

Global climate targets: Peaking, emissions reduction and renewable energy

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Introduction and background

Attempting to set global targets at the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) and the Meeting of the Parties (CMA) to the Paris Agreement (PA), through decisions and declarations, has become an important part of the climate discourse promoted by developed countries after the Paris Agreement was signed.

Unlike the Kyoto Protocol, which had binding emission reduction targets for developed countries, there are no binding targets on them under the Paris Agreement. All countries, including developed countries, have only a voluntary contribution to climate action. Hence, it has become significantly harder to enforce the obligations of developed countries for climate action based on the principle of equity and common but differentiated responsibilities and respective capabilities (CBDR&RC), with developed countries taking the lead, as enjoined under the Convention.

Directly enforcing equitable and differentiated commitments by the developed countries that are in keeping with their historical, current and future responsibilities, as they have agreed to under the UNFCCC, is difficult within the scope of the Nationally Determined Contributions (NDCs) of the Paris Agreement. It can only be asserted by the political pressure of the developing countries and international public opinion.

To counter this, developed countries are mounting global public campaigns for global mitigation targets (Climate Wire, 2023), trying to create a counter-narrative that such targets are also national targets for individual countries and are applicable to developing countries as well. In practice, this pressure to establish global targets is part of an ongoing and intense effort to pass the burden of mitigation increasingly on to developing countries, by seeking to push them into declaring progressively more mitigation commitments.

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The first global targets of this kind, but with reference to equity and CBDR&RC, were in the Paris Agreement, with reference to peaking and reaching net zero, though the latter term itself was not explicitly used.

Subsequently, the developed countries have sought to increasingly bring up the issue of quantitative global targets where there is room for ambiguity to push for singling out a particular number or value of a particular indicator as a target. The most prominent ones are:

- a. Singling out 1.5 degrees Celsius as the temperature target for limiting global warming, when the PA has both 1.5 deg. C and 2 deg. C warming temperature targets.
- b. Changing the period of reaching net zero from the second half of the century, as in the text of the PA, to mid-century and implying it to mean exactly by 2050.
- c. Fixing target dates of global peaking of emissions to 2025 for both 1.5 and 2 deg. C warming.
- d. Fixing a target for emissions reduction at the global level by 2030. At COP26 they managed to insert a target of 45% below 2010 levels by 2030, and they are now focusing on inserting a target of 43% below 2019 levels by 2030 (UNFCCC, 2022).
- e. Fixing a target for tripling global renewable energy capacity by 2030 (COP28, 2023).
- f. Fixing a target for doubling energy efficiency by 2030 (COP28, 2023).

These targets are being pushed not only at the UNFCCC, where of course they meet the informed resistance of experienced negotiators from developing countries. But they are also pushed in other international and plurilateral forums in an attempt to insert these into texts of declarations and statements.

In this piecemeal manner of bringing up targets, the main target that the world has, namely, the fixed remaining carbon budget for the world for a given temperature limit, is never brought up. However, as we will discuss below, through these piecemeal targets the developed countries are continuing their appropriation of the remaining carbon budget, without acknowledging this fact in a direct way. This is to ensure the issue of a fair share of the remaining carbon budget can be kept out of the picture.

Emission reduction target of 43% by 2030

The target of 43% reduction in greenhouse gas (GHG) emissions below 2019 levels by 2030, is the median value from modelled scenarios reported in the Working Group III (WGIII) contribution to the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) – scenarios that keep temperature increase above pre-industrial levels to below 1.5 deg. C with a probability of 50% or more.

How seriously should we take this target?

- First, the figure of 43% is only the median across scenarios; the full range is 34-60%.
- The figure of 43%, and the associated range, is from the most extreme and ambitious scenarios that the IPCC has considered, and there are several others covering the range of the Paris Agreement targets that have much less burdensome reductions (IPCC, 2022).
- The global median of 43% reduction does not tell us how the emissions reduction may be distributed. We illustrate two possibilities (see Figure 1), using the median scenario from the 1.5 deg. C warming scenarios with no or limited overshoot assessed by the IPCC.¹
- In this median scenario, which has a 45% reduction of carbon dioxide (CO₂) emissions below 2019 levels by 2030, the emissions reduction is set to be very high in developing countries – especially in Sub-Saharan Africa and Latin America – in the decade of 2020-2030.

¹ These scenarios are referred to as C1 scenarios by the IPCC, as in Table SPM.2 of the Summary for Policymakers of the Working Group III Report of the IPCC Sixth Assessment Report.

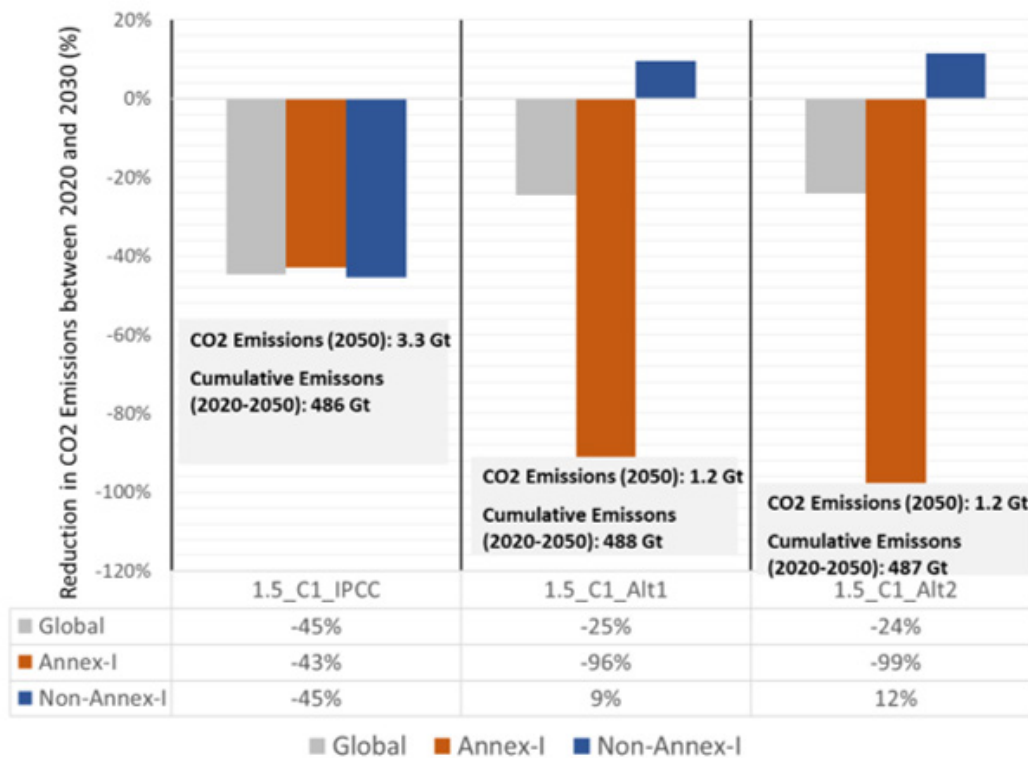


Figure 1. CO₂ reductions between 2020 and 2030 projected in the median of all assessed scenarios of the IPCC for limiting warming to 1.5 deg. C with no or limited overshoot with a 50% probability, compared with alternative scenarios constructed by the authors. The grey bars show the global reductions, brown bars show reductions projected for Annex-I Parties, and blue bars show reductions projected for non-Annex-I Parties. Cumulative emissions between 2020 and 2050 and CO₂ emissions implied in the IPCC median as well as in the alternative scenarios are also in the text boxes.

- However, there are possible alternative scenarios as Figure 1 illustrates, showing that a global reduction in emissions of only 24% or 25% is possible below 2019 levels by 2030. In these scenarios, however, over this period, the Annex-I countries (developed countries) have to reduce by at least 96% while the non-Annex-I emissions can actually have a small increase of 9% to 12%.
- In general, in the median scenario cited by the IPCC, emissions reductions are higher for non-Annex-I regions by 2030, thus violating the principles of equity and CBDR&RC.
- To ensure a differentiated reduction in emissions with some minimal emissions growth still left for non-Annex-I countries, the Annex-I countries will have to cut very sharply.
- But with the NDCs currently declared by the Annex-I countries, the non-Annex-I countries will have to start cutting emissions sharply if the global target of 43% reduction is to be met.
- The real constraint for limiting warming is to ensure that CO₂ emissions remain within the global carbon budget (IPCC, 2021). The alternative scenarios shown in Figure 1 maintain the carbon budget constraint and allow a little more time for developing countries to start reducing emissions by allocating a higher mitigation burden to developed countries. If the developed countries do not reduce emissions drastically, then the burden will be passed on to the developing countries. This is a consequence of the fact that the developed countries have already consumed well beyond their fair share of the global carbon budget and also wish to appropriate a disproportionate share of even the meagre remaining carbon budget.
- Despite the extreme nature of the scenarios considered in this category by the IPCC, there has been no filtering or choosing on the basis of feasibility. There is no idea of how investment will be mobilised for the reductions entailed even within developed countries, let alone providing climate finance for developing countries for such an effort.
- There is no credible roadmap for the 43% GHG emissions reduction, except in think-tank reports and academic literature, and certainly there is no credible indication of even a single developed-country government having a compatible national roadmap. So developed countries show no indication of taking the lead.

In this situation, it appears that the developed countries will merely try to use this target to impose decarbonisation at the earliest on developing countries. For a majority of developing countries, it will mean halting their growth even before several significant developmental targets are achieved and without perhaps even poverty eradication goals being attained.

These suspicions appear amply justified if we consider the following underlying facts about these scenarios:

- The scenarios are not based on equity or CBDR&RC, and such considerations have not entered the overwhelming majority of scenarios considered in the IPCC AR6 (IPCC, 2022).
- The scenarios are built on the assumption of permanent inequality between developed and developing countries, in per capita income, energy consumption, and several other variables (Kanitkar et al., 2022).
- In particular, in a major part of the scenarios that contribute to the average value of 43% reduction, the percentage reduction in emissions in the developing world is assumed to be higher than in the developed world.
- In these scenarios, in order to justify the relatively low emission reduction by the developed countries and justify their continued dependence on oil and gas, and yet appear to meet the temperature target, several other contestable assumptions have to be made. Prominent among these are:
 - a. Assumptions of a high level of decoupling between final energy use and economic growth that may or may not be feasible (Semieniuk et al., 2021).
 - b. Assumption of high levels of negative emissions in developing countries primarily through carbon dioxide removal by land-based mitigation. For the scenarios associated with the 43% emissions reduction, this could range from ~100 GtCO₂ to ~530 GtCO₂ (Kanitkar et al., 2022).
 - c. Assumption of further negative emissions from net zero to 2100. The IPCC AR6 WGIII report shows in its Summary for Policymakers that these scenarios further assume another ~220 GtCO₂ of carbon dioxide removal in this manner. The bulk of this carbon dioxide removal by land-based mitigation is to come from developing countries.

Thus, the figure of 43% emissions reduction by 2030 is based on shaky assumptions and/or assumptions of a highly unequal world in the future, together with the low-ambition NDCs of the developed countries. There are however a number of other scenario categories referred to by the IPCC for the full range of Paris Agreement targets, and there are many more choices available than what is sought to be imposed by developed countries.

For instance, the median scenario for 2 deg. C warming offers even more flexibility from our point of view if the appropriate equity and differentiation criteria were to be imposed on the distribution of the burden between non-Annex-I and Annex-I countries. However, in the IPCC scenarios a good part of the increase in the remaining carbon budget for 2 deg. C warming (compared with 1.5 deg. C warming) is allocated in the modelling to developed countries, while also forcing developing countries to reduce emissions immediately. An equitable solution would have been to maintain high emissions reduction for developed countries while providing more carbon space to developing countries. This possibility is illustrated in Figure 2 below, using the median scenario for 2 deg. C warming from the IPCC AR6 Working Group III Report.²

² This is the median scenario in the category C3 as in Table SPM.2 of the WGIII Report's Summary for Policymakers.

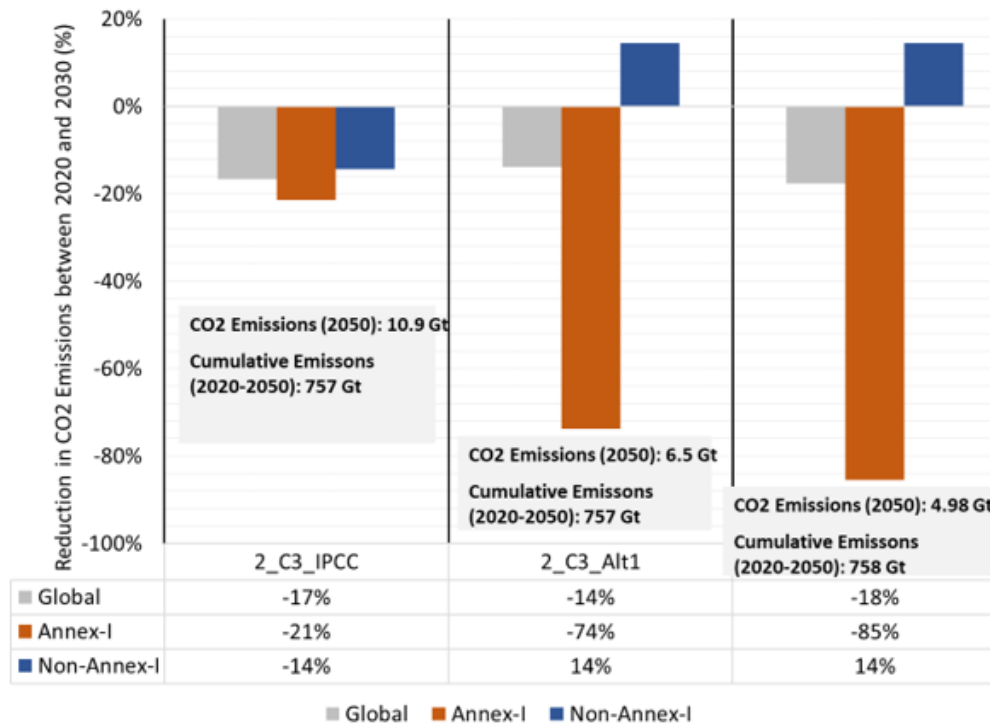


Figure 2. CO₂ reductions between 2020 and 2030 projected in the median of all assessed scenarios of the IPCC for limiting warming to 2 deg. C with a 67% probability, compared with alternative scenarios constructed by the authors. The grey bars show the global reductions, brown bars show reductions projected for Annex-I Parties, and blue bars show reductions projected for non-Annex-I Parties. Cumulative emissions between 2020 and 2050 and CO₂ emissions implied in the IPCC median as well as the alternative scenarios are also shown in the text boxes.

Peaking by 2025

The peaking year in most of the scenarios assessed by the IPCC for 1.5 deg. C and 2 deg. C warming is actually 2020, when examined in detail. Hence the target of 2025 as the peaking year is merely stretching this a little further. (The AR6 WGIII Report gives a range 2020-2025 in Table SPM.2.)

The key point is, however, that the demand for global peaking by 2025 is actually a demand on developing countries to peak their emissions and start decreasing them from 2025. This is because the Annex-I emissions as a whole have registered a decline. Hence, it appears that to achieve a global peaking, followed of course by reduction, it is the non-Annex-I countries that have to immediately halt any increase in their emissions and start decreasing emissions right away. What is not being stated is that the non-Annex-I countries are being asked to bear the burden of the wholly inadequate emissions reduction of the Annex-I countries in terms of their responsibility for cumulative emissions in the past, while their current rate of reduction enables them to disproportionately consume even the remaining carbon budget.

In the extreme 1.5 deg. C warming scenarios underlying the peaking year targets, it is only with very high Annex-I emission reduction, reaching net zero by the early 2030s, that developing countries can postpone their peaking a little bit beyond to the early 2030s. We see this clearly in Figure 3, where we compare the IPCC median scenario and the first alternative scenario (Alt1) of Figure 1. The call for peaking by 2025 (in the IPCC scenarios) is clearly seen to allow much slower emissions reduction by the Annex-I countries, with the non-Annex-I countries then bearing the additional burden.

1.5_C1_Comparison between IPCC and Alt1

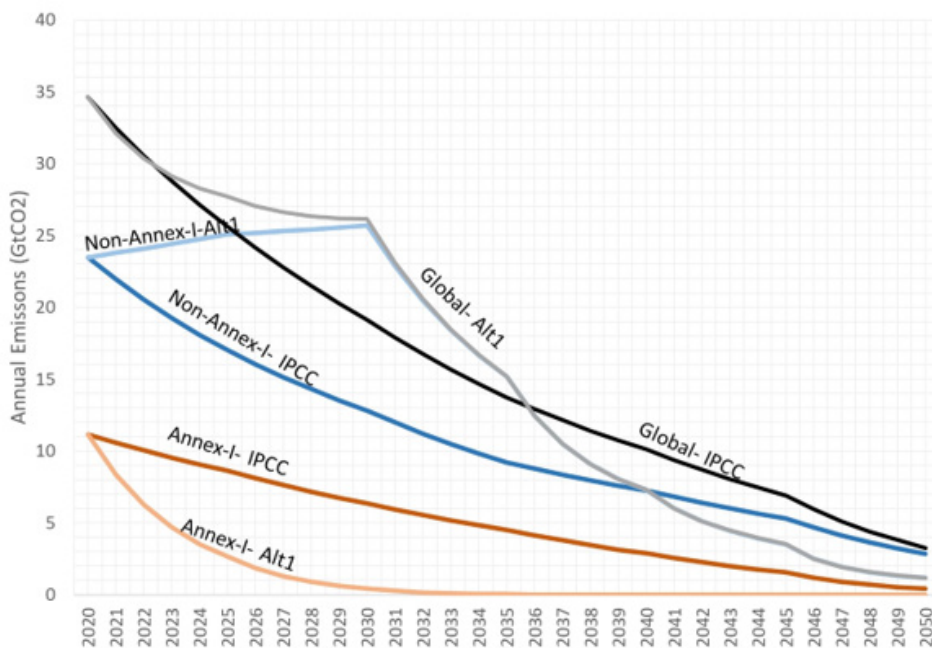


Figure 3. CO₂ emissions between 2020 and 2050 projected in the median of all assessed scenarios of the IPCC for limiting warming to 1.5 deg. C with a 50% probability with no or limited overshoot, compared with alternative scenario constructed by the authors. Shades of grey lines show global emissions, shades of brown show projected emissions for Annex-I Parties, and blue shades show projected emissions for non-Annex-I Parties.

We illustrate this for 2 deg. C warming in Figure 4 below. Here, there is more flexibility, though in our example, the alternative we show does not substantially delay peaking beyond the 1.5 deg. C warming case for developing countries.

2_C3_Comparison between IPCC and Alt1

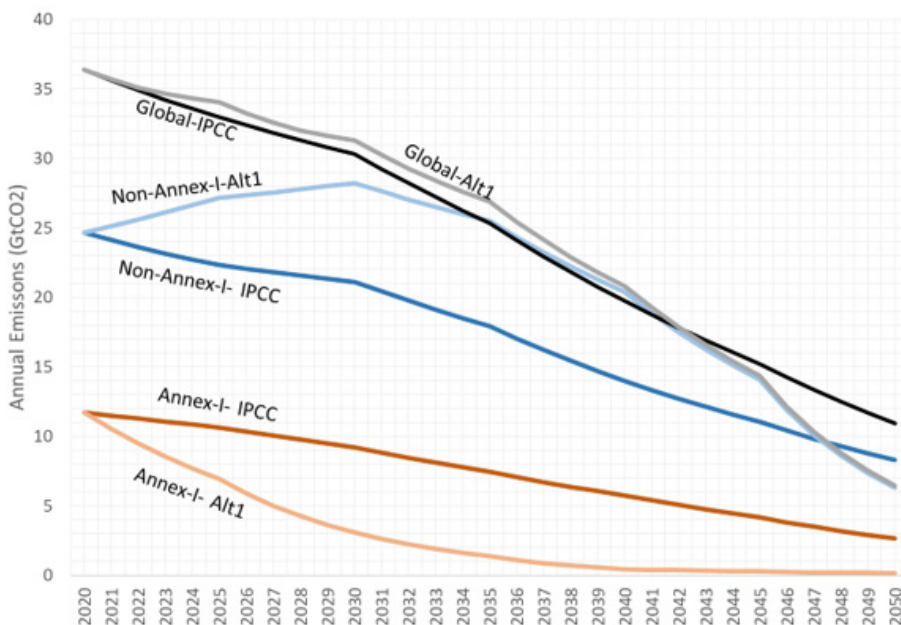


Figure 4. CO₂ emissions between 2020 and 2050 projected in the median of all assessed scenarios of the IPCC for limiting warming to 2 deg. C with a 67% probability, compared with alternative scenario constructed by the authors. Shades of grey lines show global emissions, shades of brown show projected emissions for Annex-I Parties, and blue shades show projected emissions for non-Annex-I Parties.

The triple challenge: Three global targets together as a strategy to limit access to the remaining carbon budget for developing countries

In the strategy of the developed countries, they do not openly make a linkage between the three global targets of limiting temperature increase to 1.5 deg. C, peaking by 2025, and emissions reduction of 43% below 2019 levels by 2030. However, these targets are indeed very much connected, especially in the light of the inadequate emissions reductions by developed countries that are not commensurate with their historical, current and future responsibility. Indeed, all three are different aspects of the same median scenario and so they are really a package.

It is important, therefore, to recognise that piecemeal statements of CBDR&RC on peaking and emissions reductions, reiterating that the choice of peaking year and reduction of emissions by 2030 is a matter of national circumstance and development priorities, do not actually provide adequate safeguards to developing countries.

The point is that if two of the other targets are fixed, the third is then not a choice but is forced on the world. This is because of the scarcity of the remaining carbon budget that is available to developing countries. And this scarcity is in large part due to the developed countries appropriating a larger-than-fair share of the carbon budget in the past and in the present.

For instance, accepting 1.5 deg. C as the warming level means limiting cumulative emissions to the appropriate remaining carbon budget. However, the developed countries do not want to share this budget equitably and continue to effectively demand more through their inequitable NDCs and delayed net-zero year. They still consume a disproportionate share of the remaining carbon budget every year, while increasing their oil and gas capacities over and above the existing capacities.

With 1.5 deg. C being fixed, and if a 43% reduction by 2030 is also fixed, then the extent of the remaining carbon budget is so small that peaking for developing countries will also need to be fairly soon, around 2025 or a couple of years later.

If however the peaking year is fixed globally, then the emissions reduction may not appear to be fixed, but effectively the very choice of peaking implies that immediate emissions reduction by developing countries is inevitable. And the shortage of the remaining carbon budget will force a higher, inequitable level of emissions reduction by developing countries.

In Figure 5, the net effect of the IPCC median scenario in the share of the global carbon budget until net zero is shown alongside Alt1 as an example of what a more equitable choice would imply. Even here we see that the non-Annex-I countries will still fall far short of their fair share of the global commons, the global carbon budget. Because so much of the carbon budget has been taken up by the developed countries, there is very little left to provide an equitable solution.

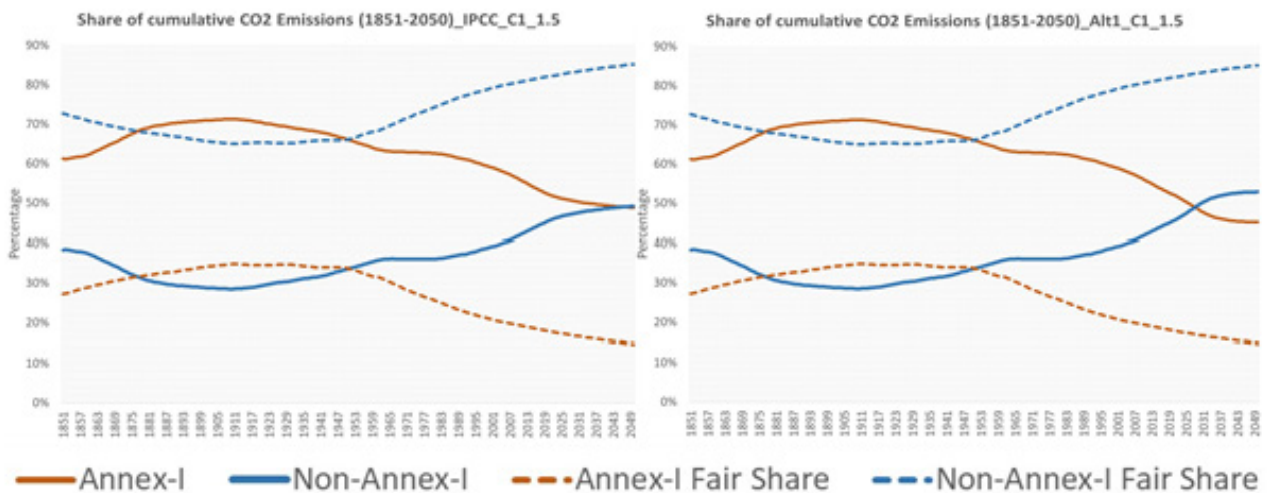


Figure 5. Per capita share of cumulative CO₂ emissions of Annex-I and non-Annex-I Parties between 1850 and 2050. The solid lines show a combination of the actual share of historical cumulative emissions between 1850 and 2019 and projected cumulative emissions in the IPCC median and Alt1 scenarios between 2020 and 2050. The dotted lines show the fair share for Annex-I and non-Annex-I Parties between 1850 and 2050 based on population in each year. Data source: Jones et al. (2023)

The figures also show how negative emissions are necessary. While the IPCC median scenario for 1.5 deg. C has substantial negative emissions (that are to be undertaken by developing countries!), the Alt1 scenario we use as an illustration does not assume such a level of negative emissions. So further negative emissions by developed countries will enable greater opportunity for developing countries to avail of a greater share of cumulative emissions which will provide them a much smoother and more equitable low-carbon transition.

Tripling of renewable energy capacity by 2030

Developed countries are also seeking to consolidate inequitable climate action through a range of non-emissions targets that they are proposing, again through the use of the same or similar global modelled scenarios. One such new call is to set a global target of tripling renewable energy (RE) capacity above current levels by 2030. The Presidency of COP28 also seems to have endorsed this call and included this target in a letter it sent to all Parties (COP28, 2023).

The global target for tripling RE capacity implies the following:

- New RE capacity of about 6,000 GW must be added between 2022 and 2030. Even though over 50% of the current RE capacity is hydro, most of the new capacity is expected to be from solar and wind energy sources given the significantly longer time that would be taken for the construction and operationalisation of hydro plants.
- With a growth of about 2.6% per annum in global electricity demand (growth in the pre-COVID decade), the target of tripling RE capacity would imply that about 38% of global electricity production would be from RE sources (IEA, 2021).

However, "global" electricity demand is only an aggregate across countries. Electricity demand varies significantly across countries at different stages of development; it is growing much more rapidly in developing countries. Therefore, where this additional global RE capacity will be installed becomes the key question. We compare a few potential scenarios to illustrate this:

- Between 2010 and 2019, annual electricity consumption in China and India grew at rates of 6.6% and 6.3%, respectively, in contrast to a 0.3% decline in the EU and a minimal 0.12% growth in the US.
- Therefore, in the US and EU, new power generation capacity will be necessary primarily for replacing older fossil fuel-based capacity, rather than to cater to "additional" demand growth.

- In a scenario where the US retains its existing fossil fuel capacity, it would only require about 26 GW of new RE capacity to meet additional demand, resulting in a mere 0.4% contribution towards the target of tripling RE capacity.
- In contrast, if both the US and EU phase out all fossil fuel-based electricity production, they would need to add about 1,565 GW and 538 GW of additional RE capacity, respectively (at current growth rates in electricity demand and a capacity factor of 25% for RE). In this scenario, the US and EU would contribute more than a third of the new capacity, aligning more closely with their equitable share of the burden.

However, such considerations are not included as part of the global call for tripling RE capacity. Instead, the inspiration for this call appears to be a report by the International Renewable Energy Agency (IRENA, 2023), with scenarios that mimic the inequities of the IPCC scenarios in projecting a higher mitigation burden for developing regions.

Achieving such an enormous increase in RE capacity in developing nations is infeasible without the concurrent development of non-RE capacity to ensure stability of supply, or the availability of feasible storage solutions, which are currently nowhere near the scale required for such ambitious targets. Additionally, securing the resources needed to construct national grids capable of supporting such RE targets presents an extra hurdle, particularly given the struggle to meet even the minimal annual goal of USD100 billion in climate finance encompassing all sectors.

Doubling energy efficiency by 2030

Another such global target also included in the letter sent by the COP28 Presidency to all Parties is that of doubling energy efficiency by 2030 (COP28, 2023).

While energy efficiency is typically defined as an output-to-input ratio at the level of the firm, at the economy-wide level, a proxy that is typically used is the energy intensity of gross domestic product (GDP), i.e., the ratio of total commercial energy produced in the country to the economic output (GDP). This is different from the emissions intensity of GDP, which is the ratio of emissions to GDP, as explained below:

- A reduction in emissions intensity results from a combination of
 - o more efficient production,
 - o structural shifts in economic production if less energy-consuming sectors are producing higher amounts of economic output,
 - o a shift from emissions-intensive energy supply to low-carbon sources (Kanitkar et al., 2015).
- However, “energy efficiency” measures capture only two of these three factors, leaving out the shift from fossil to non-fossil sources. The emissions impact of an energy efficiency target is therefore only speculative, and not guaranteed.
- For example, the US reduced its energy intensity of GDP by 58% between 1965 and 2018, i.e., the country used 58% less energy to produce one dollar’s worth of economic output in 2018 than it did in 1965. However, in the same time period, its fossil fuel-based CO₂ emissions **increased** by 58%. It is evident, therefore, that improved energy efficiency can be completely decoupled from any real emissions reduction.

Additionally, energy efficiency is also a factor of development. Countries tend to have higher (and increasing) trends in energy intensity at a certain stage of development when the dominant economic activity is shifting from primary to secondary production sectors of the economy (Wang and Zhou, 2018). This has been true of developed countries. Improved technology has enabled many developing countries to start achieving energy intensity reductions sooner, and at lower peak values as compared with developed countries which achieved their peak energy intensity levels much earlier (in the decade of 1960-70 mostly).

For developing countries, achieving scales in production and building infrastructure as well as achieving mechanisation of sectors that are still under-mechanised will mean an increase in energy use in the short term. In such a situation, setting a global energy efficiency target becomes a complex exercise.

Are those whose energy intensities are currently high expected to contribute more to this target? Most of these countries are likely to be developing countries, still addressing the range of issues listed above. Even this target, therefore, is likely to burden developing countries more, and the whole exercise may also be futile as it may mean little to no impact on emissions.

The way forward

What are the options for developing countries?

1. Developing countries must make it clear that keeping the 1.5 deg. C target alive depends on the developed countries stepping up to make up for their historical responsibility by their own “deep, rapid and sustained emissions reductions”. These words must not be directed outwards to the rest of the world, as the developed countries do today, but inwards to their own countries, to spur action, so that they take the lead.
2. Developing countries, if they want to avoid unequal, unfair and undue burdens, must require, as a precondition to agreeing to any global target, a clear indication by developed countries of how they will contribute their fair share of achieving such a global target. The developed countries can declare this fair-share effort voluntarily in their NDCs, but this must be done in a way that their intent is made evident and clear, prior to the acceptance of any target of any kind.
3. Further, there should be no statement of a global target without a corresponding statement of the investment required that will be pursued by the developed countries and the flow of climate finance, as understood in the UNFCCC and its Paris Agreement, as required for developing countries.
4. Specific global quantitative targets are important, and the developing countries agreed to the global temperature target of 1.5 and 2 deg. C in the Paris Agreement. Similarly, a new specific target may be for cumulative emissions of carbon dioxide, covering a range, together with countries agreeing to stay within their equitable and fair share.

For instance, such a target may be to limit cumulative emissions of carbon dioxide to between 650 Gt and 1,000 Gt, with developed countries staying within their fair share, and making every effort to pursue negative emissions. This covers most of the range of the remaining carbon budget associated with 1.5 deg. C and 2 deg. C temperature limits. Also, such a target can contribute to keeping the 1.5 deg. C target alive because of the uncertainties in the carbon budget.

5. Similar considerations apply to other proposed targets such as tripling renewable energy or doubling energy efficiency by 2030. Such targets can be acceptable only if the developed countries contribute their fair share by first replacing their existing electricity production with renewable energy, and also commit to the corresponding finance needed by developing countries. Several developing countries like India have stated clear targets for their renewable energy expansion (even if outside the NDC), but the majority of Annex-I Parties have no specific NDC commitments on how much renewable energy expansion they are undertaking by 2030.

The developed countries are constantly reminding the world that equity must promote ambition. But we must remind them that the best available science tells us that equity means that it is *their* ambition that has to be first dramatically and rapidly scaled up. Without this, without the developed world fulfilling the ideals of the Convention and its agreements in letter and spirit, the developing world will continue to contribute far more to climate action than its responsibility entails, but the goal of protecting both people and the planet will be in increasing danger of slipping away.

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