# Technical Note: Estimating the Indirect Impact of Climate Finance on GHG Emissions

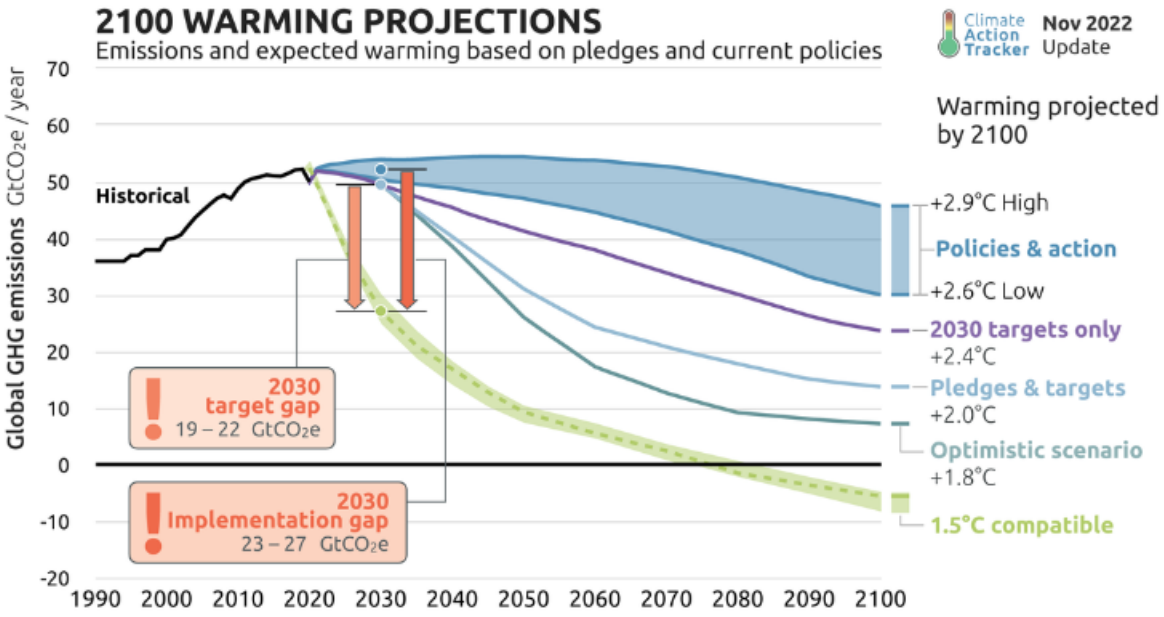
*Jonathan Beynon, June 2023*

This technical note sets out the assumptions and calculations used to conclude that the indirect effect of climate finance on reducing GHG emissions via more ambitious emission reduction targets may be many times larger than the direct effects arising from the climate finance investments themselves.

a) Estimating emissions reductions for each year by which net zero target date is advanced

This part of the analysis draws on estimates of when net zero might be reached, the length of time by which this may have been brought forward by climate finance, current levels of emissions, the share of emissions that might be influenced by the promise of climate finance, the extent to which bolder targets might actually be met, and the number of years of promised climate finance that have led to such greater ambition.

**Figure 1. Emissions and temperature projections to 2100**




*Source: Climate Action Tracker*

Specifically, let:

a = the number of years it is projected to take for the world to reach net zero emissions. Current pledges and targets (technically for *all* GHGs, see Fig.1) put us on track for about 2 degrees warming. Net zero is not reached this century. But this 2 degree trajectory is consistent with achieving net zero $CO_2$ emissions in c.2070 (see latest IPCC report, Fig SPM.5, p.23), so let **a = 50 years**. [Even though 'a' is larger for all GHGs, the way the maths works this value doesn't matter if 'b' (below) is expressed independently in years (see below)].

b = the number of years by which this has been reduced thanks to the promise of climate finance. This is the key variable, yet also the most subjective. But to start with, let's say **b = 1 year** to illustrate how much difference one year makes.

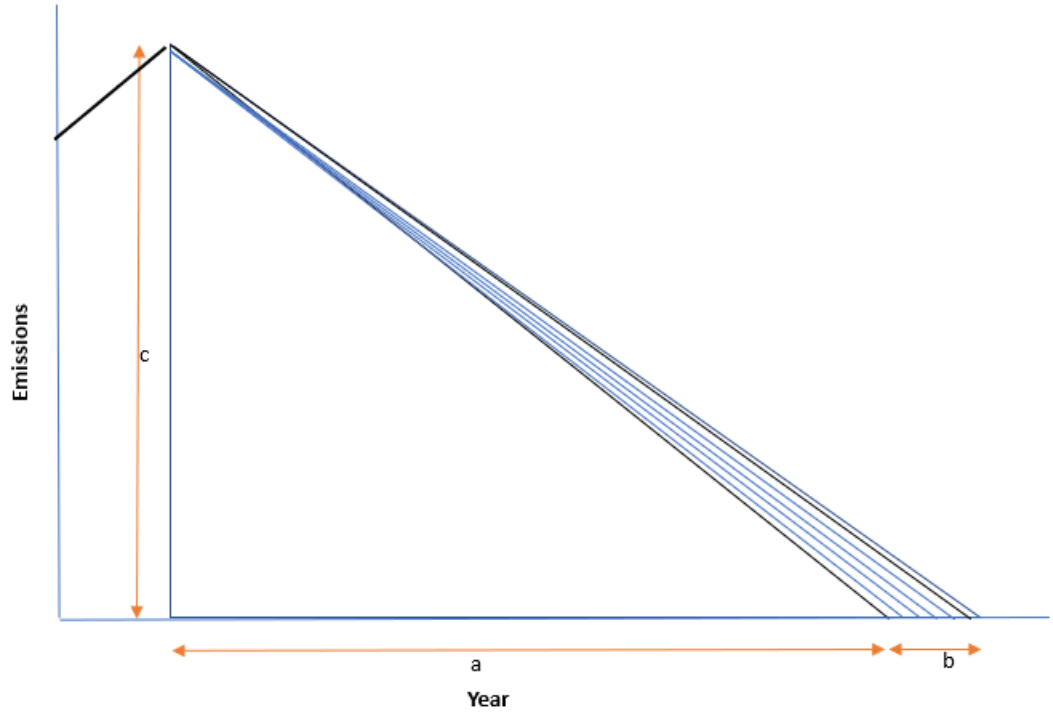
c = the current level of global GHG emissions: latest data for 2021 report this to be c. **55 billion tonnes**.

d = the share of that total that might be influenced (in terms of producing more ambitious commitments) by agreements on climate finance. Even though climate finance is directed at low- and middle-income countries (who account for c.65% of global emissions), bolder commitments from the likes of China and India have helped strengthen the ambition of the likes of the US and EU (with officials noting for example that competition anxieties meant that commitments by China were key to persuading the US to be bolder). So let **d = 80%**. A more conservative assumption might just apply the share of emissions coming from LICs and MICs (c.65%); a high case scenario might apply 100%.

e = the extent to which more ambitious commitments are actually met in practice. Most countries are not on track to achieve current commitments, so it would be unrealistic to assume that accelerated commitments are fully met. Climate Action Tracker data (in Fig.1) suggest that projected GHG emissions in 2030 based on current policies and actions are about 5% higher than 2030 targets (significantly more for later years, though it would be unreasonable to use such higher figures while specific policies and actions are still being developed). So let **e = 95%**. A more conservative assumption, based on current policies and actions being c.9% higher than '*pledges and* targets' in 2030, would be 90%.

f = the number of years of promised climate finance that have contributed to the accelerated net zero targets in 'b' (arguably this could be incorporated into our subjective estimate of 'b', but identifying it separately is preferred and converts total impacts into annual impacts for ease of comparison with the direct effects). Ten years is the period between the signing of the Paris Agreement (2015) and the year (2025) up to which the current (from 2020) annual $100bn climate finance promise is to be maintained, although it was agreed at COP26 in Glasgow that a new collective quantified goal would be set from 2025 "from a floor of USD 100 billion per year". Fifteen years is the period between the signing of the Paris Agreement (2015) and the year (2030) up to which most countries have published emission reductions targets, so let **f = 15 years**. A low case figure of 20 years could be justified given that the original $100bn target was first agreed in 2009, although probably not longer than that, because while we can expect climate finance to persist (indeed rise) in future, we can also expect future targets to strengthen as per the Paris Agreement's ratchet mechanism to ensure progressively stronger emission reduction targets. A high case scenario of 10 years could be applied on grounds that it is the current commitment period to 2025 that has mattered most to date. Note that for this analysis we do not directly use the exact volume of climate finance promised or delivered, although both would be expected to influence our estimate of 'b'.

**Figure 2. Reductions in GHG emissions as a result of more ambitious net zero targets**




The impact of one year's promised climate finance (X, in billions of tonnes of $CO_2e$) through its effect on increased ambition for reducing emissions is thus the difference in estimated emissions (between now and whenever we hit net zero) in the 'with' and 'without' climate finance scenarios calculated using the assumptions above:

X = [c*(a+b)/2 - c*a/2] * (d*e)/f
= (c*b)/2 * (d*e)/f { hatched area in Fig.2 = (c*b)/2*d }
= (55*1)/2 * (0.8*0.95)/15
= 1.4 billion tonnes

The calculations above suggest that *for every year* by which the net zero target date has been advanced, global emissions could be reduced by over 20 billion tonnes, or c.1.4 billion tonnes per year of promised finance (Table 1). This is **3.4 times** the direct benefit figure of 400m tonnes derived from total mitigation expenditures of $48.6bn in 2020 reported by the OECD (progress reports on the $100bn goal), and the $120/t figure used in the earlier comparison with UK domestic policies. Even with more conservative assumptions the figure is twice as high (and could be over 6 times higher in a high case scenario). See details in Table 1.

All those ratios could be doubled if only ODA expenditures for which mitigation was the *principal* objective (as applied in the comparative analysis with the UK's EPG) were used when estimating the direct benefits[1]. And these are likely under-estimates because they assume straight line reductions

[1] The OECD report that for climate-related ODA activities in support of mitigation (including activities supporting both adaptation and mitigation simultaneously), mitigation was the *principal* objective in 41% in value terms. This relates to bilateral spend only (the MDBs apply a different 'climate components' methodology), but if 41% were applied to all mitigation spend then the direct benefits would be more than halved. In practice more (potentially even all) of the multilateral finance could be treated as 'principal' since the 'climate components' methodology is designed to identify the components of a project that directly contribute to mitigation (and/or adaptation). However, recent analysis of World Bank climate finance does question whether this can all be legitimately treated as climate finance.

through to the net zero date. Figures with a more typical concave or backwards S-shaped trajectory are likely to be larger.

**Table 1. Calculating possible reduction in global $CO_2e$ emissions via effect of climate finance on increased 'net zero' ambition**

| Assumptions | | Base | Low | High |
|---|---|---|---|---|
| a | number of years currently required for the world to reach net zero emissions | 50 | 50 | 50 |
| b | number of years by which this has been reduced thanks to promise of climate finance | 1 | 1 | 1 |
| - *memo item: difference as % of total w/o climate finance* | | 1.96% | 1.96% | 1.96% |
| c | current level of global CO2e emissions (billion tonnes) | 55 | 55 | 55 |
| d | share of CO2e emissions that might be influenced by agreements on climate finance | 80% | 65% | 100% |
| e | % implementation rate of increased commitments | 95% | 90% | 95% |
| f | number of years of promised climate finance that have accelerated net zero targets | 15 | 20 | 10 |

| Calculations | Base | Low | High |
|---|---|---|---|
| A: projected CO2e emissions under targets *with* climate finance | 1375 | 1375 | 1375 |
| B: projected CO2e emissions under targets *without* climate finance | 1403 | 1403 | 1403 |
| difference (emissions saved, billion tonnes) | 27.5 | 27.5 | 27.5 |
| *- memo item: difference as % of total w/o climate finance* | *1.96%* | *1.96%* | *1.96%* |
| difference adjusted for share influenced by climate fin (bn tonnes) | 22.0 | 17.9 | 27.5 |
| difference adjusted for implementation rate (bn tonnes) | 20.9 | 16.1 | 26.1 |
| **difference converted into annual amount (bn tonnes per year of promised climate finance)** | **1.39** | **0.80** | **2.61** |

b) Estimating number of years by which climate finance may have advanced net zero target date

This part of the analysis compares conditional against unconditional NDCs as an indicator of increased ambition to help estimate by how long might climate finance have brought forward the net zero target date (the value 'b' in our model).

Climate Resource report aggregate GHG emissions pledges *including* conditional elements for 2030 (as of November 2022) of 49.8 $GtCO_2e$, 4.2% lower than all unconditional pledges (52 $GtCO_2e$). Figures just for non-Annex 1 countries (eligible to receive climate finance) are 35.5 Gt, 5.7% lower than unconditional pledges (37.6 Gt)[2]. But these numbers still include many countries with no conditional pledges, whereas we are interested only in countries that report both[3]. Excluding just the largest emitting non-Annex 1 countries with no conditional pledges (China, India, Brazil, Pakistan, Iraq, Egypt[4]) produces figures of 12.1 Gt, 15% lower than unconditional pledges (see Table 2). That figure would be larger at 19.4% if 'hot air' emissions were included, and larger again if *all* countries without conditional pledges were excluded[5].

[2] These figures exclude LULUCF (land use, land use change and forestry) emissions (though overall results differ little if LULUCF is included), and exclude 'hot air' emissions (emissions from unambitious pledges that exceed projected emissions even if no additional climate policy is implemented; these are replaced by 'do nothing' country-level reference scenarios).
[3] This is not to argue that only those countries with conditional pledges are incentivised by climate finance to be more ambitious. Rather, the argument is that the offer of climate finance helps create a negotiating dynamic that encourages more ambitious commitments from all, with the difference between conditional and unconditional NDCs (for those that have both) being used as an indicator of that increased ambition.
[4] Pakistan and Egypt both have lower conditional pledges, but only in Climate Resource's 'hot air' scenario.
[5] However, numbers should be treated with caution. In their detailed analysis of 38 countries, Climate Action Tracker identify 12 countries (Chile, Ethiopia, India, Indonesia, Kazakhstan, Kenya, Mexico, Morocco, Nigeria, Peru, Thailand and Vietnam) with both conditional and unconditional GHG reduction targets, some of which differ from the Climate Resource figures. The conditional emissions ($CO_2e$) in 2030 of these 12 countries are 8.2% lower than unconditional emissions, although the range is wide (from 1.7% in India to 28.8% in Morocco), with the median 12.1% and the unweighted average 14.2%.

**Table 2. Comparison of conditional and unconditional NDCs**

| Region/Country | Unconditional NDC 2030 target, MtCO2e | Conditional NDC 2030 target, MtCO2e | % by which conditional target is lower than unconditional target |
|---|---|---|---|
| World | 51944 | 49776 | 4.2% |
| Annex 1 | 13076 | 13034 | 0.3% |
| **non-Annex 1** | **37615** | **35489** | **5.7%** |
| - China | 15606 | 15606 | 0.0% |
| - India | 5079 | 5079 | 0.0% |
| - Iran | 1183 | 1085 | 8.3% |
| - Indonesia | 1154 | 826 | 28.4% |
| - Brazil | 889 | 889 | 0.0% |
| - Mexico | 882 | 743 | 15.7% |
| - South Africa | 720 | 406 | 43.7% |
| - Pakistan | 619 | 619 | 0.0% |
| - Iraq | 617 | 617 | 0.0% |
| - Egypt | 616 | 616 | 0.0% |
| - Top 10 | 27365 | 26486 | 3.2% |
| - Others | 10250 | 9004 | 12.2% |
| **- excl top 10 where cond. and uncond. NDCs the same** | **14189** | **12063** | **15.0%** |

Source: Climate Resource (figures represent the mean where a range is cited in NDC documents)

As a proxy for accelerated ambition, this figure of 15% would translate into a value of about 9 years in our model where a=50 years, but that related to $CO_2$ emissions only. GHG emission under current pledges and targets do not reach net zero until well into next century, albeit with a long tail. But even with a=70, 'b' would be over 12 years. However, this is almost certainly an overestimate given concerns over the credibility of both finance and emissions pledges, and with the relationship between the offer of climate finance and these more ambitious targets extremely unclear (few NDCs provide any indication of the scale of climate finance required to achieve these conditional targets). But while the fact that so few NDCs are costed undoubtedly reflects capacity constraints, it also supports the idea that climate finance is as much about encouraging greater ambition as financing specific investments.

Even if the net zero target has been brought forward by just 3 years, that would triple the ratios estimated above, with the baseline estimate being that the indirect effects of climate finance may be 10 times larger than the direct effect, and 20 times larger if only finance for which mitigation is the principal objective were counted.