively. In absolute terms, the difference is about 1000 $MtCO_2eq$, and it is almost entirely explained by the difference in LULUCF emissions reported across datasets. Panel B compares the emissions from Climate Watch and Minx+CGB in their full samples, which renders a similar pattern.

Table 2: Differences between databases. GHG emissions in Latin America (in $MtCO_2eq$)

	Panel A: Common sample (2015)			Panel B: Total sample (2018)		
	Total	LULUCF	Number of countries	Total	LULUCF	Number of countries
UNFCCC	1,429	220	6			
Climate Watch	1,664	385	6	4,031	784	33
Minx	2,645	1,108	6	5,080	1,406	33

Note: data below "Common sample" compiles the most recent emissions inventory data submitted to the UNFCCC since 2015. Only six countries have presented information of their emissions from 2015 onward: Brazil for 2016; Chile, 2018; Dominica, 2017; Honduras, 2015; Paraguay, 2017 and Uruguay for 2019.

Source: Authors based on Minx+GCB, Climate Watch (2022) and UNFCCC (2023) data.

All in all, Tables 1 and 2 show that the estimates of emissions in Minx+GCB, both overall and in the LULUCF sector, are higher than in some alternative and also popular datasets. We focus on using the data from Minx (2021) given its use by the IPCC. However, these differences with other sources of data are important to keep in mind. Not only because they may affect academic analyses, but because they might be of some political consequence.

3 Emissions in Latin America

3.1 Level of emissions with respect to the world

As a region, Latin America stands out with respect to most other places by the importance of the LULUCF sector as a source of emissions, which is the source of 27,6% of GHG annual emissions. Only Africa is comparable, at 29,6%. In most other places, this sector is a negligible source of net emissions, and in some it is even a carbon sink, i.e. net emissions are negative (as in the European Union and China).

That means that, if we want to assess how much Latin America emits compared to the rest of the world, the result depends on whether we include the LULUCF sector or not. And this is not a trivial question: while a comprehensive picture of emissions should include all sectors, some analyses do leave LULUCF out, mainly because of low reliability of the numbers due to the measurement difficulties involved.

When LULUCF is excluded, per capita emissions in Latin America are 11% (0,7 tCO_2eq per capita) below world average. However, including all sector changes the picture, and Latin America exceeds the world average by 12,6% (8 and 7,1 tCO_2eq respectively).

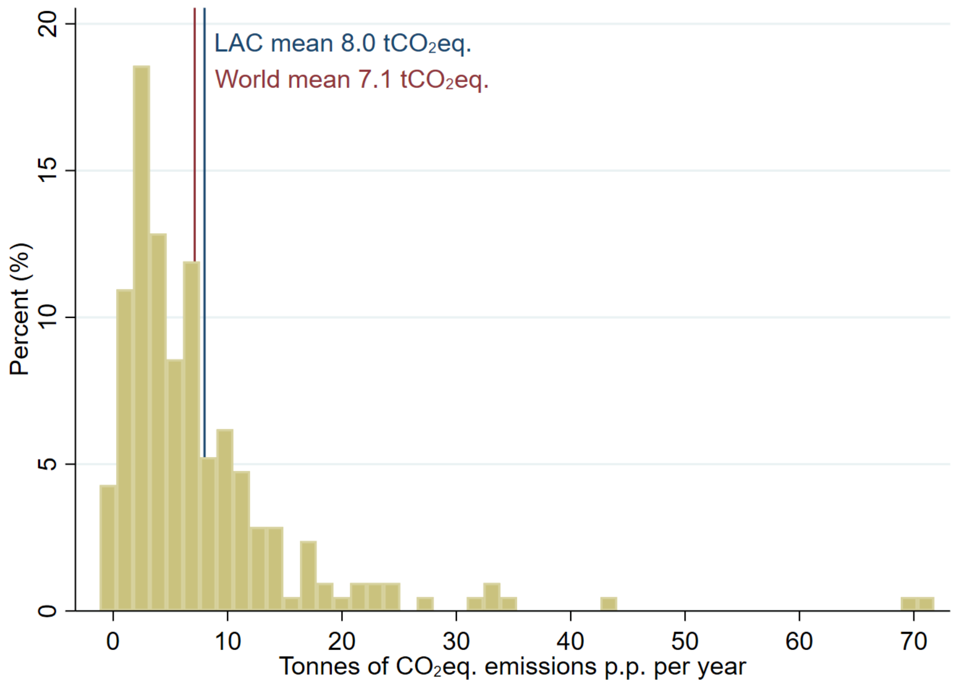
That world average, in turn, is pulled up by a relatively small number of large emitters. This can be seen in Figure 1, which presents a histogram of countries according to their level of per capita emissions. There is a big concentration of countries below 5 tCO_2eq per capita per year, but in some countries that figure goes up to 70. Taken as a whole, Latin America is at the 69th percentile of that distribution.

3.2 Sectoral composition of emissions

As it was already noted, the importance of LULUCF as a source of emissions in the continent is comparatively large. There are two reasons for this, which we explore further below: i) a relatively high use of clean sources of energy, which means that emissions from power generation are low, and ii) deforestation in the Amazon, mainly to convert land to agriculture and cattle-ranching.

Figure 2 presents the electricity generation by source type across regions following Ember (2023) data. Over 57% of electricity in Latin America and the Caribbean comes from renewable

Figure 1: Distribution of countries by their per capita emissions in 2018



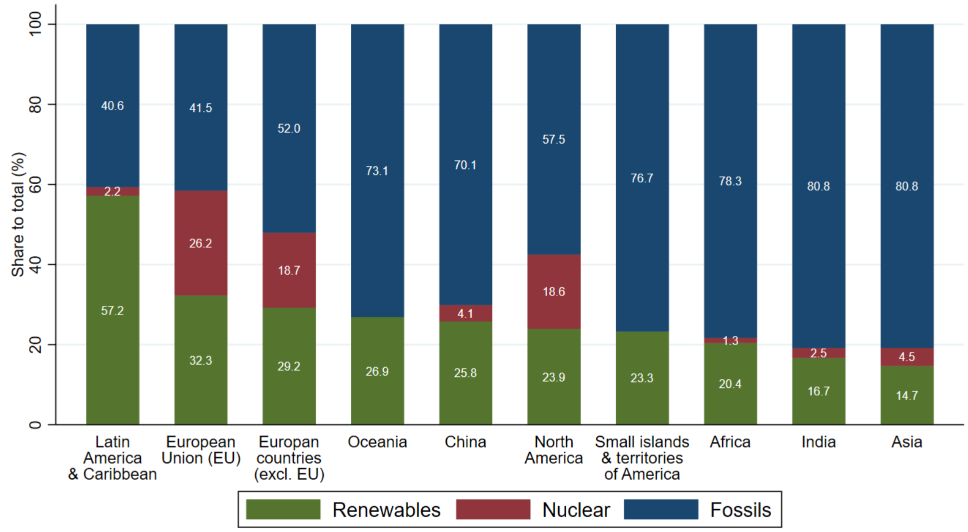
Source: Authors based on Minx+GCB and UN Population Division (2022)

sources, mostly hydro (46.3%), followed by other renewables such as bioenergy, solar and wind (which add up to 10.9% of electricity generation). This contrasts with the rest of the world. The EU has a very similar share of electricity from non-fossil fuel sources, but it is much more reliant on nuclear power, with only a third of its power from renewables (Figure 2). In no other region renewable sources account for more than 30% of electricity. As a consequence, energy per capita emissions from Latin America are only 1.5 $tCO_2eq.$, while they go up to 7 $tCO_2eq.$ in North America, to 6.5 $tCO_2eq.$ in Oceania, 4.3 $tCO_2eq.$ in China and 3.6 $tCO_2eq.$ in Europe.[2]

Then there is the issue of deforestation, which provokes emissions via changes in land use. This is an issue essentially of the Amazon and primarily of Brazil. In 2018, nearly 69% of LULUCF emissions in Latin America originated in Brazil, while Colombia, Paraguay and Bolivia contributed an additional 14% (see table A.1 of the Appendix). Although small in absolute terms, Guyana and Suriname also exhibit high per capita emissions through LULUCF, with 7.8 and 5.7 tCO_2eq per capita, respectively. Outside the Amazonian region, Belize stands out with

[2]Minx et. al (2021) define GHG emissions from "energy systems" as those coming from electricity and heat; oil, gas and mining fugitive emissions; petroleum refining; and some other less significant activities.)

Figure 2: Electricity generation by energy source type in 2018



Source: Authors based on Ember (2023) database.

15.3 tCO_2eq per capita (table A.2 of the Appendix).

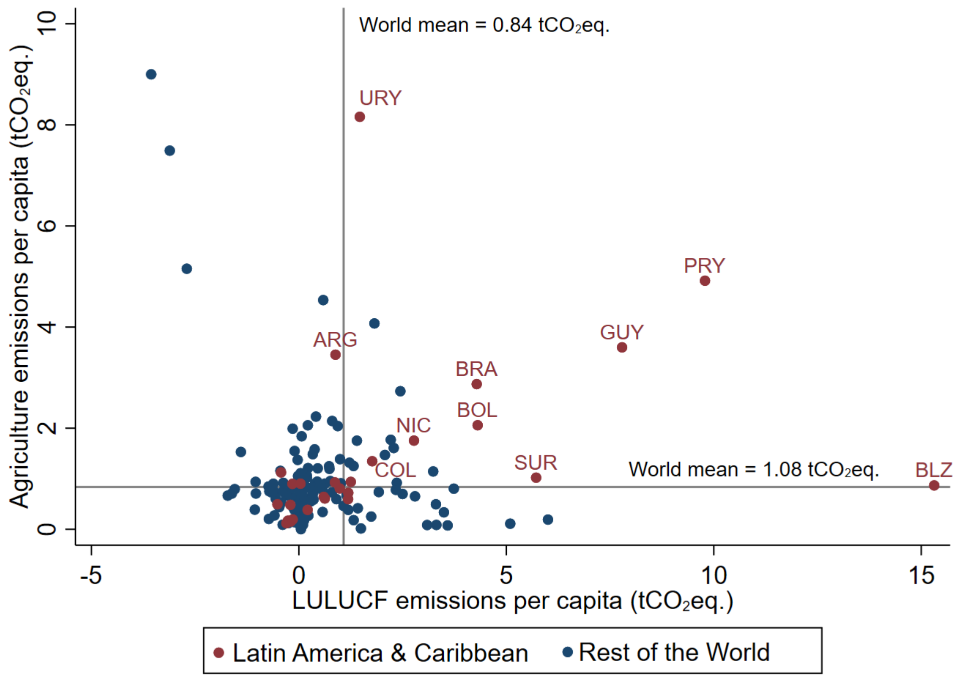
The main driver of deforestation in the Amazon is the expansion of the agricultural frontier. In fact, several countries with high LULUCF emissions also have high agricultural emissions, such as Bolvia, Brazil and Paraguay.[3] There are also some countries, namely Argentina and Uruguay, which have high levels of agricultural emissions but low emissions from land use change, because they have a big cattle-ranching sector but little or no deforestation.

The picture is summed up in Figure 3. It shows that 6 of the 10 countries with more per capita emissions via LULUCF are from Latin America, as well as 5 of the 10 countries with more per capita emissions in Agriculture.

Figure 4 completes the picture of the composition of emissions in the regions, by incorporating information from the sectors we have not discussed so far. Panel A shows the overall distribution of GHG emissions, for the region and the rest of the world. Panel B, in turn, offers a comparison in per capita terms. In line with our previous discussion, the biggest differentiating characteristics of the regions are the relative importance of LULUCF and Agriculture, and the relative unimportance of electricity as sources of emissions.

[3]In terms of GHG accounting, the Agriculture sector is distinct from LULUCF. Agriculture which comprises the emissions that come directly from agricultural and cattle-ranching practices. For example, methane produced in the digestive process of ruminants and on rice fields represent 70 percent of total GHG emissions produced by the agriculture sector.

Figure 3: Agriculture and LULUCF per capita emissions in 2018



Source: Authors based on Minx+GCB and UN Population Division (2022).

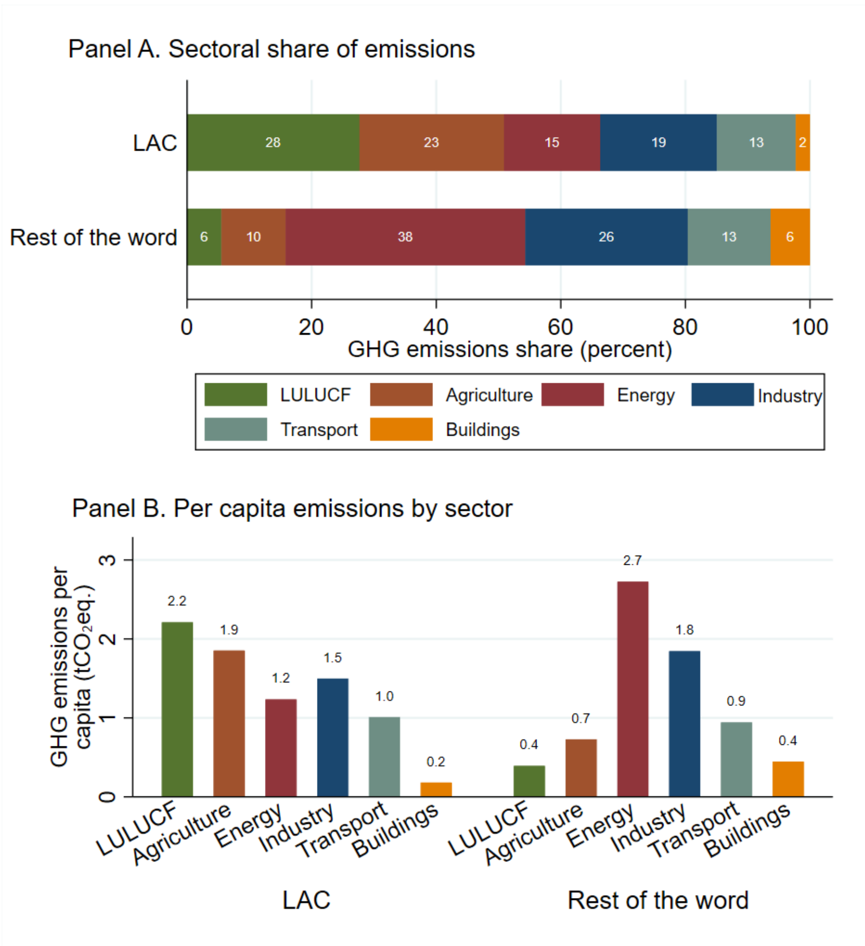
3.3 Distribution of emissions in the region

So far, we have mostly talked about the region as a whole. But, of course, there is a lot of heterogeneity within it. First of all, emissions are very concentrated in the largest and most populated countries. Brazil alone is responsible for around 43% of annual emissions in Latin America, followed by Mexico and Argentina, which account for another 18% and 9% respectively (Figure A.1 in the Appendix).

This means that the regional averages and patterns are strongly driven by these large countries, and especially by Brazil. For example, the significant share of emissions coming from LULUCF at the regional level, which was discussed above, is not replicated everywhere. It is true mainly for the Amazonian countries, plus Belize, Nicaragua and Paraguay.

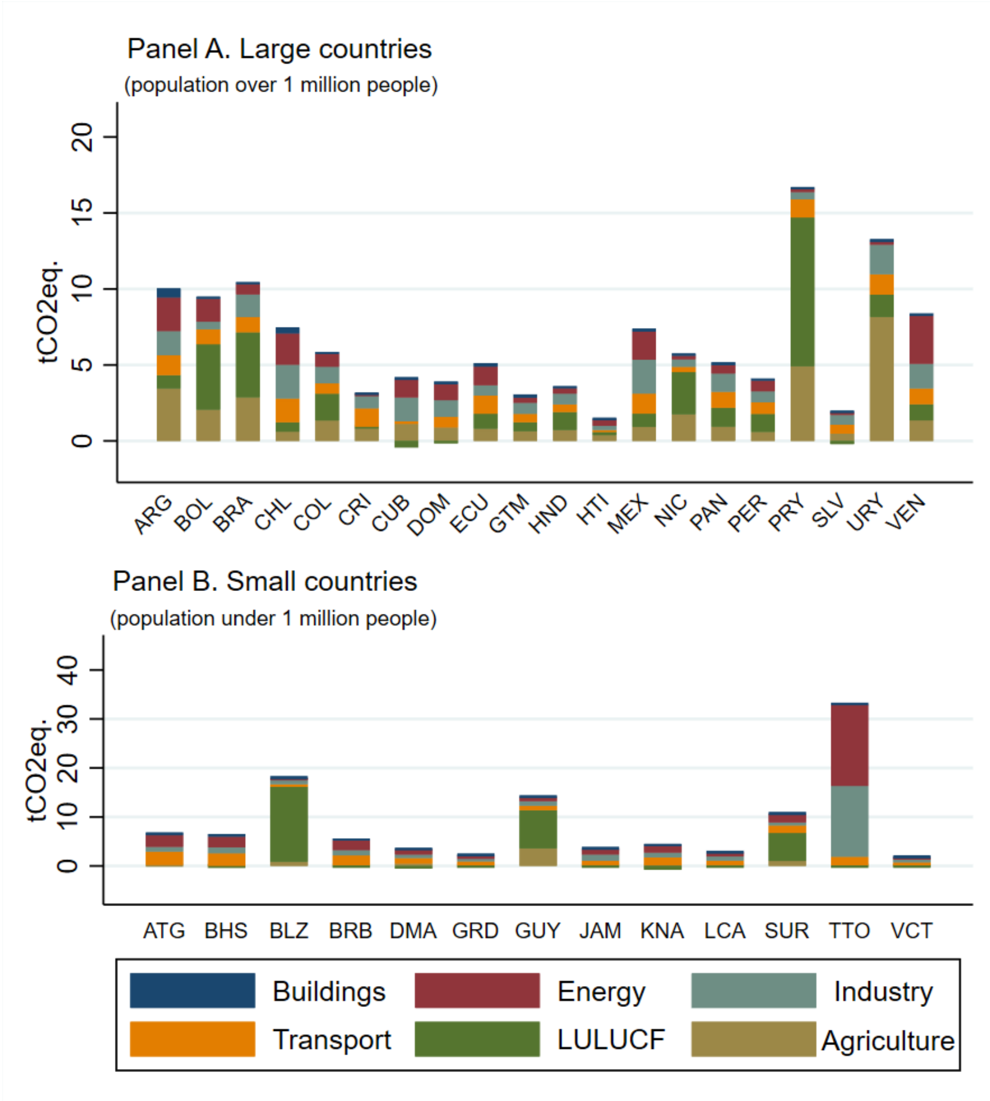
Figure 5 presents the level and sectoral composition of annual emissions by country. To ease exposition, we divided the countries in two groups, according to their population. The largest emitter in per capita terms is, by far, Trinidad and Tobago, with most of its emissions associated with the oil sector and accounted for in the energy and industry categories. Other high per capita emitters are Belize, Paraguay, Guyana (mainly LULUCF) and Uruguay (mainly

Figure 4: Sectoral composition of emissions in Latin America and the Rest of the Word in 2018



Source: Authors based on Minx+Friedlingstein and UN Population Division (2022) data.

Figure 5: Level and composition of per capita emissions in LatAm in 2018



Source: Authors based on Minx+GCB and UN Population Division (2022)

Agriculture). Brazil is slightly above the 10 tCO_2eq per capita mark. The rest of South American countries -plus Mexico, Nicaragua and Panama- are somewhere between 5 and 10 tCO_2eq per capita, with different sectoral compositions. The rest of Central American countries and the majority of Caribbean states have low per capita emissions (below 5 tCO_2eq). Some of the countries in this latter group, like Cuba and Dominica, are net sinks via LULUCF according to this data.

4 How much should Latin America mitigate?

Global emissions, which are still on the rise, need to be cut in order to meet the world's climate goals. This immediately leads to the question of how much should each country do in terms of mitigation. A starting point for that discussion is the fact that rich countries are responsible for a very large share of historical emissions (see Figure A.2 in the Appendix), and that therefore they should also take on a large share of the mitigation efforts. There is widespread consensus around that general idea, as reflected in the principle of Common But Differentiated Responsibilities that has been picked up in the instruments of international governance on climate issues, but no consensus about the specifics of what it entails.

A simplistic version of fairness in this context could demand that all countries equalize the amount of cumulative emissions per capita. To approximate this exercise, we have used data on historical emissions since 1905 from Friedlingstein et al. (2022) and population data from Our World in Data (2023) to estimate the amount of GHG generated per person and year at the country level. North America is the biggest emitter in this indicator, with 20 tCO_2eq per capita per year. Next, we compute how much should each country emit right now (with its current population) to equate North America's figure. For example, Brazil, that has so far emitted 9.7 tCO_2eq per capita per year, would have to generate an extra 3 $GtCO_2eq$ to be on par with North America's emissions level. The most interesting result of this exercise is that, in order for each country to equate (in terms of cumulative per capita emissions) the largest emitter, the world as a whole would have to put an extra 5,411 $GtCO_2eq$ into the atmosphere.[4] This is equivalent to 3 times what the world has already emitted and would lead to warming of more then 3°C above pre-industrial levels.

The previous exercise is naive and extreme, but it serves to illustrate two points: i) how big the gaps are between countries and regions in terms of historical emissions; and ii) how allowing future emissions using criteria that are permissive with developing countries can clash with the level of action necessary to curb global warming. This latter point is important. The goal of the Paris Agreement -to global warming to 2°C, and if possible to 1.5°C, above pre-industrial levels- implies a tight remaining global carbon budget: about 380 GtCO2 for the 1,5°C mark, and 1230 GtCO2 for 2°C. At the current pace of global emissions, those budgets are equivalent to 6 years and just above 20 years, respectively. Currently, developed countries generate only

[4]This is an underestimate, as we only include 69 countries in the exercise.

Table 3: Cumulative per capita emissions by region and additional emissions to meet largest per capita emitter, since 1905

	Number of countries	Emissions per capita per year (tCO_2)	Total additional emissions to match top emitter ($GtCO_2$)
North America	2	20.0	
Oceania	2	18.3	3
Europe	34	7.5	870
Latin America	5	7.4	289
Africa	6	4.9	103
Asia exc.China & India	18	4.2	1,102
China	1	2.9	1,636
India	1	1.0	1,408
Total	69	5.2	5,411

Soruce: Authors based on Friedlingstein et al. (2022) and Our World in Data (2023)

a quarter of current annual emissions. Thus, mitigation from developed countries -even if it is very heavy- would probably be insufficient to meet the existing goals.

Some of the biggest emitters at present, like China and India, have levels of income similar to or lower than many Latin American countries. This means that most countries, including those in the region, would have to contribute to the global mitigation efforts to have a chance of meeting the Paris goals.

An academic literature has emerged around these issues, with the aim of calculating how future emissions should be allocated among countries (or regions), considering the level of GHG concentration that is to be reached (the maximum allowed by the respective temperature goal). There are several criteria that are used do those hypothetical allocations, which are usually grouped into the following categories:

- Capability/Ability to pay: more intense mitigation should be required from countries that can afford to pay for it. More emissions are allowed for those with low economic development.

- Equality/convergence: emissions per capita should converge to a common level for all countries or regions.

- Responsibility: Greater emissions reductions are demanded from countries (regions) with a greater historical responsibility for the observed temperature increase. It is similar in spirit to equality criteria, with a twist: it does not demand more reductions from those who emitted the most but from those who contributed the most to global warming. Since emissions have a persistent and cumulative effect on warming, older emissions bear more responsibility for the warming that has occurred so far.

- Equality of cumulative emissions per capita (ECPC): Make equal across countries their emissions per capita during a certain period.
- Grandfathering: The distribution of emissions at the time of allocation are extended into the future. This criterion does not respond to equity concerns.
- Cost Effectiveness: It reduces emissions wherever it is most economically efficient. Also not based on an equity principle.

The description offered above simply provide a general overview of the rationale behind each criterion. There are many details that have to be defined in order to implement any of them. Note, for example, that the exercise we presented in Table 3 is a version of the ECPC criterion. In our case, we considered cumulative emissions from 1905, but the start year of the period is a parameter that can be changed and is very consequential for the results. We also didn't cap the total amount of emissions (which you would need to do to make an allocation that is compatible with a given level of warming). There are also studies that use hybrid criteria or staged approaches (in which different rules are applied according to the development level of countries).

Höhne et al. (2014) survey and summarize that literature. They consider over 40 studies that perform effort-sharing exercises and, based on them, compute a range of emission allowances according to different allocation criteria in order to reach different concentrations of CO_2eq. The level of analysis are geographical regions (e.g. Latin America), not countries. According to this survey, by 2030 the emissions from Latin America should decrease between 15% and 49% with respect to their 2010 levels.[5] This is a larger reduction than what is demanded from other regions like Sub-Saharan Africa, Middle East and North Africa, and South Asia. Another conclusion of this survey is that using different effort-sharing criteria does not change much what is demanded from Latin America. Exercises using criteria of Capability, Equality and a mixture of Responsability and Capability, all lead to very similar results. If anything, approaches that use the principle of Equality of cumulative emissions per capita ask for even stronger mitigation.[6]

[5] By 2050, they should be below half their 2010 level.

[6] The authors argue that there is more variation between approaches for countries that are further from the global average on the indicators that are used to determine the allocations (e.g. income and level of emissions per capita). Thus, the stability of the results for Latin America is due to the region being relatively close to the world average on those dimensions.

A more recent study is that by van der Berg et al. (2020), who also estimate emission pathways under different effort-sharing criteria. They only analyze the major emitting jurisdictions and only Brazil is included from Latin America. Still, the results are similar to those for the region in Höhne et al (2014). Most criteria demand the emissions from Brazil by 2030 to be somewhere between 20% and 40% lower than in 2010. Also similarly, the effort required from Brazil is very stable across criteria, and the ECPC turns out to be more demanding than most other approaches.

Taken together, these results show that effort-sharing exercises consistently require greater effort (in terms of mitigation) from Latin America than from other developing regions and that the specific approach used to compute these requirements are not too consequential for Latin America.

We can also compare the numbers that come out of these exercises with the mitigation goals that Latin American countries have set for themselves. Combining information from the most recent NDCs of each country, we estimate that the region as a whole aims at an emission level by 2030 which is 10% lower than in 2015 (Fajardo, 2023). That is, much less mitigation than the effort-sharing models would demand. This lack of ambition, however, is not unique to Latin America. The Climate Action Tracker (CAT), which observes the pledges and actions of 41 jurisdictions, finds that only 6 of them have NDC targets that are compatible with their fair contribution to the 1.5°C Paris Agreement goal. Most of those who are compatible are low-income countries, mainly from Africa. Costa Rica is the only country from Latin America which earns the "Paris Agreement compatible" mark, thanks -according to the CAT assessment- to its decarbonization initiatives, such as recent policies for electrifying transportation, the extension of the ban on oil exploration and exploitation, and the promotion of a carbon-neutral certification program. Colombia also receives a good mark ("Almost sufficient"), due in part to recent official announcements to prioritize this agenda and a climate action law enacted in 2021 which enshrines legally the country's NDC and net zero targets.

It is important to note that this discussion about fair contributions has no direct practical implications, since the international governance around these issues does not involve mechanisms to determine or negotiate explicitly what is a fair contribution of each jurisdiction. There is a formal acceptance of the general CBDR principle, but no agreement on the specific responsibilities of each party. Still, these effort-sharing calculations can serve as a guideline for countries to define their level of ambition in mitigation policies with respect to others. The literature surveyed in this section suggests that Latin American countries should do more to mitigate, but so should most everyone else.

Moreover, mitigation goals should not be isolated from other dimensions of international climate policy, and in particular climate finance. Developing countries have long demanded resources from rich countries for climate-related projects as a compensation for the asymmetry in historical responsibilities which is unlikely to be corrected via mitigation alone. The argument is that, since those asymmetries are so large that they cannot be closed via the allocation of carbon budgets going forward, financial resources can serve as a (partial) compensatory mechanisms. This would imply providing money in the form of grants and concessional loans for projects of adaptation or to pay for losses and damages. Rich countries have consistently fallen short on this. They have not complied with their own pledge to channel 100 billion annual dollars in climate finance (Conference of the Parties to the UNFCCC, 2010), and most of what has been mobilized has taken the form of non-concessional loans and has been directed to mitigation projects.

According to a study by the OECD (2022a), international finance from wealthy countries to developing ones was about USD 52.4 billion in 2013 and saw an increase to 83.3 billion in 2020, averaging a 7 percent annual growth. Other estimations show more modest numbers. A recent report by Oxfam measured these transfers at about USD 20 to USD 25 billion in 2020, representing one-third of the OECD's calculations (Carty & Kowalzig, 2022). This calculation is much lower mainly because it applies the criterion that loans, especially non-concessional ones, should not be counted towards the climate finance goals in the same way as grants. As market-rate loans do not represent an effort to the lenders, it would be unfair to count them as a compensation for historical emissions, the argument goes. This point is significant because over 70% of public resources mobilized from rich to developing countries take the form of loans, and only a quarter consists of grants (OECD, 2022b).[7] Looking forward, it is hard to imagine that developing countries will accept incurring in more mitigation that is costly in the short run without receiving compensating resources.

[7]The Climate Policy Initiative (CPI) also studies the extent and composition of global climate financing. They report that total annual climate finance added up to USD 632 billion by 2020, with 3.5 to 5.5 percent of that corresponding to Latin America. Notably, almost all climate finance is allocated to mitigation projects, and less than 10% is dedicated to adaptation (Naran et al., 2022).

Table 4: Decoupling Emissions from Economic Growth between 2000 and 2019

	Average Emissions ($MtCO_2$)		Emission reductions		GDP growth
	1999-2001	2017-2019	$MtCO_2$	%	%
Ukraine	455.2	279.0	-176.2	-38.7	39.9
United Kingdom	697.4	465.6	-231.8	-33.2	36.1
Côte d'Ivoire	116.6	93.0	-23.7	-20.3	86.4
France	528.3	427.9	-100.4	-19.0	26.3
Romania	129.6	107.2	-22.5	-17.3	101.6
Germany	1,006.1	836.4	-169.7	-16.9	26.0
Czech Republic	139.1	115.9	-23.2	-16.7	66.2
Belgium	158.0	133.8	-24.1	-15.3	33.7

Note: This table presents a list of countries among the 50 largest historical greenhouse gas (GHG) emitters that managed to reduce their emissions while experiencing economic growth. The first two columns show the average of GHG emissions between 1999 and 2001, and 2017 and 2019, respectively. The third column displays the emission reductions between those two periods, while the fourth column presents the percentage reduction. The final column provides information about economic growth between 2000 and 2019. It compares the average GDP for 1999-2001 to the average for 2017-2019. This is expressed as a percentage and is based on constant 2015 U.S. dollar (U$) prices data. To qualify for inclusion in this table, countries must have reduced their emissions by at least 15 percent and achieved a GDP growth of 15 percent or more between the periods of reference.

Source: Authors based on Minx+GCB and World Bank GDP data (The World Bank, 2023)

5 Where has mitigation come from (so far)?

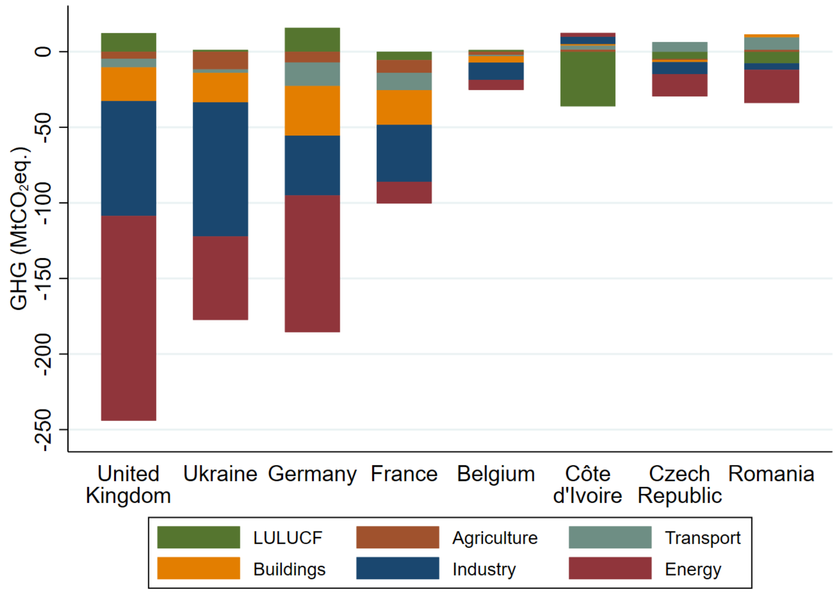
The term decoupling is often used to refer to the situation where a country grows its economy while reducing the amount of GHG emitted to the atmosphere. Given that human societies demand and seek material progress, decoupling is the goal of polities that want to reduce their carbon footprint.

Decoupling is possible. Table 4 lists the countries which, since 2000, have seen their economies grow by at least 15% with a reduction of emissions of at least 15%. They are almost all from Europe. The one exception is Ivory Coast, but this country's reduction comes exclusively from the LULUCF sector and occurs suddenly, which leaves doubts to whether that reduction is genuine or a reflection of measurement issues.

Figure 6 shows that about half the reduction of emissions in those countries come from the Energy sector, thanks to fewer coal mining fugitive emissions, more efficient refining and an increasing importance of non-fossil sources in power generation. Another large part of the reduction is due to the Industry sector, and more specifically to the waste and metals subsectors. The rest of sectors has contributed much less to the decrease in emissions. In Transport, for example, there has been very little mitigation, and it has been concentrated in the rails subsector (a breakdown of the reduction in emissions by sector for the list of decoupling countries can be seen in Figure A.3 in the Appendix).

An important factor behind the transformation of the Energy sector is the sharp fall in the

Figure 6: Decoupling of GHG emissions and GDP from 2000 to 2019. Sectoral Decomposition of Emission Reductions by Sector



Source: Authors based on Minx+GCB

cost of electricity generation from clean sources (wind and solar). This has driven the ongoing energy transition, especially in rich countries, and is expected to continue to drive it elsewhere. For the Industry sector, observed reductions come from better waste management and gains in efficiency in some processes. Going forward, hopes are in cutting emissions in cement and steel-making via electrification of processes or the use of green hydrogen, but some technical challenges still remain. The Transport sector has been harder to tackle. Electric vehicles are expected to be the driver of change but, besides the purely technological, there are significant investments that need to happen to make them a viable alternative for individuals. Electric vehicles represent an increasing share of new cars in some -usually rich- countries, but they have not yet translated into a source of emissions reduction. [8]

Compared to these sectors, there is less clarity about how to cut emissions in Agriculture. There are some positive practices around the feeding of animals, rice cultivation and manure management, but their mitigation potential seems limited (Roe et al., 2019). The relative lack of knowledge can be partly attributed to deficient R&D on agricultural practices for climate mitigation. A recent study of US federal R&D agencies and programs finds that resources

[8] Of course, electrification -both for transport and industrial processes- is only a source of emissions reduction if electricity is generated from clean sources. Electrifying when the power supply comes from fossil fuels does not reduce and may even increase emissions.

devoted to agricultural climate mitigation were around $241 million between 2017 and 2021, less than 3% of what is devoted to clean energy innovation (Blaustein-Rejto, Yu, Bass, & Núñez-Mujica, 2022). In the LULUCF sector, the way to mitigate is clear: stop deforestation and reforest lands. However, the relative clarity of what to do contrasts with the complexity oh how to do it. Unlike what happens in sectors like Energy, Industry or Transport, the obstacles here are not so much about technology or deployment of hard infrastructure, but about enforcement of land protections, state capacities, and creating economic opportunities that drive individuals away from illegal deforestation.

In summary, the paths towards mitigation differ a lot across sectors, and this is relevant to assess how decoupling might be achieved in each place. One important challenge for Latin America going forward is that a relatively high share of its emissions comes from activities (Agriculture and LULUCF) where mitigation is not simply about technological substitution and thus might be harder to achieve. Of course, for some countries there are important gains to be made in the Energy sector —where most of the rich-world mitigation has occurred—, but that channel is limited for the region as a whole, where electricity is already clean in comparative terms.

6 The political support for climate action

Since the existing arrangements for international cooperation leave a lot of autonomy for countries to decide their own goals and actions in climate policy, the level of ambition in any given jurisdiction depends largely on the internal political support received by that agenda. There are ways in which countries can receive external incentives to advance on these issues, for example through international trade policy (like the Carbon Border Adjustment Mechanism (CBAM) or the regulations on deforestation-free products, both initiatives of the EU), or through the mechanisms that allocate climate-related funding. Yet, those incentives are not currently too strong. For example, no jurisdiction other than the EU seems to be moving towards the use of trade-related instruments (and the European CBAM will at first apply only to a reduced number of industries), and international climate funding is quantitatively small. In this context, domestic politics and societal attitudes and preferences are important determinants of climate policy.

So, how much political support is there for these issues in Latin America? According to survey data, a large fraction of the population believe climate change to be an urgent problem that must be prioritized. For example, according to the 2018 wave of Latinobarometro, 58% of respondents declared that protecting the environment should be put before the economy and the creation of jobs (Latinobarómetro, 2018). That number seems surprisingly high considering the levels of poverty and socioeconomic needs of the region, and could reflect some form of social-desirability bias in the survey responses.

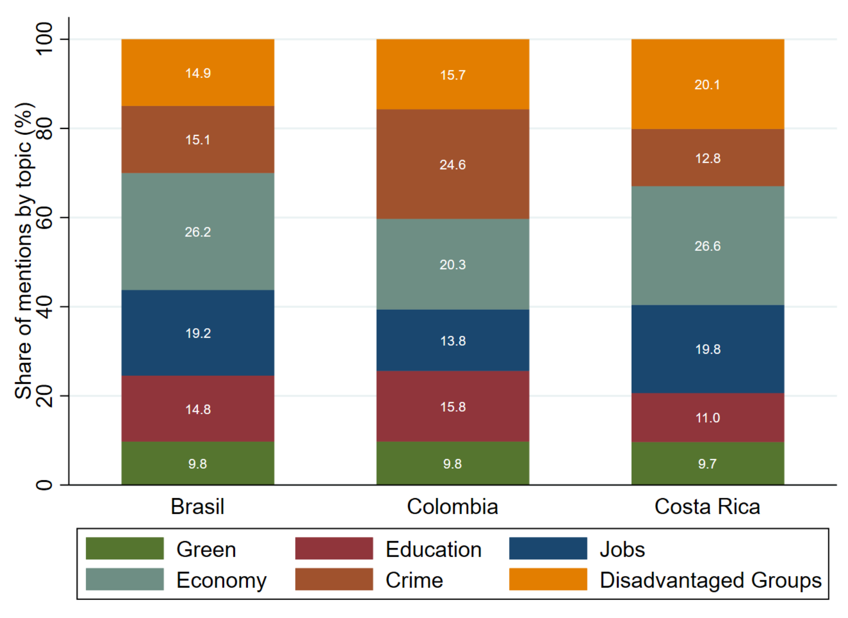
Trying to get a less biased measure of how politically salient this issue is, we turned to the social media of politicians. More specifically, we analyzed the Twitter timeline of candidates of three Presidential elections that took place in 2022 (Brazil, Colombia, and Costa Rica), to observe the frequency with which they mention a host of topics during the months before the vote.[9] Here, a topic is characterized by a dictionary of words and expressions (for example, the topic Green includes the expressions "Amazon", "climate", "drought" and "biodiversity") and our exercise counts the number of Tweets that mention each topic. Each tweet can only count once for each topic (even if it includes several topic-specific expressions) but can count for more than one topic.[10]

Among the topics that we considered, Environmental issues were the least mentioned by candidates across all three countries, accounting for about 10 percent of total mentions (see Figure 7). Jobs and the Economy are usually the most popular topics, and each receives between 2 and 3 mentions for every one that the Environmental category receives. Education is not as salient as economic topics, but still receives double the attention than environmental issues. Crime is also extremely relevant in Brazil and Colombia. Tweets are essentially costless, so candidates can produce them even for topics that are not high on their agenda in order to address the concerns of different constituencies. We believe this means that the gap in relevance between topics observed through Tweet mentions is probably underestimated with respect to what would happen if messaging was costly. Still, these observations paint a picture in which economic issues take clear precedence over environmental ones in the political agenda. Despite the methodological shortcomings this exercise may suffer from, we believe it offers a more realistic view of national priorities than what comes out of self-reported opinions

[9] The length of period for which the tweets were collected varied by country: the last 6 months before the election in Costa Rica (from October 6, 2021, to April 3, 2022), 4.5 months before the election in Brazil (from June 17 to October 30, 2022) and 2 months in Colombia (from March 26 and May 29, 2022). In total, we retrieved 14,735 tweets across 17 candidate's timelines. This dataset was acquired using the R library package rtweet (Kearney, 2019), leveraging the Twitter API service.

[10] Tables A.3 and A.4 in the Appendix display the dictionary of keywords for each topic.

Figure 7: Presidential campaigns and social media in Latin America. Share of topics mentioned by candidates in Twitter, by country



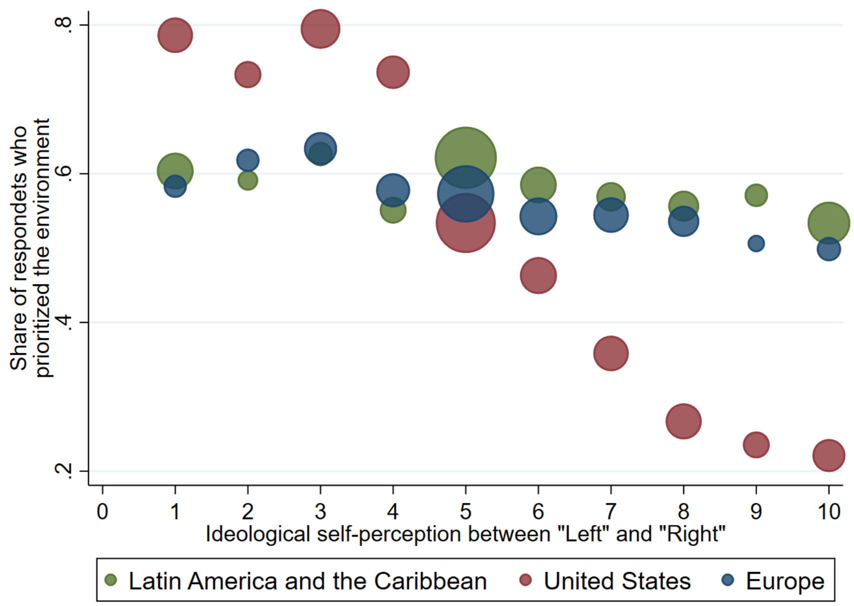
Note: The figure present the share mentions of specific topics in the Tweets of Presidential candidates during the 2021 and 2022 campaigns in Brazil, Colombia, and Costa Rica. The topic labelled as "green" accounts for the number of mentions of words related to climate change, the environment and nature (including keywords such as "climate", "ecology", "sustainability"). This is an approximate measure of the candidates' emphasis on environmental issues during their campaigns. Tables A.3 and A.4 display the full list of words included in each topic.

Source: Authors based on public X (Twitter) timelines of presidential candidates.

of individuals in surveys.

While environmental policy is not high on that list of priorities, there is one silver lining: it is not a polarizing topic in the polities of the region. As a counterexample, in the US environmental issues have turned into a thorny cleavage between the two dominant parties during the last decades. Figure 8 shows the fraction of survey respondents who believe the environment should be prioritized over economic growth, as a function of ideological self-perception. For the US, that figure goes from around 80% among those who self-identified with the left to just over 20% for those on the right of the ideological spectrum. This gradient is almost nonexistent in European countries, where the figure goes from around 60% in the left to 50% in the right. The pattern for Latin American countries is very similar to that of Europe. We take this as positive, given that the strong polarization around these issues is one factor that has stagnated progress in the US. Europe, specifically the EU, is by contrast one of the most active jurisdictions worldwide on environmental regulation. This apparent independence

Figure 8: Prioritization of the environment over economic growth, according to ideological self-perception



Note: the figure presents the percentage of respondents who affirmed that the environment should be prioritized over economic development, according to their ideological self-identification. On the horizontal scale, 1 represents Left and 10 represents Right. The size of the bubbles corresponds to the percentage of people who self-identified on each ideological scale. Responses from people who did not answer the ideological self-identification question or answered that they did not self-identify with any scale are excluded. Source: Authors based on the World Values Survey, wave 7 (2017-2022) (Haerpfer et al., 2022)

between ideology and support for "green" issues means there is room for agreements across party lines to advance policy on this front.

7 Conclusions

According to the current NDCs of Latin American countries, the regions as a whole aims at reducing its emissions by about 10% by 2030 with respect to 2015 levels. Implementation gaps can prevent that goal from being reached, but even taking it at face value, it is natural to ask if that is enough of a contribution to achieve the global climate objectives set in the Paris Agreement. This, of course, is extremely hard to judge, but the literature on effort-sharing seems to suggest that it is not. According to that, Latin American countries should do more in terms of mitigation.

That conclusion, however, does not have any direct policy implications. The existing instances of international cooperation on climate issues do not allocate responsibilities to countries nor have any mechanisms to force them to adopt specific actions or goals. Moreover, while there are instruments that allow jurisdictions to incentivize or pressure others to advance climate policies -e.g. using trade regulations-, those instruments are still not very strong. Thus, the level of ambition of climate policy is mostly determined by the internal politics of countries. Hence, preferences and attitudes are paramount.

While most Latin Americans state in surveys that they prioritize environmental issues above economic matters, the contents of recent political campaigns indicate otherwise. At least according to their social media strategies, politicians seem to think that voters put more weight on topics like the economy and crime than climate policy. This is not surprising, but it is relevant to understand what is politically feasible in the region. Mitigation is very welcome as long as it's not too costly.

In the next few years and decades, opportunities to mitigate at low cost will open up thanks to new and cheaper technologies. A good example of this is represented by power generation. Significant reductions in the cost of generation from green sources has been the driving force of the ongoing energy transition that has allowed some countries -especially developed ones- to start a process of decoupling. As technological standards settle and uncertainties diminish, these technologies will increase their penetration in developing markets. Latin America will benefit from that.

However, the sectoral composition of emissions in Latin America is very different from that in developed countries. In particular, land-based activities are much more important sources of GHG. Thus, the contribution of the energy transition to mitigation in Latin America will be relatively muted, as power generation is comparatively clean to begin with. Reducing emissions in Latin America requires working on sectors like agriculture, cattle-ranching and forest management, where i) there is less clarity about what can be done, and ii) institutional and regulatory aspects will be as or more important than technological changes.

References

Blaustein-Rejto, D., Yu, J., Bass, E., & Núñez-Mujica, G. (2022). *Assessing federal R&D funding for agricultural climate mitigation* (Tech. Rep.). The Breakthrough Institute.

Carty, T., & Kowalzig, J. (2022). *Climate finance short-changed: The real value of the $100 billion commitment in 2019–2020.* Oxfam. Retrieved from http://hdl.handle.net/10546/621426 doi: 10.21201/2022.9752

Climate Watch. (2022). *Historical country greenhouse gas emissions data.* World Resources Institute: Washington, DC. Retrieved from https://www.climatewatchdata.org/ghg-emissions

Conference of the Parties to the UNFCCC. (2010, March 30). Decision 2/CP.15 Copenhagen Accord. Report of the Conference of the Parties on its 15th session, held in Copenhagen in December 2009..

Ember Climate Organization. (2023). *Yearly electricity data.* Retrieved from https://ember-climate.org/data-catalogue/yearly-electricity-data/ (data updated on 16 June 2023)

Fajardo, G. (2023). Red 2023-chapter 4: International climate change and conservation policy: coordination challenges.

Friedlingstein, P., O'sullivan, M., Jones, M. W., Andrew, R. M., Gregor, L., Hauck, J., … others (2022). Global carbon budget 2022. *Earth System Science Data Discussions*, *2022*, 1–159.

Haerpfer, C., Inglehart, R., Moreno, A., Welzel, C., Kizilova, K., Diez-Medrano, J., … others (2022). World values survey: Round seven-country-pooled datafile version 4.0. *JD Systems Institute: Madrid, Spain*.

Höhne, N., Den Elzen, M., & Escalante, D. (2014). Regional ghg reduction targets based on effort sharing: a comparison of studies. *Climate Policy*, *14*(1), 122–147. Retrieved from https://doi.org/10.1080/14693062.2014.849452

Kearney, M. W. (2019). rtweet: Collecting and analyzing twitter data. *Journal of Open Source Software*, *4*(42), 1829. Retrieved from https://joss.theoj.org/papers/10.21105/joss.01829 (R package version 0.7.0) doi: 10.21105/joss.01829

Latinobarómetro. (2018). *Latinobarómetro database.* Corporación Latinobarómetro: Providencia Santiago, Chile. Retrieved from https://www.latinobarometro.org/latContents.jsp

Minx, J. C., Lamb, W. F., Andrew, R. M., Canadell, J. G., Crippa, M., Döbbeling, N., … others (2021). A comprehensive and synthetic dataset for global, regional, and national greenhouse gas emissions by sector 1970–2018 with an extension to 2019. *Earth System Science Data*, *13*(11), 5213–5252.

Naran, B., Connolly, J., Rosane, P., Wignarajah, D., Wakaba, G., & Buchner, B. (2022). *Global landscape of climate finance: A decade of data 2011-2020.* Climate Policy Initiative. Retrieved from https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-a-decade-of-data/

OECD. (2022a). *Aggregate trends of climate finance provided and mobilised by developed countries in 2013-2020*. Retrieved from https://www.oecd-ilibrary.org/content/publication/d28f963c-en doi: https://doi.org/https://doi.org/10.1787/d28f963c-en

OECD. (2022b). *Climate finance provided and mobilised by developed countries in 2016-2020*. Retrieved from https://www.oecd-ilibrary.org/content/publication/286dae5d-en doi: https://doi.org/10.1787/286dae5d-en

Our World in Data. (2023). *Population.* Based on HYDE (2017); Gapminder (2022); UN (2022). Retrieved from https://ourworldindata.org/grapher/population (Last update on March 31, 2023)

Roe, S., Streck, C., Obersteiner, M., Frank, S., Griscom, B., Drouet, L., … others (2019). Contribution of the land sector to a 1.5 c world. *Nature Climate Change*, *9*(11), 817–828.

The World Bank. (2023). *GDP (constant 2015 US$).* World Development Indicators. Based on World Bank national accounts data, and OECD National Accounts data files. Retrieved from https://data.worldbank.org/indicator/NY.GDP.MKTP.KD (October 5, 2023 update)

UNFCCC Secretariat. (2023). *Greenhouse Gas Inventory Data - Flexible Queries.* Retrieved from https://di.unfccc.int/flex_non_annex1 (Based on national GHG inventory submissions as at August 2023)

United Nations. (2022). *World population prospects 2022. online edition.* United Nations, Department of Economic and Social Affairs, Population Division. Retrieved from https://population.un.org/wpp/

Van den Berg, N. J., van Soest, H. L., Hof, A. F., den Elzen, M. G., van Vuuren, D. P., Chen, W., … others (2020). Implications of various effort-sharing approaches for national carbon budgets and emission pathways. *Climatic Change*, *162*, 1805–1822.

A Appendix

Table A.1: Emissions of LULUCF in Latin America and the Caribbean, share by country in 2018

	Emissions share (%)
Brazil	64.1
Mexico	7.7
Colombia	6.2
Paraguay	4.5
Bolivia	3.6
Argentina	2.8
Peru	2.7
Venezuela	2.3
Nicaragua	1.3
Ecuador	1.2
Rest of LAC	3.8

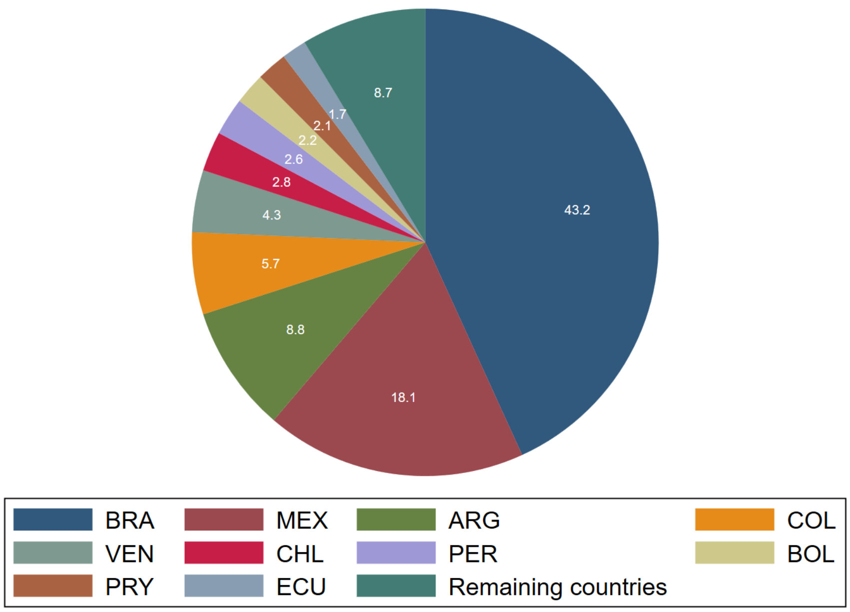
Source: Authors based on Minx+GCB database.

Table A.2: Per capita emissions of LULUCF in Latin America and the Caribbean. Countries with largest land-use per capita emissions

	Emissions per capita (tCO2eq.)
Belize	15.3
Paraguay	9.8
Guyana	7.8
Suriname	5.7
Bolivia	4.3
Brazil	4.3
Nicaragua	2.8
Colombia	1.8
Uruguay	1.5
Panama	1.3

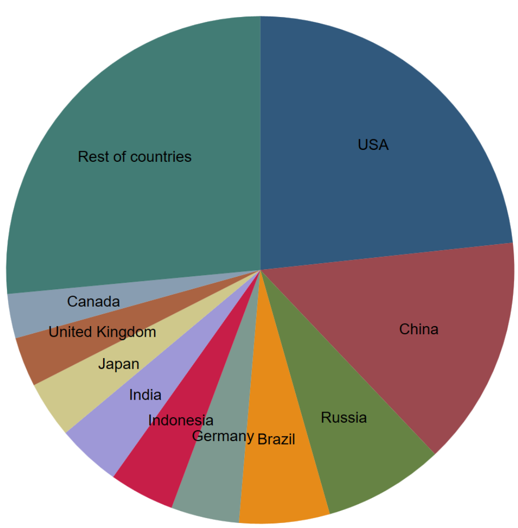
Source: Authors based on Minx+GCB database.

Figure A.1: Latin America's countries share to total emissions in 2018



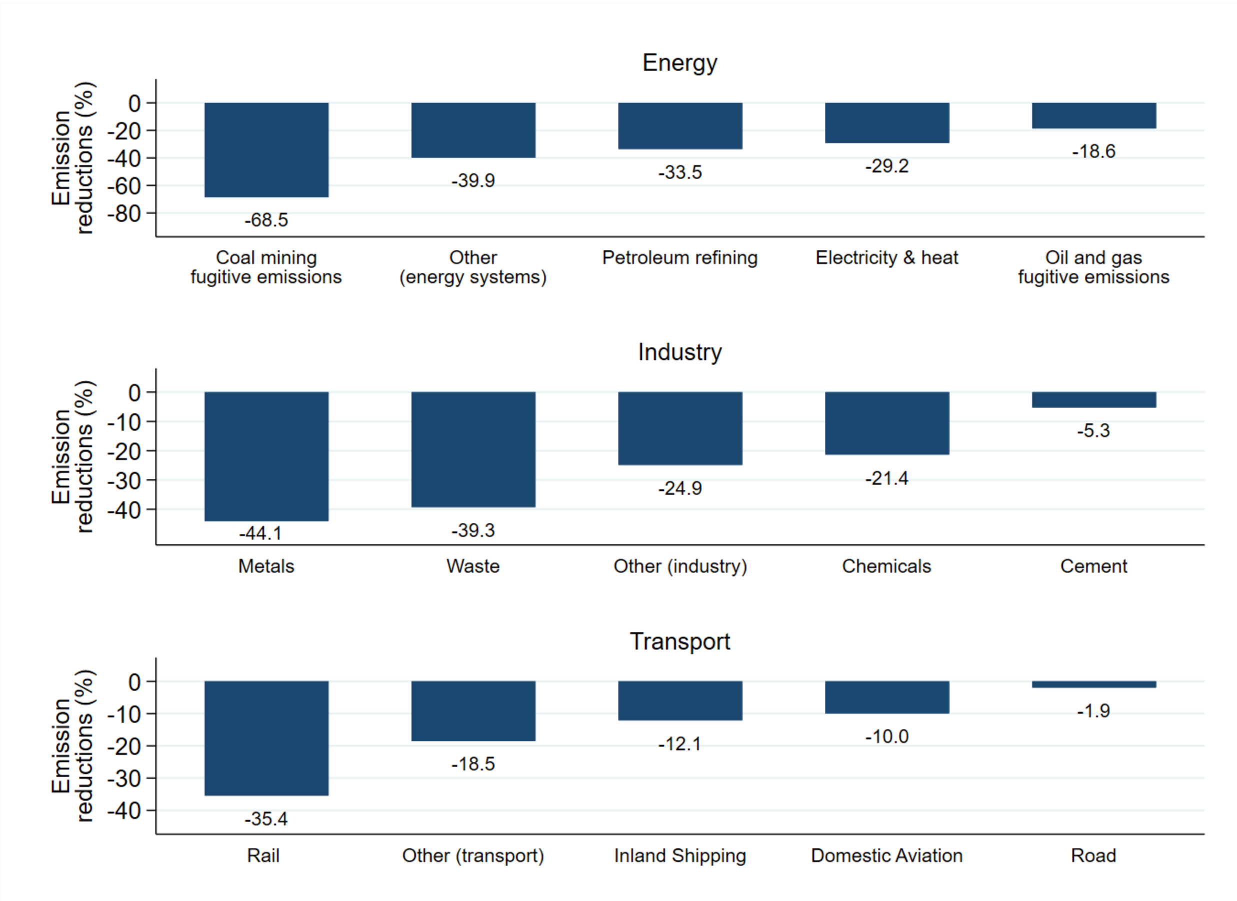
Source: Authors based on Minx+GCB. The legend "Other countries" refers to the remaining 22 countries of Latin America and the Caribbean belonging to the CELAC.

Figure A.2: Countries' share to accumulated CO_2 emissions from 1905 to 2021



Source: Authors based on Friedlingstein et al. (2022) CO_2 emissions series.

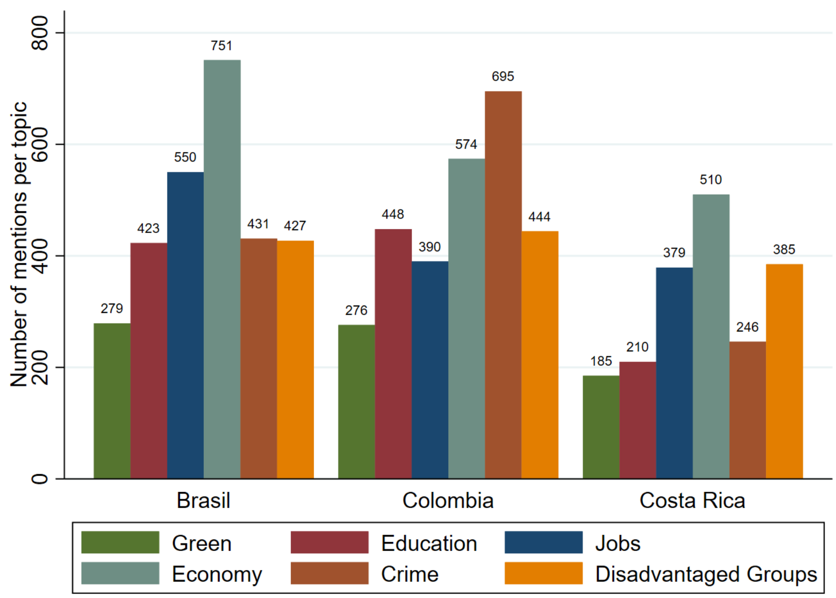
Figure A.3: Comparative Sectoral Shifts: GHG Emission Reductions (1999-2001 to 2017-2019) in Top Decoupling Countries



Note: The figure illustrates the average reduction of emissions across sectors and subsectors for the period between 1999-2001 and 2017-2019. The data is presented as a weighted average percentage reduction of Belgium, Czech Republic, Cote d'Ivoire, Germany, France, Romania, Ukraine, and the United Kingdom.

Source: Authors based on Minx+GCB.

Figure A.4: Presidential campaigns in Latin America: number of mentions by topic in candidates' tweets (2021-2022)



Note: The figure present the frequency of specific topics mentioned in the tweets of presidential candidates during the 2021 and 2022 campaigns in Brazil, Colombia, and Costa Rica. The topic labelled as ”green” counts the number of mentions of words related to climate change, the environment and nature (including keywords such as ”climate”, ”ecology”, ”sustainability”) to measure the candidates' level of concern and emphasis on environmental issues in their campaigns. Tables A.3 and A.4 dislpay the full list of words included in each topic.

Source: Authors based on public X (Twitter) timelines of presidential candidates.

Table A.3: Words per topic for candidates' tweets of Colombia and Costa Rica

Green	Education	Jobs	Economy	Crime	Disadvantaged Groups
amazonas	escuela	trabajo	crisis	crimen	joven
amazonía	educación	trabajador	inflación	violencia	jóvenes
ambiente	educar	empleo	economía	inseguridad	juventud
ambiental	educativo	desempleo	inversión	inseguro	paridad
climático	niño	laboral	impuesto	preso	género
clima	aprendizaje	sueldo	tributar	presos	mujer
climático	aprender	salario	cambiario	impunidad	mujeres
climáticos	matemática	seguro social	fiscal	corrupción	LGBTQ
verde	habilidad	canasta básica	crecimiento	corrupto	lgbtqia+
clima	estudio	sindicato	producto	seguridad	discriminación
agua	universidad	informal	empresa	policía	igualdad
ecología	universitar	informalidad	Pyme	arma	derechos
sustentabilidad	analfabet	pasantía	dinero	armamento	discapaci
naturaleza	maestr	jubilado	producción	armada	gay
medio ambiente	estudiante	negociación colectiva	exporta	pandilla	gays
tierra	aula		importaciones	guerra	lesbianas
planeta	aulas		importados	cárcel	lesbiana
fertilizante	carrera		riqueza	ejército	transgénero
pesticida	académico		negocio	droga	etnia
sequía	academia		productor	narcotráfico	refugiados
calentamiento	terciario		dólar	terrorismo	migración
biodiversidad	técnic superior			marihuana	migraciones
bioma	secundaria			cocaína	licencia
contamina	secundario				licencias
hidrógeno					comunidades
biocombustibles					originarias
combustibles					
renovable					
híbrido					
fósil					
carbono					
invernadero					
gases					
energía limpia					
bosque					

Table A.4: Words per topic for candidates’ tweets of Brazil

Green	Education	Jobs	Economy	Crime	Disadvantaged Groups
amazônia	escolas	trabalho	pobreza	crime	jovens
amazonas	educação	trabalhador	crise	crimes	jovem
atmosfera	ensino	emprego	inflação	violência	juventude
ambiental	menin	salário	economia	insegurança	paridade
clima	aprendizagem	desempreg	investimento	inseguro	gênero
climáticas	habilidade	laborales	imposto	prisioneiro	mulher
verde	estudar	cesta básica	taxa de câmbio	impunidade	LGBTQ
água	estudos	sindicato	fiscal	corrupção	lgbtqia+
ecologia	universida	informal	crescimento	corrupção	discriminação
sustentabilidade	analfabet	informalidade	produto	segurança	igualdade
natureza	professor	estagiár	empresa	polícia	direitos
meio ambiente	matemática	aposentado	empresários	arma	deficiência
terra	sala de aula	negociação coletiva	PMEs	armamento	homossexual
planeta	carreira	acordos coletivos	dinheiro	armada	gays
fertilizante	acadêmico		produção	gangue	lésbicas
pesticida	academia		exportações	guerra	lésbica
seca	maestrado		exportar	prisão	transgênero
aquecendo	ensino.*superior		importações	prisões	etnia
biodiversidade	ensino.*médio		importados	exército	étnico
bioma	secundário		fortuna	drogas	refugiados
poluição			negócios	narcotráfico	refugiado
hidrogénio			produtor	terrorismo	migrações
biocombustível			dólar	maconha	migrante
combustível				cocaína	licença
renováveis					comunidades originais
híbrido					
fóssil					
fósseis					
carbono					
estufa					
gases					
energia limpa					
floresta					