From Global Policies to Phase Out Fossil Fuels To a Sustainable Union

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Abstract

This paper is divided in three sections. First, I take stock of the current international climate policy regime. After showing that the current regime falls short on ensuring decarbonization aligned with the Paris Agreement's target and on providing sufficient resources for sustainable development in the Global South, I delineate the objectives that a new regime should meet. Second, I propose that voluntary countries form a *Fossil-Free Union* whereby they would establish an international emissions trading system to guarantee that their emissions are in line with the target, and where the allocation of emissions rights would ensure North-to-South transfers in a way that would make most countries willing to join. Third, I propose a *Sustainable Union*, where voluntary countries would commit to reallocate one percent of their GNI to all countries in proportion to their population, financed by global solidarity levies on the wealthiest. These proposals are complementary, they would put the world on track for the climate and sustainable development targets. Lastly, they garner majority support among the population in every country.

This document will soon be expanded to include a draft treaty (translating the above proposals in legal terms) as well as a comparative analysis of alternative international climate policies.

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1 Where do we stand? What do we need?

1.1 A critical assessment of the current regime

The international climate policy regime is laid down in the United Nations Framework Convention on Climate Change (UNFCCC), and its offshoot, the Paris Agreement. The consensus of the international community in favor this regime and its common temperature target is an immense success: The UNFCCC has been universally adopted, and the Paris Agreement has been ratified by all countries but three (Iran, Libya, and Yemen), before the U.S. withdrawal. As the UNFCCC takes its decisions by consensus, this also results in major limitations: agreements rest on the lowest common denominator and fall short of achieving any substantial progress on international climate action. In this section, we review the current regime and its most likely developments.

1.1.1 Developed nations taking the lead

The UNFCCC introduces the distinction between developed and developing nations: the former shall provide financial resources to the latter to promote their sustainable development and climate action. While aimed at sharing fairly the costs of climate action, this classification dates from 1992 and is now outdated. For example, **while Singapore, South Korea, Saudi Arabia and Slovenia are all richer than Greece, only the latter is considered by the UNFCCC to be a developed country with financial obligations**. This outdated classification is stalling progress in critical negotiations, as newly high-income countries resist being considered developed, and historically developed countries are reluctant to increase their contributions unless all high-income countries do so.

While high-income countries should indeed provide resources to foster climate action in lower-income countries, the determination of required transfers should not rest on an outdated, binary classification; it should be defined using up-to-date, continuous indicators such as the GNI per capita. **A simple yet fair rule would be that a country's contributions are to be made in proportion to GNI and entitlements in proportion to population**.

1.1.2 CBDR

In its Article 1, the UNFCCC states what is now known as the *CBDR* principle: "Parties should protect the climate system (...) on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities." This Article is commendable in its objective to guide the allocation of the burden of climate action between countries and reconcile different burden-sharing principles: common action, equity, historical responsibility, ability to pay, etc. Unfortunately, the CBDR principle only offers vague and inconsistent guidance. For example, does equity refer to equal per capita emissions rights or to something else (equal cost of emissions reductions, equal access to development)? How should we balance rules that result in different allocations of emissions rights, such as common action, equal per capita, historical responsibilities and ability to pay? **As the key question of the burden-sharing rule was left unresolved by the CBDR principle and its multiple possible interpretations, countries are not able to agree** on binding targets of emissions reductions and financial transfers by country.

1.1.3 NDCs

This absence of consensus on burden-sharing led to the system of Nationally Determined Contributions (NDCs), where each country sets its own targets. Countries are not sanctioned if they miss their targets. Countries do not even have to define their target using a common indicator (such as their future cumulative emissions). As NDCs rarely specify a cumulative emissions target, researchers need to formulate hypotheses to assess whether NDCs are jointly consistent with the universally agreed temperature target.[1] Even in the most optimistic hypotheses, NDCs are insufficient to meet the temperature target. If all countries respect their NDCs, global GHG emissions should be 51 $GtCO_2e$ in 2030, while 41 Gt would be needed to meet the 2 °C target with a 66% chance.[5] According to the Climate Action Tracker, **current policies and actions correspond to a global warming of +2.7 °C** by 2100, and warming may continue to rise beyond that date.

1.1.4 ITMOs

The article 6.2 of the Paris Agreement allows Parties to exchange Internationally Transferred Mitigation Outcomes (ITMOs). This enables a country to nominally reduce its emissions (the emissions as counted to assess its NDC) by purchasing an ITMO to another country. The latter country will then be credited with the buyer's ITMO emissions. As any bilateral agreement on ITMO is permitted, the use of ITMOs risks reducing buyers' domestic decarbonization efforts. Indeed, to the extent that the NDCs do not add up to the global emissions reductions objective, there would be "hot air": ITMOs would not reflect the required mitigation constraint, and their price will be too low. As a result, ITMOs may propagate a global lack of ambition to countries with otherwise ambitious NDCs, offering a cheap (and less effective) alternative to domestic decarbonization.

To prevent ITMOs from weakening domestic action, countries that use them should commit to extra rules, beyond verifying the environmental integrity of the ITMO they buy. In case of linkages between domestic carbon markets, the same rules would be required to the cross-border (or rather, cross-market) purchase of emissions allowances. Let

[1]Note that the temperature target is itself vague. Article 2 of the Paris Agreement aims at "holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels." Yet, given the uncertainty around the climate system, this (double) target is not precisely defined: does it mean a 83% chance to limit global warming to 2 °C? A 67% chance? A 50% chance? Each probability is associated with a different carbon budget – respectively 900, 1,150, and 1,350 $GtCO_2$ starting in 2020, according to the IPCC (AR6, WGI, p. 39).

us call *sellers* the countries that are willing to sell ITMOs, and *buyers* the countries they agree to sell them to. The extra rules to prevent hot air could be as follows:

- **Sellers and buyers should include a cumulative emissions target (i.e. a national carbon budget) in their NDC, decomposed in yearly targets**.
- **The joint carbon budget of sellers and buyers should be compatible with the Paris temperature target**. If the group sellers and buyers does not include all countries, their joint carbon budget should correspond to their population share of the world's budget.
- **The joint carbon budget** (of sellers and buyers) **in a given year should be lower than their preceding year's joint emissions, by at least (say) 2%.**

If a group of sellers and buyers agrees to these rules, they would effectively impose the principle of an equal per capita allocation of emissions rights, at least to govern the allocation between their group and the rest of the world. While alternative allocation principles are possible, the operationalization of the cross-border trading of emissions allowances (or ITMOs) needs to rely on an allocation principle. The inadequacy of NDCs (taken jointly) proves that the global climate regime cannot rely on diverse and self-serving allocation rules to divide the global carbon budget into consistent national targets.

1.1.5 Climate finance

An equal per capita allocation of emissions rights corresponding to the remaining carbon budget would entail transfers approaching 1% of the world's GDP (or $1 trillion per year) from high to low emitters, that is from the Global North to the Global South. Taking into account historical responsibilities for emissions, an equal per capita allocation of cumulative (past and future) emissions rights would entail even more transfers (the carbon debt that the North owes to the South is estimated at $26 trillion[6]).

At COP29, the international community reached a compromise concerning the New Collective Quantified Goal (NCQG): Developed countries committed to mobilize $300 billion per year by 2035 for developing countries for climate action (and countries "call on all actors" to mobilize $1.3 trillion, which would be in line with experts' recommendations[12,16]). **Although the quantum of $300 billion represents a tripling of the previous climate finance goal, it can be reached through loans** (including from the private sector), and does not specify what share should be provided as grants (or grant-equivalent concessional loans). In fact, the current goal of $100 billion is met with only $26 billion provided in the form of grants. In theory, the NCQG could be met with the same amount of grants (i.e. North-to-South transfers), or even less.

In contrast, at COP29, "**India specified that the NCQG should mobilize $1.3 trillion, of which at least $600 billion should come in the form of grants** and equivalent resources."[4] India, voicing Global South concerns, stated it was "disappointed in the outcome which clearly brings out the unwillingness of the developed country parties to fulfill their responsibilities. We cannot accept it." Transfers aligned with Global South's demands would allow enormous progress towards the Sustainable Development Goals, including climate action but also the deployment of public services and poverty reduction programs. Conversely, an insufficient provision of climate finance does not only infringe on climate justice, it also jeopardizes decarbonization in the Global South, as **many countries make their NDC conditional on the adequate provision of climate finance**.

Together with more North-to-South transfers, reforms to the international financial systems are needed to reorient financial resources towards climate action. These reforms are multifaceted and are more likely to be accepted by governments in the Global North than direct transfers, since that they rely on mostly painless, growth-enhancing accounting operations. The government of Barbados (supported by the UN Secretary-General) leads the movement in favor of these reforms. Their "Bridgetown Initiative" calls for debt relief for low-income countries, for a new issuance of at least $650 billion in Special Drawing Rights by the IMF to expand the loans of Multilateral Development Banks (MDBs) to at least $500 billion per year, and for public guarantees to lower interest rates on sustainable projects in the Global South.[3] Note that although the Bridgetown Initiative is most famous for its climate finance proposals, it also calls for other reforms, such as a universal carbon price and international taxes on the super-rich to finance global public goods.

While a scaling up of climate finance is crucial, it is not sufficient to decarbonize the world as it does not cap (or directly reduce) **emissions**. In the worst case scenario, the expansion of low-emissions projects would mostly add up low-carbon infrastructures on top of fossil ones, failing to meaningfully reduce emissions.

1.1.6 JETPs

The last piece of the climate regime worth mentioning is the Just Energy Transition Partnerships (JETPs). **JETPs are mechanisms where one developing country essentially commits to emissions reductions through the deployment of renewable energy in exchange for concessional terms on the required loans by a group of developed countries**. Four JETPs have been signed so far, involving Indonesia, Vietnam, South Africa, and Senegal.[10] In existing JETPs, the groups of developed countries pledged to offer loans ranging from $2.5 billion (for Senegal) to $20 billion (for Indonesia).

While JETPs offer a promising way to deliver climate finance in a way that guarantees emissions reductions, they currently suffer from several shortcomings. First, **their coverage is limited (in terms of sectors and countries)**. To improve the sectoral coverage and efficiency of JETPs, researchers have proposed to design them as a financial transfer in exchange for a national carbon price.[13] Second, as they focus on emissions reductions rather than sustainable development, **JETPs do not contribute to poverty reduction**. This concern could be mitigated by JETPs with a higher reliance on grants.[2] However, a higher provision of grants is difficult to achieve absent a dedicated source of revenue (such as an international tax).

Lastly, even if **JETPs** were improved along the previous lines, they would still **fail to guarantee that the decarbonization of big emitters like China or the European Union is consistent with required global efforts**.

1.2 Objectives for a truly sustainable regime

Now that we have a critical understanding of the current international climate regime, let us sketch the properties we desire for a new (or improved) regime. We will then be able to assess different proposals in light of these objectives. Here they are:

- **Temperature**. An effective climate regime should achieve the Paris Agreement's temperature target. It should do so by a stabilization of the concentration of each GHG in the atmosphere, and abstain from the risky bets of climate engineering such as Solar Radiation Managements. This objective would translate into a **global carbon budget**. For example, the carbon budget could be set at 1,000 $GtCO_2$ starting in 2025, which corresponds to most likely warming of +1.8°C a 67% chance to keep global warming below +2°C.

- **SDGs**. A holistic approach requires solving all humanity's greatest challenges, not just climate change. As explained above, climate justice requires sufficient **North-to-South transfers** to fund sustainable development (not just climate action). Even though the Sustainable Development Goals (SDGs) and the planetary boundaries would require additional policies and transfers, one important feature of the climate regime is how much climate finance it delivers in the form of transfers to the poorest and improved market conditions. This can be measured through SDGs indicators or GDP per capita in low- and lower-middle-income countries.

- **Efficiency**. As stated by the UNFCCC since 1992,[15] "measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost." Economists have shown that ensuring cost-effectiveness require an **economy-wide carbon price, uniform** across sectors and countries. This fundamentally results from the fact the social cost of emissions are independent from their source or location, therefore they should be priced uniformly. Note that this argument in favor of carbon pricing does not preclude other, complementary policies: these have also been shown to be optimal by economic analysis.[14]

- **Acceptability**. An interesting international agreement is one that has good chances to be accepted by most countries. To measure the success of a proposal, we can use the share of global emissions that are covered by participating jurisdictions. Different elements contribute to acceptability:

  - *Progressivity at the top*. If costs are concentrated on the richest households, the regime can benefit the majority in each country while addressing the excessive level of inequality.
  - *No loss in middle-income countries*. Countries whose population is not rich should not lose from an international climate policy. To assess whether a country loses or not, we should compare its situation in the new regime compared to the status quo. If we synthesize a country's situation by the carbon budget it

is granted, a country would lose if its carbon budget is lower than their unconditional NDC completed by the ambitious emissions trajectory that the country currently envisions.

– *Win-win*. While (per the SDG objective) transfers would be required from high-income countries, this does not necessarily mean that these countries' population would lose out. First, because (as stated above), redistributive policies can concentrate the costs on the richest households in their country. Second, everyone would benefit from a stabilized climate and from a world where SDGs are met. For example, sustainable development would spur global demand, including for advanced technology and low-carbon exports from industrialized economies. Third, while transfers imply a loss compared to the situation with the same worldwide decarbonization efforts and without international transfers, the latter situation is unlikely (as transfers are necessary to promote decarbonization in the Global South). As proposed above, the situation that should be used as a point of comparison is the status quo where the country's carbon budget corresponds to its unilaterally planned emissions trajectory and where there is no international trade in emissions allowances. **To the extent that transfers are the counterpart of the purchase of emissions allowances, a new climate regime could be a *win-win* for all participating countries, as they would all reap the efficiency gains** of an optimal location of emissions reductions.

Coalition of the willing . International negotiations have shown that it is illusory to seek universal agreement for an ambitious agreement. Therefore, political realism requires pushing for proposal that do not get accepted by all countries, and thus, that may also fail to deliver on the climate target, as countries outside the coalition would not fulfill their part of the temperature objective. If oil exporting countries, representing 25% of current emissions, do not join the coalition, temperature in 2100 would be about 0.3°C higher than with a universal participation to decarbonization efforts. While this outcome would be a partial renouncement to some objectives (full acceptability, strict temperature target), it is probably the only type of outcomes that is accessible given the political balance of power.

2 A Fossil-Free Union

Having in mind the shortcomings of the current regime as well as the objectives of a new regime, we are now equipped to propose an international agreement to phase out fossil fuels in way that is cost-effective, promotes sustainable development, and acceptable to most countries.

2.1 The principles for a Fossil-Free Union

The Union would be open to any country, as well as subnational entities (such as U.S. states).

Emissions Trading System The Union would put in place **an international Emissions Trading System (ETS), that would add up to existing ones** (to not dilute the stringency of existing ETSs). All sectors except agriculture and land-use (LULUCF) would be covered. In particular, the ETS would cover (domestic and international) aviation. International shipping could also be covered, replacing the system established by the International Maritime Organisation. The ETS would cover all gases emitted in industrial or energy processes, as in the Korean ETS. Namely, the ETS would cover CO_2, N_2O, PFCs, SF_6, HFCs, as well as methane emissions from industrial processes, fossil fuel extraction, and waste management (but not methane emissions from agriculture).

Complementary policies such as the Tropical Forest Forever Fund would be needed to cover LULUCF sectors. This is important to avoid carbon leakage that would substitute fossil fuels by biomass obtained through deforestation.

Emissions allowances would be fully auctioned by an *ad hoc* international authority to polluting companies upstream of the supply chain.

The ETS will be completed by a **carbon border adjustment** to prevent carbon leakage and ensure that the Union's carbon footprint (rather than its territorial emissions) is capped. Importers into the Union would have to purchase emissions allowances corresponding to the carbon embedded in the imported goods. Exporters out of the Union would receive a rebate for the carbon embedded in their exports, and extra allowances would be auctioned to finance the rebates.

In some federal countries like the U.S., some States may be willing to join the GCP while the federal level would not. To help such States to join the Union despite their belonging to a national customs union, they would be exempted from the carbon border adjustment. In this way, **a State like California could join**. It could also use its share of the revenues to subsidize manufacturing firms, perpetuating its way of recycling ETS revenues and preventing carbon leakage.

Once export rebates are paid, the remainder of **carbon pricing revenues would be returned to countries based on their yearly quota**.

National carbon budgets **Each country would be granted a carbon budget between the starting year (say 2030) and net-zero (say in 2080)**.

Each country would then describe how they would divide their carbon budget intertemporally into yearly quotas. As such, the yearly trajectory of the Union's emissions over the next fifty years would be known at the starting year. Each country would be relatively free on the intertemporal breakdown of their carbon budget, though this choice would have to respect some constraints, developed in Section 2.6, and related to the **rules to avoid hot air** proposed in Section 1.1.4.

Adjusted per capita allocation **By default, each country would be granted a carbon budget corresponding to an equal per capita share of the remaining global carbon budget**. This allocation can be understood as an equal right to pollute for each human, irrespective of their country. Such an allocation would induce international transfers from agents (people or countries) with a carbon footprint higher than the world average, to agents with a lower carbon footprint.

As future population is unknown (and can be affected by policy choices), the benchmark per capita carbon budget would be based on the population share taken at the starting year. Then, **some departures from the benchmark would allow adjusting to special circumstances**.

To prevent transfers flowing from lower-income countries to high-income countries, high-income countries would be granted a carbon budget corresponding to their ambitious decarbonization pathway. In particular, **the European Union would be granted emissions allowances in line with its NDC**, with 90% emissions reductions in 2040 (compared to 1990), and net-zero in 2050. This represents **less than** half of EU's benchmark **equal per capita share**.

To prevent middle-income countries from being net contributors of international transfers, **countries would be allowed to propose further departures from the benchmark** allocation, to the extent that the Union's carbon budget is respected. These departures from the benchmark **need to be agreed by a majority** of participating countries, weighted by their GHG emissions.

In particular, **middle-income countries with emissions per capita above the world average, such as China, Iran, or South Africa, could be granted** a carbon budget equal to the cumulative carbon footprint corresponding to **their own ambitious decarbonization pathway**.

Universal cash transfer The Union would **encourage countries to return the ETS revenue to the population through an equal cash transfer**. In particular, the Union would develop standard and provide technological resources to distribute the cash transfer. Despite the difficulty to reach people who lack civil status or live in remote areas, solutions exist. For example, the Indian system Aadhaar provided a unique biometric identifier to 99% of the country's population in less than seven years. In Africa, the World Bank's ID for Development program is financing the deployment of universal legal identity, in line with SDG Target 16.9. Besides, with phone-based payments and biometric identification, satellite Internet, and off-grid solar panels, the technology is mature and affordable to distribute cash transfers in a way that is fraud-resistant and leaves no one behind.

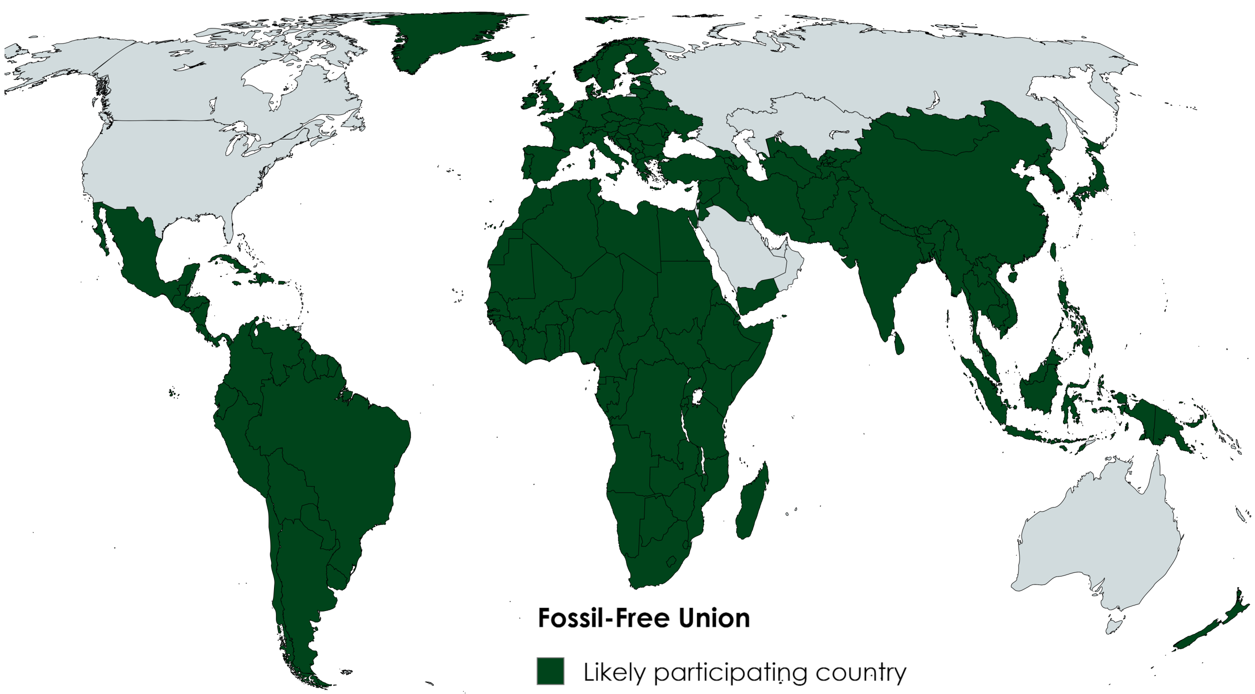
The equal cash transfer would compensate people for the rise in fossil fuel prices. The transfer would reflect each person's equal right to pollute, as it would work as if the person would have sold this right to polluting companies at the carbon price.

Countries that choose not to distribute all revenue through a cash transfer would have to prove that they spend it in a way that leaves no one behind.

2.2 Likely participating countries

Countries that would not lose from the policy are expected to join: these include all low- and middle-income countries, as well as high-income countries with a strong climate ambition. The map in Figure 1 shows which countries are likely to join the Union. These countries represent 74% of current emissions.

Figure 1: Countries likely to participate in the Fossil-Free Union.



2.3 Allocation of emissions rights

Policies currently implemented in the prospective Union would imply emissions of 792 $GtCO_2$ over 2030–2080, while current NDCs (without accounting for long-term targets) would imply 708 $GtCO_2$. In both cases, emissions are expected to continue after that date.[2] In contrast, enforcing an equal per capita share of the remaining carbon budget would **limit Union's emissions to 653 $GtCO_2$** over the period and would **achieve net-zero** emissions by 2080.

To determine the **"non-losing" carbon budget, below which a country could be considered losing**, we proceed as follows. For countries with emissions per capita lower than the world average, we use a Contraction & Convergence benchmark, whre emissions rights per capita start at their value in 2030 for current policies and linearly converge to the equal per capita share in 2050. This benchmark implicitly assumes that countries with relatively low emissions would consider as beneficial to their development the pathway that starts with current policies, gradually grants them extra resources for sustainable development (in the form of emissions rights converging to an equal per capita share of the global sum), and then make them follow the world decarbonization trend. For high-income countries and for China, we use the cumulative emissions implied by their NDCs and long-term targets.[3] Doing so implicitly assumes that these countries have the domestic capacity to deliver their long-term targets on their own. These carbon budgets imply slightly more rights than the equal per capita share for China, and less for high-income countries.

Table 1 present the cumulative emissions implied by current policies, *non-losing* budgets, equal per capita ones, and the proposed allocation. The proposed allocation departs from the equal per capita one for China and Western Europe only, which are both allocated a carbon budget corresponding to their NDCs and long-term targets. It is worth noting that **the proposed allocation grants Eastern Europe, Japan, and South Korea with their equal per capita share**. Indeed, these countries are less rich or have significantly higher emissions per capita than the world average (contrary to Western Europe). Therefore, there is few concern that these countries would turn net recipient from international transfers and no need to apply to them the same exception as for Western Europe.

Table 1: Carbon budgets over 2030–2080 for a 1.8°C trajectory (in $GtCO_2$).

	Africa	China	Latin America	India	Europe	Japan & South Korea	Other Asia	*Fossil-Free Union*	*World*
Current policies	88	226	80	143	31	46	179	*792*	*1,214*
Non-losing	124	147	57	115	22	11	104	*589*	*786*
Equal p.c.	144	**134**	62	135	**49**	16	113	*653*	*754*
Proposal	144	**147**	62	135	**23**	16	113	*640*	*754*

Table 1 shows that the sum of the Union's proposed carbon budget is 13 $GtCO_2$ (or

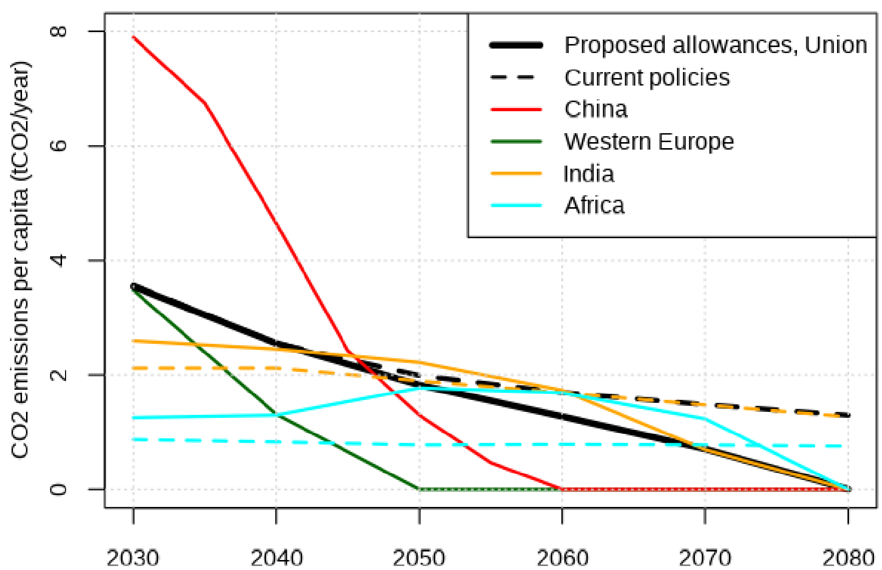
[2]The data on emissions by region from current policies and NDCs (with and without long-term targets) is given by van de Ven et al. (2023)[17]. They model post-2030 action by extending the average rate of change in emissions intensity of GDP from 2020 to 2030. The global carbon budget (and associated equal per capita rights) follows the scenario SSP226MESGB of Gütschow et al. (2021).[9]

[3]For China, the value is in line with the domestic 2°C target scenario developed at Tsinghua University.[11]

2%) lower than its equal per capita share of the world's carbon budget. The unallocated emissions allowances could be used to grant additional countries some extra carbon budget. For the moment, we have only modelled such a departure for China, but a similar one should be granted to other fossil-dependent middle-income countries with relatively high emissions: Algeria, Kazakhstan, Iraq, Iran, Libya, Mongolia, South Africa, and/or Turkmenistan. These countries currently represent 5.6% of global emissions and 3.4% of global population, translating into an equal per capita carbon budget of 22 $GtCO_2$. Therefore, the extra allowances would cover their needs.

Finally, **we propose yearly quotas by country that respect the different constraints** (Figure 2 shows trajectories for selected regions). In particular, proposed allowances are never above the *current policies* scenario, they decrease by at least 2.5% per year, they sum up to national carbon budgets for each country, and lower-income countries receive more allowances than their needs during the first years (or even decades). This allocation should entail a positive carbon price at each period, likely rising over time as the decarbonization becomes deeper. This would ensure sustained North-to-South transfers, largely paid by the efficiency gains from trade.

Figure 2: CO_2 emissions allowances for selected regions (in tCO_2 p.c.).



2.4 A win-win deal

Each country colored in Figure 1 would have an interest to join the Union:

- Every country would benefit from a stabilized climate, and from the guarantee that all countries in the Union decarbonize.
- Most countries (including all countries likely to join) would be granted a carbon budget sufficient to avoid a loss from the status quo. Exceptions include Russia,

Saudi Arabia and other high-income countries from the Gulf with low climate ambition. Even the U.S., Australia and Canada would enjoy a non-losing carbon budget.

- Lower-income countries would receive transfers from the rest of the world, spurring their sustainable development.
- Countries with an important low-carbon industry, such as East Asian countries, would gain from the stronger demand for these goods.
- High-income countries would benefit from the efficiency gains allowed by international carbon trading.
- **Large representative surveys show strong public support in favor of the Fossil-Free Union, even in high-income countries** when transfers are presented as a loss and the amount of transfers is specified. For example, there is **54% support in the U.S. and 76% in Western Europe**.[7] Moreover, academic research shows that political programs containing the Fossil-Free Union are preferred to similar programs without it by 58% to 60% of citizens in Western countries, suggesting that **candidates at an election may win vote intentions by campaigning on the proposal**.[7]

2.5 A ratcheted-up ambition

Global temperature reduced by more than half a degree Current policies correspond to a temperature trajectory reaching +2.7°C in 2100 (see Section 1.1.3).

While the carbon budgets proposed in Section 2.3 are based on a +1.8°C trajectory, to the extent that the Union is not universal, they would imply a higher temperature trajectory. The higher temperature achieved is **not only due to countries outside the Union exceeding their equal per capita share** of the +1.8°C carbon budget. It is **also due to higher emissions within the Union than what would be efficient in case of universal participation**. Indeed, as non-participating countries are those with the largest emissions per capita, their absence from the Union decreases the Union's carbon price below its cost-effective level to achieve +1.8°C. In other words, the non-participation of the largest emitters (in per capita terms) prevents the efficiency gains that would occur should they participate: in this case, they would buy emissions allowances to the rest of the world, raising the demand for allowances and hence the carbon price, and the rest of the world would decarbonize faster (in exchange for transfers).

If the whole world decarbonized at the same rate as the Union, the temperature would reach +1.95°C in 2100. Assuming that emissions in non-participating countries would follow the trend from current policies, the **temperature increase expected in 2100 is +2.15°C**.

Therefore, **the Fossil-Free Union** studied here **would bring a reduction of global temperature in 2100 of half a degree**. Of course, a lower temperature target could be reached by choosing a smaller carbon budget: the Union's decarbonization trajectory is a policy choice.

A sufficiently high carbon price It is important that the Union's carbon price be sufficiently high, for different reasons. First, as transfers are proportional to the carbon price, a substantial carbon price is required to deliver meaningful transfers, finance sustainable development, and convince lower-income countries to join. Second, a low carbon price would entail few decarbonization incentives and indicate that the carbon budget is too large, i.e. the ambition is low. Third, a low price could result in a price hike if a large emitter (like the U.S.) decided to join the Union. This, in turn, would hinder the interest that high-income countries would have in favor of an expansion of the Union to new countries, as their contributions would increase along with the price.

To make sure that the price is sufficiently high, the Union could implement a (steadily increasing) carbon price floor. However, this is not our favorite option. Indeed, **adding a price floor would redefine and obscure the distributive effects** implied by the carbon budgets. By inducing a price higher than the equilibrium market price, **the price floor would** entail emissions lower than the yearly allowances and **be equivalent to a reduction of each country's emissions allowances**. While countries recipient of transfers would be cushioned against these lower allowances through larger transfers, contributing countries would lose out compared to the situation without a binding price floor. This could jeopardize an agreement on the proposed allocation, that has been designed so that industrialized countries neither gain nor lose from the policy. Furthermore, given that we can hardly predict whether the price floor would be binding or whether the equilibrium price would be higher than the price floor, we can hardly redefine the proposed allocation to mitigate the effects of the price floor.

Instead of a carbon price floor, we propose rules to ensure that there is no excess allowances and that the carbon price increases sufficiently overtime. These rules correspond to the rules sketched in Section 1.1.4 and apply to the intertemporal allocation of national budgets. These rules are that the **Union's allowances should not exceed its joint emissions at the starting year, and that they have to decrease every year at a minimum rate of, say, 2%**.

If countries cannot agree on an intertemporal allocation of their emissions allowances that respect these rules, the Union's scientific council would propose how to allocate allowances intertemporally in a way that maximizes welfare, thereby preserving the interests of each country. **In case the Union rejects the proposal of the scientific council, a price floor would be implemented** (say, starting at \$10/tCO_2 and increasing by \$10 each year). The threat of a strong price floor should help countries find an agreement.

2.6 Timeline and governance

Initial stages To build up the administrative capacity, the ETS could be preceded for a few years by a small carbon tax (say \$10/tCO_2), instead of an ETS. The revenues would be returned to countries using a pre-agreed allocation, for example proportional to the ETS starting year's national carbon budgets.

The ETS could also gradually expand its sectoral coverage. In particular, emissions from the aviation and/or manufacturing sectors (the ones covered by the European CBAM) could be covered before the ETS is extended to all intended sectors.

What should occur upfront in any case is the negotiation and agreement about the carbon budget, its country and intertemporal allocation.

Expansion of the Union The Union can expand to a new member by approving a participation request, which should include a proposed national carbon budget and its intertemporal allocation. **When a new member joins, its entry into the ETS can be phased in** gradually, say over five years. Initially, allowances owed by the new member's companies would correspond to a fraction of their emissions, and the new member would only receive that fraction of its normal ETS revenue, with the fraction linearly increasing during the phase-in period.

Renegotiation of carbon budgets At any time, a country can propose a new carbon budget, a new allocation of the global carbon budget across countries, or a new intertemporal allocation of national carbon budgets. A prospective new member can also make such a "reallocation proposal". A reallocation proposal is submitted in the governing body at the condition that the scientific council deems it compatible with the objectives of Section 1.2. In particular, the scientific council would deem the proposal unfit if it is expected to increase the global temperature in 2100, taking into account the changes in membership (entries or exits) that an agreement on the proposal may entail.

Monitoring GHG emissions must be monitored, reported and verified by the Union's administrative authority. The Union would make countries work together and assist countries lacking administrative experience. Besides, transfers would provide resources to low-income countries, which they can use to build up administrative capacity.

Governing body In the Union, voting rights would be proportional to countries' emissions. During operation of the ETS, the governing body would define the market design and possible sanctions against non-compliant or non-participating countries. Before the starting year, the governing body would discuss and vote on the agreement. In particular, it would choose the global carbon budget, its allocation into national budgets, and the intertemporal allocation of national budgets.

Beyond its mandate, the governing body would offer a space for discussion on climate-related matters. For example, it could be used to coordinate complementary policies, such as a ban on the production or import of combustion-engine cars by 2035.

Scientific council **Each participating country would be allowed to designate a team of scientists to represent them in a scientific council**. Appointed scientists could be designated by different countries at the same time. The scientific council would assist the governing body by modelling the climate, economic, and distributive effects of the policy, by providing analyses upon request, and by proposing an intertemporal allocation of national budgets. In case of disagreement in the scientific council, each team of scientists would have a voting right proportional to the population of the country (or countries) that designated them.

Market design The compliance period to surrender emissions permits should be one calendar year, and the auctioning of emissions allowances should occur once a year. Carbon offsets should not be allowed as a substitute to surrender emissions allowances. Borrowing and banking emissions permits should be limited in time and quantity to avoid speculation.

Sanctions **Countries that do not correctly apply carbon pricing on their territory could be excluded from the Union** by a vote of the governing body. Besides, **if the governing body deems it appropriate to encourage participation, it could vote sanctions against non-participating countries, such as tariffs (beyond the carbon border adjustment)**, assets forfeiture, or travel restrictions (especially targeting elites).

2.7 Limitations of the proposal

Any proposal comes with downsides, as trade-offs are inevitable between conflicting policy objectives. The proposal for a Fossil-Free Union faces three limitations.

First, as the between-country and intertemporal allocation of the global carbon budget would be determined in advance, the agreement is not adapting to changing circumstances (e.g. a middle-income country growing and decarbonizing faster than expected, or surprises concerning the pace at which the transition can occur). However, this rigidity is necessary to guarantee that the Union is committed to meet the climate targets. In addition, the rigidity is mitigated by the possibility to renegotiate the carbon budgets, described in the previous section.

Second, to fully understand the distributive effects resulting from the carbon budget allocation (in particular the intertemporal one), one needs to know the equilibrium carbon price that would emerge at each period. Yet, the carbon price can only be estimated with uncertainty. To make sure that distributive effects are known in advance, the Fossil-Free Union can be complemented by the "Sustainable Union" proposed in Section 3, that would determine the transfers between countries based on their GDP per capita and finance them through new international taxes on the wealthiest.

Third, the North-to-South transfers involved in the Fossil-Free Union may be too low in view of the resources needed to achieve the SDGs or of the "climate debt" that high-income countries owe due to their past emissions. These concerns are resolved in the "Sustainable Union" proposed in Section 3.

3 A Sustainable Union

While the previous section focused on the phase out of fossil fuels, we propose here a more comprehensive agreement towards sustainable development, financed by global solidarity levies. **We propose new taxes on wealth, polluting fuels, financial transactions, and corporate income, raising more than $3 trillion per year**. Part of the revenues from these taxes would finance international transfers. **One percent of each country's GNI would be reallocated to each country in proportion to their population**, addressing climate finance needs and fostering sustainable development.

3.1 The design of a Sustainable Union

A group of countries forming a Sustainable Union would have to agree on **three key elements**:

1. a target for **revenues from new levies** on the richest and on pollution, **say 2% of** their **GNI**;
2. a common **contribution to sustainable development, say 1% of GNI**; and
3. the Fossil-Free Union's **global carbon budget, say 1,000 $GtCO_2$** starting in 2025.

The contributions would be returned to countries in proportion to their population. The **rules will guarantee that countries with per capita GNI above the global average would contribute financially to lower-income countries**, drawing on part of the new revenues.

Global solidarity levies We propose to tax wealth at a rate of 2% above $5 million, and 5% above $100 million (i.e. less than the return on capital for large fortunes). Thus, a couple with $10 million in wealth (i.e. $5 million each) would not be taxed, while a person with $150 million in wealth would be taxed at 3% per year.[4] Our proposal remains moderate; two or three times as much could be raised by adopting a more progressive tax schedule. The remaining revenues would come half from carbon pricing (with a higher rate on the aviation sector, currently exempt from taxes) and half from taxes on financial transactions and profits. We could also add a tax on inheritance, on the super-profits of fossil fuel companies and a tax on digital advertising.[1]

We estimate the potential revenues from new taxes at global level.[8] These would amount to over 3% of global GDP (as shown in Table 2), the majority of which would come from a wealth tax.

The participating countries would commit to applying a minimum rate of taxation individual wealth, corporate income, carbon emissions from aviation fuel, and financial

[4] Indeed, 5% of $150 - 100 = 50$M and 2% of $100 - 5 = 95$M, i.e. $2.5 + 1.9 = 4.4$M, that is 2.9% of 150M.

Table 2: Estimated revenues from new global taxes (in billions of dollars per year).

Financial Transaction Tax	Carbon price ($10/tCO$_2$)	Aviation tax ($300/tCO$_2$)	Corporate income tax (21%)	Tax on the ultra-rich (3% above $100M)	Wealth tax (2% above $5M)	**Total**
327	356	223	299	765	1,364	**3,334**

transactions, and to creating a global asset register to list the assets held by each person. Thanks to the extraterritorial mechanism of "tax collector of last resort" proposed by economist Gabriel Zucman,[18] the Union would collect the "missing" tax due to the non-application by countries outside the Union of the minimum rate on multinational profits and individual wealth. In this case, the Union would demand payment of the "missing" tax, pro rata to the activities of the company (or companies controlled by the wealthy individual) that take place inside the Union, on pain of retaliatory measures against the company in question. These revenues would be used to increase transfers from the Union to the countries with per capita GNI below the world average.

The link with the Fossil-Free Union The countries of the Sustainable Union would commit to joining the Fossil-Free Union. The carbon price would thus be probably higher than the figure of $10/tCO$_2$ used in the simulation. Importantly, **the transfers entailed by the Fossil-Free Union would be counted as part of the contributions required by the Sustainable Union**. Therefore, if all countries from the Fossil-Free Union join the Sustainable Union, the calculation of international transfers would be greatly simplified, as these would be determined by the simple formula of the Sustainable Union.

An issue with this arrangement is that transfers from or to a country would cease to depend on its carbon emissions, so incentives to implement national legislation to decarbonize would be reduced. Two mechanisms would maintain incentives for a country to decarbonize. First, as the carbon price of the Fossil-Free Union would apply to companies rather than governments, even though costs for a country as whole would not depend on its emissions, consumers would still face the marginal cost of the carbon price, and be incentivized to decarbonize accordingly. Second, to discourage countries from repealing existing climate legislation, any participating country would have to increase its net contribution to the Union if it reduces the climate ambitious of its legislation. More precisely, any change in a country's legislation that is estimated to lead to increased emissions (or reduced emissions reductions) would be counted negatively in the country's contribution. Thereby, **a country renouncing to a decarbonization policy would have to compensate other countries by the induced extra emissions priced at the Union's carbon price**.

Monitoring A recurring concern on the part of contributors is that transfers could be diverted or misused, and could fail to contribute to the intended uses. Opinions also differ as to the best way to ensure that the poorest people benefit from transfers: should they be paid to governments, development agencies, NGOs, or households? In order to respect the plurality of solutions and the sovereignty of States, the treaty would leave the choice of programs to be financed to the beneficiary States, provided they are validated by **a multilateral agency** such as the World Bank. The agency in question **would ensure that funds are traceable, and that they finance only public services, social protection and sustainable infrastructure**. In the event of non-compliance with conditionalities, management of the funds would be entrusted to (another) multilateral agency, which would itself ensure that the population actually benefited.

Flexibility and conditional cooperation The Sustainable Union would be open to all countries. To encourage as many countries as possible to join, the treaty funding the Union would include elements of flexibility and conditional cooperation. In particular, **the contribution required of a high-income country would be reduced to the extent that other high-income countries did not participate**. Thus, if the European countries join the Union but the United States and Japan do not, Europe's contribution could be halved. Also, **a country could make its participation conditional on the participation of one or more specific countries, or on emissions covered by the Fossil-Free Union exceeding a threshold**, or on the GDP covered by the Sustainable Union exceeding a threshold. For example, the European Union could choose to participate on condition that 60% of global emissions are covered by the Fossil-Free Union, which would de facto make its participation conditional on that of China to international carbon pricing (as China accounts for 30% of global emissions).

3.2 The distributive effects of a Sustainable Union

Figures 4 and 3 estimate in each country the revenue collected from the new taxes as well as the transfers between countries. As one percent of each country's GNI is reallocated to each country in proportion to their population, with universal participation these mechanisms would entail **$766 billion in North-South transfers** (Figure 3), **mostly borne by the richest 1%**, and up to $1 trillion per year if one adds up existing Official Development Assistance. **The new taxes would collect $3.3 trillion globally** (Table 2), **enough for all developed countries to finance their net international contribution** (Figure 4). See Supplementary Material of Fabre et al. (2024)[8] for details.

Figure 3: International transfers to be financed by new global taxes.

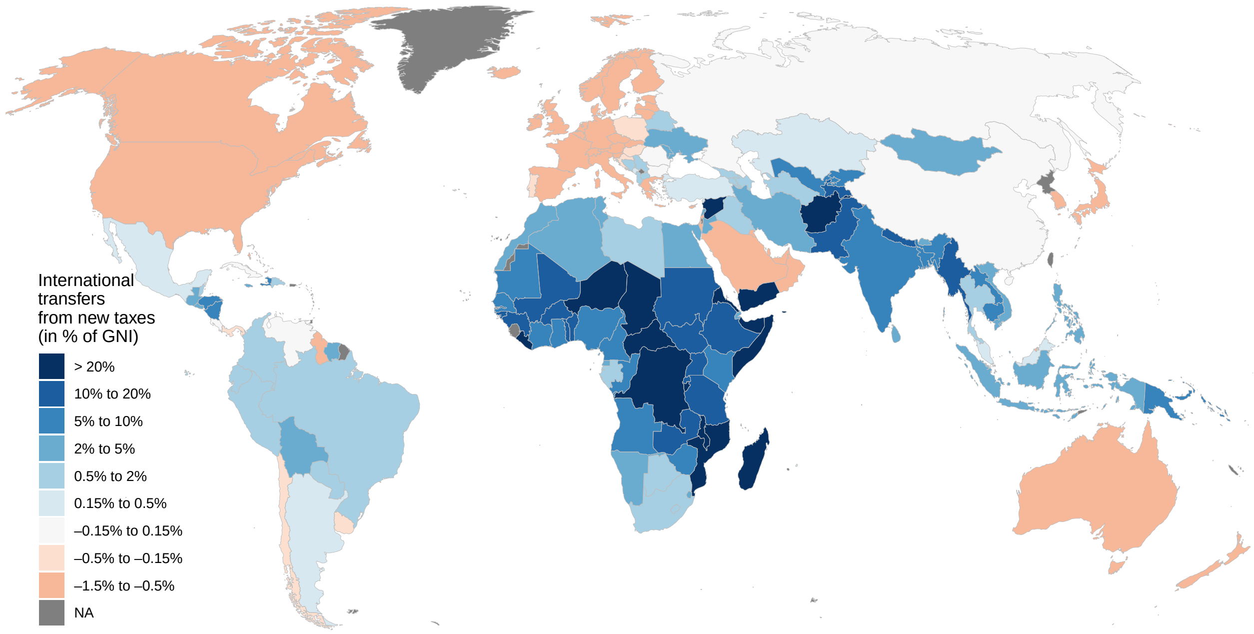
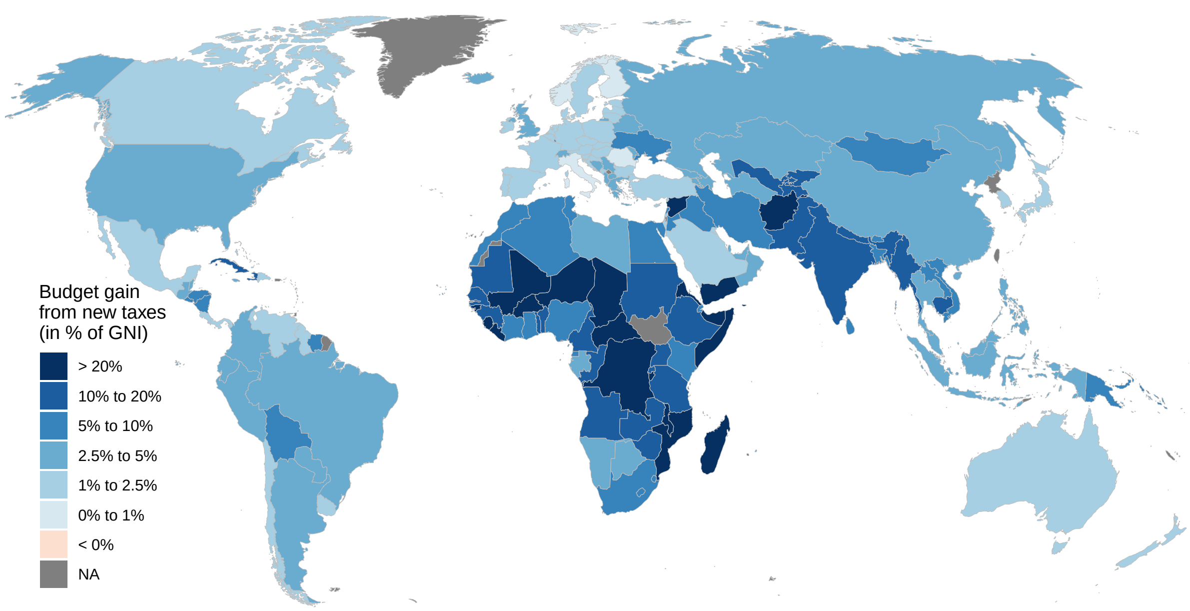


Figure 4: Net gain for state budgets from new taxes and international transfers (revenue plus net transfer).



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