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plugging the gap

an easy guide to a safe climate future

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Summary

If the global effort to ensure a safe climate future for people and nature was a tooth, the world would be in terrible pain. That's because there is a huge hole, at risk of growing bigger and eroding the entire tooth unless it gets a filling quickly. This WWF paper explains that the hole is there because the world has been eating too much cake. Or in other words: We are using up too much of the remaining global carbon budget that's collectively owned by the people all around the world. Once that budget is used up, it will be impossible to limit global warming to 1.5°C above pre-industrial levels.

Based on scientific studies, WWF argues that the remaining carbon budget between 2010 and 2050 – or in other words the gross emissions to the atmosphere we can allow over that period – is less than 1000 GtCO₂eq.¹ The cumulative net emissions to the atmosphere over the 40 year period have to be even lower: less than 900 GtCO₂eq. The reference to net emissions implies that deforestation stops and that global forests and other land – currently a source of emissions due to logging and degradation – act as a permanent sink for greenhouse gases. If, however, deforestation in the tropics is not fully reversed in the next two decades, the overall allowable emissions to the atmosphere from all other sources – such as burning fossil fuels – would be much smaller.

Against the backdrop of this remaining global carbon budget, the paper states that we need to reduce annual global emissions to 44 GtCO₂eq by 2020 for a pathway to limit global warming to 2°C above pre-industrial levels, or to 40 GtCO₂eq for the more ambitious and safer threshold of 1.5°C. However, examining the emission reduction pledges put forward by countries in and since Copenhagen, scientists have found that annual global emissions by 2020 are estimated at 47.9 to 53.6 GtCO₂eq, suggesting that we are eating the remaining cake much faster than we should.

This “gigatonne gap” – i.e. the gap between emission reductions pledged by countries and the actual reductions needed to stay within a safe global carbon budget – is mainly the result of insufficient climate action by many developed countries, as they lack speed in the race towards a low-carbon future. In order to plug the gigatonne gap, research indicates that if developed countries increase their emission reduction targets to levels in line with IPCC climate science, by 2020 it would save up to 4.3 GtCO₂eq per year from being emitted to the atmosphere.

In addition to that, emission reduction pledges under the Copenhagen Accord don't account for loopholes which are imminent within the pledges and will increase emissions to the atmosphere. Closing such loopholes which undermine the integrity of current targets – for example flawed LULUCF accounting rules and so called “hot air” from surplus AAUs – could result in another 2.4 GtCO₂eq of avoided emissions per year by 2020.

A closer look at non-additional CDM credits – which are essentially cheating the atmosphere – and at sectors and gases that have so far not been covered by the climate

¹ References for this figure and others mentioned in this brief summary can be found in the relevant parts of the subsequent chapters.

regime reveals a potential of at least 1.3 GtCO₂eq emissions per year that could be avoided by 2020 to help close the gap. Emissions saved from fixing dodgy policy design flaws like double-counting of CDM credits or climate finance are estimated at 1 GtCO₂eq. Closing the “dollar gap” with financial support from developed countries for developing countries to boost their efforts towards low-carbon transition can result in 1.7 GtCO₂eq of avoided emissions per year by 2020.

This paper provides climate negotiators and decision makers in governments with an easy guide to a safe climate future, by examining different ways to plug the gigatonne gap. It explains how to manage the global carbon budget effectively, and that there are more than enough options to choose from for plugging the gigatonne gap that currently puts us at risk of overspending our remaining carbon budget. The earlier we start, the more we will benefit. Every additional year of delay beyond 2010 adds another US\$ 500 billion to the overall investment needed to decarbonize the global economy. The following table details the low-carbon diet options for those who have been eating too much cake and should now take the lead on plugging the dangerous gap.

According to science, the annual gigatonne gap between what's needed to be on track for keeping global warming below 1.5°C and what countries are pledging to do in terms of emission reductions by 2020 compared to 1990 emission levels is:		7.9 to 13.6 GtCO₂
Plugging solutions	Plugging potential	Remaining gap
Developed countries increase their emission reduction targets to 40% by 2020 from 1990 levels	Up to 4.3 GtCO ₂ eq	3.6 to 9.3 GtCO ₂
Developed countries close loopholes undermining the integrity of their targets (i.e. AAU surplus, LULUCF accounting rules)	At least 2.4 GtCO ₂ eq	1.2 to 6.9 GtCO ₂ eq
The climate regime includes previously omitted sectors and gases and ensures additionality of CDM credits	At least 1.3 GtCO ₂ eq	0 to 5.6 GtCO ₂ eq
Dodgy policy design flaws are eliminated that allow for double-counting of CDM offsets	Up to 1 GtCO ₂ eq	0 to 4.6 GtCO ₂ eq
Developed countries close the dollar gap and provide financial support for developing countries to boost low-carbon transition	1.7 GtCO ₂ eq	0 to 2.9 GtCO ₂ eq
The world takes additional action to protect the ozone layer and starts to regulate black carbon	To be calculated	To be calculated
Richer developing countries undertake additional climate action independent from financial support by developed countries.	To be calculated	To be calculated

Table 1: Overview of plugging potential of various transformational solutions which governments could endorse in order to close the gigatonne gap and keep global warming below 1.5°C. The gigatonne gap is presented as a range, because many countries have presented their emission reduction targets as ranges. Based on the cuts pledged by countries under the Copenhagen Accord, scientists project global emissions of 47.9 to 53.6 GtCO₂eq for the year 2020. To be on track for keeping global warming below 1.5°C, however, emissions have to be at 40 GtCO₂eq by 2020. Therefore the gigatonne gap is calculated at 7.9 to 13.6 GtCO₂eq.

1. THE BUDGET, OR: *YOU CAN'T HAVE YOUR CAKE AND EAT IT TOO*

Safety in a changing climate and prosperity in a changing economy are interlinked. The low-carbon societies and the climate resilient future we all want for ourselves as well as for our children and grandchildren come at a certain temperature – a global average temperature that's ultimately at most 1.5°C above pre-industrial levels. Keeping global warming to this level will be the result of deep cuts in emissions, which are a side-effect of smart innovation, rapid modernization and sustainable development in the race to the low-carbon future that has only just begun.

We have already seen 0.74°C warming from the average levels before the industrial revolution, and even if the world stopped emitting greenhouse gases today, we would still have to expect an additional temperature increase of 0.6°C, as a result of emissions that have already occurred and are still to take their effect on temperature levels.²

Any increase in global average temperature is linked to the amount of greenhouse gases that accumulates in our planet's atmosphere. So we ought to avoid exceeding a certain amount of carbon in the atmosphere if we want to have a good chance of avoiding a certain temperature threshold. We refer to this amount of carbon the world can afford to add to the atmosphere as the global carbon budget. All people on Earth own this budget and need to share it equitably amongst themselves.

Managing the global carbon budget

A recent study by WWF and Ecofys has assessed the global carbon budget, the amount of allowable gross greenhouse gas emissions to the atmosphere between now and 2050 for the entire globe from all sources and sectors. According to this study, the remaining budget between 2010 and 2050 is just below 1000 GtCO₂eq – if we want to have a good chance of keeping global warming at least below 2°C.³

The cumulative net emissions to the atmosphere over the 40 year period have to be even lower: less than 900 GtCO₂eq. The reference to net emissions implies that deforestation stops, that global forests – currently a source of emissions due to logging and degradation – act as a permanent sink for greenhouse gases, and that the land-use sector sequesters roughly 80 GtCO₂eq globally over the 40 year period beginning in the next years.

Sustainable land management and protection of carbon-rich ecosystems such as tropical rainforests and peatlands would turn this sector into a net sink. If, however, deforestation in the tropics is not fully reversed in the next two decades, the overall allowable emissions to the atmosphere from all other sources – such as burning fossil fuels –

² IPCC: 4AR, WG III, 2007

³ WWF and Ecofys: Sharing the effort under a global carbon budget. 24 August. 2009

would be much smaller. In any case, the budget implies that by 2050 our global net emissions are reduced by more than 90%.⁴

So the carbon budget gives us an indication of the amount of greenhouse gas we can still afford to add to the atmosphere during the process of transforming our economies on the way towards a low- or zero-carbon future. To put this remaining budget into context, it's useful to know that the world has emitted about 1300 GtCO₂eq between 1860 and today just as a result of burning fossil fuels.

After 2050, the world has to be a net-zero emitter and later even become a negative emitter, which means that we will have to ensure that all human-induced activities of storing and protecting carbon are larger than activities that emit carbon. We must avoid overspending and distribute the precious budget that remains fairly, in a way which allows people from North and South to achieve a high quality of life and full access to safe, reliable and clean energy. The most important parameters when assessing how to share the global carbon budget in a fair and equitable way among nations are per capita emissions, the capacity to pay, historic emissions since 1990, and the share of population living above and below the poverty line.

Currently, average global per capita emissions – including all sources and gases – stand higher than 6 tCO₂eq annually. By 2050, and based on a medium projection of future population growth, average global per capita emissions must decrease to about 0.5 tCO₂eq per year in order to stay within the global carbon budget.⁵ To make headway, higher per capita emissions in developed countries and lower per capita emissions in developing countries must converge over time, with the former decreasing throughout and the latter increasing first before decreasing later.⁶

A joint effort, but different roles

Unfortunately, we can't have our cake and eat it too. If we imagine the global carbon budget as a giant cake, the world has already gobbled up most of it. In a fair world those who have eaten most of the cake (the developed countries) would leave the rest to those who didn't get much so far (the least developed and developing countries).

In the UN climate negotiations, this approach to fairness and equity is known as the principle of common but differentiated responsibilities and respective capabilities. The race to the future is a common challenge and all nations need to contribute to staying within the remaining carbon budget until our economies stop emitting. Each nation, however, has a different role and responsibility in this joint effort.

⁴ WWF (ibid)

⁵ WWF (ibid)

⁶ WWF (ibid)

2. THE GAP, OR: *SAVOUR THE CAKE, DON'T GOBBLE IT*

Developed countries are in the best position to lead the transformation of the global economy, and to support action in developing countries that matches their domestic measures, in order to ensure global change at the scale we need for prospering societies and climate resilience.

The Copenhagen Accord from December 2009 includes a goal to keep the rise in global average temperature to 2°C, and advocates a review to be finalized by 2015 to assess 1.5°C as an alternative goal. This has been endorsed by more than 120 countries responsible for more than 85% of global emissions, including the G8 countries which enshrined the 2°C limit in the conclusions of their 2009 summit.

Separately, more than 100 countries – including those that are most vulnerable to climate change – are promoting a development model that would ensure global warming doesn't cross the 1.5°C threshold. However, most of the countries that have endorsed the 1.5°C or 2°C limit are far from living up to their commitments.

Measuring the gigatonne gap

The lack of ambitious and transparent targets and plans for transformative action has created the “gigatonne gap”. This is the gap between what countries need to do and what they have so far pledged to do in order to ensure we all don't over-spend our remaining carbon budget and cross the 1.5°C temperature threshold.

There are different scientific projections for the annual global emissions in the year 2020 under a business as usual scenario, i.e. in a world that's not building low-carbon economies and reducing its emissions in the process. A recent estimate puts it at 57 GtCO₂eq.⁷

Given that our entire global carbon budget between now and the middle of the century is limited to net emissions of less than 900 GtCO₂eq, it is obvious that annual portions of 57 GtCO₂eq or similar will result in the world spending its budget much faster than it should. In other words, our cake will be eaten up long before the middle of the century.

Scientists suggest that annual global emissions should be reduced to 44 GtCO₂eq by 2020 if we want to have about a 50:50 chance of staying below 2°C global warming, and to 40 GtCO₂eq to stay below 1.5°C.⁸ So compared to the illustrative business as usual scenario of 57 GtCO₂eq per year, the cuts in annual emissions we achieve as a result of low-carbon growth should add up to 13 to 17 GtCO₂eq by 2020.

⁷ Hoehne N. et al.: Copenhagen Climate Deal – How to close the gap? Briefing paper by Climate Analytics and Ecofys. 15 December 2009.

⁸ Hoehne N. et al. (ibid)

Where we need to be, and where we are

If we don't meet these goals, it will be either impossible or extremely expensive to catch up later on – not least because the world will have invested in more long-lasting high-carbon infrastructure like inefficient buildings and coal-fired power stations, while failing to begin the race to deploy clean technologies.

Looking at what the emission reduction pledges put forward by countries under the Copenhagen Accord add up to, scientists project global emissions of 47.9 to 53.6 GtCO₂eq for the year 2020.⁹ This is 3.4 to 9.1 GtCO₂eq below the illustrative business as usual scenario of 57 GtCO₂eq. However, it's also 3.9 to 9.6 GtCO₂eq above the 2020 goal for the 2°C threshold, and even 7.9 to 13.6 GtCO₂eq above the 2020 goal for the 1.5°C threshold.

So the changes planned so far are not sufficient if we want to stay within the remaining global carbon budget we have left and below the temperature thresholds that define climate resilience and economic prosperity.

⁹ Meinshausen M. et al.: Copenhagen Accord pledges are paltry. *Nature*. Vol. 464. 22 April 2010.

3. THE PLUG, OR: ***PUTTING THE GLUTTONS ON A DIET***

There are many ways to plug the gigatonne gap, and governments can choose from a rich menu of options. Taken together, these different options would likely result in emission reductions that even exceed the level of ambition we need to plug the gap. This clearly shows that we don't lack ideas to manage our global carbon budget wisely, but political will and courage to take some bold steps.

3.1 Developed countries transform faster

Plugging potential: up to 4.3 GtCO₂eq

While managing the carbon budget remains a joint task for North and South, it's useful to look at the developed and developing world separately to understand who is responsible for driving the low-carbon trend. A WWF calculation based on a European Commission assessment of the emission reduction pledges by developed countries made in Copenhagen last December and thereafter shows that developed countries are likely to still emit 15.07 GtCO₂eq to 16.17 GtCO₂eq in 2020.¹⁰

The range in this total is a result of the ranges of the individual pledges made by a few countries, mainly the EU and Russia, which have pledged two options depending on whether other countries make efforts that are similar or smaller. The estimated 16.17 GtCO₂eq emitted by developed countries in 2020 represents a pragmatic scenario in which they stick to the lower ends of their pledges. In this scenario, more than a third of the entire global emissions the world can afford in 2020 if it wants to have a good chance to stay below 1.5°C would be accounted for by the developed countries, i.e. a comparably small number of countries. That doesn't leave much remaining cake to the least developed and other developing countries that haven't had much of it so far.

A more pessimistic scenario would even question these numbers and ask for higher potential emissions than the assessed 16.17 GtCO₂eq in 2020, simply because some countries have not been able to agree domestically on their pledges, particularly the US.

How developed countries can contribute

According to the Intergovernmental Panel on Climate Change (IPCC), scenarios consistent with delivering a decent chance of staying below 2°C require developed countries to cut emissions by 25 to 40% by 2020 compared to 1990 levels. Compared to

¹⁰ European Commission: Staff working document accompanying the communication from the Commission to the European Parliament, the Council, the European Economic and Social committee and the Committee of the regions. Analysis of options to move beyond 20% greenhouse gas emission reductions and assessing the risk of carbon leakage. Background information and analysis Part II. May 2010

these IPCC figures and the WWF call on developed countries to aim at the upper end of the IPCC range, present targets even under the more optimistic scenario are insufficient.

Some developed countries have relatively decent targets, such as Norway or Japan with their 2020 targets of 40% and 25%, respectively. However, the unilateral 20% target offered by the EU as a block is outside the IPCC recommended range and reflects neither the EU's contribution to causing climate change nor the bloc's potential to implement clean technologies at a much faster speed. The 2020 targets of other developed countries are even worse, for example those considered by Canada, Russia or the US.¹¹

It's clear that the slow transition of many developed countries into low-carbon economies is the main reason for the gigatonne gap and the risk that the world may overspend its remaining carbon budget. Estimates show that reducing developed country emissions by 30% instead of the 15.6% promised in the current more positive scenario for 2020 would result in 2.4 GtCO₂eq less emitted to the atmosphere. Increasing the collective effort from 15.6% to 40% would even lead to 4.3 GtCO₂eq less emitted to the atmosphere.¹²

3.2 Closing loopholes that undermine targets

Plugging potential: at least 2.4 GtCO₂eq

We only have one cake, and when it's gone it's gone. So transparent accounting will be essential to ensure fair sharing of the remaining carbon budget. But loopholes could prevent the world from measuring its carbon output accurately. Loopholes are accounting tricks that allow countries to hide emissions that have occurred or will occur, undermining targets and effectively shrinking them while growing the gigatonne gap.

Use of loopholes makes countries comply with their pledges on paper while in effect increasing their emissions. They result in a distorted picture and a serious risk of overspending, which in this case means a much greater risk of crossing the 1.5°C warming threshold. Closing the loopholes would ensure carbon clarity and convince the world that pledges are designed to deliver genuine low-carbon action, instead of functioning as smokes and mirrors.

Based on present pledges, WWF estimates that a whole series of loopholes practically allows industrialized countries to increase their domestic emissions, which stands in sharp contrast to the reductions foreseen in their plans and proposals.¹³ The size of some of these loopholes can be estimated, and WWF's calculations show that closing the loopholes introduced below could add up to roughly 2.4 GtCO₂eq of eliminated non-reductions per year by 2020, i.e. non-reduction that otherwise could have been accounted for as reductions under flawed targets that are undermined by loopholes. It

¹¹ A useful resource to learn more about the transformational ambitions of different countries is www.climateactiontracker.org

¹² Hoehne N. et al.: Copenhagen Climate Deal – How to close the gap? Briefing paper by Climate Analytics and Ecofys. 15 December 2009.

¹³ WWF: The Copenhagen Accord: A Stepping Stone? February 2010

should be clear that the elimination of non-reductions is different from creating new reductions.

The “hot air” problem with surplus AAUs

The “hot air” loophole is the result of emission reduction targets given mainly to Russia and Eastern European countries when the Kyoto Protocol was negotiated in 1997. These targets for 2008 to 2012 were far above even the “business as usual” or “do nothing” projection for the same period, meaning that these countries were given the right to emit at a much higher level than their actual emissions in 1997, based on the argument that they have suffered from economic breakdown and should be given space to grow.

Such internationally tradable permits to emit are called Assigned Amount Units (AAU), and the large surplus of AAUs deriving from this over-allocation is widely known as “hot air”. It is now clear that the actual cumulative emissions from Russia and other Eastern European countries for the period 2008 to 2012 are likely to be around 11 GtCO₂eq below their existing Kyoto targets.¹⁴ Unless ruled out by the UNFCCC, this AAU surplus can be carried over into a subsequent commitment period under the Kyoto Protocol.

Assuming an eight year period (2013-2020), this surplus of AAUs could amount to 1.4 GtCO₂eq per year. Because major emitters in Eastern Europe and Russia are not likely to need these permits for themselves until 2020, this would effectively stall the low-carbon actions needed by developed countries as they could buy the surplus AAUs and count them against their emission reduction targets – even though they do not represent any real, additional reductions.

The “hot air” problem could become even bigger, if some developed countries take on weak emission reduction targets for 2020 that could be delivered easily under a business as usual scenario, thus generating more surplus AAUs on top of those that are already flooding the market. Avoiding more “hot air” and retiring the current AAU surplus would prevent a gigatonne gap extension of at least 1.4 GtCO₂eq per year by 2020.

Flawed LULUCF accounting rules

If well drafted, the rules for accounting for emissions and sinks from the LULUCF (Land Use, Land Use Change and Forestry) sector could help to encourage sustainable forest management and environmentally sound agriculture by providing true measurement of the actual emissions or emission reductions and carbon sequestration achieved through these practices.

However, current Kyoto Protocol rules for accounting for LULUCF in industrialized countries have been shown to be biased towards ignoring real emissions and over-crediting carbon sequestration from land use activities.

If this approach is maintained in future Kyoto Protocol commitment periods post-2012, it will result in another huge loophole that effectively undermines low-carbon action by

¹⁴ Meinshausen M. et al. (ibid)

developed countries and reduces the drive to deliver real reductions in emissions. Based on current accounting rules, and matching the conclusions put forward by scientists¹⁵, WWF estimates the size of the LULUCF loophole to be 1 GtCO₂eq per year by 2020.

On top of that, the debate in the international climate negotiations about new rules for accounting for LULUCF is headed towards making the loopholes even bigger.

3.3 Sectoral omissions and cheating the atmosphere

Plugging potential: at least 1.3 GtCO₂eq

A low-carbon future is possible if loopholes that undermine action plans in developed countries are closed, if these countries speed up their transformative efforts in the race to the future, and if they support the developing countries with funding and technology to make them a bigger part of the solution. However, we also have to stop cheating the atmosphere.

When CDM offsets are simply not additional

Currently, the Kyoto Protocol's Clean Development Mechanism (CDM) allows developed countries to meet their emission reduction targets under the Kyoto Protocol partly through purchase of emission credits from projects in developing countries that have also ratified the Kyoto Protocol. Developed countries are projected to use at least 1.5 GtCO₂eq per year of these CDM and other offset credits by 2020.¹⁶ Weak targets by developed countries in combination with an over-reliance on offsets will slow down their efforts to modernize and transform their economies for the low-carbon future, as they could carry on polluting and lock themselves into high carbon infrastructure such as new coal-fired power stations.

From a global emissions perspective offsets ideally do not increase emissions. Yet, the key problem with offsets in the context of the gigatonne gap is their "non-additionality". Offsets can lead to an increase in global emissions because a substantial proportion of these credits are non-additional. In other words, they were generated through actions that would have happened anyway under a business as usual scenario. It is difficult to assess precisely how many CDM offsets would be non-additional, but a very conservative assessment – based on a number of studies – would put the figure at 20%.¹⁷ This means that ensuring additionality of offsets would result in a gigatonne gap filling of 0.3 GtCO₂eq per year or more in 2020. More recent analysis even estimates that more than half of all CDM offsets are non-additional, i.e. about 0.7 GtCO₂eq annually.

While stopping to cheat the atmosphere is one important step, looking at sectors and gases that have been omitted so far is another. International aviation and shipping are

¹⁵ Meinshausen M. et al. (ibid)

¹⁶ WWF: The Copenhagen Accord: A Stepping Stone? February 2010

¹⁷ WWF and Oeko Institut: Is the CDM fulfilling its environmental and sustainable development objectives? An evaluation of the CDM and options for improvement. November 2007

good examples of important sectors that so far have not contributed to low-carbon transformation. In a business as usual scenario, bunker fuel emissions from these sectors are estimated to add up to 1.8 GtCO₂eq per year by 2020, which means twice their emissions in 1990.¹⁸

Currently, these emissions are not covered by the Kyoto Protocol or a comparable treaty, and as a result neither the shipping nor the aviation sector is bound to any mandatory actions to decarbonize. If both sectors were to accept targets, e.g. return to 1990 levels by 2020 or aim at a significant cut from 1990 levels by 2020, emissions in the area of 1 GtCO₂eq could be easily avoided, further shrinking the gigatonne gap.

Including new industrial gases not covered by the Kyoto Protocol

F-gases, including CFCs, HCFCs, HFCs, PFCs or SF₆, are all part of a family of gases known as fluorocarbons. The regulatory control of F-gases is split between the Montreal Protocol and the Kyoto Protocol. Chlorofluorocarbons (CFCs, and their close cousins HCFCs) are ozone layer depleting substances regulated by the Montreal Protocol. These are also strong greenhouse gases, but the Kyoto Protocol doesn't cover them, because they were already being regulated.

However, Hydrofluorocarbons (HFCs), PFCs and SF₆ – other groups of strong greenhouse gases – are covered by the Kyoto Protocol. These gases are not ozone-depleting and were developed as replacements for CFCs. Other lesser known f-gases could be covered as well, especially those that can be easily measured, and thus controlled under an emission reduction regime. For example, fluorinated ethers, perfluoropolyethers, NF₃, or SF₅CF₃, are all gases that – if properly regulated – could contribute to global greenhouse gas reductions.

The aforementioned gases may not be the most common greenhouse gases, but if we want to manage our remaining carbon budget efficiently to make the cake last longer, so to speak, we need to look beyond the usual suspects. The same applies for industrial sectors, where the Kyoto Protocol has a strong focus on some of the most polluting sectors such as utilities, steel, concrete, glass or pulp and paper. Other less polluting but also harmful sectors could be added.

3.4 Dodgy policy design flaws

Plugging potential: up to 1 GtCO₂eq

The second problem with CDM offsets – apart from non-additionality – is the risk of double-counting of emission reductions. If emission reductions from a CDM project generate credits for use by a developed country, but are also counted against the host country's own emission reduction pledge or national inventory, the effect is to increase the gigatonne gap. No agreement has yet been reached in the international climate negotiations on how to practically avoid double-counting of CDM offsets, or in other potential future market mechanisms. Such a practice would cook the books, and the best

¹⁸ Hoehne N. et al. (ibid)

way to avoid this flawed approach to book-keeping is having CDM host-countries add the emission reductions to their own inventories, while not adding them to the inventories of the investors who bought the credits.

In addition, developed countries have an obligation to provide climate finance to developing countries to support their mitigation and adaptation efforts, and there is a danger that some developed countries will try to double count CDM and other carbon market mitigation towards their financial obligations. Avoiding dodgy policy design flaws like these would mean avoiding a gigatonne gap extension of up to 1 GtCO₂eq per year by 2020.¹⁹

3.5 Closing the dollar gap

Plugging potential: about 1.7 GtCO₂eq

Just like many developed countries, a number of developing countries have also pledged actions of different levels of ambition, meaning target ranges. Whether they go to the lower or upper ends of these ranges largely depends on the provision of adequate financial and technical support from developed countries. Finance remains a major sticking point in the international climate negotiations. As long as sufficient amounts of secure, predictable and additional funding are not forthcoming, it's likely too optimistic to assume that developing countries can deliver the maximum level of ambition suggested by their pledges.

According to scientists, unilateral actions planned by developing countries to switch to a low-carbon development path and reduce emissions currently add up to 1.5 GtCO₂eq less emitted to the atmosphere. Conditional to external funding, however, additional action worth 1.7 GtCO₂eq is pledged.²⁰ So if financial and technological support from the developed world was forthcoming, developing countries would more than double their effort.

Developed countries should therefore not only look at closing the gigatonne gap through faster and bigger changes at home, but also at closing the dollar gap – and thus empower developing countries to do their part in closing the gigatonne gap. However, such financial support would only really contribute to closing the gigatonne gap if we can avoid double-counting of one effort on two sides, e.g. in a developed and in a developing country.

Independent of conditional support from rich nations, developing country pledges differ in ambition, scope, comprehensiveness and the type of targets. While the emerging economies of Brazil, India, South Africa, Mexico, Indonesia and China are good examples, some high-emitting developing nations have not put forward any promising pledges. In line with substantially enhanced actions by developed nations, the overall ambition level of some wealthier and high-emitting developing nations should also

¹⁹ Project Catalyst, ClimateWorks Foundation & European Climate Foundation: Taking stock – the emission levels implied by the pledges to the Copenhagen Accord. February 2010.

²⁰ Hoehne N. et al. (ibid)

increase. The potential of such enhanced actions in terms of avoided emissions still needs to be calculated.

3.6 Creative financing for creative solutions

The space for creative thinking about ideas how to close the gigatonne gap is almost as big as the gigatonne gap itself. A lot will also depend on creative financing to fund the creative solutions that the world may or may not implement to speed up the low-carbon transition and to close the gigatonne gap. Scientists and climate NGOs have joined forces to identify technical solutions like those discussed above, and to find ways to generate the money that's needed to make things happen quickly.

These can involve financial incentives for industries to endorse or reject certain options, e.g. cutting subsidies for fossil fuels and increasing feed-in tariffs for renewable energies. Other new sources of finance could be revenues from auctioning CO₂ permits on the carbon market, new taxes (e.g. the much debated Foreign Transaction Tax) or sectoral emissions trading systems (e.g. on bunker fuels from shipping and aviation), or the utilization of Special Drawing Rights as proposed by financial experts such as George Soros.

New money like this could be used in manifold ways to boost the transition of countries in North and South, and to make sure that the race to the future picks up speed and results in low-carbon economies before we have spent our carbon budget or crossed the 1.5°C temperature threshold.

3.7 Beyond the gap: ozone and black carbon

It has been estimated that additional action under the Montreal Protocol to protect the Ozone Layer can save – cumulatively – up to 6 GtCO₂eq by 2015 and about 14 GtCO₂eq thereafter by collecting and destroying “banks” of otherwise unwanted stockpiles from discarded refrigerators, insulating foam and air conditioners. An additional 5 GtCO₂eq can be avoided by 2015 by destroying discarded equipment from those sectors containing HFCs.²¹

In addition, addressing tropospheric ozone (O₃) via clean air and sustainable agricultural policies will reduce short term and seasonal warming substantially. Tropospheric O₃ is not emitted, but a potent greenhouse gas and an aggressive toxic pollutant resulting from complex physio-chemical processes between the sunlight and gaseous precursors which are not greenhouse gases. Those precursors are pollutants themselves, such as CO, NO_x and volatile organic compounds originating from fuel combustion, agricultural (over-) fertilisation and various transport modes including shipping and cars.

It has been estimated that tropospheric O₃ is responsible for up to US\$ 26 billion damage to crops annually threatening food security.²² Reducing tropospheric O₃ has

²¹ Molina M. et al.: Reducing abrupt climate change risk using the Montreal Protocol and other regulatory actions to complement cuts in CO₂ emissions. PNAS 2010

²² Molina M. et al. (ibid)

many non-climate and health benefits, but it's obvious that enhanced action to protect the ozone layer would also have a huge potential with respect to closing the gigatonne gap. The annual filling potential, however, hasn't been calculated yet.

Black carbon waiting to be addressed

A whole new area of research that caught the attention of climate scientists in addition to old and new greenhouse gases or old and new industrial sectors is black carbon, also known as soot. These particles in the atmosphere result from incomplete combustion of fossil fuels or biomass, and there is growing scientific evidence that black carbon deposited on light snow and glacier surfaces absorbs sunlight, warms regionally and hence contributes to exceptional melting, in particular in the Arctic and Himalaya ecosystems.

Recent research shows that black carbon may be a major reason for extraordinary melting rates observed in certain glacial and ice-related ecosystems. Unlike CO₂ or many other gases mentioned here, black carbon is not being addressed in any systematic way. Black carbon is also a short-lived phenomenon compared to some of the greenhouse gases that can stay in our atmosphere for thousands of years.

Even though black carbon only stays in the atmosphere for a few weeks, it has an impact that – as some suggest – may be the main culprit for observed very high temperature increases in both the Arctic and Tibetan Himalaya.²³ This could easily be mitigated, and key policies to do this are similar to traditional clean air and development policies and include energy-efficient wood stoves and sustainable biomass in developing countries as well as removing particles from Diesel engines. Reducing Black Carbon brings utmost health benefits to mainly poor and rural communities relying on inefficient biomass use, which causes about a million premature deaths annually.

Black Carbon's range of sources and some prevailing large uncertainties in accounting for its impacts mean that the best approach for now is probably to simply address major sources in appropriate existing fora. For example, shipping soot should be addressed by the International Maritime Organization (IMO) rather than the UNFCCC, and diesel particulate filters should be mandatory for all modes of transport. Soot from biomass cooking stoves in some developing countries should be reduced by addressing the source as a primary development and health topic covered by ODA and other financial support mechanisms, in the context of access to safe, reliable and clean energy for the more than two billion people mainly in poor developing countries who still rely on locally collected biomass for cooking and heating.

What this would add up to in terms of GtCO₂eq avoided emissions is still unclear at this stage, but the amount of black carbon in the atmosphere is significant, thus the positive effect of regulating it could be equally huge.

²³ Molina M. et al. (ibid)

4. THE RACE, OR: **LESS CAKE IS MORE**

The race to the future has begun, and governments are making relevant decisions every day: At which speed should we move towards economic prosperity and climate resilience?

For example, massive amounts of capital stocks will be replaced and added during this decade between 2010 and 2020, because economic recovery packages to tackle the recent recession mean huge additional investments, because old stock is being decommissioned as it reaches the end of its lifespan, or because the demand for energy is growing worldwide and demands fresh supply. Half of the power supply required by 2020, for example, has yet to be built.²⁴

In this situation, it makes complete economic sense to rush into clean energy technologies and focus investments there, rather than investing in long-lasting high-carbon technologies and assets which won't be able to operate until the end of their normal technical lifespan when we cross economic and environmental tipping points that make them intolerable and unprofitable.

300.000 lives, 500 billion dollars

The longer we hesitate, the more we lose, both in the short- and long-term. In the short-term, the International Energy Agency (IEA) estimates that every additional year of delay beyond 2010 adds another US\$ 500 billion to the overall investment needed to decarbonize the global economy.²⁵ In other words, making changes now to enter the race and reduce emissions is much cheaper than starting later and making the same cuts then.

In the long-term, failure to make the right investment decision now could mean we overspent our carbon budget later and cross the 1.5°C temperature threshold. According to scientific estimates, the financial as well as non-financial costs of global warming above 1.5 or 2°C and the resulting climate impacts will far outweigh the costs of making the low-carbon transformation we need for staying within our budget and temperature threshold.

Global warming of 3 to 4°C or even higher is what we'll be dealing with in case we don't manage to plug the gigatonne gap. This will be costly not only in terms of dollars, but more importantly in terms of biodiversity, food security and human lives we lose, especially in the least developed and most vulnerable parts of the world. Already in our times, climate change is killing 300,000 people per year²⁶, a number likely to increase rapidly in a 3 to 4°C world, where rare species and precious ecosystems would also suffer or even be lost forever.

²⁴ Project Catalyst et al. (ibid)

²⁵ IEA: World Energy Outlook 2009

²⁶ Global Humanitarian Forum: The Anatomy of a Silent Crisis. 2009

The piece of cake that's left has to last until the middle of the century, and if we cut off fat annual slices between now and 2020, the remaining slices between then and 2050 could be too thin to cut. The world would be best off opting for a gradual approach where slices are portioned wisely. This means we benefit from filling the gigatonne gap quickly, while in turn spending our carbon budget slowly.

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