

# Indicators for the implementation of international climate protection law

Gerd Winter

## Abstract

This article strives to contribute to the study of implementation of international environmental law. The case presented is climate change mitigation as propounded by the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. Considering the structure of indicator analysis guiding this book, I will discuss indicators for both the effectivity and effectiveness of those international treaties. As the number of imaginable indicators is huge, some choice must be made. Mine is to focus on the substance of the law rather than the organizational framework of its implementation. In more detail the process how the sometimes vague phrasing of the treaties is successively concretised and put into practice shall be described, with a particular attention to the influence of climate science and science based policy proposals.

The analysis starts with examining the bindingness of the treaties as being a major precondition of a treaty's influence on climate protection. It goes on identifying the level of acceptable or non-acceptable harm propounded by the treaties. Further on, the efforts required to mitigate climate change and the principles of effort sharing are reconstructed. Finally, methods of predicting greenhouse gas emissions are explored and measured against allowable emissions budgets. Finally, considering the enormous challenge posed by the budget approach a more practicable approach is suggested that requires states to "bottom up" explore and take all measures that are technically and economically possible.

## I. Bindingness of the treaties

The Framework Convention on Climate Change (UNFCCC) and the Paris Agreement (PA) will be the core object my study. Of particular interest are those provisions that define the level of climate protection and the sharing of efforts to maintain such levels. This means that the technical instruments offered by the treaties, in particular monitoring and reporting duties, are left aside. Before the relevant provisions are explained in more detail, I shall summarise to what extent they have become binding law.

Bindingness of a treaty as such must be distinguished from bindingness of its content. An international treaty, which is formally binding because ratified by the contracting parties may only have programmatic or indeterminate content. But even such content can have informal importance on the making and interpretation of law (Preston, 2021, p. 14). Inversely, an international non-binding agreement may be formulated in rather precise and demanding language and as such have considerable influence on state practices (Birnie, Boyle, & Redgwell, 2009, pp. 35-38). This means that resolutions agreed at Conferences of Parties may be referred to when interpreting binding but substantively open provisions.

According to ruling opinion, the PA while formally binding does not have much prescriptive value in substance. It is considered to advocate a bottom-up concept leaving wide discretion to the

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contracting states and rather guide them by procedural tools such as the declaration of pledges, reporting duties and global stock takes. This understanding often refers to the negotiations at the past conferences of parties to the UNFCCC. However, historical reasoning through references to the so-called *travaux préparatoires* is only an auxiliary instrument of interpretation.<sup>1</sup> Treaty interpretation is basically “objective”, “textual”. This means it must start from the text and look at its telos and systemic context. In addition, interpretation shall be dynamic, meaning that not the time of adoption but of the application of the treaty guides the understanding.<sup>2</sup> This will, for instance, be the case, if terms have adopted a new meaning in the light of new scientific evidence. There are thus legitimate interpretative tools that may excavate more substantive value of the PA.

Insofar as some binding substance is identified, it is to be clarified how that interacts with domestic legal orders. “Monist” states accept treaties as directly applicable, some even conceding them higher rank in relation to domestic laws. “Dualist” states accept applicability only if the relevant treaty provision was by legal act transposed into national law. The EU, for instance, conceives its relation with international treaties as monist<sup>3</sup>, and the UK, for further instance, as dualist.<sup>4</sup> Some “dualist” states nevertheless accept direct applicability, if the provision is ‘self-executing’ which means if it is aimed at creating legal relationships involving individuals and formulated in precise and unconditional terms. Vice versa, monists states deny direct applicability of an international provision that is vague or conditional.<sup>5</sup> Therefore, one can speak of a trend to convergence of the two basic approaches (Preston, 2021, p. 7). An additional facet of convergence is that both the monist and dualist approaches recognize that domestic law which leaves room for different interpretations should be interpreted in the light of international law.

All this means that the UNFCCC and PA must be examined as to their textual preciseness and unconditionality.

## II. Concretising the level of (un)acceptable harm

A rule normally has a conditional structure, or ‘if A then B’, meaning in relation to climate change: if a level of acceptable harm will be or is already exceeded, those responsible must take measures such as to prevent damage, reduce further aggravation, or make good past damages. As will be shown this structure is more or less explicitly also embedded in the relevant international rules. While the current legal-scientific discourse rather focusses on the second aspect, i.e. the obligation to take measures, I will nevertheless also sketch out the first because this better structures the interpretation and application of the relevant law. The first step therefore is to identify the level of acceptable or

1 Art. 32 Vienna Convention on the Law of Treaties.

2 ICJ 1970: “[...] an international instrument has to be interpreted and applied within the framework of the entire legal system, prevailing at the time of the interpretation. In the domain to which the present proceedings relate, [...] the *corpus iuris gentium* has been considerably enriched, and this the Court, if it is faithfully to discharge its function, may not ignore.” See further Dallier, Forteau & Pellet, p. 287, who propose to apply retrospection to technical terms and prospection to conceptual or generic terms.

3 More precisely, a treaty provision must be precise and unconditional to be directly applicable. See ECJ C-265/03 (Simutenkov) para. 21.

4 See, in relation to the Paris Agreement, UK Supreme Court in *Friend of the Earth/Plan B v Heathrow Airport*, judgment of 16 December 2020, [2020] UKSC 52, at para 108.

5 An example of an international agreement not considered to be directly applicable is the GATT, see ECJ C-280/93 (Banana import regulation) para 106.

unacceptable harm, and the second to determine the amount and sharing of measures. Both steps help to concretise broadly framed provisions.

There are two ways how to define (un)acceptable harm: by pointing to damages caused in the real world, or by representing damage through abstract indicators.

The first route can be found in Art. 1 UNFCCC which sets a standard at the ‘stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.’ Considering the wealth of knowledge about damage caused already at the present time, it must be acknowledged that ‘dangerous anthropogenic interference’ is already a fact.

It is important to note that whether dangerous interference is given must be separated from whether the interference can be justified by weighing against other concerns. Science sometimes overlooks this, such as in the suggestion of the IPCC to define dangerous interference as a ‘complex task’ requiring, the balancing of the risks of climate change (risks of gradual change and of extreme events, risk of irreversible change of the climate, including risks for food security, ecosystems and sustainable development) against the risk of response measures that may threaten economic sustainability.<sup>6</sup> This must be rejected. “Dangerous anthropogenic interference” clearly points to the effects of climate change, not of mitigation measures. The costs of measures may only be considered at the second step when reasons to justify interferences are tested.

In intermediate conclusion, it must be acknowledged that the real-world threshold of damage as established by Art. 1 UNFCCC has already been transgressed. This understanding of harm as real-world damage is also supported by the customary no-harm rule. According to this rule “a state must use all means at its disposal to prevent significant damage caused in another state from activities originating in its territory and for which the state is responsible.”<sup>7</sup> “Significant damage” obviously points to realities, not to abstract parameters.<sup>8</sup>

The second route was taken by the PA in its Art. 2. It can be understood to define the level of unacceptable harm abstractly by globally averaged temperature ceilings that shall not be exceeded. Art. 2 PA reads as follows:

‘This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

- (a) 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, recognizing that this would significantly reduce the risks and impacts of climate change;’
- (b) ...

The ceilings ‘well below 2°C, and ‘efforts to limit [...] to 1.5°C’ are formal treaty law binding the contracting parties. Concerning its prescriptive content, however, legal scholars have seldomly

6 IPCC AR 4 WG 3.

7 ICJ Nuclear Weapons 1996, 242, para. 29.

8 The no-harm rule was not overridden by the PA, as low-lying nations have declared as a condition of joining the PA. See UN Treaty Collection, Ch. XXVII, 7.d, available at: [https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg\\_no=XXVII-7-d&chapter=27&clang=en#EndDec](https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=en#EndDec).

discussed this with scrutiny. Most of them just mention the ceilings to be there and immediately turn to discussing the obligations of mitigation, adaptation and financial assistance highlighting that the hard law of the PA is rather procedural when requiring nationally declared contributions (NDCs) (Bodansky, 2016; Thorgeirsson, 2017; Birnie, Boyle, & Redgwell, 2021; Voigt & Ferreira, 2016). Those authors who do discuss the binding value of the ceilings conceive them as aims that give general direction to national contributions (Franzius & Kling, 2021, p. 203; Rajamani & Werksman, 2018). In contrast, binding force has, for instance, been suggested by Preston (Preston, 2021, p. 21).

It is true that the chapeau of the article starts with somewhat weak language ('aims to strengthen the global response'). It however becomes prescriptive when postulating that the global response shall be strengthened by '(H)olding the increase [...] well below 2°C [...] and to pursue efforts to limit [...]'. This is clear and indicative language not relativised by any other concern. The warming limits hence are ceilings that shall not be exceeded. The prescriptive character can also be explained by considering the history of the limits. 2°C was proposed as a so-called *Leitplanke* (guard rails) by the German Scientific Council of Global Environmental Change (WBGU) in 1995 when the Conference of Parties of the UNFCCC met in Berlin (Schlacke, 2014; WBGU, 2009). At that time, the warming still was at well below 1.5°C so that 2°C provided ample space for taking action. Hence, 2°C as a limit was not contested at subsequent COPs which were rather dominated by increasing evidence and discussions about risks accruing already from 1.5°C warming.

Asking what the qualification "well below" 2°C means some information about confidence levels is useful. When UNFCCC decisions from 2010 suggested to hold warming 'below 2°C' they assumed a likely chance of 66% to in reality stay below 2°C, with a remaining 33% likelihood that the limit would be exceeded. The 'well below' was meant to be a strengthening of the likelihood of staying below 2°C up to a likelihood of more than 90%. This means in the terminology of the IPCC that 'below 2°C' means a 'likely' limit and 'well below 2°C' means 'very likely' (Schleussner, Ganti, & Rogelij, 2022, p. 3). If assessed in terms of the precautionary principle (which advises that the more serious the effects are the higher the likelihood of prevention must be (Wiener, 2018, p. 608)), the catastrophic effects of warming up to 2°C demand that a probability of 98% must be required to stay below the level of 'real' 2°C. Remarkably, this equals the ceiling of 1.5°C if that is calculated with (only) 50% likelihood.<sup>9</sup>

One more argument opposing the substantial bindingness of the well below 2°C ceiling has been taken from Art. 4 (1) PA which provides that parties are to "achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century". This poses the problem that the budgets derived from the ceiling may have been spent before the second half of the century so that if emissions continue the ceiling will be exceeded. Some authors opine that Art. 4 (1) PA by allowing spending later accepts such overshoot (Franzius & Kling, 2021, p. 203). However, I believe if the temperature limit is a ceiling Art. 4 (1) PA can only be understood to require that the budgets must be spent without overshooting. If nevertheless some net emissions shall be acceptable after 2050 this can only be allowed if drastic immediate cuts are implemented that leave some small amounts to be stretched until later.<sup>10</sup> Overshoots may have to be accepted as

9 Schleussner et al., 2016; similar the CAT at <https://climateactiontracker.org/methodology/paris-temperature-goal/>

10 See the statement of the UK Committee on Climate Change: "The Paris Agreement aims to limit warming to well below 2°C and to pursue efforts to limit it to 1.5°C. To achieve this aim, the Agreement additionally sets a target for net zero global emissions in the second half of this century." The "additionally" implies that no overshooting is accepted. The statement was cited in and approved by High Court Case No

a factor of determining probability intervals. But they cannot be accepted as a planned component of policies. In particular, free rides are not allowed that calculate with massive but yet unknown removal techniques. This disregards the fact that once elevated temperatures set trajectories in motion which cannot be stopped by decreased temperatures (Baur et al., 2021), and it ignores tipping points (Schleussner et al., 2016).

The bindingness of the 2°C limit has also been approved by many courts, including the UK Court of Appeal<sup>11</sup>; the Federal Constitutional Court of Germany<sup>12</sup>; the Land and Environment Court, New South Wales<sup>13</sup>; and the Supreme Court of the Netherlands.<sup>14</sup> Some courts have interpreted the ‘well below’ to mean some degree between 2°C and 1.5°C. The BVerfG, for instance, found 1.75°C appropriate.<sup>15</sup> Moreover, many states have based their climate legislation on the temperature limits<sup>16</sup>, and many more states which submitted NDCs have referred to them.<sup>17</sup> It thus appears that a general practice has evolved among states qualifying as a “subsequent practice” that fortifies a more stringent interpretation.<sup>18</sup> This interpretation also corresponds to the ‘object and purpose’<sup>19</sup> of the PA which is to ‘strengthen the global response’ (Art. 2 (1)). It is also supported by the internationally recognized principle that treaties shall be interpreted so that they are given ‘effet utile’.<sup>20</sup>

While concerning 2°C the PA strictly demands to ‘holding the increase [...] below’, there is more leeway concerning 1.5°C (‘pursue efforts to limit’). It is unclear if this can be understood to accept a likelihood of only 50% for that limit. The knowledge collected by the IPCC 1.5°C report and the presently almost daily evidence of extreme weather events speak against such assumption, as does the Glasgow Climate Pact that was adopted in 2021. It lays out that the Conference serving as the Meeting of Parties to the Paris Agreement:<sup>21</sup>

21. Recognizes that the impacts of climate change will be much lower at the temperature increase of 1.5°C compared with 2°C and resolves to pursue efforts to limit the temperature increase to 1.5°C;

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CO/16/2018 (Plan B Earth et al v. Secretary of State for Business etc., [2018] EWHC 1892 (Admin), paras 21, 30.

- 11 Court of Appeal judgement of 27 February Case C1/2019/1053 (Plan B Earth v Secretary of State for Transport) [2019] EWHC 1070 (Admin) para 185.
- 12 BVerfG Case No 1 BvR 2656/18, 78/20, 96/20 and 288/20, BVerfGE 157, 30 para 159. More precisely, the court opined that the government was constitutionally enabled to incorporate the ceiling into national law.
- 13 Land and Environment Court New South Wales, Order of 8 February 2018, Case [2019] NSWLEC 7 (Gloucester Resources Ltd v Minister for Planning, paras 441, 697.
- 14 Hoge Raad, judgment of 20 December 2019, Case 19/00135 (State of the Netherlands v Urgenda) ECLI:NL:HR:2019:2007, para 7.2.8.
- 15 BVerfGE 157, 30 para 219.
- 16 See, for instance, Regulation (EU) 2021/1119 of the EP and Council, Art. 1 (2).
- 17 Rajamani et al. (2021) counted 127 states (representing 76% of NDCs) that referred to the temperature limits in their NDCs.
- 18 See Art. 31 (3) (b) Vienna Convention which accepts as a legitimate basis for the interpretation of treaties ‘any subsequent practice in the application of the treaty which establishes the agreement of the parties regarding its interpretation’. ‘Agreement’ is meant as some kind of consensus, not as a formal treaty. See ICJ (The Corfu Channel case) ICJRep. 1949, 25.
- 19 Cf Art. 31 (1) Vienna Convention.
- 20 ICJ (The Corfu Channel Case) ICJRep. 1949, 24. For more references to ICJ-cases see Daillier/Forteau/Pellet (2009) para. 169.
- 21 FCCC/PA/CMA/2021/10/Add.1, Decision 1/CMA.3 Glasgow Climate Pact.

22. Recognizes that limiting global warming to 1.5°C requires rapid, deep and sustained reductions in global greenhouse gas emissions, including reducing global carbon dioxide emissions by 45 per cent by 2030 relative to the 2010 level and to net zero around mid-century as well as deep reductions in other greenhouse gases.

This justifies to postulate that even 1.5°C must be held as a limit, and with a likelihood higher than 50%.

As a result, the two routes of determining the level of (un)acceptable harm come to different conclusions. According to the FCCC harm is already there, while according to the PA it will only occur in future. As the UNFCCC is the mother convention and its intention is supported by customary law it can be argued that it prevails. This means that the PA temperature limits cannot anymore be interpreted to mark the acceptable level of damage. Instead, however, they can be maintained as yardsticks if reinterpreted as an emergency reserve that is as a strategy agreed by the community of states but must never be exceeded.

### III. Effort determination and sharing

The conception of an emergency reserve serves as a basis for the determination of efforts. Such efforts can first of all be elaborated on a global level and then scaled down to national levels. The method how that is made transparent is the budget approach. Global emissions budgets are compiled and distributed among states. They serve as yardstick against which the emissions reduction measures are assessed.

Different steps and related parameters have been proposed how such analysis can be conducted. First of all, as said, the global budget must be calculated. The same must then be distributed among states. This is done by applying two criteria, equity and feasibility. Finally, it must be examined if the predicted factual emissions meet or exceed the respective national budget of a state. These steps have been elaborated by the Intergovernmental Panel on Climate Change (IPCC) and further tailored by the Climate Action Tracker (CAT). They will now be explained in more detail.

#### 1. Determining the overall effort

Climate science in general, including the CAT and its cradle, the IPCC, has investigated the necessary effort, or the available emissions budget, on a global scale. As already explained, the global budgets are derived from assumed warming limits. Their amount greatly depends on the likelihood that a given budget will ensure that the limit is kept. The higher the requested likelihood the smaller the budget will be, and vice versa. The CAT assumes a likelihood of 67% for the 2°C limit and 50% for the 1.5°C limit. This leads to budgets in 2020 of 1150 Gt CO<sub>2</sub> for a 2°C warming limit and 500 GtCO<sub>2</sub> for a 1.5°C warming limit.<sup>22</sup> This scientific information must be evaluated in legal terms. Just 67% likelihood of success or fatal 33% of failure appears as intolerable considering the catastrophic effects if 2°C is really reached. A higher percentage must be postulated such as above 90%, all the more so if the precautionary principle is applied. On that background and as explained above the 'well below' 2°C can be understood to coincide with a 50% likelihood to stay within 1.5°C.

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22 IPCC AR6 Synthesis Report p. 46.

A question to be separated from the calculation of the budget is how the budget shall be spent. There are three possibilities: spend now and save later ('convex'), save now and spend later ('concave'), or linear degression. Normally linear degression is chosen, such as in EU climate law. This raises the question of allowing overshooting the assumed trajectory due to an actual need of fossil energy supply. This may be tolerated if the excess is made good by later extra reductions. More problematic is whether overshooting can also be tolerated concerning the entire budget, or, in other words, the temperature limit from which it was derived. For instance, the CAT suggests to allow overshooting 1.5°C of the related budget if this is subsequently compensated by carbon removal from the atmosphere.<sup>23</sup> I believe this is not compatible with a strict understanding of the warming limits because higher temperatures set dangerous causalities in action that cannot be stopped later on. For instance, once melted ice cannot timely be refrozen.

## 2. Principles of effort sharing

The budget derived from each of the temperature limits can be illustrated as being like a house within which the states have agreed to live. The living space must be shared without an enlargement of the house being allowed. How much room the individual states shall be able to occupy is a question of appropriate allocation principles.

According to Art. 2 (3) PA 'This agreement [viz. the PA] will be implemented to reflect equity and the principles of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.' Art. 4 (3) PA repeats them adding 'highest possible ambition' when addressing second round nationally determined contributions.<sup>24</sup>

In addition, all or some of these principles are also set out or alluded to in the preamble to the PA as well as in Art. 4 (1), Art. 4 (4), and Art. 4 (19) of the PA. They are flanked by principles concretising needs of developing states, such as eradication of poverty (Art. 4 (1)), the obligation to support their mitigation actions (Art. 4 (5), Art. 9) and the possibility for them to peak their emissions later and go slower (Art. 4 (1) and (6)).

When exploring the binding character of these principles, it should be noted that they are set out in indicative form ("This Agreement will be implemented"). The future tense does not change this. "Will" does not mean "is wished to" but is a promise to do something in future. This means the principles are binding not only in form but also in content. Still, there is no indication of priorities between them leaving room for states to make a choice.

A thread that runs through all of the principles is that they are open for differentiation, designing the responsibility to be 'differentiated', capabilities to be 'respective', and 'national circumstances' to be 'different' (Voigt & Ferreira, 2016). However, the possibility of choice and differentiation does not concede limitless discretion of states. There are two outer limits: first, grandfathering cannot be defended on equity grounds because it one-sidedly privileges those who have early on captured a major slice of the budget (Dooley et al., 2021, p. 302). And second, the community of states must as an entirety respect the set temperature limits. This means, by implication, that the individual state must keep the overall limits in mind when regulating its GHG emissions.<sup>25</sup>

23 <https://climateactiontracker.org/methodology/paris-temperature-goal/>

24 On the tightening of obligations for second round NDC's see Winkler, 2017, p. 148; Voigt & Ferreira, 2016; Nash et al., 2021, p. 1113.

25 It has been argued that because the provision does not mention the contracting parties as addressees



More criteria than those laid out by Art. 2 (3) PA have been suggested but I believe they can be subsumed to the said list. In particular, the right to development which is alluded to in Art. 4 (1), (4)-(6) PA can be regarded as covered by ‘differentiated responsibility’ and ‘respective capabilities’.

### 3. Principles of effort sharing applied

Climate science including the CAT have structured the principles as suggesting two approaches: one based on equity criteria and the other on feasibility of measures. The CAT, together with other authors, calls the equity based approach ‘fair shares’ and the feasibility based one ‘modelled domestic pathways’. I shall treat the two in turn.

#### 3.1 Fair shares

The CAT differentiates the equity criteria into responsibility, capability/need, equality, equal cumulative per capita, and responsibility/capability/need. These criteria can also be staged, moving from less to more ambitious ones. In terms of the PA principles the CAT criteria can be subsumed as follows: equality for equity, responsibility and need for common but differentiated responsibility, and capability for differentiated capabilities. Equal cumulative per capita resorts both to responsibility and equal per capita. Concerning staged approaches each particular stage corresponds to the respective principle.

I will now explain the implications of the individual principles the CAT applies. ‘Equal per capita’ puts pressure on developed states because their population is used to much higher yearly emissions than the population of states with lower living standards. Per capita has been criticised for ignoring ‘the inequalities in people’s needs, their level of development, internal economic stratification and access to other sources of energy’ (Dooley et al., 2021). But this objection cannot succeed. The welfare of people is highly dependent on the availability of energy, and if there are inequalities of the level of development it can be assumed that the poorer citizens aspire to improve their life conditions.

Of course, a major determinant of equal per capita is the time from which it shall count. The more it is located in the past the more emissions allowances will be deducted from the budgets of states, and in particular the industrialised ones (Robiou du Pont, 2023). The CAT indeed factors in past emissions naming the criterion responsibility. In terms of the Paris Agreement, the pertinent principle would be equity and/or common but differentiated responsibility. When identifying an appropriate time of departure, the start of industrialisation in the 19th century has often been referred to. But from a legal perspective, responsibility presupposes that an actor is aware of the damage it causes – which cannot be assumed for the early industrialisation. Taking awareness of a problem as the starting point one should rather choose 1992, the year of conclusion of the UNFCCC when all states agreed that urgent action was needed.

Concerning capability, the CAT interprets this to mean a country’s ability to pay for measures of emissions reduction, the metric being GDP per person.<sup>26</sup> This implies that the higher the GDP is the

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it is not prescriptive (Mayer, 2021; Rajamani & Werksman, 2018). However, the ceiling mirrors the sum of emissions from all contracting parties so that the entirety of parties bears the obligation. This does not hinder the provision to be prescriptive. It just addresses all states that have become contracting parties. In addition, Mayer (Mayer, 2021, p. 569) argues that an obligation holder must be a legal person which is not the case with the PA contracting parties. But, for instance, the civil law partnership is not a legal person and can nevertheless bear obligations which are then obligations of each individual member.

26 Actually, the CAT offers an alternative which is capability/need and capability/costs. In both cases the



more a country is expected to invest in emission reduction. Although this indicator is a rough one it appears to be reasonable in terms of fairness of effort sharing.<sup>27</sup>

'Need' appears to relate to the right to development and is captured by the Human Development Index (HDI) which refers to levels of education, life expectancy and income per capita. While it legitimately works in favour of allowing developing countries a greater share in the emissions budget, it would need to be critically discussed for its incentivising of resource consumption (WWF, 2014).

As the different criteria result in different national budgets, the question arises what criterion should be applied.

National courts such as the German Federal Constitutional Court have chosen present equal per capita which is easy to apply because the global budget must only be divided according to the population size of a country.<sup>28</sup>

In contrast, the CAT proposes that multiple criteria should be applied. The calculation is as follows: for each criterion and for each individual state, the allowable emissions are compiled. This generates ranges of emissions per state with high quantities arising from criteria that are benign for the states, down to low quantities arising from ambitious criteria. Once these so-called fair share ranges of countries are identified, the lowest emissions of all states are summed up as well as the highest emissions of them.<sup>29</sup> This yields a worldwide equity best case scenario and a global equity worst case scenario (Wachsmuth et al., 2019). The impacts of the lowest and highest emissions aggregates on global warming are then evaluated applying the 1.5°C and 2°C limits. This results in three categories: below 1.5°, 1.5° to 2°, and above 2°C.

As it is to be expected that the highest aggregate (or the least effort of all states combined) will reach much beyond 2°C, the entire package needs to be compressed in order to be compliant with the 2° and possibly 1.5°C limits. The reduction percentages necessary to reduce the package are applied equally to each state rather than differentiating according to equity criteria, considering that equity criteria already determined the fair share range of the individual states. The calculation starts at the top end of each state's fair share range and descends along the range until the aggregate over all states reach the emission level that is consistent with a targeted temperature level (Rajamani et al., 2021, p. 16).

As a result of this process, fair share ranges for each country's three temperature categories—<1.5°, 1.5° - 2°, and >2°—are established, with the >2° category further subdivided into <3°, <4°, and >4°C. Each of these six categories corresponds to the temperature outcomes that would result if all other states were to put forward emissions reduction commitments with the same relative position on their respective fair share range, or, in other words, the same ambition level.

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GDP per person of a country is referenced, in the first in absolute terms (the higher it is the more must be invested by a state) and in the second in terms of costs per GDP per person (the higher it is the less a state must invest).

27 On capabilities in terms of feasibility of measures see below.

28 BVerfGE 157, 30 para 225.

29 Be aware that the range of efforts can be based on different allocation principles. For instance, a strong effort with low emissions may be based on responsibility (viz. for past emissions) in a highly industrialised state and on capability in a developing state that disposes of rich renewable energy sources.

This normative profile makes it possible to calculate the emissions quantities or budgets that are available for a state if it wants the world to keep global temperatures below the temperature limits that shall be maintained or risk to be exceeded.

### 3.2 Modelled domestic pathways

While, as said, fair shares are based on equity criteria the overall budget can also be distributed by application of feasibility criteria. This leads to modelled domestic pathways of emissions reduction. In legal terms the modelling of pathways can be based on the principles ‘respective capabilities’ and ‘highest possible ambition’ contained in Arts. 2(3) and 4(3) PA. ‘Respective capabilities’ in the feasibility context mainly relates to technical progress while if the same criterion is applied in the fair share context it is rather concerned with financial means and consequently measured by GDP.<sup>30</sup> “Highest possible ambition” directly addresses the efforts to be taken. Although only related to second round NDCs, it is almost universally applicable because most states have meanwhile submitted first round NDCs (Voigt, 2023, p. 241).

Like fair shares, “modelled domestic pathways” are also prescriptive constructs. They outline the emission reduction strategies that a country is able to implement. Designing pathways at the global and regional levels and scaling them down to individual states are the two steps in the modelling process.

The CAT describes the methodology as follows:

“Scenarios of integrated assessment models (IAM) quantify storylines of future development of the coupled energy-land-economy-climate system and describe the anthropogenic emissions of greenhouse gases across sectors and regions over the twenty-first century. Between feasible transition pathways for a given set of technological, socio-economic and policy assumptions, these models select global least-cost solutions rather than an equitable distribution of burdens.”

The “storylines” are drawn from hundreds of studies that have been collated at the international, regional, and national levels and merged to form global pathways (IPCC AR 4 Full Report, p. 61). The studies show the potential for reducing emissions from the major sectoral sources, including industry, transportation, buildings, agriculture, and waste<sup>31</sup>, as well as from cross-sectoral policies (such as renewable energy) and tools (like regulation, economic incentives, emissions trading; see, for example, IPCC AR 4 WG 3 ch. 11.3). The reduction potentials of five world regions are differentiated based on cost-effectiveness standards.<sup>32</sup> This makes it possible to identify the world regional least cost reduction pathways. The remaining emissions are summed up and categorised according to corresponding warming impacts resulting in five ranges of temperature limits  $<1.5^{\circ}\text{C}$ ,  $1.5^{\circ} - 2^{\circ}\text{C}$ ,  $2^{\circ} - 3^{\circ}\text{C}$ ,  $3^{\circ} - 4^{\circ}\text{C}$ , and  $>4^{\circ}\text{C}$ .

30 Cf above.

31 Due to a lack of accurate data and consensus counting, emissions and absorptions from land use, land use change, and forestry (LULUCF) are not included. See <https://climateactiontracker.org/methodology/land-use-and-forestry/>

32 Cost-effectiveness is calculated by assuming that the cost of a ton of CO<sub>2</sub>eq emissions is the same worldwide (this is known as the marginal price), and then counting the amount of reduction investment a state would make at this price. This naturally indicates that, given a fixed price, nations with abundant sunlight and low wages will produce more renewable energy than nations on the other side. The warming impacts of the remaining emissions are then tallied and evaluated. Temperature ranges are created by raising or lowering the marginal price in accordance with various temperature ceilings are formed.

In order to determine domestic modelled pathways, the world regional least cost scenarios must be downscaled to pathways of individual states. This is done by applying the emission intensity (ratio of emissions to GDP) of the states while taking into account the fact that the ratio will fluctuate over time but is expected to eventually converge.<sup>33</sup>

### 3.3 Comparing fair shares and modelled pathways

As mentioned, modelled pathways are compiled relying on cost effectiveness. This means that industrialised states have lower burdens to bear because climate protection measures will be more costly for them than for developing countries where wages are lower and technology less advanced. This means that for industrialised states the budgets allowable from modelled pathways are larger than those allowable from fair shares. According to the CAT, this so-called fair share gap shall be bridged by transfer payments of industrialised to developing states.<sup>34</sup>

However, there are legal concerns about the cost-effectiveness criterion. It should first of all be noted that this criterion is not explicitly set out by the PA (Rajamani et al., 2021). It does appear in the UNFCCC but only as an aspect qualifying precautionary measures.<sup>35</sup> One would expect that because of its highly consequential nature it would have been listed in the PA as one of the legitimate allocation principles if it was politically welcome. It may have been left out because its core shortcoming is distributional injustice. Cost-effectiveness causes unequal treatment when one state – the ineffective one – is allowed to forgo climate protection measures and another state – the more effective one – is burdened to do more. This may be economically rational but economics must leave room for distributional considerations. In consequence, of course, if modelled pathways were calculated without concern for cost effectiveness, the budgets of industrialised states would significantly be reduced (Rajamani et al., 2021).

## 4. Measuring and evaluating effectiveness

The budgets resulting from fair shares and modelled pathways serve as yardsticks against which the predicted factual emissions are assessed.<sup>36</sup> If the budget that equals the level of acceptable harm is exceeded by the prognosticated factual emissions the CAT labels the performance of a state as insufficient, and highly or even critically insufficient depending on degree of excess.<sup>37</sup> In legal terms the rating as insufficient can be regarded as a violation of the PA temperature limits and effort sharing criteria.

There are certainly different methods how to predict the de facto emissions of a state from now until an assumed reference year, which commonly is the year 2030. The CAT has proposed two parameters, “policies and actions” on the one hand and “domestic targets” on the other.

33 <https://climateactiontracker.org/methodology/cat-rating-methodology/modelled-domestic-pathways/>

34 <https://climateactiontracker.org/methodology/cat-rating-methodology/>

35 See Art. 3 (3) 2nd sentence which reads: “Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost.”

36 <https://climateactiontracker.org/methodology/cat-rating-methodology/>

37 <https://climateactiontracker.org/methodology/cat-rating-methodology/>

#### 4.1 Policies and actions

“Policies and actions” refer to the actual emissions that were computed using a state’s current policies and activities. These are compiled in accordance with historical occurrences as well as projections for the years up to 2030. The parameter is descriptive, meaning it is based on actual measurements or predictions of effects of policies and actions. The main emission sectors are examined, including industry, transportation, buildings, and agriculture/forestry/land use (AFOLU), as well as cross-cutting measures such as renewables and instruments like payments for emissions, regulation, and self-regulation.

The predicted factual emissions are then evaluated with the emissions corresponding to the normative modelled pathway temperature categories. If both of them are consistent, the “policies and actions” are classified as sufficient, and as insufficient the allowable budget is exceeded. Likewise, the predicted emissions can also be evaluated with the emissions corresponding to fair shares.

#### 4.2 Domestic targets

“Domestic targets” is the second descriptor. These are made up of the emission reduction goals a state has established for a future year. The domestic target may also be included in the state’s Nationally Determined Contributions (NDCs) under Article 4 (2) of the Paris Agreement. NDCs are proclaimed either as unconditional or as conditional, conditional in the sense that it is predicated on receiving international financial and technological support. The emissions resulting from the domestic target are then compared to the emissions remaining from modelled pathways, and may also be rated accordingly. They can also be evaluated against the fair share ranges.

## IV. Conclusions: summary and a reform proposal

### 1. Summary

This contribution has demonstrated how the somewhat vague provisions of the FCCC and PA can be concretised by science-based parameters, in particular by:

- global emissions budgets that are derived from the PA warming limits,
- equity based fair shares and feasibility based modelled domestic pathways that are grounded on the effort sharing criteria laid out by the PA, and
- policies and actions as well as domestic targets from which the real emissions of a country are predicted; the emissions can then be evaluated against the budgets corresponding to fair shares and modelled pathways.

This implementation route rests on the premise that given the already present damage from climate change any calculation with budgets can only be understood as management of an emergency reserve, not as distribution of a merited resource.

But even on that premise there are doubts whether the budget approach is indeed an effective tool of treaty implementation. If the available global budget is derived from a ceiling of 2°C with more than 90% likelihood, or of 1.5°C with 50% likelihood, as it should be, there is almost nothing to distribute anymore. If the global budget is assumed to be larger, under any of the allocation principles (excluding grandfathering) the budgets allocated to industrialized states will be tiny and even negative,

demanding timely zero emissions and increased removal of CO<sub>2</sub> from the atmosphere. This is true for both the equity based fair shares and the feasibility based modelled pathways (provided the latter leave out cost-effectiveness).

This situation is discouraging and may lead to an attitude of suspense and endless disputes about uncertainty and evaluations of the budget approach. If related actions are brought to court alleging violations of the treaties, there is a risk that the judges will refuse to take position and defer to state practices. This does not mean that fair share and modelled pathway calculations should not be pursued. They can serve as an urgent warning sign (and – by the way – as grounds for compensation claims for loss and damages).

For these reasons a more realistic approach is submitted that better fits into common court practice. This is the obligation that states must employ best possible means to reduce GHG emissions. The standard will first be discussed as one of regulatory nature (2.1). But possibilities of flexibilisation through financial transfers may also be considered (2.2).

## 2. A reform proposal

### 2.1 'Best possible means' as regulatory concept

'Best possible means' demands that any state must reduce GHG emissions:

- from all source sectors
- to a degree that is technically, economically, socially, geographically and institutionally makeable
- and employing the most effective instruments.

The sectors, evaluative criteria and instruments are about the same the IPCC has employed in many mitigation reports (IPCC AR 4 WG 3 chapters 4-13; IPCC AR 1.5°C Cross Chapter Box 3; IPCC AR 4 Synthesis Full Report ch. 4.3, p. 61).<sup>38</sup> There is a difference of methodology though. The IPCC elaborates reduction potential on the global and regional level and scales this down to national levels. In contrast to this top-down reasoning<sup>39</sup>, the standard 'best possible means' addresses each individual state without immediate calculation of total effects on warming limits. It is a fall-back position, an urgent appeal to states to at least do what they can. As a second step, though, accompanying studies can of course do the addition and inform about overall warming effects.

In some more detail the sectors to be looked at include energy, industry, transport, buildings, agriculture, waste, and, notably, consumers. Land use, land use change and forestry (LULUCF) would also be integrated because for a bottom-up perspective no transnationally agreed counting

38 An early example of bottom-up feasibility is the so-called triptych approach which in the late 1990ies assisted the negotiations in the European Community (EC) on the sharing of the EC reduction target between the Member States (Phylipsen et al., 1998). This approach focussed on three major emission sources: power generation, large industrial energy consumers, and domestic production and consumption. It designed reduction targets for each sector based on their technical and economic potential. The sum of the sectoral and state related pathways finally yielded the overall reduction percentage the EU was able to achieve.

39 To be precise the modelled pathways concept not only uses global scenarios but also national ones. The IPCC calls this a double approach combining top-down and bottom-up scenarios. Still, the national scenarios are integrated into global pathways before being scaled down (IPCC AR 4 SYR Full Report p. 58, fn 21). In contrast, 'best possible means' would take the national studies as such, i.e. as evidence for whether the potentiality of a state was exploited or more can be done.

is necessary; it is sufficient for a state to understand that LULUCF should reduce emissions and enhance removal of GHG gases as far as possible.

The evaluative criteria would need to include more dimensions than the technical and economic components. They would embrace socio-cultural feasibility in order to ensure acceptability for citizens, especially when it comes to sufficiency measures. Geophysical feasibility advises to factor in natural conditions of a state (such as in relation to sun, soil, and water). Institutional feasibility must be respected as, for instance, in relation to powers of governance vis à vis vested interests. Economic feasibility would need to imply a look at transnational relations of a state with a view to avoid what is called the “island effect” of progressive states (Duwe et al., 2019).

Concerning instruments, the usual types must be scrutinized including capping emissions, regulation, emissions pricing, emissions trading, tort liability, financial incentives, voluntary agreements, and information.

Methodologically, the complex investigation will make use of existing physical and societal models and itself result in new modelling. The state of the art of model composition (Gray & Gray, 2017) must of course be respected and legally evaluated.

Interestingly, an approach searching for best possible means was recently adopted by the EU Scientific Advisory Board on Climate Change (SABCC, 2023) which proposed bottom-up feasibility as a complement to fair share reasoning. While the SABCC concentrated on best possible means to promote renewable energy, in the present context more strategies must be included, such as, for instance, concerning energy efficiency and sufficiency. It seems that also the legal scholarship moves towards focussing on bottom-up reasoning (Voigt, 2023).

In legal terms ‘best possible means’ is akin to already existing tools of environmental law, and notably the requirement of best available techniques (BAT). BAT is a standard that combines with environmental quality objectives (EQO) pushing for further emission reduction where EQO shall be underbidden or are based on uncertain dose-response correlations (Meinken, 2011; Krämer, 2016, ch. 8).<sup>40</sup>

Most importantly, the approach may better correspond to court practices. Notably, the ECtHR requires that ‘appropriate investigations and studies’ must be undertaken<sup>41</sup>, ‘using detailed and rigorous data’<sup>42</sup>, that ‘a legislative and administrative framework designed to provide effective deterrence against threats to the right to life’ must be put in place<sup>43</sup> and that the public must be given opportunities to comment.<sup>44</sup> An instructive example of how the ECtHR applies this test is *Cordella v Italy* where the court carefully scrutinizes the search and measures undertaken by the respondent government concluding that they were insufficient.<sup>45</sup>

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40 See the definition of ‘best available technology’ in Art. 2 (10) Directive 2010/75/EU on industrial emissions (OJ L 334, p. 17) which refers to the ‘most effective and advanced state in its development’, the ‘practical suitability’ and the ‘economically and technically suitable conditions’.

41 *Budayeva v. Russia*, appl. no. 11673/02, para 136.

42 *Fadeyeva v. Russia*, appl. no. 55723/00, para 128.

43 *Budayeva v. Russia*, appl. no. 11673/02, para 129.

44 *Taşkın et autres c. Turquie*, appl. no. 46117/99, paras 118-119.

45 *Cordella et autres c Italie*, appl. nos. 54414/13 et 54264/15.

'Best possible means' can also be a standard for national expert commissions when they assess their government's climate policy. For instance, the UK Climate Change Commission (CCC) in its 2022 report found that:

'the Government has made a relatively high-risk choice to rely heavily on technology to reach its targets, with much less focus on efficiency improvements and demand management across the economy. This is a narrow approach that could lead the UK down a more expensive path to Net Zero, with a higher risk of failure and energy insecurity. It also misses the opportunity to maximize on co-benefits to the transition via improvements to health through more comfortable homes, reduced air pollution, healthier diets and more active lifestyles.' (CCC, 2022, p. 79)

The standard 'best possible means' should not be understood as a purely voluntary choice of states. It has a legal basis in 'respective capabilities' of the PA. Beyond that, it would be useful to design a more specific code of appropriate methodology. This could be compiled as an informal agreement of scientists and lawyers, for instance instigated by the IPCC that could draw on its own work with national scenarios. Preferably, binding national climate laws could lay out a prescriptive framework, and even better international agreement that could be set up in the framework of the PA. In addition, court jurisprudence could develop bits and pieces of requirements from experiences made with case constellations. In addition, reporting must be required which is easy to obtain from the bi-annual reports required according to Art. 13 (4) PA.

Once appropriate scenarios for each state have been elaborated and started to be implemented the emissions unavoidably remaining can be summed up as a second step. The resulting global aggregate could then be compared with the budgets corresponding to the temperature limits. If an assumed limit is exceeded and the emissions shall be further reduced, a method must be found how to distribute the reduction among states. A percentage applied to all states would not be fair because privileging those who have not done their homework. Instead, those states which lag behind should be urged to catch up. If the entire community must move forward, no way out is possible but than either to proact or to perish.

## 2.2 Flexibilisation through financial transfers?

It remains to be considered whether 'best possible means' as a regulatory approach should be flexibilised by allowing that emissions reduction quantities can be compensated by financial transfers. There are different schemes of such transfers that should be browsed to find a possibly suitable one. The following five grounds for transfers may be distinguished.

- (1) Compensation for loss and damages: This ground is envisaged in Art. 8 PA and subject to ongoing negotiations, called the Warsaw mechanism, about a legal framework. It however progresses at very slow pace (Johanson et al., 2022; Puig, 2022). It is anyway different from an idea of offsetting reduction activities.
- (2) Development aid: This ground is largely altruistically aiming at enabling public welfare of the receiver country. It does not primarily pursue a specific own interest of the provider state which would be the case with offsets.
- (3) Commons approach: All participating states commit themselves to reach a common goal, such as to limit warming. But some may not be able to afford what is technically appropriate and possible for them. This is the reason for assisting them financially. The commons concept of financial transfers can be found in Art. 6 (8) and Art. 9 PA which oblige industrialized countries to assist developing



countries to fulfil the latter's own PA based reduction obligations. Such finance shall be based on the global stocktake (Art. 9 (6) PA) which is currently being elaborated and shall meet certain enabling conditions (IDDRI, 2023). It is combined with obligations of technology transfer and capacity building (Arts. 10, 11 PA). This ground requires that financial transfers come in addition to the best possible means standard.

(4) Sales of surplus fair shares: This ground is based on the fair share concept. If, for instance, the per capita criterion is applied, states with low per capita emissions may receive more emission allowances than they can make use of for some time. These allowances can be sold to high consumption states which generates revenue that the receiving state can spend for mitigation measures. The concept is a kind of reverse offsetting. What is paid for are non-used emission rights, not emissions reductions.

(5) Cost effectiveness: This type is based on the feasibility of emissions reductions and the fact that the costs of emissions reductions are different in different states. High-cost states are allowed not to invest and thus save money while low-cost states will receive financial support and be able to invest (Höhne & Wachsmuth, 2020, p. 4). As explained this ground is advocated by the CAT as possibility to compensate the gap between reduction requirements for fair shares and modelled pathways. The idea is certainly attractive but the concept needs more stringency in order to prevent that states both on the provider and receiver side use the idea as an excuse for inaction.

The concept has before been practiced as 'Clean Development Mechanism' (CDM) in the framework of the Kyoto Protocol. It reappears in Art. 6 (2) PA as a cooperative setting of individual partners as well as in Art. 6 (4) as a multilateral undertaking. It suggests that financial support for mitigation outcomes in a host state is provided in exchange for the provider state to count the outcome against its NDCs. However, as experiences made with the CDM advise,<sup>46</sup> any offsetting project must be embedded in a reliable framework that needs to be agreed internationally. Such project should only be accepted if the receiving state was not anyway legally required or politically engaged to implement the reduction amount, in other words it must be additional to the law and policy of the receiving state. There must also be standards how to determine the baseline from which reduction amounts are counted, and for how long the envisaged project must endure. Such requirements must be supervised by independent bodies. While in the PA context some progress has been made regarding cooperative arrangements, the framework for a multilateral mechanism foreseen by Art. 6 (4) and (5) PA is still under elaboration. Meanwhile, such requirements could of course be laid down in national legislation and bilateral contracts between provider and receiver states.

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## About the author

**Gerd Winter**, Born 1943. Studies of law and sociology. Since 1973 Professor of Law, University of Bremen. Founder and long-term director of research Center for European Environmental Law (FEU). Since retirement in 2008 Research Professor of Environmental Law. Focus of teaching and research on comparative, European and international environmental law and law implementation. Consultancy of administrative and environmental law development in transition countries. Counsel in various court proceedings about environmental issues, lately in Carvalho et al. v EU and Duarte Agostinho et al. v 32 states.