Taking stock – the emission levels implied by the current proposals for Copenhagen

Briefing paper, 7 Dec 2009

ClimateWorks FOUNDATION

European Climate Foundation

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About Project Catalyst

Project Catalyst is an initiative of the ClimateWorks Foundation. ClimateWorks is a global, non-profit philanthropic foundation headquartered in San Francisco, California with a network of affiliated foundations in China, India, the US and the European Union. The ClimateWorks family of organisations focus on the enactment of policies that reduce greenhouse gas emissions through three general policy areas: energy efficiency standards, low-carbon energy supply, and forest conservation/agriculture.

Project Catalyst was launched in May 2008 to provide analytical and policy support for stakeholders engaged in the United Nations Framework Convention on Climate Change (UNFCCC) negotiations on a post-Kyoto international climate agreement. Project Catalyst members have been organised into five working groups: abatement, adaptation, technology, forestry, climate-compatible growth plans, and finance. Each working group has received analytical support from the international consulting firm, McKinsey & Company. Working group members have included a total of about 150 climate negotiators, senior government officials, representatives of multilateral institutions, business executives, and leading experts from over 30 countries.

Project Catalyst and its working groups provide a forum where key participants in the global discussions can informally interact, conduct analyses, jointly problem solve, and contribute ideas and proposals to the formal UNFCCC process. This paper summarises output from Project Catalyst, but the views expressed in this paper have not necessarily been endorsed by all of the members of Project Catalyst nor their governments or organisations. The ClimateWorks Foundation takes sole responsibility for the content of this paper.

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Executive Summary

Copenhagen must lock-in commitments at or above the high-end of the current proposal range in order to preserve the possibility of limiting warming to 2°C.

Project Catalyst's original scenario for business-as-usual (BAU) annual global emissions was 61 billion tonnes (gigatonnes or Gt) of CO_2e by 2020. We have revised this estimate downward to 58 Gt based on the impact of the economic downturn (1.5 Gt) and updated data on deforestation and anthropogenic peat emissions (1.5 Gt). This updated BAU is consistent with a path to 950 ppm and 5°C warming – a level of warming that risks catastrophic and irreversible damage to human and natural systems.

In order to get on a path to stabilising long-term concentrations at 450 ppm and having a 40-60 percent chance of containing warming to 2°C above pre-industrial levels, emissions must be no higher than 44 Gt by 2020. Thus emissions need to be reduced by 14 Gt by 2020 versus the revised BAU.

We estimate that the high-end of the current proposals for reduction from all countries would achieve 9 Gt of abatement versus BAU and lead to 2020 emissions of 49 Gt. This is still 5 Gt above what is needed for a 450 ppm path, but nonetheless would represent significant progress – in essence Copenhagen would lock-in two-thirds of the reductions needed. Other analysis by Project Catalyst shows that even the high-end of the proposals currently on the table still do not reflect the full potential of what is within the technical and economic potential of the participating countries.[1] With sufficient political will, the proposals could be raised above the current high-end of the range and the 5 Gt gap could be reduced further.

The low-end of the proposal range would risk permanently losing the opportunity to limit warming to 2°C and exposing the world to unacceptable climate risks.

The low-end of the proposal range would only abate 4 Gt versus BAU leading to emissions of 54 Gt by 2020. This level of emissions is consistent with a 550 ppm path and a temperature rise of 3°C or more, which risks severe levels of climate damage. Furthermore, if only the low-end of the proposed abatement is achieved, it is very unlikely that it will be possible to catch-up post-2020. Our analysis shows that in order to return to a 450 ppm path after 2020, 30 Gt of abatement would be required in 2030 versus BAU. We estimate that only 19 Gt of abatement would be economically feasible under €60 per tonne. This is because the world will replace and add massive amounts of new capital stock during the next decade – over half of the power supply required for 2020 has yet to be built. If that stock is built using high-carbon technologies, then abating the necessary

[1] See Project Catalyst , 'Towards a global climate agreement - Synthesis paper' (www.project-catalyst.info).

30 Gt post-2020 would require the abandonment of large amounts of capital stock before the end of its useful life. This in turn would require massive and rapid investments to replace abandoned high-carbon capital stock, severely damaging the global economy and limiting growth. Thus 'catching up' post-2020 is not a realistic option. One way or another, a weak deal or no deal in Copenhagen will have severe long-term economic consequences – either through the negative impacts of climate change itself, or through the radical economic dislocations that would be required by 2020 to avoid it.

Achieving the high-end of proposed mitigation range will require strong financial, technology, and capacity building support for developing country action.

Of the 9 Gt of proposed abatement at the high-end of the proposal range, approximately 5 Gt is from developing countries. A further 1 Gt while pledged by developed countries, would likely be undertaken in developing countries via offset mechanisms. First, this shows that a number of developing countries are willing to commit themselves to nationally appropriate mitigation actions that could have a significant impact. And second, it reinforces the criticality of providing appropriate financial, technological, and capacity building resources to support such efforts. Project Catalyst has conducted detailed analysis of the level of resources required, and current offers from developed countries will need to scale up significantly to reach the needed levels.[2]

Copenhagen must produce a 'review and ratchet' mechanism that raises ambitions and closes any remaining gap to a 2°C pathway by no later than 2015.

While a Copenhagen agreement at the high-end of the proposal range would be a major step forward, it would only be the beginning of a journey. If the high-end of the proposals is reached, there will still be a 5 Gt gap between what is achieved in Copenhagen and a 450 ppm pathway. It is thus essential that any Copenhagen agreement also include a 'review and ratchet' mechanism whereby an independent technical review of progress on mitigation against the latest science is conducted. Following such a review, a new round of negotiations would then occur whereby parties would be strongly encouraged to ratchet-up their mitigation commitments to close any gaps between committed actions and what is necessitated by a 2°C pathway. The IPCC will be delivering its 5th Assessment Report on the science in 2014 and the first 'review and ratchet' round should therefore occur in 2015.

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[2] See 'Scaling-up Climate Finance', Project Catalyst briefing paper, September 2009, www.project-catalyst.info

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The heads of state, heads of government, ministers, and negotiators who will be at Copenhagen face a clear choice. We can lock-in and even increase the high-end of the proposals that are currently on the table in Copenhagen, provide the resources that are necessary to support developing country actions, and create a structure that further raises ambition and increases commitments over time. Or by achieving anything less, risk permanently missing the window to 2°C, expose societies around the world to unacceptable levels of climate risk, and condemn ourselves to grave choices in the coming decades between climate security and economic growth. The time for decision has come.

Introduction

In L'Aquila, Italy in July 2009 the leaders of 17 major economies recognized the scientific consensus that in order to avoid the worst risks of climate change, increases in global mean temperature must be limited to no more than 2°C above pre-industrial levels. In order to have just a 40–60 per cent chance of meeting this objective, long-term atmospheric concentrations of greenhouse gases (GHGs) must be stabilised at no more than 450 parts per million (ppm) of carbon dioxide equivalents (CO_2e).

This paper analyzes mitigation proposals made by parties to the United Nations Framework Convention on Climate Change (UNFCCC) in preparation for the Copenhagen global climate negotiations. Our analysis is of all proposals as of 4th December 2009, and assesses how consistent those proposals are with the objective of setting the world on a path to 450 ppm or less. The paper considers both confirmed policies, and policies that have been proposed but are contingent on domestic political approval, or are contingent on outcomes in the international negotiations such as action by other countries or funding support. It should also be noted that this analysis includes unilateral, domestic policies and proposals for 'nationally appropriate mitigation actions' made by developing countries that may or may not be formally included as commitments in an international treaty by those countries. But whether formally in a treaty or not, if implemented, these policies and proposals would have an impact on mitigation outcomes and thus are included in the analysis.

As each country's policies and proposals are formulated in different ways, the analysis has required interpretations and assumptions that enable the policies and proposals to be put on a common basis for assessment and comparison. Project Catalyst welcomes feedback on these interpretations and assumptions and detail on them can be found in the appendices to this briefing paper. Furthermore, not all parties to the UNFCCC have come forward with proposals and some countries may modify their proposals in the course of the negotiations. Project Catalyst will continue to refine and update this analysis during the Copenhagen summit

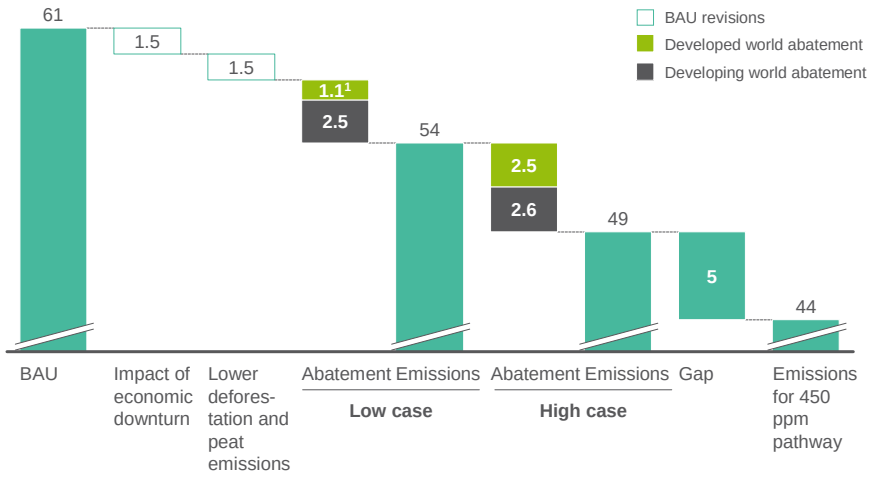
Detailed Findings

In the following sections we describe how our estimate of BAU has been revised due to the economic downturn and updated scientific and technical data.[3] With a revised BAU established, we will then assess the potential impact of national mitigation proposals and pledges made in the course of the UNFCCC negotiations.

Overall, our estimate for 2020 BAU annual global emissions has been revised downwards by 3 Gt from 61 Gt to 58 Gt due to the economic crisis and updated estimates for forestry and anthropogenic peat emissions (Exhibit 1). The set of firmly committed proposals on the table in the negotiations (our low case) could reduce this updated BAU further to 54 Gt. If the high-end of proposals and pledges is achieved than this would reduce emissions to 49 Gt, still leaving a 5 Gt gap to the 44 Gt required for a 450 ppm pathway. If this was further reduced during the course of the Copenhagen negotiations, and any remaining gap addressed quickly in the next few years (e.g. between 2010 and 2015), then a 450 ppm path could be achieved. Anything less and the window to such a path may be permanently missed.

Exhibit 1 – Emissions under current proposals

Gt CO_2e per year, 2020



1 The 1.1 Gt of abatement from developed countries is on top of 1.5 Gt of reduction as a result of the economic crisis
Source: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis

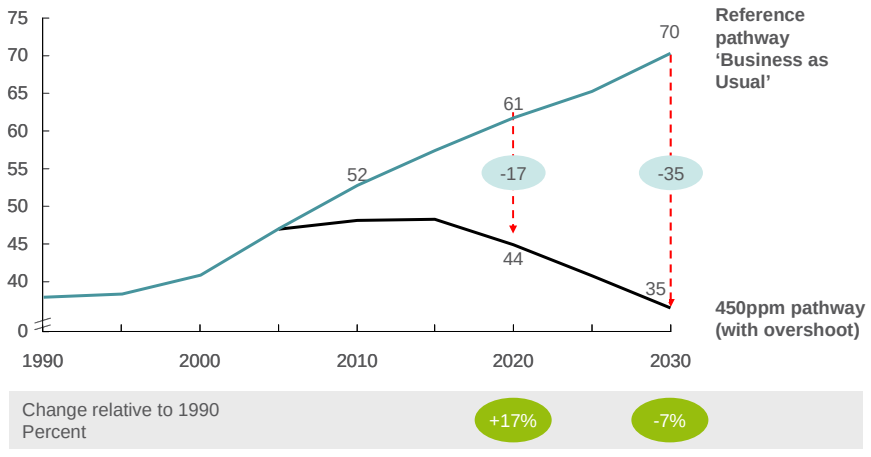
[3] The original 61 Gt 2020 BAU is drawn from the McKinsey Global GHG Abatement Cost Curve v2.0

1. Revised estimates suggest that post-downturn BAU emissions in 2020 might be closer to 58 Gt than the original Project Catalyst estimate of 61 Gt. This is caused by a 1.5 Gt reduction due to the economic downturn and a 1.5 Gt reduction due to revised estimates of emissions from deforestation and anthropogenic peat emissions. In order for the world to start down a path to 450 ppm or better, an additional 14 Gt of reductions in annual CO2e emissions are needed in 2020 versus BAU, requiring year-on-year cuts in emissions beginning in 2010.

Our assessment of current policies and proposals begins with an estimate of BAU emissions –projected emissions per year on the basis of economic trends and actual or planned mitigation actions that were known at the time of the analysis.[4] Project Catalyst's original estimate of BAU shows emissions rising from 46 Gt in 2005 to 61 Gt in 2020 (Exhibit 2). Recent evidence suggests that global BAU emissions might be up to 3 Gt lower due to the effect of the economic downturn, as well as lower estimates for deforestation and anthropogenic peat emissions.[5] This would reduce the gap between BAU emissions and the 450 ppm pathway from 17 Gt to 14 Gt in 2020.

Exhibit 2 – Global GHG emissions

Gt CO_2e per year



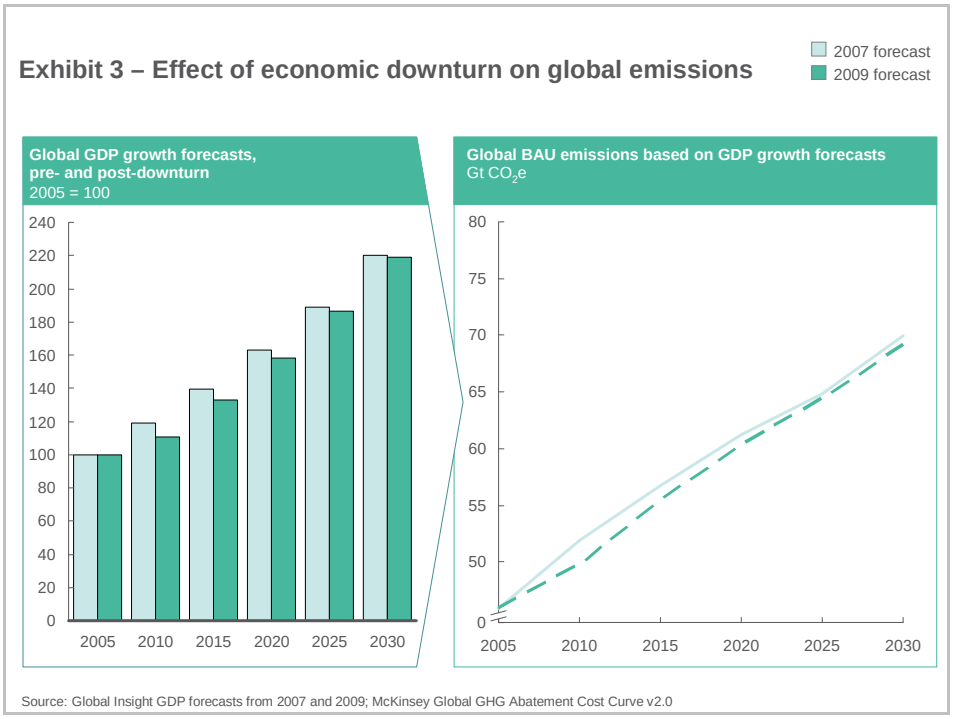
Source: McKinsey Global GHG Abatement Cost Curve v2.0; Houghton; IEA; US EPA; den Elzen, van Vuuren; Project Catalyst analysis

[4] Policies and actions announced before 2008 are included in Project Catalyst's BAU.

[5] A comparison with estimates for BAU emissions from other sources is shown in Appendix I.

Impact of economic downturn

The economic downturn that began in 2007 has caused a significant drop in current emission levels, and will also affect projected future (BAU) emission levels. To assess this effect we performed a regression analysis of GDP forecasts and emissions by country, supported by a review of recent public estimates. Exhibit 3 shows the forecast decline in GDP and associated declines in emissions levels. Overall the analysis indicates that the economic downturn is likely to cause a reduction of global emissions of 1.5 Gt by 2020 versus the pre-downturn BAU.



This is generally in line with other projections; however, most analyses do not account for where the emission reductions are taking place. Our individual country-level data and regression analysis enables us to assess how the downturn has differentially impacted emissions in developed and developing countries (Exhibit 4). The downturn has had a more dramatic impact on developed world GDP growth than on the developing world. Developed world GDP has dropped 3.4 per cent from the peak in 2008 to current levels, whereas we have seen only a 0.2 per cent fall in the developing world. Furthermore, the duration of the downturn in the developing world is expected to be shorter. This means that all of the economic downturn-driven emission reduction in 2020 will take place in the developed world, slightly reducing the required abatement efforts of these countries. However, this situation may also reduce the need for offset credits, thereby potentially

reducing the financing available from the carbon market for abatement in developing countries.

Exhibit 4 – Effect of economic downturn on developed and developing world emissions

* Global bunker emissions split 60/40 between developed/developing based on IMO estimate of unloaded cargo ratio
Source: Global Insight GDP forecasts from 2007 and 2009; McKinsey Global GHG Abatement Cost Curve v2.0

Lower projections for deforestation and anthropogenic peat emissions

In addition to the economic downturn effect, recent analyses suggest that emissions from peat and forestry may have been over-estimated in the IPCC's fourth annual report (AR4). This could lead to a 1.5 Gt lower BAU estimate for 2020. The reduction in deforestation in these estimates is largely caused by a drop in deforestation in South-East Asia in the 2000–2005 period versus the 1995–2000 period on which previous analyses were based.

Overall, both effects would result in BAU emissions of 58 Gt rather than 61 Gt in 2020. The corresponding gap to be closed by 2020 would reduce from 17 Gt to 14 Gt.

2. We estimate that the cumulative effect of current abatement proposals (taking into account firm commitments and additional proposals) would result in emissions of 49–54 Gt per year in 2020. The extent to which this range is realised depends on whether potential commitments (such as the EU 30 per cent cut versus 1990 or US 17 per cent cut versus 2005) get translated into policy and actual performance.

Our analysis covers abatement proposals that have either been committed to since 2008 (actions taken before then are included in the BAU forecast) or those that have been proposed in the run-up to the United Nations Climate Change Conference in Copenhagen (COP15). The assessment shows that if all countries would enact their most ambitious proposals, 2020 emission levels after abatement could be 49 Gt (compared to BAU emission levels of 58–61 Gt).[6] Even the high-end of proposals, however, would leave a gap of 5 Gt relative to the 44 Gt needed for a 450 ppm pathway.

The details on the commitments and proposals assessed are provided in Appendix IV. The analysis provides a range of potential outcomes.

- **Low case scenario**: Taking only firm commitments into account, annual emissions would be 54 Gt in 2020. This would amount to a reduction of developed country emissions by 3 per cent below 1990 levels by 2020 and by 7 per cent below BAU for developing countries. In this so-called low case scenario, only relatively firm developed country commitments (e.g., EU target of 20 per cent below 1990 by 2020) and developing country initiatives that have been enacted through national policy (e.g., Brazil's more stringent biofuels penetration targets) have been taken into account. The gap between these commitments and a 450 ppm pathway is 10 Gt in 2020, missing the 450 ppm path by a wide margin.

- **High case scenario**: In the high case scenario, further potential proposals are also taken into account at their most ambitious interpretation. Under this scenario, 2020 annual emissions would be 49 Gt in 2020. This translates into developed country emissions in 2020 that would be 18 per cent below 1990 levels. Developing country emissions would be 13 per cent below BAU in 2020. These emission reductions include the upper limit of developed country proposals (e.g., EU sets a target of 30 per cent below 1990 by 2020, US enacts a 17 per cent target below 2005) and developing countries increasing their domestic policy contributions (e.g., China enacts an ambitious 12th 5-year plan, Indonesia enacts its proposed reduction of 41 per cent

6 This analysis takes into account the impact of the economic downturn, which affects the BAU but not the abatement case. See Appendix II for more details on the methodology.

relative to BAU, conditional on international funding). As such, they should not be regarded as guaranteed abatement, but rather as high-level pledges that require significant commitment if they are to be achieved.

It should also be noted that the accounting of emissions due to land use, land use change and forestry (LULUCF) could have significant implications on the scale of emissions reduction delivered by developed country targets. Low quality LULUCF credits could potentially undermine emissions reductions in other sectors. Additionally, accounting loopholes could allow countries to hide LULUCF emissions. Analysis by Ecofys and Climate Analytics, examining the effect of the inclusion of emissions reductions credits and debits from LULUCF and taking into account individual country preferences on potential accounting rules, shows that the emissions reduction implied by the high-end of developed country targets relative to 1990 could be as low as 14% (compared to 19% with the effect of LULUCF credits excluded)[7]. This discrepancy, if not resolved, could lead to 1 Gt of extra emissions under the same set of targets.

Last, the Assigned Amount Unit (AAU) surplus that exists in some Annex I countries (also known as "hot air") also has the potential of reducing the abatement results of committed and announced proposals, if treated inappropriately.

3. To reduce emissions to 44 Gt in 2020 (the emission level consistent with a 450 ppm pathway), developed and developing countries would need to cut emissions by a further 5 Gt, even in the high case scenario that marks the high-end of current proposals. Significant international financial support will be required in all scenarios to cover incremental costs in developing countries.

In a previous paper Project Catalyst put forward a framework for fairly allocating emission reductions that reconciles the need for equity between the developed and developing world and the need to minimize the global costs of GHG emission reductions.[8] This framework (based on a BAU of 61 Gt) suggests that the developed world should realise its full domestic abatement potential of 5 Gt versus BAU, whilst also buying 3–6 Gt of offsets to take responsibility for reducing emissions by 25–40 per cent below 1990 by 2020, consistent with analyses by the IPCC (Exhibit 5A). Developing countries would reduce

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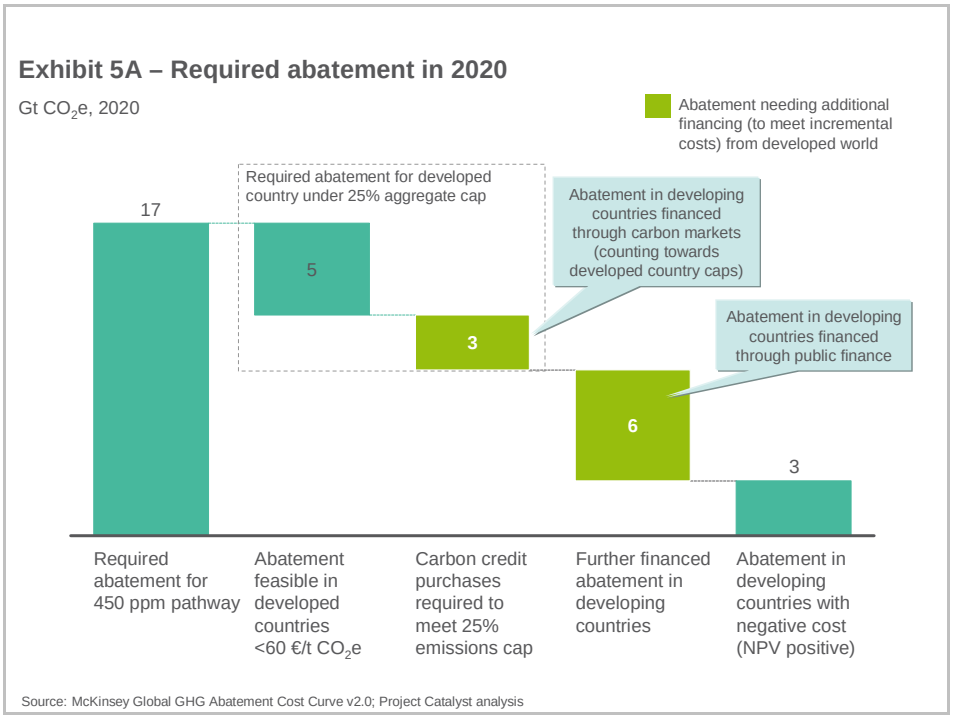
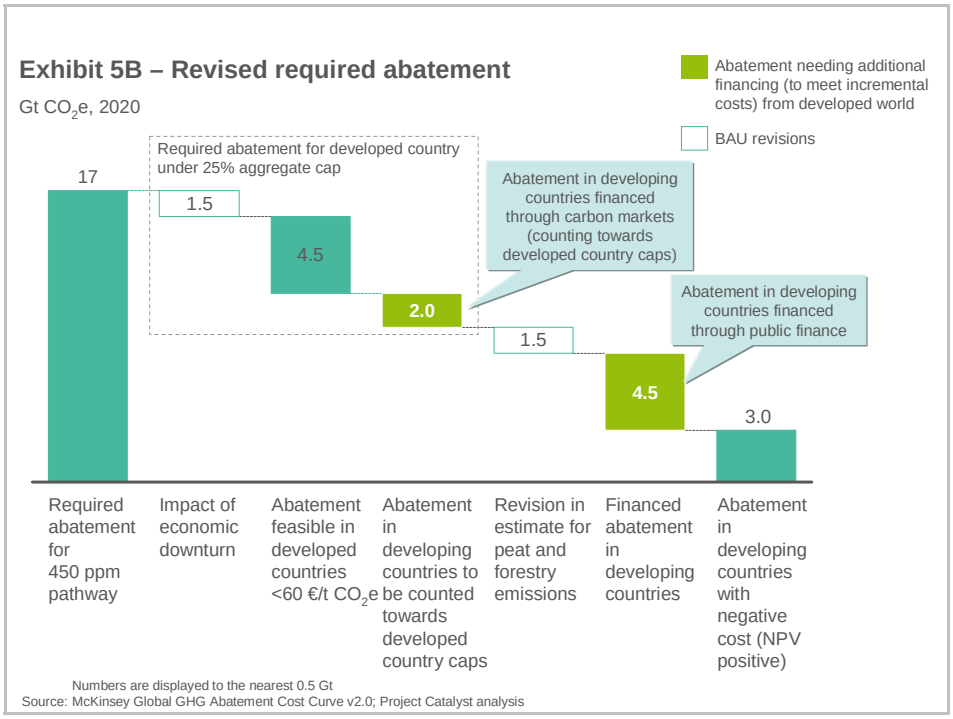
[7] Correct as of 4th Dec 09. See www.climateactiontracker.org

[8] Project Catalyst , *Setting a Benchmark: How Developed Countries Might Equitably Contribute Towards a 450 ppm Pathway*, Briefing paper, September 2009 (www.project-catalyst.info).

emissions by 12 Gt versus BAU – capturing cost savings through energy efficiency (3 Gt reduction) via self-financing, with the remaining 9 Gt financed by the developed world through offsets and public finance. See Appendix III for more details.



As discussed in section 1, recent BAU revisions reduce the gap to the 450 ppm pathway with the effect of the economic downturn mostly benefiting the developed world. In order to reduce emissions by 25 per cent below 1990 levels by 2020, the developed world would have to capture its full (revised) abatement potential of 4.5 Gt (down from 5 Gt) and would require 2 Gt of offsets (down from 3 Gt as estimated in our previous analyses) (Exhibit 5B). The latter factor implies that there will be less financing available from carbon markets for abatement in developing countries. The reduction of 1.5 Gt in expected 2020 emissions due to lower deforestation rates and anthropogenic peat emissions would also reduce the need for abatement in developing countries. The net effect is a lower public finance requirement (4.5 Gt as opposed to 6 Gt). The combination of the economic downturn and revised forestry and peat emissions leads to a reduced requirement for developed-world-financed abatement in the developing world from 9 Gt (Exhibit 5A) to 6.5 Gt (Exhibit 5B).



Comparing the results of our analysis of the high case scenario (Exhibit 5C) to Exhibit 5B provides a means of examining how developed and developing countries could seek to bridge the remaining gap to the emission levels required for a 450 ppm pathway.

Abatement in developed countries under current proposals

Our analysis shows that in the high case scenario, the developed world will achieve abatement of approximately 4 Gt in addition to the 1.5 Gt reduction caused by the economic downturn. The split between domestic abatement and offsets will be determined by the prevailing carbon price within the carbon markets. Our preliminary analysis suggests that developed countries will abate approximately 3 Gt domestically and buy around 1 Gt of offsets. These offsets will be bought by companies in domestic carbon markets (e.g., the EU ETS, the US carbon markets) as well as by country governments. The proposed carbon market design suggests that the US carbon market will demand more offsets than other carbon markets.

The role of offsets

Our analysis highlights a contradiction in developed country proposals. Developed country statements regarding climate finance frequently note the important role that carbon

markets can play in delivering funding flows for developing country mitigation. Given the pressures that the economic downturn has placed on developed country public finances, carbon markets will be required to play a larger role than previously foreseen. However, carbon market financing depends on strong mitigation targets in developed countries to generate significant offset demand and adequate offset pricing. The economic downturn and its effect on BAU emissions in the developed world will essentially make abatement targets easier to achieve and therefore reduce the need for offsets.

In the high case scenario, stated commitments and proposals currently only generate about 1 Gt of offset demand versus the 2 Gt in our adjusted benchmark scenario (versus 3 Gt in the original case), thus leaving a gap not only in mitigation versus potential, but also in financing. Lower developed country targets in the low case scenario, especially the absence of a US cap, could bring this potential offset demand down to 0.1 Gt.

The problem of surplus AAUs (caused by targets under the Kyoto Protocol for former Soviet Union countries which were higher than BAU emissions) could further exacerbate the issue of insufficient carbon market financing. Much of the demand for emissions credits could be filled by surplus AAUs, thereby depressing carbon market prices. Lower availability of carbon market financing translates directly into greater requirements for public finance.

Abatement in developing countries under current proposals

A growing number of developing countries have announced – and in some cases enacted – policies to reduce their emissions. Our tally of these proposals yields (in the high case scenario) a total of 5.0 Gt that would be funded through either self-financing or public finance contributions from developed countries. Up to an additional 1 Gt could be supported with carbon market financing.[9] As an example, Indonesia has pledged reductions in domestic emissions of 26 per cent versus BAU (0.7 Gt) by 2020 and has made an additional 15 per cent (0.5 Gt) contingent on international funding. Mexico, too, has made a significant portion of its commitment contingent on international funding. If this international funding were to come from carbon markets the associated emissions reduction would count as part of developed countries' abatement achievements.

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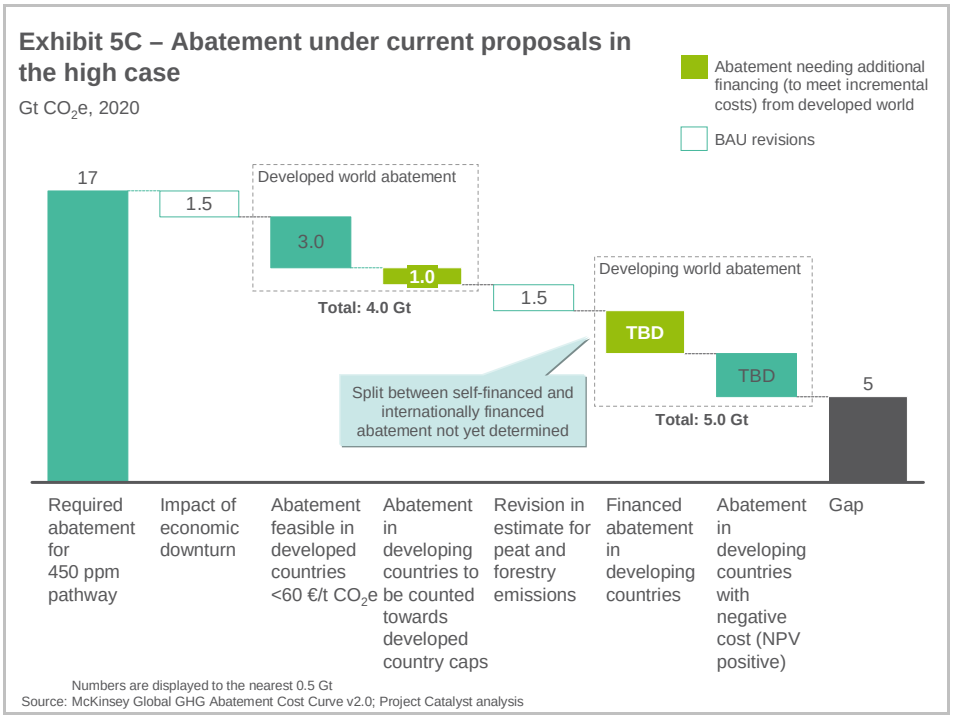
9 To avoid double counting, we have made the simplifying assumption that all developed country offset purchases will be filled by additional abatement action in developing countries that are not covered by existing developing country policies or proposals. This may result in a slight overstatement of total abatement from current proposals.

The commitments and proposals put forward by developing countries are, on one side, highly significant – with expected abatement exceeding what has been proposed by developed countries – but on the other side, they also fall well short of what is needed to achieve a 450 ppm path. It should be noted in this context that while there is also some prospect of international public financing from the developed world, the total commitments (€2–15 billion per year of public finance proposed by the European Commission by 2020 and a 720 Mt forestry fund proposed in the American Clean Energy and Security Act) are falling short of the requirement to cover the gap.



Appendix IV shows the emission reductions of individual countries under current proposals in the low and the high case scenarios. In the proposals submitted to date, developed countries claim credit for offsets they buy, while developing countries claim credit for any abatement achieved, whether or not as the result of offsets. Therefore, the global total is not simply the sum of the individual proposals. By highlighting the overlap between developed countries' offset demand and developing country mitigation our analysis seeks to avoid any double-counting.

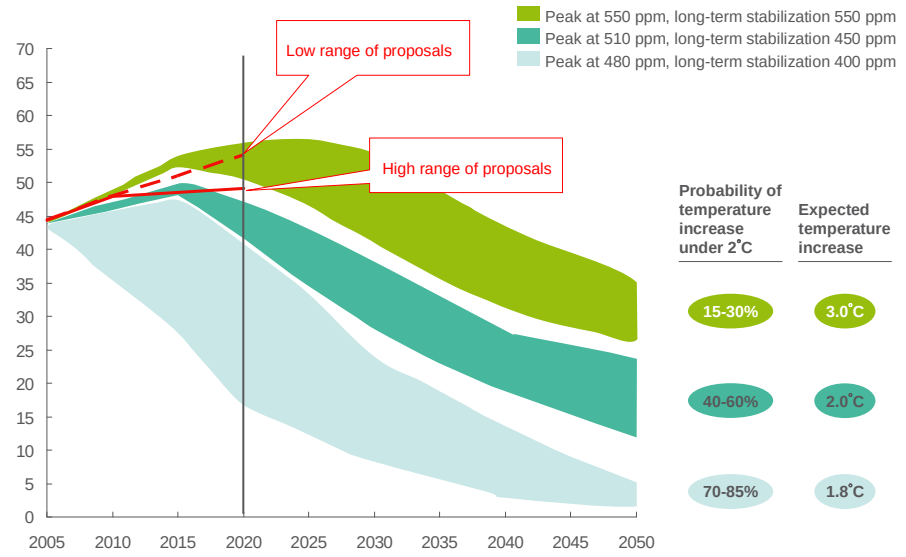
4. The low-end of current proposals are more consistent with a 550 ppm (or more) pathway and with temperature increases of 3°C or more.

The emission levels resulting from the low case scenario (54 Gt) results in 2020 emission levels more closely aligned with a 550 ppm pathway than with the stated 450 ppm target (Exhibit 6). According to the best current estimate of climate sensitivity, atmospheric greenhouse gas concentrations of 550 ppm would result in an average global temperature increase of more than 3°C above pre-industrial levels. This level would have dramatic effects on ecosystems, economies, and societies. For example, 150–550 million additional people in Africa could be exposed to famine due to climate-related crop failures. Also, increased sea level rises under a 3°C scenario would result in a dramatically higher number of people affected by coastal flooding – from around 10 million to 170 million. In addition, catastrophic climate change becomes a distinct possibility on a 550 ppm pathway – on such a path, exceeding 4°C attains a probability of up to 53 per cent. Such levels of warming can bring about non-linear environmental impacts. In a world that is 3°C warmer, for example, the probability of the Greenland ice sheet melting completely increases strongly. This would lead to higher sea levels still, with potential increases of 6–7 meters. In relation to ecosystems, while a 2°C increase could lead to the extinction of 15–40 per cent of species, some models suggest that at a 3°C increase in global mean temperatures, the Amazon rainforest system could fully collapse putting as much as 50 per cent of species at risk of extinction. Given these impacts, long-term costs for adaptation to climate change would increase considerably, as would residual impacts to which the world cannot adapt.[10]

[10] Climate Solutions 2: Low-Carbon Re-Industrialisation, A Climate Risk Report to WWF, 2009.

Exhibit 6 – Potential emission paths

Global GHG emissions and pathways for GHG stability, Gt CO_2e, 2020

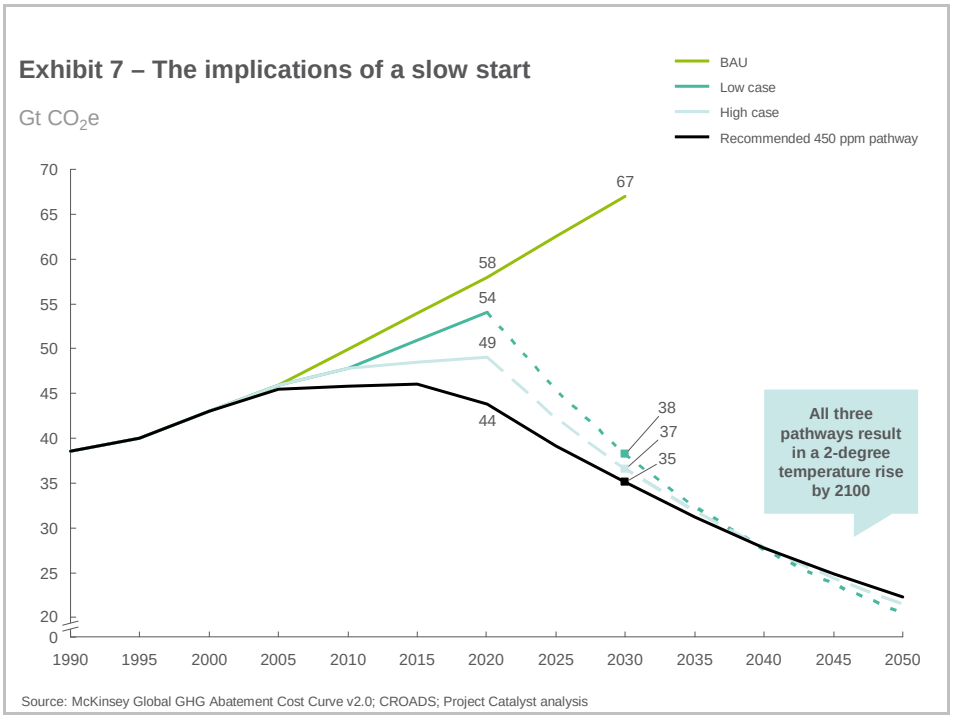


Source: IPCC WG3 AR4; den Elzen, van Vuuren; Meinshausen; McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis

5. The possibility of 'catching up' after 2020 is sometimes discussed as an alternative to early action. Our analysis shows that due to lock-in to high carbon infrastructure and a scarcity of additional abatement opportunities such an option would be extremely expensive and practically unattainable.

The recommended 450 ppm pathway that underlies the Project Catalyst analysis is not the only trajectory that could limit the global temperature increase to 2°C. Higher emissions in the short-term could be compensated for by a steeper decrease in emissions in the mid-term and by lower emissions in the long-term. But while such trajectories may be comparable from a climate standpoint, they have very different implications for the economics and achievability of emissions reduction.

We have used CROADS (Climate Rapid Overview and Decision-support Simulator), developed by the Sustainability Institute, Ventana Systems and MIT, to estimate the post-2020 emissions pathways that would get us back onto a 2°C path under the high and low case of current proposals (Exhibit 7). The results show that emissions need to decrease rapidly after 2020 at 1.2–1.6 Gt per year compared to 0.9 Gt per year in the case of the recommended 450 ppm pathway.



In 2030, the absolute amount of emissions on the 'catch-up' pathways is slightly higher than that of the 450 ppm scenario and by 2050 is only slightly lower. On the face of it, this seems like an attractive option: reduced need for short-term abatement action, with only a modest impact later on. But this conclusion overlooks two important aspects of the economics of abatement.

Firstly, as emissions are left to grow under the low and high cases through to 2020, new infrastructure is built that 'locks in' future emissions which are difficult to reduce in later years. In the power sector for example, a coal-fired power station built in 2019 will continue to emit CO_2 for 40 years or more. New buildings that are poorly insulated would exhibit similar emissions lock-in for decades to come.

Secondly, if limited investment is made in the new technologies, policies and institutions required to tackle climate change in the near term, the learning that drives abatement costs down over time will not occur. When abatement is required in ever increasing quantities after 2020, the costs will be higher than they would otherwise have been had that learning already taken place.

The impact of both of these factors has been estimated by updating McKinsey's carbon abatement cost curve for 2030 under these catch-up scenarios. As shown in Exhibit 7, the amount of abatement available in 2030 at less than €60/tonne falls from 33 Gt on the

recommended 450 ppm pathway to just 19–24 Gt under the catch-up pathways. In other words, some 7–14 Gt of 2030 abatement potential is lost due to locked-in emissions under the slow start.

	Required abatement in 2030	Potential abatement in 2030	**Abatement gap in 2030**	Locked-in emissions from 2020
Recommended 450 ppm pathway	32	33	**-**	3
Scenario 1 - high-end of current proposals up to 2020	29	24	**5**	9
Scenario 2 - low-end of current proposals up to 2020	30	19	**11**	14

Unit of measure: Gt

As a result of this lost abatement potential, it suddenly becomes very difficult to achieve the rate of decarbonisation required to follow a 2°C pathway after a slow start. Even if 100% of abatement potential could be captured after 2020, there would still be 5–11 Gt of additional abatement required. Short of a substantial technological breakthrough this would require either dramatic behavioural and lifestyle change or significant additional cost. These costs would result from actions such as replacing the newly built coal-fired power plants with low-carbon alternatives and expensive retrofitting of the poorly-insulated building stock constructed in 2010–2020.

Catch up after 2020 is not a realistic option.

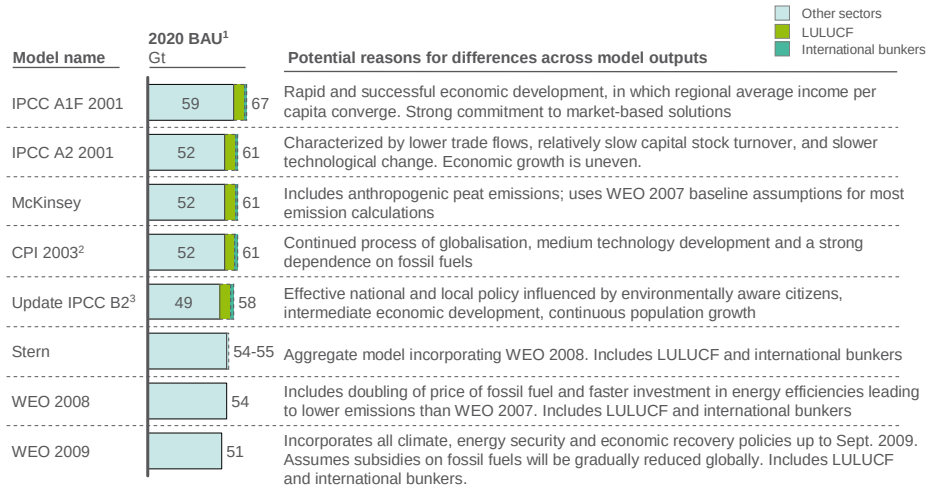
Appendix I – Comparison of published business-as-usual (BAU) scenarios for 2020

Project Catalyst's original baseline estimate is one of multiple estimates available. We have conducted a detailed analysis of multiple baselines in the public domain (Exhibit 8) and concluded that our baseline lies within the range of other estimates of 2020 BAU emissions.

Exhibit 8 – Comparison of business as usual scenarios

NOT EXHAUSTIVE

Gt CO_2e, 2020



1 Where non-McKinsey projections are without LULUCF and international bunkers, McKinsey 2020 estimates for these elements are added for comparability. Assumption: 2005 split between domestic and international air and sea applies in 2020 across all countries
2 Common POLES-IMAGE baseline (van Vuuren et al. 2003, 2006)
3 Updated IMAGE/TIMER implementation of the IPCC-SRES B2 scenario (van Vuuren et al. 2007)

Source: den Elzen and Hoehne, 2008; IEA; Project Catalyst analysis

IEA World Energy Outlook 2009

The International Energy Agency (IEA) released its World Energy Outlook (WEO) 2009 report on 9th Nov 2009. The report estimates that BAU emissions in 2020 will be 51 Gt. We have conducted a preliminary analysis of the differences between this figure and McKinsey's revised estimate of 58 Gt as used in this paper. The remaining difference can be explained by two key factors:

- **Consideration of specific emissions sources**: McKinsey includes anthropogenic emissions from peatlands which are excluded from the IEA's estimates. Additionally, the IEA includes carbon sinks in its analysis whereas McKinsey does not.
- **Methodological differences:** The IEA has included recent climate, energy security and economic recovery policies up to September 2009 within its BAU (for example the

gradual reduction in fossil fuel subsidies). These reductions are included in McKinsey's abatement case as opposed to BAU. Hence, the effect of this methodological difference on our analysis of current proposals is expected to be small. Additionally, the IEA makes more conservative assumptions in the transport and industry sectors such as lower estimates of vehicle numbers in India and China.

Appendix II – Methodology for assessing the total impact of current proposals

To arrive at a total impact for the commitments and proposals currently on the table, we have conducted a detailed bottom-up assessment of the emission reduction of each individual proposal on the table, calculating the resulting emissions after abatement. This assumes that developed countries limit emissions by cap (e.g., EU limiting emissions to 20 per cent below 1990 by 2020, Japan limiting emissions to 25 per cent below 1990 by 2020) and that developing countries enact domestic legislation that reduce emissions (e.g., Brazil establishing more stringent biofuels penetration targets). To calculate the low case scenario we used confirmed proposals only. For the high case scenario, we used proposals that have been discussed but not enacted or committed to. So far, we have assessed the most material proposals from the largest (potential) emitters.

The total impact of commitments, that is the abatement in 2020 as implied by current proposals, has then been calculated based on the original Project Catalyst BAU of 61 Gt, unless the reference scenario in 2020 was given by the country in its commitment:

- Developed country targets are benchmarked off historic emission levels and changes in the BAU therefore do not affect abatement targets expressed as percentage reduction versus 1990 or 2005 levels. This means that emission reduction targets in Gt below 1990 levels remain the same. However, since BAU reductions do contribute to reaching these targets, they reduce the incremental effort required to reach the envisaged emission levels. Therefore, of the total 2.1 Gt of abatement committed by developed countries in the low case scenario, only 0.7 Gt are reflected in Exhibit 1. The remaining 1.5 Gt has already been captured by the impact of the economic downturn on lowering the BAU.
- In developing countries, lower BAU emissions do affect abatement targets, as commitments are expressed relative to the BAU. We have nevertheless chosen to calculate the impact of committed and announced abatement actions based on our original BAU of 61 Gt because no detailed breakdown was available for the BAU revisions – as a consequence, the abatement proposals in developing countries are slightly overstated.

Appendix III – A contribution framework based on a 25 per cent reduction target for developed countries in 2020

Analysis by Project Catalyst indicates that reaching the 2°C pathway is technically feasible.[11] In earlier work we have described what could be an equitable distribution of the required burden between developed and developing countries (Exhibit 5A)[12]. The key points of this framework are as follows:

- 5 Gt of abatement opportunity at less than €60/tonne CO_2e is located in the developed world. It is critical to capture this full potential if we are to reach a 2°C pathway.
- There is also 3 Gt of cost negative abatement potential (concentrated in energy savings) in the developing world. Whilst it is in the best interest of the developing world to capture this, these countries will require support in doing so. This support will mostly be in the form of capacity building, best practice sharing and loans to overcome capital constraints.
- A further 9 Gt of abatement potential exists in the developing world and incurs real cost. In line with the text of the Convention the developed world needs to finance the incremental costs of such low carbon choices over their BAU alternatives. If developed countries set their own emission reduction targets in line with the low-end of the IPCC's recommended 25–40 per cent reduction target, they would generate an offset demand of 3 Gt by 2020. This would leave 6 Gt to be funded by public finance sources such as international transport levies, concessional debt and funds from public coffers.

11 McKinsey Global GHG Abatement Cost Curve v2.0.

12 Project Catalyst, Scaling Up Climate Finance – Finance Briefing Paper, September 2009 (www.project-catalyst.info).

Appendix IV – Country proposals

Exhibit 9 shows the outcomes of analysis per country, both in absolute terms (Gt) and mapped against either a base year (developed countries) or the original Project Catalyst BAU (developing countries)[13]. Further detail on individual proposals within each country can be found in the subsequent exhibits. 'Other countries' includes Belarus, Croatia, Iceland, Liechtenstein, Monaco, New Zealand, Norway, Switzerland, Turkey and Ukraine.

Exhibit 9a – Outcomes from country proposals (low case)

Gt CO2e, 2020

Country/Region	Announced targets/initiatives	Abatement (low case) Gt	Emissions after abatement (low case) Gt	vs. 1990[1]	vs. 2005[1]
• EU27	• 20% reduction below 1990 exc. LULUCF	1.2	4.5	-20%	-13%
• Japan	• 15% reduction below 2005 inc. LULUCF	0.4	1.2	-8%	-14%
• United States	• Various initiatives; see below	0.3	7.6	+24%	+7%
• Canada	• 20% reduction below 2006 inc. LULUCF	0.2	0.6	+3%	-17%
• Australia	• 5% reduction below 2000 inc. LULUCF	0.1	0.5	+14%	-10%
• Russia	• 20% reduction below 1990 inc. LULUCF	0.2	2.7	-19%	+27%

Country/Region		Gt	Gt	vs. BAU
• China	• Various recently confirmed domestic actions; see below for details	1.7	12.2	-13%
• Brazil		0.1	2.6	-5%
• India		0.3	3.0	-9%
• Mexico		~0.0	0.8	-6%
• Indonesia		0.0	2.8	0%
• South Korea		0.2	0.6	-30%
• South Africa		~0.0	0.6	-1%
• Other countries		0.2	14.5	
• Transport Air & Sea[2]		0.0	2.1	

1 Excluding LULUCF
2 Includes international aviation and maritime emissions and non-Annex I domestic aviation and maritime emissions. Annex I domestic aviation and maritime emissions are included in country totals

Source: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis

Exhibit 9b – Outcomes from country proposals (high case)

Gt CO2e, 2020

Country/Region	Announced targets/initiatives	Abatement (high case) Gt	Emissions after abatement (high case) Gt	vs. 1990[1]	vs. 2005[1]
• EU27	• 30% reduction below 1990 inc. LULUCF	1.7	4.0	-28%	-22%
• Japan	• 25% reduction below 1990 inc. LULUCF	0.6	1.0	-24%	-29%
• United States[2]	• 17% reduction below 2005 inc. LULUCF	1.8	6.1	0%	-14%
• Canada	• See low case assumptions	0.2	0.6	+3%	-17%
• Australia	• 15% reduction below 2000 inc. LULUCF	0.2	0.4	-5%	-25%
• Russia	• 25% reduction below 1990 inc. LULUCF	0.3	2.5	-24%	+19%

Country/Region		Gt	Gt	vs. BAU
• China	• Various proposed domestic actions; see below for details	1.7	12.2	-13%
• Brazil		1.1	1.7	-39%
• India		0.6	2.7	-19%
• Mexico		0.2	0.7	-21%
• Indonesia		1.2	1.7	-41%
• South Korea		0.2	0.6	-30%
• South Africa		0.1	0.5	-12%
• Other countries		0.4	14.3	
• Transport Air & Sea[3]		0.0	2.1	

1 Excluding LULUCF
2 Does not include the 0.7Gt set-aside for forestry under the ACES Act
3 Includes international aviation and maritime emissions and non-Annex I domestic aviation and maritime emissions. Annex I domestic aviation and maritime emissions are included in country totals

Source: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis

13 Unadjusted baseline emissions for the McKinsey Global GHG Abatement Cost Curve v2.0

Committed and proposed actions, Mt CO_2e in 2020

EU27

	2020 emissions reduction vs. 1990 (excluding LULUCF)[1]		BAU[2]	Emissions after abatement[3]
Summary	▪ Low case	-20%	5,646	4,451
	▪ High case	-28%	5,646	3,995

	Stated target	Source	Abatement
Low case	▪ 2020 emissions reduction target of 20% below 1990 – Excludes LULUCF	Adopted by legislation	1,195
High case	▪ 2020 emissions reduction target of 30% below 1990 – Includes LULUCF – Conditional on "global action"	High range of UNFCCC submission	1,651

1 1990 emissions source: UNFCCC
2 Source: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis; Includes domestic transport air and sea emissions
3 Excluding LULUCF sinks

Japan

	2020 emissions reduction vs. 1990 (excluding LULUCF)[1]		BAU[2]	Emissions after abatement[3]
Summary	▪ Low case	-8%	1,532	1,167
	▪ High case	-24%	1,532	971

	Stated target	Source	Abatement
Low case	▪ 2020 emissions reduction target of 15% below 2005 – Includes LULUCF	Official announcement under previous government	365
High case	▪ 2020 emissions reduction target of 25% below 1990 – Includes LULUCF – Conditional on "global action"	Official announcement under current government	561

1 1990 emissions source: UNFCCC
2 Source: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis; Includes domestic transport air and sea emissions
3 Excluding LULUCF sinks

USA

	2020 emissions reduction vs. 1990 (excluding LULUCF)[1]		BAU[2]	Emissions after abatement[3]
Summary	▪ Low case	+24%	7,841	7,556
	▪ High case	0%	7,841	6,065

	Stated target	Source	Abatement
Low case	▪ Setting target for cars, LDVs and MDVs to meet combined average emissions of 250 g CO_2/mile	Draft Regulatory Impact Analysis (EPA)	165
	▪ Tightening appliance standards and expanding their coverage	*Ka-BOOM! The Power of Appliance Standards,* American Council for an Energy-Efficient Economy, July 2009	~70
	▪ Abatement achieved through economic stimulus bill	American Recovery and Reinvestment Act	~50
High case	▪ 2020 emissions reduction target of 17% below 2005 – Assumed to include actions mentioned above in low case	American Clean Energy and Security Act	1,777

1 1990 emissions source: UNFCCC
2 Source: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis; Includes domestic transport air and sea emissions
3 Excluding LULUCF sinks

Committed and proposed actions, Mt CO_2e in 2020

Canada

	2020 emissions reduction vs. 1990 (excluding LULUCF)[1]		BAU[2]	Emissions after abatement[3]
Summary	▪ Low case	+3%	831	608
	▪ High case	+3%	831	608
	Stated target		**Source**	**Abatement**
Low case	▪ 2020 emissions reduction target of 20% below 2006 – Inclusion of exclusion of LULUCF TBD (assumed to be included for purpose of this analysis)		UNFCCC submission	224
High case	▪ None			

1 1990 emissions source: UNFCCC
2 Source: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis; Includes domestic transport air and sea emissions
3 Excluding LULUCF sinks

Australia

	2020 emissions reduction vs. 1990 (excluding LULUCF)[1]		BAU[2]	Emissions after abatement[3]
Summary	▪ Low case	+17%	551	475
	▪ High case	-3%	551	394
	Stated target		**Source**	**Abatement**
Low case	▪ 2020 emissions reduction target of 5 % below 2000 – Includes LULUCF		Low range of UNFCCC submission	77
High case	▪ 2020 emissions reduction target of 25 % below 2000 – Includes LULUCF		High range of UNFCCC submission	157

1 1990 emissions source: UNFCCC
2 Source: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis; Includes domestic transport air and sea emissions
3 Excluding LULUCF sinks

Russia

	2020 emissions reduction vs. 1990 (excluding LULUCF)[1]		BAU[2]	Emissions after abatement[3]
Summary	▪ Low case	-19%	2,865	2,688
	▪ High case	-24%	2,865	2,520
	Stated target		**Source**	**Abatement**
Low case	▪ Emissions reduction target of 20% below 1990 – Includes LULUCF		Low range of UNFCCC submission	178
High case	▪ Emissions reduction target of 25% below 1990 – Includes LULUCF		High range of UNFCCC submission	346

1 1990 emissions source: UNFCCC
2 Source: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis; Includes domestic transport air and sea emissions
3 Excluding LULUCF sinks

Committed and proposed actions, Mt CO_2e in 2020

Brazil

	2020 emissions reduction vs. BAU		BAU[1]	Emissions after abatement
Summary	▪ Low case	5%	2,703	2,563
	▪ High case	39%	2,703	1,651

	Stated target	Source	Abatement
Low case	Enacted elements of the Brazilian National Action Plan on Climate ▪ Reduce deforestation through Amazon Region Protected Areas Project ▪ Increase biodiesel blend to 5% by 2010; currently achieved 4% ▪ Deploy solar power heating systems, resulting in reduction of electricity consumption by 2.2 TWh/year by 2015 ▪ Increase energy supply from cogeneration to 3% of the total supply by 2030 (PNE) ▪ Increase electricity supply from hydropower by an additional 34.4 GW ▪ Increase share of energy from wind and sugarcane bagasse; 7 GW of renewable sources implemented by 2010 ▪ Encourage industry to increase average annual ethanol consumption by 11% in the next 10 years	Brazilian National Action Plan on Climate	140
High case	Reduction from BAU of 36.1–38.9%[2]	Ministry of Environment – presentation Nov 2009	
	▪ Land use: Reduction deforestation in Amazon forest (80%)		565
	▪ Land use: Reduction deforestation in Cerrado (40%)		104
	▪ Agriculture & Livestock: Pastureland restoration		104
	▪ Agriculture & Livestock: Integration pastureland and agricultureland		22
	▪ Agriculture & Livestock: Direct plantation system		20
	▪ Agriculture & Livestock: Biological nitrogen fixation		20
	▪ Energy: Energy efficiency		15
	▪ Energy: Increase on Biofuels use		60
	▪ Energy: Expansion on energy supply by hydropower		99
	▪ Energy: Alternative sources (Small hydro, bioelectricity, wind)		33
	▪ Others: Steel – substitution coal from defeorestation with coal from plantation		10
	Total		1,052

1 Brazil has quoted a top down 2020 emissions target in its recent communication. The business as usual figure stated by Brazil for 2020 of 2,703 Mt has been included in this analysis in place of the McKinsey Global GHG Abatement Cost Curve v2.0 figure of 3,100 Mt
2 The high end of the range has been used in this analysis

Committed and proposed actions, Mt CO_2e in 2020

India

	2020 emissions reduction vs. BAU		BAU[1]	Emissions after abatement
Summary	▪ Low case	9%	3,333	3,046
	▪ High case	19%	3,333	2,706

	Stated target	Source	Abatement
Low case	▪ National Solar Mission: Solar power: 20 GW installed capacity by 2020	National Action Plan on Climate Change	42
	▪ National Solar Mission: Other solar applications (lights, thermal collectors, rooftop PV)	National Action Plan on Climate Change	21
	▪ Shift to super-critical coal capacity	CEA/MoEF[2]	100
	▪ Reducing transmission and distribution losses by 12% by 2030	Accelerated Power Development and Reforms Program[2]	84
	▪ Appliance labeling program: 10% penetration of high-efficiency air conditioners and fridges, and 100% penetration of labeled appliances by 2030	National Action Plan on Climate Change[2]	26
	▪ Compact fluorescent lamp program: 50% penetration in 2020 and 90% in 2030	National Action Plan on Climate Change[2]	8
	▪ Agricultural pump efficiency improvement program: efficiency increase of 15% over next 20 years	National Action Plan on Climate Change[2]	6
	Total		**287**
High case	▪ Actions included above in the low case		287
	▪ Increasing nuclear capacity to 20 GW by 2020 – Emission reduction capped at full technical potential	National Action Plan on Climate Change	240
	▪ Hydro – Adding 15.6 GW capacity by 2012 – Creating 50 GW new capacity by 2025–26 (Accelerated Hydro Development Plan)	National Action Plan on Climate Change	100
	▪ Reduction in carbon intensity of 20–25% by 2020 compared to 2005 levels[3]		-

1 Source: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis
2 Quantified by project Catalyst based on targets included in national plans
3 Using the baseline emissions for India as stated in the McKinsey Global GHG Abatement Cost Curve v2.0, this target does not result in further emissions reduction. Higher BAU estimates and/or lower GDP estimates may lead to a predicted emission reduction.

China

	2020 emissions reduction vs. BAU		BAU[1]	Emissions after abatement
Summary	▪ Low case	12%	13,889	12,159
	▪ High case	12%	13,889	12,159

	Stated target	Source	Abatement
Low case	▪ Reduce energy intensity by 20% between 2005 and 2010[2]	China's 11th 5-year plan	530
	▪ Increasing the share of non-fossil fuels in primary energy consumption to about 15% by 2020	President Hu Jintao's UN speech (22/09/09)	1,050
	▪ Increasing forest coverage by 40 million hectares and forest stock volume by 1.3 million cubic meters by 2020 from 2005	President Hu Jintao's UN speech (22/09/09)	150
	▪ Reduction in carbon intensity of 40–45% by 2020 compared to 2005 levels[3]	China state council announcement (26/11/09)	–
High case	▪ Actions included above in the low case		1,730

1 Source: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis
2 China is on course to meet its energy intensity target as stated in it's 11th 5 year plan
3 Using the baseline emissions for China as stated in the McKinsey Global GHG Abatement Cost Curve v2.0, this target does not result in further emissions reduction. Higher BAU estimates and/or lower GDP estimates may lead to a predicted emission reduction.

Committed and proposed actions, Mt CO_2e in 2020

Mexico

	2020 emissions reduction vs. BAU		BAU[1]	Emissions after abatement
Summary	▪ Low case	6%	882	833
	▪ High case	21%	882	700

	Stated target	Source	Abatement
Low case	▪ Energy efficiency in commercial and residential buildings	PECC (Special Program on Climate Change)[2]	5.6
	▪ Energy efficiency in transportation		5.7
	▪ Energy efficiency in industry		0.5
	▪ Switching fuel oil fired power plants to natural gas (and installing LNG terminal)		6.8
	▪ Installing 7 GW of renewable energy capacity		0.4
	▪ Agriculture initiatives		1.9
	▪ Forestry initiatives		13.2
	▪ Oil and gas initiatives		9.9
	▪ Waste-related initiatives		5.4
	Total		**49.4**
High case	▪ 2020 emissions target of 700 Mt after abatement, contingent on international action – Target includes actions mentioned above in low case – Conditional on 'global action' and financing from the developed world	PECC (Special Program on Climate Change)	182

1 Mexico has quoted an absolute 2020 emissions target in its PECC (Special Program on Climate Change). The business as usual figure stated by Mexico for 2020 of 882 Mt has been included in this analysis in place of the McKinsey Global GHG Abatement Cost Curve v2.0 figure of 714 Mt

2 PECC has set emission reduction targets for the year 2012, as shown in the low case. We have quoted these targets directly and have assumed no further abatement between 2012–2020

Committed and proposed actions, Mt CO_2e in 2020

Indonesia

	2020 emissions reduction vs. BAU		BAU[1]	Emissions after abatement
Summary	▪ Low case	0%	2,820	2,820
	▪ High case	41%	2,820	1,664

	Stated target	Source	Abatement
High case	▪ 41% reduction below BAU by 2020 (26% self-financed increasing to 41% with international support) – Targeting energy mix policy and forestry – Includes LULUCF	Speech by Indonesia's President Yudhoyono, G20 Leaders Summit, Pittsburgh (25/09/09)	1,156

1 Source: National Council on Climate Change (NCCC), Indonesia

South Africa

	2020 emissions reduction vs. BAU		BAU[1]	Emissions after abatement
Summary	▪ Low case	1%	578	570
	▪ High case	12%	578	510

	Stated target	Source	Abatement
Low case	▪ Creating feed-in tariffs and other renewables policies leading to 10 TWh from renewables by 2013	SA white paper on renewable energy 2003	8
High case	▪ Actions included above in the low case		8
	▪ Energy savings of 12% below BAU by 2015[2]	SA energy efficiency strategy 2009	60

1 Source: McKinsey Global GHG Abatement Cost Curve v2.0; Project Catalyst analysis
2 South Africa has set reduction targets for the year 2015. We have assumed no further abatement between 2015 and 2020.

South Korea

	2020 emissions reduction vs. BAU		BAU[1]	Emissions after abatement
Summary	▪ Low case	30%	815	570
	▪ High case	30%	815	570

	Stated target	Source	Abatement
Low case	▪ 2020 emissions reduction target of 4% below 2005, for example through – Increasing renewables' share to 11% in 2030 – Reducing energy intensity to 0.185 toe/$000 by 2030 – Increasing share of nuclear to 27.8% of energy mix by 2030	Cheong Wa Dae (Office of the President)	244
High case	▪ Actions included above in the low case		244

1 South Korea's target of 4% below 2005 results in emissions by 570 Mt based on South Korea's own figure for 2005 emissions (594 Mt). 2020 BAU emissions have been updated to 815 Mt (from 698 Mt in the McKinsey Global GHG Abatement Cost Curve v2.0) to reflect South Korea's view that their target also translates to 30% below BAU.

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