

Report

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The Paris Agreement Implementation Blueprint: a practical guide to bridging the gap between actions and goal and closing the accountability deficit (Part 1)

Ladies and Gentlemen, we face the actuality of scarce resources and the increasing potential for conflict. Policy instruments such as tradable emissions, carbon taxes and joint implementation may well serve to make matters worse unless they are properly referenced to targets and timetables ... Equitable burden sharing in emission reduction has no meaning unless it is preceded by equitable benefit sharing of environmental space.

Kamal Nath,
on behalf of the Government of India,
UNFCCC COP 1, 1995

Summary

Using the basic proposition that all people have equal rights to the earth's atmosphere the Blueprint advances a coherent, integrated framework which, if adopted, would:

- (i) Help quantify the rights of historically low emitting countries to financial support
- (ii) Provide a reference point for determining legal liability for climate change and its adverse consequences
- (iii) Provide a clear and rational basis for the apportionment of damages resulting from historic emissions (including the costs of adaptation), and
- (iv) Limit anthropogenic emissions of CO₂ to a total consistent, according to the 'best available science'¹, with the 1.5C / 'well below' 2C temperature goal

* We are grateful to the many experts (both scientists and lawyers) who have provided invaluable comments and suggestions on earlier drafts of this paper. Responsibility for this final version lies, of course, exclusively with the authors.

¹ In practical, political terms the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) serves as the 'best available science', recognizing that events in the Arctic, in particular, imply that the pace of change is ahead of its predictions

We do not suggest that implementation of such a framework will be straightforward: after so much procrastination straightforward solutions are no longer available.

Crucially, however, implementation of the Blueprint does not depend on the political process. Courts have begun to recognise that the climate crisis threatens constitutional protections and fundamental human rights, and to rule accordingly. However, even where they are willing in principle to order the steps logically and practically necessary to avert disaster, to do so in practice they require a framework for quantifying 'common but differentiated responsibilities' in terms of the common goal.

The Blueprint has been designed to meet this need. By providing an accessible, science-based framework for navigating the complexity of carbon budgets and climate finance it facilitates objective, mutually consistent decision-making in both climate policy and litigation.

Following some further introductory sections, this paper falls into two main parts.

Part 1: Explanation of the approach to historic emissions and division of the future carbon budget

Part 1 introduces the global and country charts, which reveal:

- a country's contribution to historic carbon emissions (between 1750 and 2013), in absolute and relative terms;
- the carbon credit or debit arising;
- and the country's equal per capita share of future carbon budgets.

Together, these three elements contextualize each country's current emissions and finance commitments.

Part 1 also explains the methodology underpinning the charts, using the chart for Norway as illustration.

Part 2: Legal avenues to Blueprint implementation

Recognising the difficulties of raising ambition through the political process, and the growing momentum behind climate change litigation,² Part 2 of this paper highlights a number of different legal avenues to:

- (i) securing appropriate financial resources to support developing countries in implementing mitigation measures and achieving sustainable development;
- (ii) securing appropriate compensation for loss and damage (including the costs of adaptation) arising from historic emissions; and
- (iii) implementation of a science-based framework for the division of the remaining carbon budget, in order to limit warming to 1.5C or ‘well below’ 2C.

Specifically Part 2 considers legal actions on the following basis:

- Breach of a country’s duty to prevent harm to other countries.
- Breach of a country’s duty to prevent pollution of the marine environment (under UN Convention on the Law of the Sea, Article 194).
- Breach of fundamental norms of human rights (such as the right to life)
- Breach of a government’s duties to its citizens (including procedural obligations to act reasonably and rationally).

Background

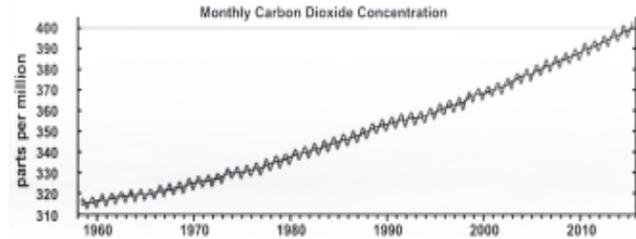
It was in 1992 that the governments of the world agreed the UN Framework Convention on Climate Change (UNFCCC). This acknowledged that:

the global nature of climate change calls for the widest possible cooperation by all countries and their participation in an effective and appropriate international response.

The ‘ultimate objective’ of the Convention and related legal instruments, as set out in Article 2, is:

to achieve ... stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

The graphic below, from the US Government’s Carbon Dioxide Information Analysis Centre (CDIAC), reveals the failure of the UNFCCC to realise this objective (CO₂ is the



most significant greenhouse gas).

The impacts of climate change are already diverse. Rising sea-levels, melting glaciers and ‘extreme weather’ – such as drought, flooding and super-typhoons – are its most obvious manifestations.³ More insidious are the consequences for international security and the economy. Research suggests that the worst drought in Syria’s history (between 2007 and 2011) was significantly intensified by climate change, driving mass internal migration that contributed to the outbreak of civil war and the rise of ISIS.⁴ The near total loss of Lake Chad, likewise accelerated by climate change, has displaced millions of people, and been linked to the rise of Boko Haram.⁵ More generally, the US Department of Defense *Report on National Security Implications of Climate Change, 2015*⁶ asserts:

Case studies indicate that in addition to exacerbating existing risks from other factors (e.g., social, economic, and political fault lines), climate-induced stress can generate new vulnerabilities (e.g., water scarcity) and thus contribute to instability and conflict even in situations not previously considered at risk.

In September 2015, Mark Carney, Governor of the Bank of England, and Chair of the G20’s Financial Stability Board, warned darkly of the threat to the global economy:

The challenges currently posed by climate change pale in significance compared with what might come ...

Climate change is the tragedy of the horizon ... The horizon for monetary policy extends out to two to three years. For financial stability it is a bit longer, but typically only to the outer boundaries of the credit cycle – about a decade. In other words, once climate change becomes a defining issue for financial stability, it may already be too late.

³ See, for example, ‘Scientists are tying more and more extreme events to a changing climate’, *Washington Post* 15 December 2016.

⁴ See: <http://www.pnas.org/content/112/11/3241.full> for the original research; and <http://www.independent.co.uk/news/world/middle-east/climate-change-key-in-syrian-conflict-and-it-will-trigger-more-war-in-future-10081163.html>, March 2015, for a newspaper summary.

⁵ See Coe and Foley, ‘Human and natural impacts on the water resources of the Lake Chad basin’, *Journal of Geophysical Research and Atmospheres*, 27 February 2001, pp 3349-3356; see also <http://www.africareview.com/News/Climate-change-fuels-Nigeria-terrorism/-/979180/1334472/-/vq4tja/-/index.html>.

⁶ <http://archive.defense.gov/pubs/150724-congressional-report-on-national-implications-of-climate-change.pdf?source=govdelivery>.

² See for example ‘*Could the Courts bring Order to Climate Change?*’, Isabella Kaminski, The *ENDS* Report, 8 December 2016

The 21st Conference of the Parties to the UNFCCC (COP 21), held in December 2015, concluded *the Paris Agreement*. The Paris Agreement commits governments collectively to:

Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels ...⁷

When it comes to the individual parties, however, the Agreement itself requires only that they:

aim to reach global peaking of greenhouse gas emissions as soon as possible ... and to undertake rapid reductions thereafter in accordance with best available science.⁸ (emphasis supplied)

Measures taken by the parties in accordance with this provision are referred to as ‘nationally determined contributions’ (‘NDCs’).⁹

In the absence of specific principles for aligning national measures to the temperature goal it was predictable that their combined effect would prove inadequate. Indeed the Preamble to the Paris Decision emphasises:

with serious concern the urgent need to address the significant gap between the aggregate effect of Parties’ mitigation pledges ... and aggregate emission pathways consistent with [the temperature goal].

Meanwhile in November 2016, nearly a year on from COP 21, the UN Environment Programme published its *Emissions Gap Report*, stating:

[W]e are actually on track for global warming of up to 3.4 degrees Celsius. Current commitments will reduce emissions by no more than a third of the levels required by 2030 to avert disaster.

UNFCCC and the Paris Agreement also leave a ‘finance gap’. The Paris Agreement states that:

Developed country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation.¹⁰

Although the Paris Decision refers to a collective goal ‘*from a floor of USD 100 billion per year*’¹¹ for finance mobilisation prior

to 2025, neither Agreement nor Decision provides a framework for quantifying the rights and obligations of individual countries in terms of financial provision. In the absence of such a framework it is impossible for many developing countries (in particular the least developed countries) to plan effectively their energy transitions. The finance gap, in other words, is inextricably linked to the emissions gap, and an integrated framework is required, which addresses both simultaneously.

Introduction to the Blueprint

There are four principal impediments to bridging ‘the emissions gap’:

- a challenging political context,
- the absence of objective frames of reference for interrogating the equity and adequacy of individual country commitments on emissions of greenhouse gases (GHGs),
- the absence of objective frames of reference for determining rights and obligations in terms of financial support for mitigation efforts,
- the absence of principles for apportioning responsibility for climate change loss and damage (including the costs of adaptation).

This Implementation Blueprint (‘the Blueprint’) has been developed to overcome these impediments. It provides an integrated framework¹² for assessing:

- (i) the equitable distribution of entitlements to the future carbon budget
- (ii) rights and obligations in terms of financial support for mitigation efforts
- (iii) potential liability for loss and damage (including the costs of adaptation) and
- (iv) the apportionment of damages.

In the first instance it may be used to support negotiations through the political process, but, where necessary, it may also support hard-edged accountability through courts of law.

Taken together, the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement and the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC) provide a partial framework for co-operative governmental action against climate change.

⁷ Paris Agreement Article 2(1)(a).

⁸ Ibid Article 4(1).

⁹ Ibid Article 4(2). In the build-up to COP21 parties submitted what were known as ‘*intended nationally determined commitments*’ (INDCs)

¹⁰ Ibid Article 9(1).

¹¹ COP21 Decision, para 54.

¹² The procedural detail of which might be substantiated either through the UNFCCC process or the courts.

The Paris Agreement confirms international agreement to taking the necessary steps to limit global warming to 1.5C or at least ‘well below’ 2C. AR5 provides a range of global carbon budgets, as from 2011, consistent with those (and other) temperature limits.

Examples include:¹³

550 Gt CO₂ (150 Gt C) for a 50% likelihood of <1.5C
 850 Gt CO₂ (232 Gt C) for a 33% likelihood of <1.5C
 1000 Gt CO₂ (272 Gt C) for a 66% likelihood of <2C.

On the face of it only the first budget is consistent with ‘pursuing efforts’ to limit warming to <1.5C. A budget of 1000 Gt CO₂ is almost certainly inconsistent with the terms of the Paris Agreement (since it only provides a 20 per cent likelihood of limiting warming to 1.5C, and indeed creates a 34 per cent chance of exceeding 2C).

The UNFCCC and the Paris Agreement (reflecting general principles of law) confirm principles applicable both to the *selection* of a budget and its *distribution* between countries. UNFCCC Article 3(3), for example, invokes the precautionary principle:

The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects.

Both UNFCCC and the Paris Agreement emphasise the principle of equity:

The Parties should protect the climate system ... on the basis of equity ...¹⁴

In pursuit of the objective of the Convention, and being guided by its principles, including the principle of equity ...¹⁵

This Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities ...¹⁶

In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible ... and to undertake rapid reductions thereafter ... on the basis of equity ...¹⁷

Additionally, both UNFCCC and the Paris Agreement require ‘developed country Parties’ to provide ‘developing country

Parties’ with financial resources to support the costs of mitigation measures.¹⁸

There are, however, essential elements missing from the framework, specifically:

- agreement on which carbon budget (in light of the precautionary principle) is most appropriate to the temperature goal,
- agreement on how the principle of equity should be applied to distribution of that budget,
- agreement on the principles for allocating financial resources.

In the absence of these elements there is no reliable platform to support negotiation and co-operation towards the common goal.

Imagine a fishery on which a number of different communities depend. It is recognised by all that overfishing is threatening the fishery’s survival. All parties agree the fish population must be stabilised at a minimum of, say, 100,000 fish. If each community chooses its own fishing limit (without first agreeing a collective budget and principles for distributing that budget), it is likely that the aggregate of the fish caught will exhaust the fishery, leading to food insecurity and conflict.

The same principle applies when it comes to burden-sharing of climate change mitigation actions. If each country determines ‘equitable use’ of the atmosphere according to its own terms it is more or less inevitable that each country will adopt an approach that favours its own interest. This will result in insufficient overall mitigation, and unsafe atmospheric greenhouse gas concentrations; in other words, ‘overshooting’ the carbon budget, leading to increasingly dangerous temperature rises, climate insecurity and possible conflict.

In 2011, the Conference of the Parties to the UNFCCC, established a subsidiary body, the Ad Hoc Working Group on the Durban Platform for Enhanced Action (‘the ADP’). The ADP was mandated to develop the legal instrument that was to become the Paris Agreement. It conducted its work over a period of four years, concluding it only at the end of the first week of the 21st COP of the UNFCCC (‘COP 21’ the conference that culminated in the Paris Agreement). Significantly one of the missing elements of the framework was included as an option in the ADP’s final draft, presented to the parties on 5 December 2015:¹⁹

[Parties [collectively][cooperatively] aim to reach the global temperature goal referred to in Article 2 through

...

13 To derive a figure for carbon (tC) derived from tCO₂, divide by 3.664

14 UNFCCC Article 3(1).

15 Paris Agreement, Preamble.

16 *ibid* Article 2(2).

17 *ibid* Article 4(1).

18 See UNFCCC Article 4(3) and Paris Agreement Article 9(1).

19 Draft agreement and draft decision on workstreams 1 and 2 of the Ad Hoc Working Group on the Durban Platform for Enhanced Action, Article 3(1)(e), 5 December 2015.

[Equitable distribution of a global carbon budget based on historical responsibilities ...]

Although political representatives ultimately rejected this part of the text, practically and logically the proposed approach remains key to realisation of the temperature goal, and it is reflected within the Blueprint.

In alignment with the language of the UNFCCC, equal *per capita* emissions over time are used to give effect to the concept of 'equitable distribution':

Noting that the largest share of historical and current global emissions of greenhouse gases has originated in developed countries, that per capita emissions in developing countries are still relatively low ...²⁰

The approach provides an objective, coherent and non-arbitrary framing for division of a global carbon budget. Any attempt to introduce additional variables (such as adjustments for GDP) risks intractable dispute and division. Moreover, since the more developed economies have generally been constructed on the basis of a high *per capita* consumption of fossil fuels, distribution of a carbon budget on the basis of historic responsibility and equal *per capita* emissions over time, already serves as a good indicator of relative economic development and capacity.

The difference between a country's actual historic emissions and its share of the total, based on equal *per capita* emissions, produces its running 'carbon credit' or 'carbon debit'. These credits and debits provide a basis, grounded in equity, capacity and historical responsibility, for both (i) the allocation of financial resources to support mitigation measures; and (ii) the apportionment of responsibility for loss and damage (including the costs of adaptation). Since damages reflect real world loss and damage, credits do not represent either 'rights to damages' or limits to the quantum of damages.

Allocation of notional shares of the future carbon budget, on the basis of equal *per capita* shares linked to the provision of finance, provides the basis for an international 'cap-and-trade' scheme, anchored by IPCC science to the temperature goal ('a framework-based market not a market-based framework').

This is a critical feature of the scheme. In practical and political terms compliance with UNFCCC obligations depends on establishing a framework which links finance to shares of the carbon budget, incentivising ambition and co-operation towards the common goal.

A number of other features of the Blueprint may be emphasised at the outset:

- It provides an integrated framework, which informs (i) allocation of financial resources to support mitigation measures and sustainable development, (ii) responsibility for loss and damage (which includes the costs of adaptation measures), and (iii) allocation of the remaining carbon budget.
- It adopts a comprehensive approach to historic emissions. In the interests of transparency and in order to avoid prejudice to any party, we have begun the account in 1750, when the historic record for fossil fuel emissions begins.
- Recognising the challenges in the political process, the Blueprint makes the concept of carbon budgets accessible to NGOs, civil society and others.
- It may be used by courts confronted with climate cases as an objective framework for assessing the adequacy of government action.
- It may be used flexibly, providing an objective reference point for negotiations, policy-making and court judgments. It does, however, highlight the inescapable logic that If Country X consumes more than its share of the carbon budget, then that excess must come out of the shares of Countries Y and Z. Thus, in order to remain collectively within budget, Countries X, Y and Z must work together.
- The Blueprint provides a framework for operationalising the principles of equity and common but differentiated responsibilities, and the right to sustainable development. It does not, however, presume to define equity precisely, and does not, therefore, attempt to value the carbon credits and debits, which reflect historic responsibility. Given the complex political and economic issues arising, the value of carbon credits and debits may need to be determined through arbitration or the courts (assuming it cannot be agreed between countries).
- Finally, and most importantly, in terms of collective security, subject to the selection of an appropriate budget, and the accuracy of the IPCC budgets, operating within the framing of the Blueprint presents a reasonable chance of compliance with the long-term temperature goal set out in the Paris Agreement.

It should be noted that throughout this report we emphasise that loss and damage includes the costs of adaptation measures. We do this to correct for the potentially misleading distinction between 'loss and damage' and 'adaptation' in the UNFCCC process and the Paris Agreement. It is a general principle of law that the victims of legal wrongs should take reasonable steps to minimise their loss; and that the costs of doing so will be recoverable as an element of loss and damage.

20 Preamble to UNFCCC.

Blueprint methodology

The Blueprint makes transparent the different pathways to the temperature goal, providing a framework within which country emissions may be understood as shares of the global carbon budget, and therefore as contributions towards the common goal set out in Article 2 of the Paris Agreement.

It does so on the basis of internationally accepted data, in particular the IPCC assessments of cumulative emissions of carbon dioxide (or ‘carbon budgets’) consistent with:

- Low risk of non-compliance 0 per cent likelihood of limiting warming to <1.5C (budget 1)
- Medium risk of non-compliance 33 per cent likelihood of limiting warming to <1.5C (budget 2)
- High risk of non-compliance 66 per cent likelihood of limiting warming to <2C (budget 3)

More specifically the Blueprint reveals (measured in metric tonnes of carbon):

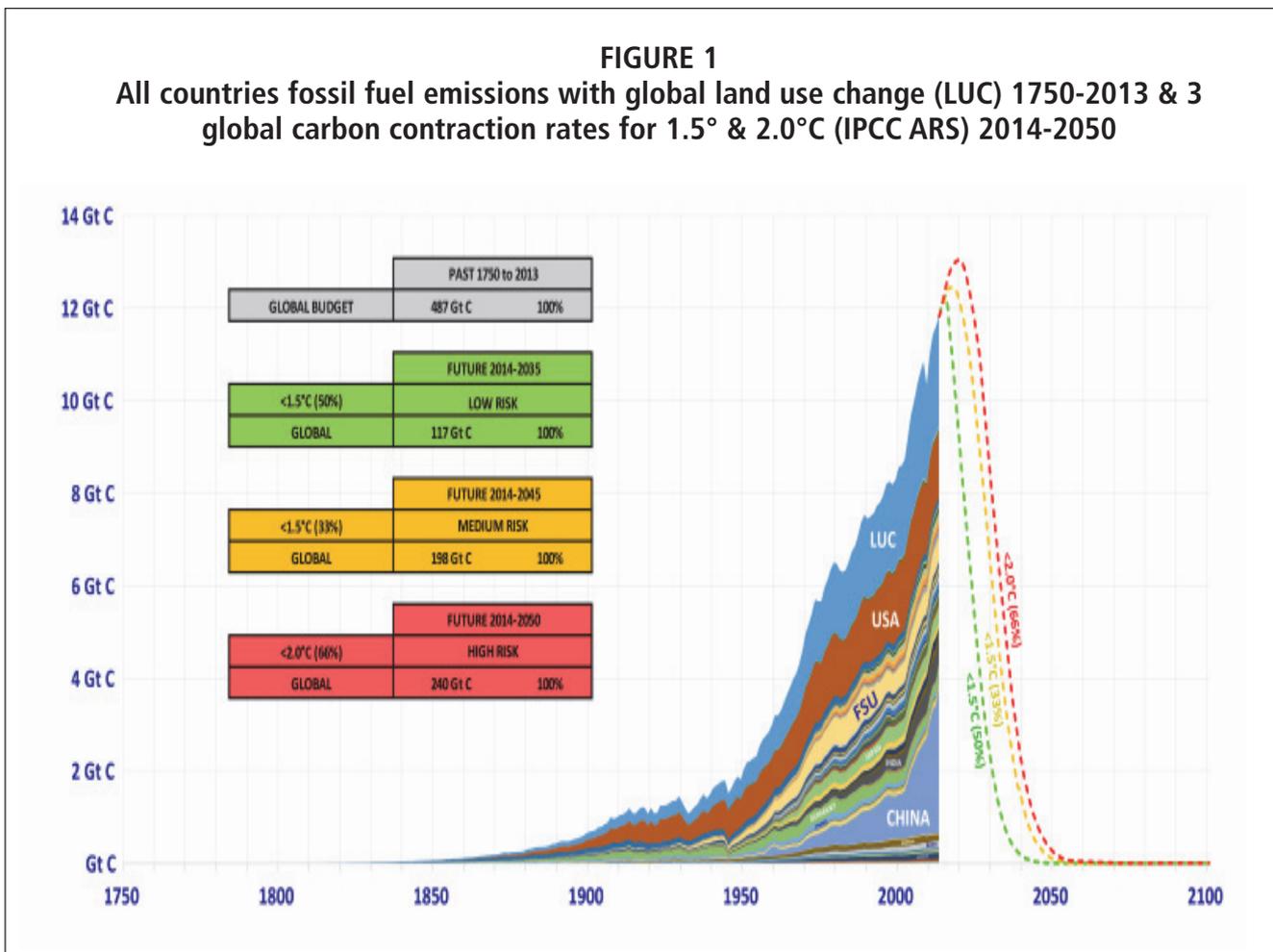
- the pathway of global historic carbon emissions (‘emissions’) over time, setting the future challenge of

rapid decarbonisation within the context of the upward global trend of historic emissions,

- individual countries’ historic *per capita* and gross emissions (from 1750 to 2013), contrasted with country ‘shares’ calculated with reference to equal *per capita* emissions,
- the variance between individual parties’ gross emissions over time and their shares, expressed as a ‘credit’ or ‘debit’ and measured in tonnes of carbon,
- party shares of the remaining budget based on equal *per capita* emissions (with historically accrued credits and debits reflecting obligations and entitlements relating to financial support for sustainable development in ‘creditor’ countries),
- an approximation of the relationship between a country’s (Intended) Nationally Determined Contribution (INDC or NDC), and its share of the remaining budgets.

The purposes of the framework are:

- to provide transparency on what is required both globally and nationally, if climate disaster is to be avoided,



- to provide transparency on historic responsibility for carbon emissions,
- to provide a frame of reference for determining rights and obligations to financial resources in support of mitigation measures and sustainable development (where debits and credits, measured in tonnes of carbon, represent key considerations),
- to provide frames of reference, derived from authoritative sources of data, for the formulation of NDCs, based in equity, which are consistent with the temperature goal,
- to provide all parties (including UNFCCC parties, the UNFCCC Secretariat and civil society) with a clear and objective basis for interrogating the adequacy and equity of NDCs,
- to provide a frame of reference for apportioning responsibility for climate change loss and damage (including the costs of adaptation),
- to provide a reference for assessing whether parties are exercising due diligence in meeting the temperature goal.

The methodology underpinning the Blueprint is intended to be transparent, objective and easily explicable, making it appropriate for use in policy-making and judicial proceedings.

It draws the line between past and future at 2014, reflecting the fact that 2013 is the last year of authenticated CDIAC data for country emissions. The Blueprint will be updated as new data become available.

Guide to charts

Global Carbon Budget Chart

Figure 1: This chart shows cumulative historic emissions of carbon dioxide; together with demarcation of the total areas representing the remainder of budgets 1 to 3 (green, amber, red) as of 2013. The X-axis shows years (from 1750); the Y-axis, the mass of carbon emitted in that year (expressed as giga-tonnes, or billions of tonnes of carbon). The different coloured layers, stacked on top of each other, represent the historic emissions of the different country parties. Additionally the chart includes a global estimate for emissions resulting from 'land use change' ('LUC'). Post-2013, three dotted lines (green, amber and red) demarcate the remaining carbon that may be emitted consistent with the remainder of budgets 1 to 3. The scale of the transformation required to buck the trend of emissions rising in line with economic and population growth, to a near immediate decarbonisation, should be readily apparent.

The green dotted line, shows the 'low risk of non-compliance' pathway. This is the cumulative mass of carbon (117 Gt C) that may still be emitted into the atmosphere consistent, as from 2014, with a 50 per cent chance of keeping warming to <1.5C. It can be seen that following a sharp decline, the line reaches zero by around 2035, that is within 20 years.

The amber dotted line, shows the 'medium risk of non-compliance' pathway. This is the cumulative mass of carbon (198 Gt C) that may still be emitted into the atmosphere, as from 2014, consistent with a 33 per cent chance of keeping warming to <1.5C. This shows a sharp decline with net neutrality by around 2045.

The red dotted line, shows the 'high risk of non-compliance' pathway. This is the cumulative mass of carbon (240 Gt C) that may still be emitted into the atmosphere, as from 2014, consistent with a 66 per cent chance of keeping warming to <2.0C. This shows a sharp decline with net neutrality by 2050. This is the path beyond which climate catastrophe is more likely than not.

The precise pathways shown by these dotted lines are no more than indicative: it is the area under the lines that is fixed rather than the pathway. It is evident, however, that if the paths were to decline immediately, the rate of subsequent decline could be somewhat slower, providing for slightly later dates for net neutrality to be attained.

Note that it is recognised that for many the impacts of climate change are already devastating. Reference to levels of risk is not intended to imply the existence of a 'safe' level of climate change; but simply to reflect the likelihood (on the basis of IPCC projections) of limiting warming to the agreed temperature goal.

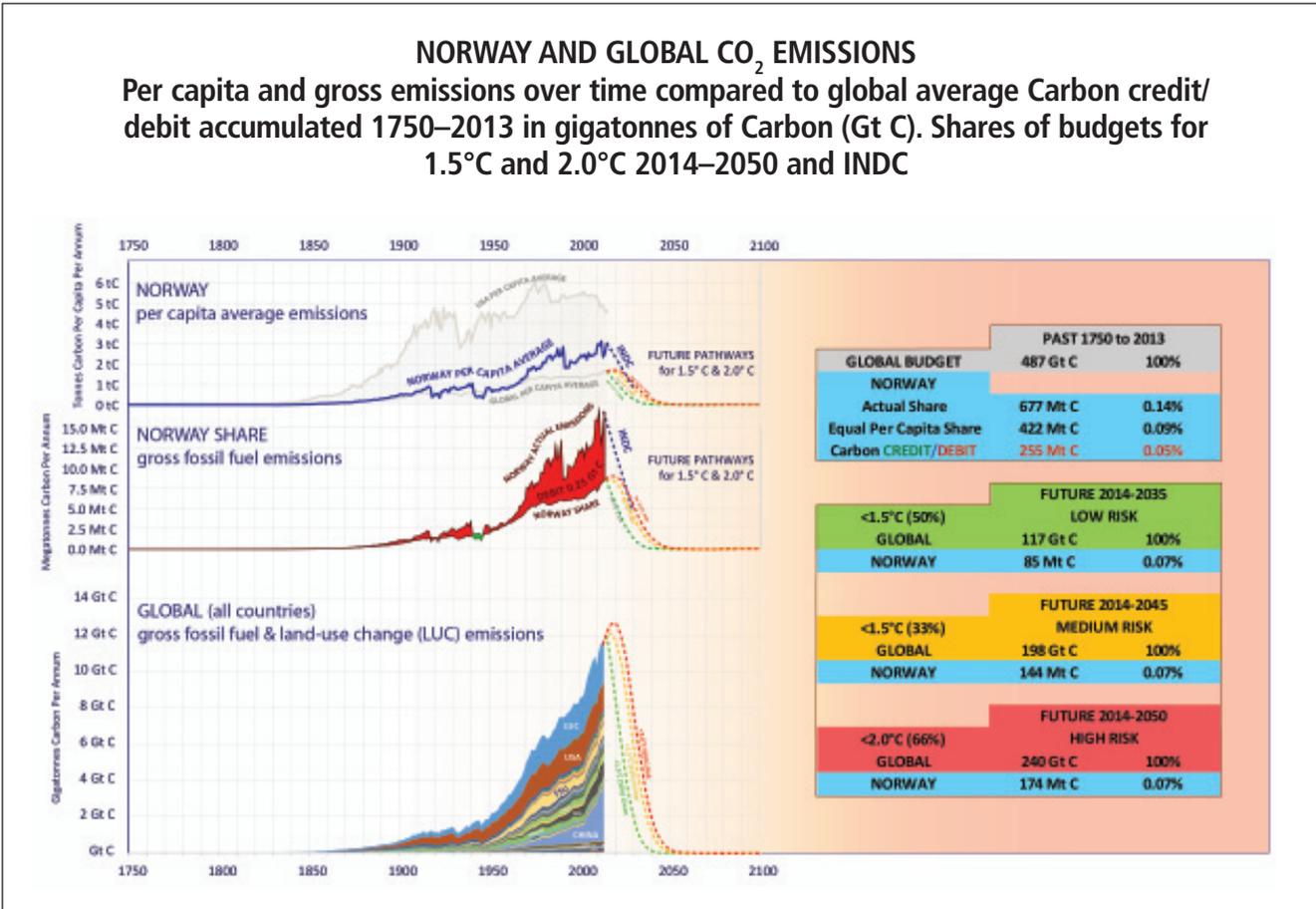
Country carbon budget charts (example chosen here is Norway)

Country charts reveal:

- the subject country's historic responsibility for past emissions (1750–2013), in both absolute and relative terms, displayed as either a 'credit' or a 'debit', and
- the subject country's share of future budgets 1 to 3, together with a rough representation of its (I)NDC for comparison.²¹

For illustrative purposes, Norway's chart is given on the next page.

²¹ For the time being we have used INDCs, but the charts may easily be updated to reflect NDCs as and when they become available.



We now discuss each element of the chart in turn.

1.2.2.1 Budget boxes; global totals and country shares

PAST 1750 to 2013		
GLOBAL BUDGET	487 Gt C	100%
NORWAY		
Actual Share	677 Mt C	0.14%
Equal Per Capita Share	422 Mt C	0.09%
Carbon CREDIT/DEBIT	255 Mt C	0.05%
FUTURE 2014-2035		
<1.5°C (50%)	LOW RISK	
GLOBAL	117 Gt C	100%
NORWAY	85 Mt C	0.07%
FUTURE 2014-2045		
<1.5°C (33%)	MEDIUM RISK	
GLOBAL	198 Gt C	100%
NORWAY	144 Mt C	0.07%
FUTURE 2014-2050		
<2.0°C (66%)	HIGH RISK	
GLOBAL	240 Gt C	100%
NORWAY	174 Mt C	0.07%

These boxes correlate the global with the country-specific graphics.

The top box contains historic carbon emissions from 1750 to 2013 (referred to as ‘global budget’²²). The grey part contains the global total, that is, 487 Gt C (to convert this into CO₂, multiply by 3.664, that is, 1,784 Gt CO₂).

Measured in tonnes of carbon the lower part of the top box contains the featured country’s shares of historic emissions, expressed as:

- *Actual share*: the country’s actual historic emissions are expressed in tonnes of carbon and as a percentage of the total. Norway, for example, emitted 677.0 Mt C over this period (1750–2013), representing 0.14 per cent of historic global emissions.
- *Equal per capita share*: the country’s ‘share’ of historic emissions are also expressed in tonnes of carbon and as a percentage.
- *Carbon debit* (in red): this is the difference between a country’s equal per capita share and the amount by which its actual share was more than this. Norway’s ‘carbon debit’ over this period (1750–2013) was 677 Mt C minus 422 Mt C, showing an ‘excess’ or ‘carbon

22 We recognise that ‘budget’ is a potentially confusing term in this context, since it refers only to actual historic emissions, rather than a pre-determined allocation. We have used it simply to correspond to the concept of the country ‘shares’ of historic emissions, which, in turn, provide the basis for the assessment of credit and debit.

debit' of 255 Mt C, representing 0.05 per cent of historic global emissions.

- Carbon credit (in green) is the difference between a country's equal per capita share and the amount by which its actual share was less than this. Overall in 1750–2013, Norway had no 'credit', although it did dip below the global per capita average during World War II (shown on the country chart in green).

- the per capita emissions of the specific country being analysed (in this example Norway),
- the global average of per capita emissions over time past, and
- the global average of per capita emissions over time future for the green, amber and red budgets (for simplicity of analysis, the population figure was 'frozen' at seven billion from 2014 onwards).

The lower boxes reflect the traffic-light coding of carbon budgets 1 to 3, and correspond to the future budgets represented by the dotted curves on the right-hand side of the charts. The top parts of these boxes express the global total mass of carbon remaining for each of the budgets. The lower part shows the country's share on the basis of equal per capita emissions, expressed as a percentage of global population (in Norway's case, 0.07 per cent).

As can be seen in this example, Norway's per capita emissions were historically higher than the per capita global average (but significantly below those of the United States).

The template for each country graphic are non-stochastic line plots that provide context for the featured country's per capita emissions, which are key vectors for the quantitative analysis 1750–2050. Each graphic contains:

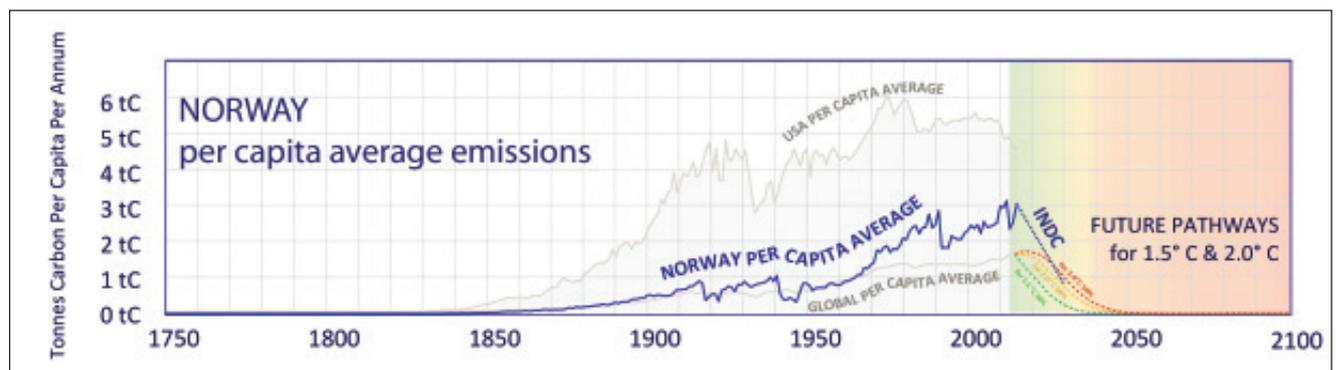
Moving into the future (that is, for illustrative purposes, 2014 onwards) as the global per capita average line crosses 2013 on the X-axis, the line branches into green, amber and red dotted paths, showing (here Norway's) equal per capita emissions associated with future budgets 1 to 3).

- the per capita emissions of the United States, historically the greatest cumulative and highest per capita emitter,

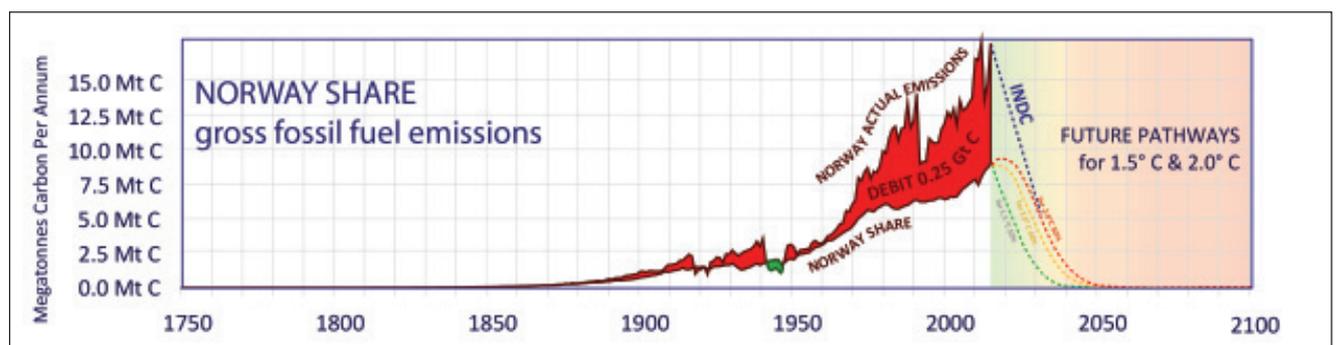
Passing into the future the country per capita average line breaks into dots (in dark blue) to 2030, providing a rough description of the country's future per capita emissions on the basis of its INDC/ NDC.

It can also be seen that Norway's INDC appears to exceed its share of the future budgets for 1.5 C. It should be noted that this is aside from the matter of Norway's historical debit, which would need to be repaid to creditor countries in order for Norway to qualify for a remaining part of the future budget. Accounting for historical emissions also remains relevant to calculating for past damages.

1.2.2.2 Per capita country emissions over time (top left-hand side of each country specific chart)



1.2.2.3 Gross country emissions over time (middle left-hand side section of each country specific chart)



Actual emissions line. This line shows the country's actual gross emissions over the period 1750–2013 and then its approximate INDC (the blue dotted line), assuming carbon emissions fall in line with GHG emission pledges.

Country 'share' line. This line shows the country's share of the global budget and then its future share of the green, the am-ber and the red budgets (2014–2050) on the basis of globally equal per capita emissions.

Credit/debit. The total past difference between share line and actual emissions line is the country's running debit or credit. Where actual emissions are less than share for the relevant year, the line passes beneath the share line and the area between the two lines is the 'credit', shaded in green. Where actual emissions are higher than share, the line passes above the share line and the area between the two lines is the 'debit', shaded in dark red.

As can be seen, for most of the period between 1750 and 2013, Norway's actual emissions exceeded its share on an equal per capita basis (leading to the area between the lines being shaded in red). For a short period in the 1940s however (during World War II), Norway's emissions were running below the average, so that there is a small area shaded in green. Norway's overall debit for the period 1750 to 2013 can be seen to be 0.25 Gt C.

(I)NDC/NDC reference. As the actual emissions line passes 2013 on the X-axis, it becomes dotted providing a rough indication of the country's (I)NDC. This allows for the (I)NDC to be seen in relation to the country's share of the past and the remaining budget. Intended Nationally Determined Contributions (INDCs) were submitted in anticipation of the Paris Agreement, which formally requires parties to submit Nationally Determined Contributions (NDCs). For the moment the Blueprint references INDCs. It will be updated to show NDCs once these are generally available.

Notes on methodology

'Share' calculation method (including note on bias)

On a year-by-year basis for the past (1750–2013) each country's equal *per capita* share of past emissions is derived from:

- (a) compiling the estimates of each country's population for each year 1750–2013 as paths, but not integrals (source primarily World Bank and various);
- (b) compiling the estimates of each country's CO₂ emissions from fossil fuel burning for each year 1750–2013 as paths but also as integrals (source primarily CDIAC);

- (c) summing the CO₂ emissions from fossil fuel burning for each country to totals for each year 1750–2013, but also as an integral, that is, as an individual total for each country, summing all years 1750–2013 – giving an overall total of 376 Gt C;
- (d) adding and summing a global estimate of the non-fossil CO₂ emissions from land use change (LUC) for each year, giving an integral of 111 Gt C 1750–2013;
- (e) summing both the fossil and the non-fossil CO₂ emissions globally for all years 1750–2013 that are also then summed to a global total integral of emissions of 487 Gt C; and this is the composite global carbon budget for the period 'the past' 1750–2013;
- (f) the emissions per capita of each country are calculated by dividing the CO₂ emissions for each year by the population for each year (as paths only and not as integrals);
- (g) each country's 'emissions share' of the global emissions total is calculated as being equal to their annual share of the global population total as that total emerged, 1750–2013;
- (h) Norway's equal per capita share of global emissions over the period 1750–2013 was 433.5 Mt C or 0.09 per cent of the total global carbon budget for that period, reflecting its share of global population.

For shares of future budgets, a static population is assumed post-2013. The population of developed countries tends to rise less fast (or decrease) in comparison with that of developing countries. An unintended consequence of the assumption of static population, therefore, is a bias in favour of developed countries, tending to exaggerate their shares of the budget (with a corresponding diminution of developing country shares). It is difficult for us to quantify the impact of this bias, and ideally shares would be based on projections of future population;²³ the general point, however, is that, on an equal per capita basis, the developed countries shares of budgets can be assumed to be somewhat less than indicated by Blueprint figures, while developing country shares can be assumed to be somewhat greater.

There is a critical distinction to be drawn between notional shares of historic emissions and shares of the future carbon budget. Past shares are used to derive the credits and debits (see below), which represent rights and obligations in relation to climate finance. They do not represent 'rights to pollute' (if they did the result, given

²³ Such an analysis could, of course, be undertaken but, at least for the time being, it is beyond the scope of the authors.

the scale of credits accrued, would be overshoot of the global budget). Shares of the future budget, however, may be understood as ‘rights to pollute’ (that is, within the context of a scheme in which carbon debtors discharge their debts and continue to meet the costs of loss and damage in proportion to those debts) and are referred to as ‘certificated carbon shares’ (see below). Historic debts that are not discharged would deprive a debtor country of its entitlement to the future budget. Creditor countries might use finance derived from credits to purchase certificated carbon shares, enabling historic credit to be used to obtain greater than equal shares of the future budget.

Carbon ‘debit/credit’

Carbon debits and credits are derived by subtracting a country’s ‘actual’ share from its ‘equal per capita share’ (where a positive value is expressed as a credit and a negative value as a debit). In Norway’s case, for example, there is a historic ‘debit’ of 255 Mt C.

A debit quantifies a debtor country’s obligation to provide finance to developing countries in support of their mitigation efforts.²⁴ A credit is the corresponding entitlement to that finance. Credits and debits give effect to the principle that countries that have used more than their share of the atmospheric space must compensate those whose shares have been correspondingly reduced.

Valuation of credits and debits requires only a price to be attached to a tonne of carbon. There is a great deal of existing work on valuing the price of carbon,²⁵ which, in the absence of a specific mechanism, courts might draw upon to set an appropriate figure. The approach to valuing historic carbon credits and debits will involve specific considerations relating to equity as well as the environmental integrity of the framework.

Crucially, it is not for the Blueprint to propose a valuation. The Blueprint provides a conceptual framework for navigating the complexities of finance and carbon budget distribution. Given the political and economic significance of credit/debit valuation, this issue is better left to arbitration or the courts (assuming a value cannot be agreed upon by the parties).

For illustrative purposes only let us assume a price of \$10 per tonne of carbon. On that basis Norway’s debt would amount to \$2.55 billion. A country with credit of

255 Mt C or more (Party B) could claim the \$2.55 billion to support its mitigation efforts. On transfer of the funds Norway’s debit would be discharged, while Party B’s credit would be reduced by 255 Mt C.

Plainly the valuation of credits and debits, and the imposition of appropriate interest rates incentivizing timely payment, would be key to ensuring equity to all parties.

The obligation to provide finance, however, is distinct from liability for loss and damages (which includes the costs of adaptation). There is no cap on the potential for liability for loss and damages, and discharging a debit does nothing to reduce liability under this head of claim.

Nevertheless, debits may be used to determine liability and apportion damages (see further below).²⁶

Certificated carbon shares

Since historic responsibility for past emissions is accounted for through credits and debits linked to finance, the remaining future budget can be divided into shares on the basis of equal per capita emissions. To distinguish these from shares of past emissions they will be referred to as ‘certificated carbon shares’.

Carbon debtor countries would need to discharge their debts in order to access their shares. Where debtor countries are locked into existing energy infrastructure to the extent that they are unable to meet their needs through their initial allocation of shares, they would need to purchase additional shares. Countries at a relatively low level of development may have greater potential to ‘leap-frog’ straight to a clean energy base, and therefore to remain within budget, obtaining additional finance.²⁷ The Blueprint framework would support the development of a ‘cap-and-trade’ scheme that would:

- incentivise ambition on the part of all parties,
- anchor aggregate NDCs to the long-term temperature goal, and
- support the efficient allocation of ‘rights to emit’.

It is beyond the scope of the present report to consider the detail of a scheme for trading in shares of the future carbon budget. Practical questions arise, for example, regarding the establishment of a starting point and regulatory oversight. However, the following general points may be made:

24 Pursuant to the Paris Agreement, Article 9(1) and the duty to take prevention measures under general principles of law.

25 See, for example, the work of the World Bank: <http://www.worldbank.org/en/programs/pricing-carbon>.

26 Practical application of the duty to prevent harm.

27 It is worth noting in this context the commitment of the 48 countries of the Climate Vulnerable Forum to move to a 100 per cent renewable energy base by 2050: <http://www.thecvf.org/countries-vow-100-renewable-by-2050/>.

- Trading would be in certificated shares measured in tonnes of carbon, where the sum of all shares equals the total remaining carbon budget.
- Consequently, accounting would be transparent and straightforward: at any given moment the correspondence between total shares and the remaining carbon budget might be easily checked and verified.
- The global carbon budget would be reduced annually, to account for actual global emissions for the previous year, with the stock of shares reduced accordingly.
- As the supply of shares reduces, their price rises in response, harnessing market forces to the long-term temperature goal.
- All parties would have an economic incentive to stay within budget, but all parties would have the option to pay for additional shares (in the case of creditor countries, such purchases might be financed through the funding generated by their credits).
- Given the catastrophic consequences of the global budget being exceeded, courts might rule, as a matter of policy, that any countries failing to operate within the framework for the future budget will be jointly and severally liable for all loss and damages arising. This would, of course, be a compelling incentive to budgetary compliance.
- Such a cap-and-trade approach may be conceived of as a ‘framework-based market’ (as distinct from a ‘market-based framework’).

It is possible to conceive of an alternative approach in which ‘historic responsibility’ is used to allocate shares of the future budget in proportion to credit and debit, so that the historically lowest emitting countries would have the highest shares of the remaining budget. Such an approach would encounter serious practical difficulties. Historically high emitting countries would have negligible or negative shares of the remaining budget, that would quickly or immediately be exhausted through their actual emissions. Since the price of certificated shares is likely to rise over time, initially the historically low emitting countries would be reluctant to sell their shares. A scheme in which those with currently the highest emissions have (a) negligible rights to the remaining budget, and (b) no guarantee of obtaining shares to support excess use, would most likely founder for lack of plausibility and credibility. For this reason, the Blueprint instead translates ‘historic responsibility’ into obligations to provide finance for sustainable development and mitigation.

The example of Norway has been used in this paper for illustrative purposes. Equivalent charts for all countries are accessible at:

<http://www.gci.org.uk/CREDIT-DEBIT.html> and
<http://www.planb.earth/blueprint--emissions--finance-and-damages.html>

Part 2 of this report, to be published in the next edition of *Environmental Liability*, will consider different routes to implementing the Blueprint framework through the courts. It will also include a hypothetical case study, showing how its principles might operate in practice.