

3 Secondary obligations due to historical non-compliance with CDD by systemic global North actors?

Following the establishment in the previous parts that a general overarching duty of due diligence applies to climate (Part 1), and that this duty is enforceable before courts (Part 2), this final part (Part 3) undertakes a historical analysis to determine whether “secondary obligations” may arise¹³⁹⁸. When finding breaches of the law, courts can generally award injunctions to return to compliance and prevent damages and further global warming, as this thesis established (see the existence and enforceability of the primary CDD duties discussed in Parts 1 and 2). Alternatively, or additionally, courts could also provide monetary compensation. This part thus examines whether systemic actors from the Global North may incur secondary obligations as a result of historical and ongoing non-compliance with CDD duties.

To know whether “secondary obligations” are due, it is necessary to assess whether the primary obligation of general CDD has i) existed over time, and then ii) has been breached. As scientific knowledge of climate risks and the availability of mitigation techniques (i.e., decarbonisation) have evolved, so too have certainly the requirements of due diligence. This evolution is one of the first challenges to consider when carrying out this compliance assessment. However, this part will only deliver a *prima facie* and *in abstracto* analysis of compliance with CDD, which can only lead to *potential* breach findings. This analysis is interesting for the following reason: Secondary obligations could have significant impacts on mitigation ambition, especially if they are aimed at compensating historical emissions through more stringent future GHG reductions.

A brief methodological clarification is also necessary, including by recalling key features of due diligence set out in the introduction and previous parts.

1398 The term “secondary obligations” is used in international law and refers to the obligations arising after the violation of a primary duty, which can concern cessation and reparation. See, among others: ILC, Draft articles on Responsibility of States for Internationally Wrongful Acts, with commentaries, 2001 (Text adopted by the International Law Commission at its fifty-third session, in 2001, and submitted to the General Assembly as a part of the Commission’s report covering the work of that session (A/56/10).

To assess compliance, Part 3 evaluates whether individual actors have carried out best or reasonable efforts according to the due diligence standard, and the principle of shared responsibility, which both require each actor to contribute its share (see previous parts). The preceding means that individual actors must adequately implement internationally agreed measures, or those deemed necessary to prevent dangerous risks, if scientific, institutional, and political consensual elements mention those, especially if they were labelled as “no-regret” measures (i.e., affordable measures “easy” to implement). The failure to prevent risks adequately could ground breaches of due diligence¹³⁹⁹.

This part also examines whether the “international community” has responded appropriately to the general duty of CDD. Does a collective failure to do so indicate the absence of *individual* liability, given that no single actor can halt global warming alone, or does it rather mean that all countries are potentially responsible for it?

In such cases, some individual actors with higher capacity, such as some Global North actors, may have obstructed climate action and international cooperation for decades and would therefore be particularly responsible for the current situation. While the obligations to cooperate are clearly recognised at the international level for states (the German Constitutional Court has also recognised the relevance of this obligation on the domestic level¹⁴⁰⁰), it seems arguable that private actors have similar obligations to cooperate for effective climate action, or at the very least, not to obstruct it.

Furthermore, even in the context of collective responsibility, the ICJ opinion makes clear that there is a collective need to ensure adequate climate action, and compliance with due diligence obligations over time,

1399 See, for example, the following concurring opinion: Maljean-Dubois S, “The No-Harm Principle as the Foundation of International Climate Law” in *Debating Climate Law* (2021) p 5.

1400 See the consolidating duty to collaborate on the global level in the consolidating climate case law, notably affirmed by the Constitutional Court of Germany (*Bundesverfassungsgericht* in German), *Climate Protection Law*, 1 BvR 2656/18, 24 March 2021, § 200 – 205; See as well, ITLOS, *Advisory Opinion on Climate Change and International Law*, 21 May 2024, § 294 – 321. Other domestic and regional courts have affirmed the duty to contribute domestically to achieving global consensus in order to prevent the obstruction of global cooperation (see, for example, ECtHR, *Klimaseniorinnen v Switzerland*, no. 53600/20, 9 April 2024, § 441 – 444).

notably through the duty to cooperate¹⁴⁰¹. One also cannot exclude the possibility of “creative” legal claims being brought against international organisations that represent the international community, such as the UN, WTO, World Bank, and others.

As previously noted, the preventive obligation within due diligence becomes applicable only once a risk is *foreseeable*, meaning that one cannot expect preventive measures where climate-related harms are not yet conceivable¹⁴⁰². Further, due diligence has a *procedural* dimension as it requires *identifying* risks of harm and corresponding prevention measures by keeping up with the progress of science in a reasonable manner (*procedural* due diligence¹⁴⁰³). This implies a proactive dimension: once a risk becomes commonly identified, or should be known, such as for example the need to limit warming to 1.5°C since 2018, preventive substantive measures must be identified, set out, and implemented. This includes the adoption of concrete mitigation and prevention measures, such as the reduction of the use of fossil fuels, decarbonisation, energy efficiency, etc.

However, before that point, there were more uncertainties. Precise climate-related impacts (or potential harms) were more difficult to identify, alongside precise climate mitigation measures and strategies. Nonetheless, this uncertainty does not necessarily mean that CDD was not applicable. In fact, the precautionary principle, encompassed in due diligence, requires that serious dangers be prevented, even if they are uncertain. In France, courts have considered this principle in an *ex post* manner to some factual elements dating back to the 1960s¹⁴⁰⁴, and the ECtHR also considers the principle when assessing compliance with the Convention¹⁴⁰⁵ (see the ITLOS¹⁴⁰⁶ and the ECtHR¹⁴⁰⁷). Beyond the precautionary principle, judicial bodies can also consider uncertain elements as long as they are plausible. The issue is more whether the uncertainty is too great or not, as SCOTUS

1401 ICJ, *Obligations of States in respect of Climate Change*, Advisory Opinion, 23 July 2025, § 304-305.

1402 See 0.2 of the introduction concerning the definition of due diligence.

1403 *Ibid.*

1404 In France, see: *Distilbène* case law: Cass. 1re civ 7 March 2006 [2 judgments], pourvoi n 04-16.179 et n 04-16.180, Bull. civ I, n 142 et n 143.

1405 See, for instance, ECtHR, *Tatar v Romania*, 67021/01, 6 July 2009, § 120.

1406 ITLOS, *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area*, Advisory Opinion of 1 February 2011, ITLOS Reports 2011, § 131; ITLOS, *Advisory Opinion on Climate Change and International Law*, 21 May 2024, § 242 and § 441 (e).

1407 ECtHR, *Tatar v Romania*, n°67021/01, 6 July 2009, § 120.

laid it out in *Massachusetts*¹⁴⁰⁸ and the German Federal Civil Supreme Court (*Bundesgerichtshof*) in another case¹⁴⁰⁹. Thus, in the face of uncertainty, CDD may still require, from a *procedural* angle, adequate measures, such as further identifying risks or mitigation measures, or even some substantive measures, such as reducing GHGs adequately, etc.

Given these basic requirements of due diligence, this third part begins its analysis after the Second World War period, as there was no widely shared knowledge of global warming prior to that point, meaning that CDD could not have applied before then. However, the gradual development of environmental and climate-related scientific knowledge progressively gave rise to due diligence obligations.

While the early development of climate science took place especially in the US, justifying a focus on this country, Part 3 has a wider scope and assesses Global North actors in general. To make *prima facie* assessments of compliance or non-compliance, this analysis considers the level of availability of climate science over time to determine whether the duty bearers – developed States and multinational corporations – could or should have known these elements, and implemented adequate and reasonable responses. While IPCC reports from 1990 onwards serve as the main references, as they represent the “best available science” according to the UNFCCC and the international community (see the COP findings, which mainly rely on the IPCC), Part 3 may also refer to other authoritative scientific findings.

It should be noted that this part is more speculative than the preceding ones, given the limited or even absence of case law properly addressing historical non-compliance with due diligence. Moreover, the threshold for finding non-compliance remains high, as it requires *in concreto* assessments beyond the *in abstracto* consideration of objective elements. In fact, to establish wrongful conduct, it must be shown that a given individual actor has not made their best or most reasonable efforts, which is a very demanding evidentiary standard.

Hence, methodologically, this part chronologically discusses the main scientific, political and legal evolutions, in order to know whether Global North actors adequately responded to those, by complying with the standard of due diligence. For each significant development that may have occurred annually, this part first presents the factual evidence and then

1408 SCOTUS, *Massachusetts v EPA*, 549 U. S. ____ (2007), p 31.

1409 German Supreme Court (*Bundesgerichtshof*), VI ZR 259/06, 8 July 2008 (NJW 2008, 2846), § 22: “a degree of certainty is sufficient that would silence doubts of a prudent, conscientious and life-experienced assessor”.

analyses whether a due diligence obligation (*procedural* or *substantive*) was triggered and whether a breach occurred, by indicating a “Finding”.

In any case, it is not the task of this thesis to formally determine breaches of the law; this remains the prerogative of courts or policymakers. Rather, this part offers an analysis of the potentialities of such breaches, for scientific purposes.

This Part is structured more precisely as follows:

Subpart 3.1 explores the potential applicability of procedural and substantive CDD from the 1940s onwards, with possible individual breaches beginning in the 1980s, even though neither the IPCC nor any relevant international climate conventions yet existed during this period.

Subpart 3.2 identifies structural shortcomings in both domestic and international policies following the establishment of the IPCC in 1988 and up to the Paris Agreement in 2015. It highlights systemic misalignment with scientific recommendations, resulting in manifest breaches of due diligence.

Subpart 3.3 investigates the period following the adoption of the Paris Agreement. While the Agreement constitutes a landmark in terms of procedural commitments and may have restored collective compliance at the *procedural* level, *substantive* mitigation efforts remain insufficient to meet its targets—thus perpetuating individual and collective breaches of due diligence.

Subpart 3.4 offers concluding reflections on the legal and normative consequences of potential past breaches of CDD.

3.1 1945-1988: The beginning of CDD's applicability and the first potential instances of non-compliance

Section 3.1.1. shows that scientific understanding of climate change and the corresponding risks significantly progressed after World War II, especially in the USA, where it reached the highest level of decision-making in the federal government, the fossil fuel industry and the automotive industry. This early knowledge even spilt over to European industrial actors. A *procedural* dimension of CDD was applicable from the 1960s onwards, at least in the USA and within the fossil fuel industry.

Section 3.1.2 finds that *procedural* CDD became applicable on the international level from 1972, since the Stockholm Declaration recognised due diligence as a fundamental principle and climate change as an issue.

Eventually, section 3.1.3 discusses the first potential CDD breaches, notably by the USA, which, despite its scientific knowledge of global warming

and the need to develop low-carbon alternatives, repealed pre-existing programmes in favour of solar energy. While this thesis did not find enough evidence to find a similar potential breach by another actor, it cannot rule it out either, as it was clear on the international level that emissions had to be controlled (see the recommendation of the international 1985 Villach conference).

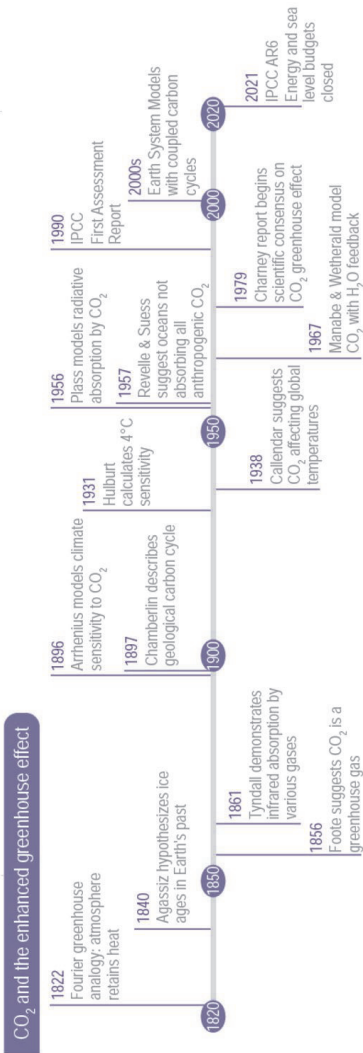
3.1.1 Before 1972: the beginning of CDD's applicability due to early scientific breakthroughs

3.1.1.1 CDD “in the making” until 1959-65

As the chronological chart just below shows, the very first hypothesis on the radiative effect of greenhouse gases stemmed from papers published in the 19th century, whereas the first concrete predictions about the effects of *anthropogenic* GHG (due to coal emissions) on the climate came from 1896 (Arrhenius). More precisely, according to the IPCC:

“Arrhenius (1896) calculated that a doubling of atmospheric CO₂ would produce warming of 5°C–6°C, but in 1900 new measurements seemed to rule out CO₂ as a greenhouse gas due to overlap with the absorption bands of water vapour (Ångström, 1900; Very and Abbe, 1901). Further investigation and more sensitive instruments later overturned Ångström's conclusion (Fowle, 1917; Callendar, 1938). Nonetheless, the major role of CO₂ in the energy balance of the atmosphere was not widely accepted until the 1950s (Callendar, 1949; Plass, 1956, 1961; Manabe and Möller, 1961; Weart, 2008; Edwards, 2010). Revelle and Keeling established CO₂ monitoring stations in Antarctica and Hawaii during the 1957–1958 International Geophysical Year (Revelle and Suess, 1957; Keeling, 1960). These stations have tracked rising atmospheric CO₂ concentrations from 315 ppm in 1958 to 414 ppm in 2020.”¹⁴¹⁰

1410 IPCC, AR6 (2021-23), WG I, Full Report, p 175.



Source: IPCC, AR6, WG I, Full Report, p. 174.

Therefore, there was very early knowledge available on climate change already in the 19th century. However, neither Arrhenius nor other scientists before him (Fourier, Agassiz, Tyndall, Callendar and others) seem to have warned about the risks associated with global warming. On the contrary, some may even have welcomed global warming, such as Arrhenius. Nonetheless, their work was instrumental in advancing climate science.

After World War II, growing concern about smog and air pollution due to automobiles emerged, particularly in California, USA¹⁴¹¹. An industry association, the American Petroleum Institute (API), established “the Smoke and Fumes Committee” to conduct research on air pollution and coordinate with members, including foreign oil and gas majors such as Shell and British Petroleum (BP)¹⁴¹². Given the close ties between air pollution and global warming, the Smoke and Fumes Committee proved to be instrumental in the industry’s private research on climate change, as disclosed documents testify¹⁴¹³.

More generally, the US scientists, the federal government, and the fossil fuel industry played a key role in shaping climate knowledge, policies, and technologies. The US aimed to establish a hegemonic position in economic, technical, and scientific terms after World War II to stay ahead of global economic and geopolitical competition¹⁴¹⁴. Developing the best knowledge in geological and physical sciences was considered necessary to ensure prestige, power, and long-term access to natural resources, as well as to facilitate technological development, all of which were seen as key to reducing the chances of the Cold War escalating¹⁴¹⁵.

In 1955, the USA enacted the first federal legislation on air pollution, which was intended to facilitate further research on this issue (see The Air Pollution Control Act).

Finding: If due diligence was applicable to climate back then, then it could only have been from a procedural angle (i.e. a duty to investigate the risks to people and the environment). If so, the USA complied with this dimension at that time.

In 1956, Plass, a renowned physicist from prestigious US American Universities (Harvard, Princeton) who worked at Ford Automobiles in 1955¹⁴¹⁶, published a study in the American Journal of Physics called “Effect of

1411 Feit S and Muffett C, *A Crack in the Shell: New Documents Expose a Hidden Climate History*, CIEL, April 2018.

1412 *Ibid*, p 6.

1413 *Ibid*, p 4.

1414 Mahrane Y et al, “From Nature to Biosphere: The Political Invention of the Global Environment, 1945–1972”, *Vingtième Siècle. Revue d’histoire* 2012/1 (No 113) p. 127–141.

1415 *Ibid*.

1416 Joselow M, “Exclusive: GM, Ford knew about climate change 50 years ago”, *E&E News*, 26 October 2020.

Carbon Dioxide Variations on Climate”¹⁴¹⁷. According to the IPCC, Plass contributed to the wider scientific acceptance of the role of CO₂ in global warming¹⁴¹⁸. Following an article about the knowledge in the automotive industry, Plass sent a private letter to Callendar in 1956 in which he wrote that: “I do not agree with your remark that there is little danger of the earth becoming too warm from an excess of fuel CO₂”¹⁴¹⁹. This letter shows that the scientific community was already discussing climate-related risks, albeit not publicly.

In addition, the fact that Plass worked at Ford Automobiles led journalists to assume that there may have been early knowledge within the company and perhaps the wider automotive industry, but investigative journalists did not find any internal documentation showing that Plass warned the highest decision-makers within the company.¹⁴²⁰

In 1958, the Smoke and Fumes Committee of the API, led by a Shell Executive Charles Jones, commissioned a study to “determine the amount of carbon of fossil origin” in the atmosphere¹⁴²¹. According to a 2018 research paper published by the environmental NGO CIEL, this “document is the earliest evidence yet unearthed that demonstrates a coordinated industry-wide research program into the accumulation of fossil carbon in the atmosphere and clear evidence that major oil producers, including Shell, were on notice of potential climate risks.”¹⁴²² The researchers also noted the industry’s awareness of the *air pollution* problem resulting from the use of tailpipe emissions¹⁴²³ (in other words, “scope 3 emissions” – a responsibility that the oil and gas industry still disputes today).

1417 Plass G N, “Effect of Carbon Dioxide Variations on Climate”, *American Journal of Physics* 24(5) (1956) pp. 376–387, DOI: 10.1119/1.1934233.

1418 IPCC, AR6 (2021-23), WG I, Full Report, p 175.

1419 Joselow M, “Exclusive: GM, Ford knew about climate change 50 years ago”, *E&E News*, 26 October 2020, quoting “Plass also corresponded with the prominent English climate scientist Guy Stewart Callendar, according to a series of letters included in the 2009 book ‘The Callendar Effect’ by the historian James Rodger Fleming”.

1420 *Ibid.*

1421 Feit S and Muffett C, *A Crack in the Shell: New Documents Expose a Hidden Climate History*, CIEL, April 2018 p 4.

1422 *Ibid.*

1423 The petroleum industry supplies the fuel used by the automobile, and thus has an interest in the solution to the problem of pollution from automobile exhaust. The stated objective of the Smoke and Fumes Committee of the American Petroleum Institute is to “determine the causes and methods of control of objectionable

In 1959, Edward Teller – a former nuclear scientist – urged the API to find *additional* energy sources to *supplement* fossil fuels due to (i) depleting fossil fuel reserves, and (ii) the risk of sea-level rise due to global warming-related risks¹⁴²⁴. Moreover, Teller described the causal link between the use of fossil fuels and CO₂ and the climate-related risk of sea-level rise:

“Ladies and gentlemen, I am to talk to you about energy in the future. I will start by telling you why I believe that the energy resources of the past must be *supplemented*. First of all, these energy resources will run short as we use more and more of the fossil fuels. [...] Carbon dioxide has a strange property. It transmits visible light but it absorbs the infrared radiation which is emitted from the earth. Its presence in the atmosphere causes a greenhouse effect [...] It has been calculated that a temperature rise corresponding to a 10 per cent increase in carbon dioxide will be sufficient to melt the icecap and submerge New York. All the coastal cities would be covered, and since a considerable percentage of the human race lives in coastal regions, I think that this chemical contamination is more serious than most people tend to believe.”¹⁴²⁵

Finding: The lecture by Teller did not ground a *substantive* duty to mitigate warming. Nonetheless, it still provided a compelling reason for the API and its members to further investigate the issue.

In 1962, the US National Academy of Sciences published a report drafted by Marion King Hubbert, a prominent geologist and geophysicist, Chief Geology Consultant at Shell. Although his report also addressed climate change according to a CIEL publication¹⁴²⁶, Hubbert insisted more particularly on the rapid depletion of fossil fuels. Actually, Hubbert remains well-known today for having democratised the “peak oil theory”, following which oil production will be curbed either way due to its depletion. He notably foresaw that the USA (and the world) would experience a global oil and gas supply crisis in the 1970s, a prediction that would prove to be

atmospheric pollution resulting from the production, manufacture, transportation, sale, and use of petroleum and its products.

1424 Franta B, “On its 100th birthday in 1959, Edward Teller warned the oil industry about global warming”, *The Guardian*, 2018.

1425 *Ibid.*

1426 I cannot access the 1962 report myself, but the following paper addresses its contents: Steven Feit and Carroll Muffett, A Crack in the Shell, New Documents Expose a Hidden Climate History, CIEL, April 2018, p 4.

accurate¹⁴²⁷. His work led the oil and gas industry to focus increasingly on so-called non-conventional oil and gas reserves (such as heavy oil, oil sands, deepwater reserves, shale oil and gas)¹⁴²⁸. Nonetheless, Hubbert wrote in 1962 that:

“There is evidence that the greatly increasing use of the fossil fuels, whose material contents after combustion are principally H₂O and CO₂, is seriously contaminating the earth's atmosphere with CO₂. Analyses indicate that the CO₂ content of the atmosphere since 1900 has increased 10 per cent. Since CO₂ absorbs long-wavelength radiation, it is possible that this is already producing a secular climatic change in the direction of higher average temperatures. This could have profound effects both on the weather and on the ecological balances. [...]

In view of the dangers of atmospheric contamination by both the waste gases of the fossil fuels and the radioactive contaminants from nuclear power plants, Professor Hutchinson urges serious consideration of the maximum utilization of solar energy.”¹⁴²⁹

Finding: One may argue that this 1962 report contained all the ingredients to ground the application of substantive CDD over time (i.e. recognition of the “dangers” of CO₂ and fossil fuels, causal chain, and the recommendation to *consider* using solar energy as an alternative). However, as this report did not specifically address climate change, but rather the depletion of energy Resources in general (i.e. the “peak oil theory”), and given that it was not directly distributed to the government or industrial actors (still published by the US National Academy of Sciences), this report did not suffice to render *substantive* CDD applicable. In any case, this report certainly contributed to the increasing line of evidence on climate change, ultimately demonstrating a need to investigate the topic (i.e. potential *procedural* CDD applicability).

In 1963, the US Congress passed the first version of the Clean Air Act (CAA), an important piece of legislation in the USA, which introduced a

1427 Narváez A, “M. King Hubbert, 86, Geologist; Research Changed Oil Production”, *New York Times*, 17 October 1989.

1428 *Ibid.*

1429 Hubbert MK, “Energy Resources: A Report to the Committee on Natural Resources of the National Academy of Sciences – National Research Council”, United States, N.p., 1962.

national programme to address air pollution¹⁴³⁰. Congress enacted amendments in 1970, 1977, and 1990 to introduce emission standards, controls, and enforcement mechanisms for stationary and mobile sources, implemented by the Environmental Protection Agency (EPA), the federal agency working under this Act. During that time, the EPA also issued numerous scientific reports on climate change (see below). However, it is only after the 2007 Supreme Court ruling in *Massachusetts v EPA* that the EPA attempted to regulate specifically GHG emissions, with limited success due to the political rollback under the two Trump administrations. Nonetheless, before the judgement, the EPA's standards for stationary sources and fuel economy standards for mobile sources still affected and reduced GHG emissions.

Finding: The enactment of the Clean Air Act (CAA) enabled the USA to achieve further compliance with *procedural* CDD by 1963, as it laid the groundwork for additional relevant studies on climate change, and the regulation of emissions, initially air pollutants, but later on GHG emissions as well.

3.1.1.2 Procedural CDD applicability from 1965 onwards, especially in the USA

In 1965, the Science Advisory Committee of the White House (US President) issued a report in which it also addressed climate change. The scientific team responsible for the section “Atmospheric Carbon Dioxide” was led by Roger¹⁴³¹ as Chairman, and Charles D. Keeling¹⁴³², two scientists referenced by the IPCC reports on the evolution of climate science. In

1430 EPA, Evolution of the Clean Air Act, 2024, [https://www.epa.gov/clean-air-act-overview/evolution-clean-air-act#:~:text=The%20enactment%20of%20the%20Clean,industrial\)%20sources%20and%20mobile%20sources](https://www.epa.gov/clean-air-act-overview/evolution-clean-air-act#:~:text=The%20enactment%20of%20the%20Clean,industrial)%20sources%20and%20mobile%20sources), last accessed 20 October 2025.

1431 Roger Revelle established measurement stations of CO₂ emissions in the Antarctica and rightfully described that humanity is conducting a “large scale geophysical experiment”.

1432 Charles D. Keeling established measurement stations at Hawaii and therefore gave birth to the “Keeling Curve”, showing the incremental increase of CO₂ concentration in particles per million (ppm); considered nowadays as one of the most important scientific data set of the 20th century according to the climatologist and physicist Prof. Dr. Wahner (Patra P, “40 Years Ago: First World Climate Conference, Questions to Prof. Dr. Andreas Wahner”, *Forschungszentrum Jülich*, 2022).

the main part of their study, the experts concluded that climate change is occurring:

“Carbon Dioxide is being added to the earth’s atmosphere by the burning of coal, oil, and natural gas at the rate of 6 billion tons a year. By the year 2000 there will be about 25% more CO₂ in our atmosphere than at present. This will modify the heat balance of the atmosphere to such an extent that marked changes in climate, not controllable though local or even national efforts, could occur.”¹⁴³³

One year later, in 1966, the US President Lyndon B. Johnson addressed climate change before the US Congress: “[t]his generation has altered the composition of the atmosphere on a global scale through [...] a steady increase in carbon dioxide from the burning of fossil fuels.”¹⁴³⁴

Some legal complaints filed in the USA against the US federal government and private corporate groups cite this 1965 report to showcase a turning point¹⁴³⁵ and the beginning of wrongful conduct. However, after re-examining this report, it does not seem that it supports *substantive* CDD breaches. The report recognises that “[t]he automobile is our most rapidly growing cause of many and diverse pollution problems”¹⁴³⁶. It subsequently recommends the introduction of a proportionate tax for general pollution problems, which manifestly encompasses all kinds of pollution, particularly air pollution but also CO₂ pollutants, if “appropriate and effective” (two core ingredients of due diligence)¹⁴³⁷. In other words, it recommended implementing policies that impose CDD or similar measures to require relevant actors to do their part. It seems that the US federal government has complied with this recommendation, as it adopted the Motor Vehicle Air Pollution Control Act of 1965, which amended the aforementioned Clean Air Act (CAA) of 1963 and introduced mandatory tailpipe emission regulations.

1433 President’s Science Advisory Committee, “Restoring the Quality of Our Environment: Report of the Environmental Pollution Panel”, November 1965, p 9.

1434 Frank Adam, “The Forgotten History of Climate-Change Science”, *NPR*, 13 May 2014.

1435 See *San Mateo v Chevron et al*, complaint, Case n°17CIV03222, July 2017, § 2; *Juliana v USA*, Case No.: 6:15-cv-01517-TC, 09 October 2015, § 2; Speth G, “Declaration of James Gustave Speth in Support of Plaintiffs’ Response in Opposition to Defendants’ Motion for Summary Judgment”, *Juliana v USA*, Case 6:15-cv-01517-TC, Document 298, 28 June 2018.

1436 President’s Science Advisory Committee, “Restoring the Quality [...]”, *op cit*, p 16.

1437 *Ibid*, p 17.

Regarding CO₂ issues specifically, the synthesis of the 1965 report noted that there may be technical and technological measures to “counteract” the CO₂ effects, “by deliberately modifying other processes that affect climate may then be very important”¹⁴³⁸. These measures are now known as “geoengineering techniques” and basically consist of injecting particles into the atmosphere to cool down the global climate, and they are highly controversial due to their significant risks and uncertainties involved with their introduction¹⁴³⁹. In the same vein, the full report, which assessed climate change more specifically, acknowledged the relative causal certainty of the CO₂ effect on planetary warming and, for the first time, the “deleterious” and “significant” climate-related risks such as sea-level rise¹⁴⁴⁰. However, it also explicitly stated that technical countermeasures need to be explored, such as increasing the albedo¹⁴⁴¹ reflectivity and/or “spreading very small reflecting particles”¹⁴⁴², nowadays defined as aerosols. The “best available science” recently confirmed that both albedo and aerosols have a global cooling effect, although it is clear that the warming effect of GHG is more potent¹⁴⁴³.

1438 *Ibid*, p 9.

1439 IPCC, AR5 (2014), SYR, SPM, p 26: geoengineering techniques “entail numerous uncertainties, side effects, risks and shortcomings and has particular governance and ethical implications. SRM [Solar Radiation Management, in other words, geoengineering techniques] would not reduce ocean acidification. If it were terminated, there is high confidence that surface temperatures would rise very rapidly impacting ecosystems susceptible to rapid rates of change.”

1440 President’s Science Advisory Committee, “Restoring the Quality [...]”, *op cit*, p 123 – 127.

1441 According to the IPCC Glossary of SRI.5, 2018, the term albedo means “The fraction of solar radiation reflected by a surface or object, often expressed as a percentage. Snow-covered surfaces have a high albedo, the surface albedo of soils ranges from high to low, and vegetation-covered surfaces and the oceans have a low albedo. The Earth’s planetary albedo changes mainly through varying cloudiness and changes in snow, ice, leaf area and land cover.” (SRI.5, Annex I: Glossary, p 542).

1442 President’s Science Advisory Committee, “Restoring the Quality [...]”, *op cit*, p 127.

1443 The first IPCC report summarised the cooling effect of both albedo and aerosols as follows (IPCC, ARI (1990), WGI, SPM, p 15): “A change in the albedo (reflectivity) of the land, brought about by desertification or deforestation affects the amount of solar energy absorbed at the Earth’s surface. Human-made aerosols, from sulphur emitted largely in fossil fuel combustion can modify clouds and this may act to lower temperatures.” See also IPCC, AR6 (2021-23), SYR, SPM, 2023, § A.1.2: “A.1.2 The *likely* range of total human-caused global surface temperature increase from 1850–1900 to 2010–2019 is 0.8°C–1.3°C, with a best estimate of 1.07°C. Over this period, it is *likely* that well-mixed greenhouse C8, gases (GHGs) con-

In any case, the 1965 report mainly suggested that the CO₂ issue should have been further investigated, including technical fixes. Additionally, the report recommended the establishment of systematic measurements of CO₂ concentrations in the atmosphere¹⁴⁴⁴.

Findings: The 1965 study certainly triggered the applicability of CDD from this point in time, but only from a procedural angle. Said differently, the recognition of the climate-related risks required further measures to *investigate* the CO₂ problem, in other words, to exercise *procedural* CDD. Since the USA issued this report, it appeared that the USA had complied with *procedural* CDD.

Further, even if one were to argue that *substantive* CDD was already applicable, given that the report also recommended enacting measures to tackle wide-ranging pollution, it should be noted that the USA implemented measures to reduce air pollution in the automotive sector. In any case, it seems difficult to accept that this study supported the applicability of *substantive* CDD, as it only showed first results on climate science, including by highlighting key uncertainties, which were too significant to infer the need at this point to reduce emissions.

3.1.1.3 No evident CDD duty to manufacture electric vehicles by 1967

As early as 1967, the US Congress was asking whether electric vehicles could be a viable alternative given the air pollution issues associated with combustion cars¹⁴⁴⁵, a concern also raised by US President Lyndon Johnson¹⁴⁴⁶. In its response, the former Chairman of the API told the US Congress that electric cars would not be better than the existing combustion cars since their emissions would be “controlled”:

tributed a warming of 1.0°C–2.0°C and other human drivers (principally aerosols) contributed a cooling of 0.0°C–0.8°C, natural (solar and volcanic) drivers changed global surface temperature by –0.1°C to +0.1°C, and internal variability changed it by –0.2°C to +0.2°C.”

1444 President’s Science Advisory Committee, “Restoring the Quality [...]”, *op cit*, p 25 – 26.

1445 It seems that Congress asked this question to assess the need to fix the air pollution issue, but not the climate problem: see Franta B, “On its 100th birthday in 1959, Edward Teller warned the oil industry about global warming”, *The Guardian*, 2018.

1446 President Johnson, “State of the Union Address: President Lyndon B. Johnson’s Natural Beauty Message”, 1965, <http://acsc.lib.udel.edu/items/show/292>, last accessed 19 October 2025.

“We in the petroleum industry are convinced that by the time a practical electric car can be mass-produced and marketed, it will not enjoy any meaningful advantage from an air pollution standpoint. Emissions from internal-combustion engines will have long since been controlled.”¹⁴⁴⁷

Current scientific knowledge shows that the API 1967 statement is clearly wrong. Electric cars are necessary since combustion engines still emit today (in 2025) far too many air and climate pollutants. No technology is being discussed that could fix the problems with combustion cars; instead, electric vehicles need to replace combustion engines to decarbonize the transport sector and achieve the Paris LTTG, according to the IPCC¹⁴⁴⁸. The IEA specifically found in its successive reports since 2021 that its 1.5°C scenario called “Net Zero Emissions” (NZE) models the end of the sale of combustion cars by 2035¹⁴⁴⁹. Electrification has two advantages: Firstly, the efficiency of electric cars is “three times higher than that of a gasoline car” as recognised by the IEA¹⁴⁵⁰ and the IPCC¹⁴⁵¹. Secondly, the electricity mix (powering e-vehicles) can be CO₂-free by using renewables or other zero-carbon energies, such as nuclear energy and so-called “*abated fossil fuel*” power plants¹⁴⁵².

However, the fact that the API was wrong in 1967 may not be enough to argue a potential CDD breach that began back then. It is rather necessary to prove that the industry knew that it was not possible to sufficiently reduce emissions from combustion cars. On the contrary, one may argue that the state of the technology and the rate of technical progress at that time were so significant that it could have led engineers and other experts to believe that it was possible to fix air pollution and climate issues. As Zahar recalled in a paper on historical responsibility, engineers managed to make steam engines approximately 15 times more fuel efficient in the space of a

1447 Franta B, “On its 100th birthday in 1959, Edward Teller warned the oil industry about global warming”, *The Guardian*, 2018.

1448 IPCC, AR6 (2021-23), WG III, SPM, § C.8.

1449 IEA, WEO 2022, p 123.

1450 *Ibid*, p 130.

1451 IPCC, AR6 (2021-23), WG III, TS, Box TS.9 p 92: “Electricity is a versatile energy carrier, with much higher end-use efficiencies than fuels, and it can be used directly to avoid conversion losses.”

1452 “Abated fossil fuel” means the use of fossil fuels with certain technologies such as “carbon capture and sequestration” (CCS) to reduce GHG emissions (IPCC, AR6 (2021-23), WG III, SPM, Footnote 55).

century (1750–1850)¹⁴⁵³. In addition, the invention of internal combustion engines in the 19th and early 20th century led to further improvements in fuel efficiency¹⁴⁵⁴. One may have had the wrong (but not wrongful) belief that fuel efficiency was steadily improvable, or that every environmental nuisance would have a technical solution. In light of this technical progress, it is not unplausible that the API leader could have argued in good faith in 1967 that emissions could be brought under control.

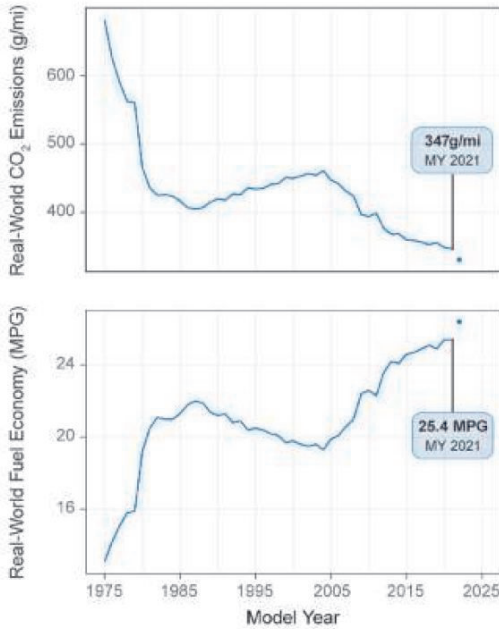
One could even argue that the recent history of automotive fuel efficiency also confirmed the industry's ability to make significant progress. In the USA, between 1975 and 2020, the fuel economy doubled, meaning that CO₂ emissions of *individual* cars fell by 50%, as the graphs below show, while automotive vehicles became, on average, significantly more powerful (i.e., more horsepower)¹⁴⁵⁵.

1453 Zahar A, “Two Arguments Against Historical Responsibility for Climate Change”, 2021 p 13 – 14.

1454 Zhibin Wang et al, “The Development Trend of Internal Combustion Engine”, *Journal of Physics: Conference Series* 1626 012139 (2020) (International Conference on Electrical Automation and Mechanical Engineering).

1455 CO₂ emissions halved for the period 1975 – 2020 according too the EPA, see <https://www.epa.gov/automotive-trends/highlights-automotive-trends-report>, last accessed 27 October 2025.

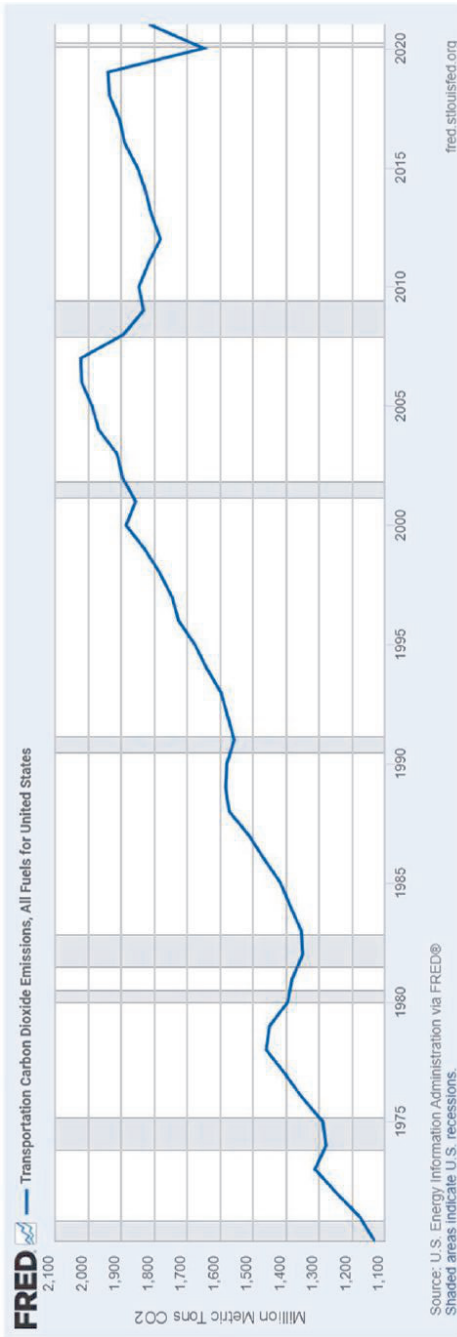
Figure ES-1. Estimated Real-World Fuel Economy and CO₂ Emissions



Source: US EPA, “Highlights of the Automotive Trends Report”, 25 November 2024: <https://www.epa.gov/automotive-trends/highlights-automotive-trends-report>, last accessed 27 October 2025.

However, although emissions from individual cars fell significantly between 1975 and 1990, emissions from the entire US transportation sector rose again significantly thereafter, as the graph below shows. This increase in sectoral emissions is due to the fact that combustion cars are now made more widely available.

3.1 1945-1988: The beginning of CDD's applicability



Source: GHG emissions from transportation sector in the USA, U. US Energy Information Administration, “Transportation Carbon Dioxide Emissions, All Fuels for United States [EMISSCO2TOTVTCOUSA]”; retrieved from FRED, Federal Reserve Bank of St. Louis, 27 October 2023.

Hence, industrial activities and products expanded significantly, especially with globalisation. One might now question whether the industry could have foreseen that the fuel efficiency gains would not have been sufficient. Although selling more products, including in other countries, was certainly an objective of industrial actors to maximise profits, it is unclear whether the industry knew that higher fuel efficiency performance standards would not be sufficient to compensate for the growth in sales of automobiles. In the same vein, while the issue of air pollution was foreseeable, it is less clear whether the automotive industry could have anticipated its contribution to global warming. Further investigation is needed since no public evidence seems to exist in this regard.

Finding: At this juncture, the available evidence does not permit the identification of a violation of CDD either. The air pollution issue required the private industry to devise less polluting cars, but it did not seem to require a switch to electric vehicles.

3.1.1.4 No CDD breach either from 1968 onwards

In 1968, the aforementioned American Petroleum Institute (API) commissioned an internal report on global warming from the Stanford Research Institute (SRI). The API shared the results with all its members, including large oil and gas companies such as Exxon, BP, Shell, Total etc. The summary of the chapter “Carbon dioxide in the Atmosphere” of the SRI report states:

“In summary, Revelle makes the point that man is now engaged in a vast geophysical experiment with his environment, the earth. Significant temperature changes are almost certain to occur by the year 2000, and these could bring about climatic changes. [...] The argument has been made that the large scale cooling trend observed in the northern hemisphere since about 1955 is due to the disturbance of the radiation balance by fine particles and that this effect has already reversed any warming trend due to CO₂ [...]. there seems to be no doubt that the damage to our environment could be severe. [...] It is clear that we are unsure as to what our long-lived pollutants are doing to our environment; however, there seems to be no doubt that the warming theory as described in detail by Revelle and others or the potential damage to our environment could be severe. Whether one chooses newer cooling prospect indicated by

McCormick and Ludwig, the prospect for the future must be of serious concern.”¹⁴⁵⁶

As the underlined passages in the quote show, this internal study once again considered the cooling effect of aerosols (i.e. fine particles). Although the “best available science” nowadays confirms that the global cooling effect of aerosols is less strong than that of GHG¹⁴⁵⁷, the state of the science was not able to reach that conclusion in 1968, as the SRI study shows. More generally, the IPCC’s 2021 AR6 section on the evolution of climatology confirms that the effect of aerosols was not well understood at that time¹⁴⁵⁸. Nevertheless, the SRI report regarding the “research needs identified the need to find “systems in which CO₂ emissions would be brought under control”¹⁴⁵⁹.

Finding: This study may have made *procedural* CDD applicable since it identified CO₂ as a *potential* “cause of serious world-wide environmental changes” that could severely disrupt the environment. Even though the study noted the potential cooling effect of aerosols, it still highlighted that the consequences may be severe either way, whether global cooling or warming. It also recommended that the industry devise systemic measures to bring CO₂ emissions under control. Hence, there is no doubt that this study, which was accessible to oil and gas companies’ members of the API, should have prompted the industry to start investigating and tackling the climate issue (in short: to exercise *procedural* CDD).

In 1970, the Congress of the USA passed the 1970 Clean Air Act Amendments, which was a “significant turning point” in the control of pollution from both stationary and mobile sources¹⁴⁶⁰. Since then, the EPA has requested that automotive manufacturers substantially reduce carbon monoxide and nitrogen oxide emissions by 90% between 1976 and 1970¹⁴⁶¹. These mandates improved the combustion processes and fuel efficiency of

1456 Robinson E and Robbins R C, “Sources, Abundance, and Fate of Gaseous Atmospheric Pollutants”, Stanford Research Institute, February 1968, pp. 109–110.

1457 IPCC, AR6 (2021-23), SYR, SPM, 2023, § A.1.2 (*op cit*).

1458 IPCC, AR6 (2021-23), WG I, Chapter I, p 179 – 180.

1459 Robinson E and Robbins R C, “Sources, Abundance, and Fate of Gaseous Atmospheric Pollutants”, Stanford Research Institute, February 1968, p 112.

1460 Rogers P G, “EPA History: The Clean Air Act of 1970”, *EPA Journal*, January/February 1990.

1461 US EPA, “Hearings Set on Automobile Pollution Control”, Press Release, 4 March 1971 <https://www.epa.gov/archive/epa/aboutepa/hearings-set-automobile-pollution-control.html>, last accessed 27 October 2025.

automotive vehicles, incidentally reducing CO₂ emissions (see the chart above regarding the substantial reduction in CO₂ emission from individual vehicles¹⁴⁶²).

Finding: By introducing the Clean Air Act Amendments, the USA seemingly also complied with substantive CDD, although its aim was not to tackle CO₂ emissions. As shown above in the 1967 discussion, there is not enough evidence to hold either the USA or corporate groups (carmakers or oil producers) accountable for failing to mandate the production of electric car vehicles, since there may have been a genuine belief that the pollution was controllable through combustion cars. The drastic CO₂ emissions reductions between 1975 and 1985 (which almost halved) show, in any case, the efficiency of these first regulations.

In 1971, the French oil company Total (now TotalEnergies) published an article on the scientific knowledge of climate change in its company magazine “Total information”, which showed that advances in climate science even reached companies from “non-English speaking” countries¹⁴⁶³. Since Total was a public company, one may reasonably infer that the French State manifestly also knew about climate change. At least, the government official journal published articles on anthropogenic climate change in 1970 and 1972 in a French official journal by the government¹⁴⁶⁴. The French Ministry for the Environment was established in 1971¹⁴⁶⁵.

This piece predicted correctly that the CO₂ concentration would reach 400 ppm (parts per million) around 2010; consequently leading to 1 – 1,5°C of warming (which is correct) and to “catastrophic consequences”:

“Since the 19th century, humans have been burning increasing amounts of fossil fuels. [...] The overall amount of carbon dioxide present in the atmosphere, therefore, has increased significantly. [...] The increase has been around 15% over the last 150 years, which is not negligible. And [...] if the consumption of coal and oil keeps the same rhythm in the years to come, the concentration of carbon dioxide will reach 400 parts per million around 2010 [...]. This increase in concentration

1462 US EPA, “Highlights of the Automotive Trends Report”, 25 November 2024, <https://www.epa.gov/automotive-trends/highlights-automotive-trends-report>, last accessed 27 October 2025.

1463 Bonneuil C, Choquet P-L, Franta B, “Early warnings and emerging accountability: Total’s responses to global warming, 1971–2021”, *Global Environmental Change* 71 (2021).

1464 *Ibid*, p 2.

1465 *Ibid*.

is quite worrying [...] It is possible, therefore, that an increase in the average temperature of the atmosphere is to be feared. The calculated orders of magnitude are obviously small (from 1—1.5°C) but could have important impacts. Atmospheric circulation could be modified, and it is not impossible, according to some, to foresee at least a partial melting of the polar ice caps, which would certainly result in significant sea level rise. The catastrophic consequences are easy to imagine.”¹⁴⁶⁶

In addition to this piece, Total and other petroleum producers subsequently published a paper highlighting the significant uncertainties surrounding global warming due to the cooling effect of aerosols and albedo¹⁴⁶⁷. However, this public position reflected the scientific position back then, as notably evidenced by the 1965 study and related commentary above¹⁴⁶⁸.

Finding: The state of scientific research in 1968, to which Total also contributed, should have led to further research into carbon emissions and low-carbon energies¹⁴⁶⁹ (in short: *procedural* CDD). However, at this point in time, this thesis cannot assert any breach of CDD, since Total's publications were in line with the former state of science¹⁴⁷⁰.

Intermediate conclusion: A range of climate legal actions in the USA argued that global warming was foreseeable, and that the knowledge was sufficient to trigger liability. The German Appeals Court of Hamm also recently made this bold point succinctly in an *obiter dictum* in the RWE case, although it dismissed the case for evidentiary reasons¹⁴⁷¹. However,

1466 *Ibid*, p 2 (Translation provided by Christophe Bonneuil et al of Durand-Dastès, La pollution atmosphérique et le climat, Total Information 47, p 18).

1467 *Ibid*, p 4 (quoting : Union des Chambres Syndicales de l'Industrie du Pétrole (UCSIP), 1971, p 24–25).

1468 President's Science Advisory Committee, “Restoring the Quality [...]”, *op cit*, p 9.

1469 See the discussion in: IPCC, AR6 (2021-23), WG III, Chapter 13, p 1376, and Chapter 16, p 1649; Robinson E and Robbins R C, “Sources, Abundance, and Fate of Gaseous Atmospheric Pollutants”, Stanford Research Institute, February 1968, p 112.

1470 Nonetheless, Total *may* have breached its CDD two decades later as the Bonneuil et al paper on Total suggests, since the company invested in coal after the OPEC crisis, ignored the scientific evolution in 1970's-80's, until it coordinated with other oil and gas actors to delay climate mitigation policies between 1987-96 (see Bonneuil C, Choquet P-L, Franta B, “Early warnings and emerging accountability: Total's responses to global warming, 1971–2021”, *Global Environmental Change* 71 (2021).

1471 Court of Appeal of Hamm, *Saül Luciano Lliuya v RWE*, Az. 5 U 15/17, 28 May 2025, p 49. In this case, the court argued that global warming was foreseeable for a fossil fuel company such as RWE. However, it did not discuss this point in detail and

according to this doctoral dissertation, neither a violation of CDD was discernible at that moment, nor a *substantive* obligation to reduce GHGs¹⁴⁷², due to the following scientific uncertainties regarding:

- the chain of causation, due to the cooling effect of albedo and aerosols;
- the detrimental climate-related effects and their severity beyond sea-level rise;
- the appropriate climate-related measures required. Geo-engineering measures were discussed in the 1965 report as a way to “counteract” global warming. However, there was no consensus on the need to reduce individual sources of emissions in order to mitigate global warming. And even if there had been one, it was unclear what would have been required. For example, fuel efficiency measures were legitimately considered appropriate to tackle air pollution instead of electric vehicles.

Thus, this thesis comes to a different conclusion than the US plaintiffs and the RWE decision: CDD was only applicable procedurally from that moment in time, meaning that it was necessary to investigate further climate-related risks and identify potential GHG reduction measures.

omitted to address the scientific evidence on the uncertainty of global warming in particular. The Court then asserted that the adoption of the UNFCCC made global warming objectively foreseeable.

1472 In fact, plaintiffs in the *Juliana v USA* case claimed that the USA breached its constitutional duties from 1965 onwards, including the substantive due process clause of the fifth and fourteenth amendment (rights to life, liberty, and property), similar to due diligence. Additionally, thirteen legal actions against oil and gas producers by municipalities make this claim, by relying on US state tort law, legal bases used against companies, such as negligence, public nuisance, failure to warn; see Setzer J and Byrnes, *Global trends in climate change litigation: 2020 snapshot*, 2020, p 20; to see a specific complaint, see, for instance, the full complaint filed by the city of San Mateo against a range of defendants (https://climatecasechart.com/wp-content/uploads/case-documents/2017/20170717_docket-C17-01227_complaint.pdf, last accessed 28 October 2025).

3.1.2 The 1972 Stockholm Declaration: international procedural CDD's applicability

3.1.2.1 The Stockholm recognition of environmental due diligence and climate change as an issue

The Stockholm Declaration, issued at the 21st plenary meeting on 16 June 1972 of the United Nations Conference on the Human Environment, has set the stage for international environmental law.

The reasons why the global environment received international attention at that time were: (i) the scientific recognition of new global ecological issues; (ii) the obvious need to ensure the habitability of the Earth, particularly for humans; and (iii) the fact that the development of international environmental law helped ease Cold War tensions (known as “*détente*”), similar to space research¹⁴⁷³. In other words, the Stockholm Conference marked the beginning of modern global environmental protection, shifting the focus from “[n]ature preservation” to global “[b]iosphere consideration” to ensure that the global environment is not overly imbalanced and that resources will be available in the long term (“overshoot day”), and to address issues such as overpopulation, overfishing and the pollution of soils, water and air¹⁴⁷⁴.

According to some historians, the conceptualisation of the global environment was previously pioneered by some prominent US authors who were mainly concerned with resource depletion and overpopulation. These authors also introduced the term “Anthropocene” to compare the impact of humans on Earth with a geological period that normally has a much longer timeframe¹⁴⁷⁵.

The Stockholm declaration has laid the ground principles of international environmental law:

- The right of mankind to live in a sustainable environment and the duty to protect it: “[m]an has the fundamental right to freedom, equality and adequate conditions of life in an environment of a quality that permits

1473 Mahrane Y et al, “From Nature to Biosphere: The Political Invention of the Global Environment, 1945–1972”, *Vingtième Siècle. Revue d'histoire* 2012/1 (No 113) p. 127–141.

1474 *Ibid.*

1475 *Ibid.*, p III: “Fairfield Osborn, *Our Plundered Planet* (Boston: Little Brown, 1948); William Vogt, *Road to Survival* (New York: Sloane Associates, 1948).”

a life of dignity and well-being, and he bears a solemn responsibility to protect and *improve* the environment for present and future generations.” More precisely, the Declaration recognises the need to “ensure that serious or irreversible damage is not inflicted upon *ecosystems*”¹⁴⁷⁶.

- The recognition of due diligence in the international environmental law, or the duty to “not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction”¹⁴⁷⁷ and the related duty to “co-operate to develop further international law regarding liability and compensation for the victims of pollution and other environmental damage”.¹⁴⁷⁸
- To properly prevent environmental harm, the Declaration also acknowledges the need to provide assistance from developed countries to developing countries in numerous forms, including through the “transfer of substantial quantities of financial and technological assistance”¹⁴⁷⁹.

This PhD needs to stress here the importance of the recognition of these principles since they are the core ingredients of almost any climate case today: (i) the human right to a secure “liveable” environment, including for future generations; (ii) the universal due diligence obligation to prevent serious and irreversible damage; (iii) the Global North’s higher responsibility, which justifies judicial intervention against them¹⁴⁸⁰. So, did the Stockholm Declaration make international CDD applicable?

While the Stockholm Declaration itself did not explicitly address climate change¹⁴⁸¹, the full report did so:

1476 Stockholm Declaration (Report of the United Nations Conference on the Human Environment, A/CONF.48/14/Rev.I, Stockholm, 5 - 16 June 1972, United Nations, 1973), Principle 6.

1477 Stockholm Declaration, principle 21. See Sands P and Peel J, *Principles of International Environmental Law* (3rd edn, Cambridge University Press 2012) p 191.

1478 Stockholm Declaration, principle 22.

1479 Stockholm Declaration, Principle 9.

1480 See Chapter VIII, Brief Summary of the General Debate (Report of the United Nations Conference on the Human Environment, A/CONF.48/14/Rev.I, Stockholm, 5 - 16 June 1972, United Nations, 1973), § 45, p 46.

1481 As environmental issues, the speakers addressed over-population (although not sufficiently addressed according to numerous speakers), nature conservation, water supplies, “the need for understanding and controlling the changes man produced in the major ecological systems; the need for accelerating the dissemination of environmentally sound technologies; marine pollution (contamination, oil discharge, excessive use of pesticides, atmospheric pollution eventually contaminating the sea, ocean dumping), for more information see Chapter VIII of the Report providing a “Brief summary of the general debate”, especially at page 47.

“It is recommended that Governments be mindful of activities in which there is an appreciable risk of effects on climate, and to this end: (a) Carefully evaluate the likelihood and magnitude of climatic effects and disseminate their findings to the maximum extent feasible before embarking on such activities; (b) Consult fully other interested States when activities carrying a risk of such effects are being contemplated or implemented.¹⁴⁸² [...]

It is recommended:’ (a) That approximately 10 baseline stations be set up, with the consent of the States involved, in areas remote from all sources of pollution in order to monitor long term global trends in atmospheric constituents and properties which may cause changes in meteorological properties, including climatic changes; (b) That a much larger network of not less than 100 stations be set up, with the consent of the States involved, for monitoring properties and constituents of the atmosphere on a regional basis and especially changes in the distribution and concentration of contaminants; (c) That these programmes be guided and co-ordinated by the World Meteorological Organization; (4 That the World Meteorological Organization, in co-operation with the International Council of Scientific Unions (ICSU), continue to carry out the Global Atmospheric Research Programme (GARP), and if necessary establish new programmes to understand better the general circulation of the atmosphere and the causes of climatic changes whether these causes are natural or the result of man’s activities.”¹⁴⁸³

Finding: These recommendations should have prompted States and other key international actors to conduct further research into risk identification. Thus, this thesis concludes that international *procedural* CDD was applicable, but not *substantive* CDD.

1482 See in Report of UN Conference on the Human Environment, “Chapter II Action Plan for the Human Environment; B. Recommendations for action at the international level; Identification and control of pollutants of broad international significance, A. Pollution generally, Recommendation 70”.

1483 *Ibid*, Recommendation 79.

3.1.2.2 Balancing environmental concerns with industrialisation

3.1.2.2.1 The birth of global sustainable development

As shown above, the declaration expressed the need for “improvement” of the environment through human intervention, recognising more generally those human societies and settlements that made nature a better place:

“In the long and tortuous evolution of the human race on this planet a stage has been reached when, through the rapid acceleration of science and technology, man has acquired the power to transform his environment in countless ways and on an unprecedented scale. Both aspects of man’s environment, the natural and the man-made, are essential to his well-being and to the enjoyment of basic human rights—even the right to life itself.”¹⁴⁸⁴

This very self-confident, anthropocentric view, shared by Law Professor Zahar among others¹⁴⁸⁵, is at odds with a certain cultural and legal trend that questions the hegemonic position of humans in the world. This trend aims to provide rights to nature by recognising the pure ecological loss as a cause of action¹⁴⁸⁶ and advocating for nature to have the right to remain unharmed and untouched¹⁴⁸⁷. This latter trend evolved from “nature preservationists” who existed before World War II and who wanted to protect “unspoiled nature” from human activity, both in the USA and in former colonies, and this persisted after decolonisation, especially within the International Union for Conservation of Nature (IUCN)¹⁴⁸⁸. It is there-

1484 Stockholm Declaration, Principle 1.

1485 Zahar A, “Two Arguments Against Historical Responsibility for Climate Change”, 2021: Zahar argued that industrialisation brought an exhaustive range of significant advantages for human conditions, in addition the positive effects for the environment, as it enabled reforestation and nature protection by sparing large pieces of land after the agriculture-based pre-industrial civilisation depleted their ecological resources (especially forests).

1486 See the recognition of the pure ecological loss in international law (ICJ, *Certain activities carried out by Nicaragua in the border area (Costa Rica v Nicaragua)*, 2 February 2018) and in French law (articles 1246 – 1252 of the French Civil Code).

1487 Notre Affaire à Tous, *Les droits de la nature: Vers un nouveau paradigme de protection du vivant* (Le Pommier 2 March 2022).

1488 Mahrane Y et al, “From Nature to Biosphere: The Political Invention of the Global Environment, 1945–1972”, *Vingtième Siècle. Revue d’histoire* 2012/1 (No 113) p. 127–141. The authors rely on a remarked study by Samuel Hays to make the difference between Nature Preservation and Resource Conservation: while Nature

fore surprising and contradictory that the first international declaration on environmental protection started by recognising the benefits of humans shaping the environment, while also recognising the need to protect.

“3. Man has constantly to sum up experience and go on discovering, inventing, creating and advancing. In our time, man’s capability to transform his surroundings, if used wisely, can bring to all peoples the benefits of development and the opportunity to enhance the quality of life. Wrongly or heedlessly applied, the same power can do incalculable harm to human beings and the human environment. We see around us growing evidence of man-made harm in many regions of the earth: dangerous levels of pollution in water, air, earth and living beings; major and undesirable disturbances to the ecological balance of the biosphere; destruction and depletion of irreplaceable resources; and gross deficiencies, harmful to the physical, mental and social health of man, in the man-made environment, particularly in the living and working environment.”¹⁴⁸⁹

As the Preamble to the Stockholm Declaration clearly shows, world governments were mainly concerned (still today) with achieving further development, since “environmental problems are caused by under-development”¹⁴⁹⁰, and because it enabled them to ensure their own “protection” with respect to environmental changes¹⁴⁹¹. There was also a strong belief that social, scientific and technical solutions would emerge to mitigate environmental issues and “improve the environment”¹⁴⁹². In other words, the purpose of this conference was clearly not to create the conditions to bring back wildlife on Earth, but rather to pursue “sustainable development”. This was a significant and somewhat contradictory challenge, given that the Preamble recognised that in “industrialized countries, environmental problems are generally related to industrialization and technological development”¹⁴⁹³.

Preservation aims at protecting nature as it is (wildlife), resource conservation aims at providing the maximum output of resources in the long run; see Hays S, “Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890–1920”, Cambridge, Harvard University Press, 1959.; or US Council on Environmental Quality, “Annual Report”, 1981, p 6.

1489 Stockholm Declaration, Preamble, Paragraph 3.

1490 *Ibid*, Paragraph 4.

1491 *Ibid*, Paragraph 3.

1492 *Ibid*, Paragraph 5 and 6.

1493 Stockholm Declaration, Preamble, Paragraph 4.

Even today, the “fight against climate change” involves numerous human interventions and technological solutions. Reducing GHG does not only mean consuming and producing less energy, or fossil fuels. Rather, climate mitigation can be achieved through multiple technological and industrial fixes, such as the deployment of massive solar and wind energy, electric vehicles, hydrogen, CCS, etc. The deployment of these technologies may generate as much economic growth as the “business as usual scenarios”¹⁴⁹⁴. Furthermore, climate adaptation also inevitably implies human intervention to adapt to global warming and its impacts.

3.1.2.2.2 Developing countries asserting their right to development and equity

As the subsection above highlights, countries worldwide did not want to give up economic development, especially developing countries, as they recognised that poverty is the most pressing issue. Indeed, pursuant to paragraph 4 of the Stockholm Conference’s preamble:

“[i]n the developing countries most of the environmental problems are caused by under-development. Millions continue to live far below the minimum levels required for a decent human existence, deprived of adequate food and clothing, shelter and education, health and sanitation.”

The welcoming of industrial development by “global South countries”, thereby becoming “developing countries”, is an additional tension between development and environmental protection beyond the more general challenge of reconciling environmental protection with human interventions. It is important to understand this additional layer of complexity: some African, Southeast Asian and South American territories still had significant portions of intact wildlife, whose protection was a goal after decolonisation. Nonetheless, the conference participants believed that it was possible to “avoid the mistakes made by developed countries in their development”¹⁴⁹⁵.

In any case, developing countries strongly rebutted the “no growth” economic theory, considering it “absolutely unacceptable”¹⁴⁹⁶. They submitted

1494 IEA, “Net Zero by 2050: A Roadmap for the Global Energy Sector”, 2021, p 13.

1495 Stockholm Conference, Part III “Proceedings of the Conference”, Chapter VIII “Brief Summary of the General Debate” (p 46), § 44.

1496 *Ibid.*

that environmental protection could not be used as a pretext to hamper their economic and social development, by endorsing the view “that there need be no clash between the concern for development and the concern for the environment”.¹⁴⁹⁷ Degrowth theories just became popular in Western countries, especially following the publication of the Meadows Report by the “Club of Rome” just before the Stockholm Conference¹⁴⁹⁸. Again, for people who care about nature protection and who have developed a critical eye on the need to pursue constant economic growth, the 1972 developing countries’ position may give a strong feeling of contradiction, as one may consider that they thereby actually only recommitted the same errors as industrialised nations. In fact, the openness of developing countries to industrialisation significantly triggered the interests of Western multinational corporate groups, despite the opposition of some countries¹⁴⁹⁹. Multinationals also affected the environment of these corporate groups, including climate change. This maintained some form of economic dependence, as the economic power of some corporate groups is immense.

However, as Professor Zahar argued in his piece against historical responsibility, industrialisation brought a range of significant advantages for human conditions, in addition to the positive effects for the environment, as it enabled, according to him, reforestation and nature protection by sparing large pieces of land after the agriculture-based pre-industrial civilisation depleted their ecological resources (especially forests)¹⁵⁰⁰.

To further combat the structural global inequalities and unfairness, the Stockholm Conference proposed that developed countries should cover the costs of global environmental problems and support developing countries with financial and technical means¹⁵⁰¹. However, despite these commitments, which were renewed, the sustainable development and climate objectives are far from being achieved, and the financial support provided by the global north in this respect might still be insufficient.

Finding: Globalisation has prompted humans to consider environmental protection for their own survival due to their dependency on the environment and its ecological balances, including the global climate. The

1497 *Ibid.*

1498 Meadows D H et al, *The Limits to Growth*, Universe Book, New York, 1972.

1499 Stockholm Conference, Chapter VIII, Brief Summary of the General Debate, § 45, p 46.

1500 Zahar A, “Two Arguments Against Historical Responsibility for Climate Change”, 2021.

1501 Stockholm Conference, Part III “Proceedings of the Conference”, Chapter VIII “Brief Summary of the General Debate” (p 46), §.47.

Stockholm Conference marked the beginning of the recognition of the “Anthropocene” and the willingness to achieve “sustainable development” to redress the global imbalance. It laid down the groundwork for the concepts of CBDRRC and equity, and global sustainable development, which remain very important nowadays, particularly in relation to climate, CDD and the “fair share” issue.

3.1.3 The 1972-1988 period: from substantive CDD’s substantive applicability to the first potential breaches

3.1.3.1 Substantive CDD’s applicability in the making between 1975 – 1979

In 1977, the Council on Environmental Quality of the USA, an official expert body on environmental issues¹⁵⁰², established by NEPA (see above), stated in the “HIGHLIGHTS” section of its annual report that:

“Several global air pollution problems of international concern are the carbon dioxide ‘greenhouse’ effect [...]. If we use up the world’s stores of fossil fuels at a rapid rate, the predicted CO₂ level will double by 2025 and reach a maximum of seven to eight times today’s level by the year 2100. A doubling of CO₂ level could cause a 2-3° C increase in average atmospheric temperatures [...], a major global environmental threat”¹⁵⁰³.

Climate scientists regularly assessed the implications of the *doubling of CO₂ concentration* as a heuristic and labelled the concept as “equilibrium climate sensitivity”, or “effective climate sensitivity”¹⁵⁰⁴. According to my research, this is the first time that a government expert body has identified the 2°C threshold as dangerous¹⁵⁰⁵.

1502 The Council on Environmental Quality of the USA, “which was created in 1969 by the National Environmental Policy Act (NEPA), advises the US President and develops policies on climate change, environmental justice.

1503 US Council on Environmental Quality, “The Eighth Annual Report”, 1977, Chapter 2, p xiv.

1504 See IPCC, SR1.5 (2018), Glossary, p 545, Randalls S, “History of the 2°C target”, *WIREs Climate Change* 1 (July/August 2010) p 599.

1505 Randalls Samuel, Professor of Geography, who researched the history of the 2°C target, noted in 2010 that Manabe and Wetherald found in 1965 and 1975 that the doubling of CO₂ (climate sensitivity) may lead to approximately 2°C or more of warming, without flagging it as particularly concerning; Randalls then found that only around 1990 authors and institutions (such as the Advisory Group on

Finding: It is unclear whether the 1977 annual report can ground a substantive duty to avoid the doubling of CO₂ concentrations and the overstepping of the 2°C target¹⁵⁰⁶. In any case, the 1977 study demonstrated that the US federal government and the competent bodies continued to advance climate science and policies, thereby complying with *procedural* CDD.

In 1978, in line with previous scientific research identifying the need for further in-depth research, the Congress of the USA adopted the “National Climate Program Act”¹⁵⁰⁷ to help “the Nation and the world to understand and respond to natural and man-induced climate processes and their implications.”¹⁵⁰⁸ More precisely, the legislation aimed to, among others: Achieve a better understanding of the climate-related risks “on the natural environment, agricultural production, energy supply and demand, land and water resources, transportation, human health and national security”, track weather-related issues; and collect and track atmospheric data, and share the results widely, especially among governmental bodies.

Finding: This legislation enabled the US to achieve further compliance with *procedural* CDD.

Meanwhile, in the same year, the Council on Environmental Quality of the US President also issued additional reports on the likelihood and dangerousness of global warming, including one in 1978 on the progress and credibility of solar energy, meaning it could reach 25% of the US energy needs by the year 2000¹⁵⁰⁹. According to the IPCC, there was a

Greenhouse Gases) started to assess more systematically the implications of some levels of warming, global temperatures should remain under 2°C. This threshold will be more prominent after 1996 when the European Union officially labelled the below 2°C as a global target after corresponding IPCC reports, and especially in 2009 after the Copenhagen COP (see Randalls S, “History of the 2°C target”, *WIREs Climate Change* 1 (July/August 2010) p. 599–602).

1506 IPCC, AR6 (2021-23), WG I, TS, Figure TS.9.

1507 See Public Law 95-367, 95th Congress, 17 September 1978.

1508 According to section 3, defining the purpose of the legislation.

1509 Speth G, “Declaration of James Gustave Speth in Support of Plaintiffs’ Response in Opposition to Defendants’ Motion for Summary Judgment”, *Juliana v USA*, Case 6:15-cv-01517-TC, Document 298, 28 June 2018, § 26, referring to the report: US Council on Environmental Quality, “Solar Energy: Progress and Promise”, SE 025 290, April 1978.

momentum around solar energy at that time¹⁵¹⁰. The US President Carter even proposed a goal of 20% of renewable energy by the year 2000¹⁵¹¹.

However, the USA failed by far to achieve this goal: in 2000, renewables accounted for 6.2% of the primary US mix, mainly composed of “traditional renewables” such as biomass and hydroelectricity.”¹⁵¹² By 2021, the US was still only sourcing 12% of its primary energy from renewable sources, with only 1% coming from solar power and 3% from wind power¹⁵¹³.

The question arises as to whether missing this target constituted a legal breach. Firstly, this target was not introduced into legislation, and thus could not be legally binding as such. Secondly, it is unclear whether it constitutes a CDD breach over time since it was not the same administration governing the USA afterwards. Did the Carter Administration, which introduced this target, implement sufficient efforts to achieve it, though?

According to the Gus Speth Expert Report filed in the *Juliana v USA* case, the Carter Administration continued to significantly encourage fossil fuel development, especially coal, despite the announced 20% of renewable energy target¹⁵¹⁴. It is worth noting that Carter’s solar power target was announced in 1978, several years after the oil embargo imposed by OPEC countries¹⁵¹⁵. Unlike fossil fuels, renewable energy is non-exhaustible, which was one of the main advantages of this energy source in the eyes of the

1510 See IPCC, Special Report on Renewable Energy Sources and Climate Change Mitigation (SRREN), p 340: “With the oil crisis of the 1970s, most countries in the world developed programs for solar energy R&D, and this involved efforts in industry, government labs and universities. These policy support efforts, which have, for the most part, continued up to the present, have borne fruit: now one of the fastest growing renewable energy (RE) technologies, solar energy is poised to play a much larger role on the world energy stage.”

1511 Speth G, “Declaration of James Gustave Speth in Support of Plaintiffs [...]”, *op cit*, § 27.

1512 US Congressional Research Service (Melissa N Diaz), “U.S. Energy in the 21st Century: A Primer”, R46723, 16 March 2021, p. 26, Figure 11.

1513 US Energy Information Administration, Monthly Energy Review, Table 1.3 and 10.1, April 2022, preliminary data (eia.gov/energyexplained/us-energy-facts/)

1514 Speth G, “Declaration of James Gustave Speth in Support of Plaintiffs [...]”, *op cit*, § 29.

1515 The OPEC countries imposed an oil embargo as a sanction on the USA and other OECD countries for solidarizing themselves with Israel in the Arab-Israeli war : US Office of the Historian, “Milestones in the History of U.S. Foreign Relations”, unknown date, <https://history.state.gov/milestones/1969-1976/oil-embargo>, last accessed 29 October 2025.

former President¹⁵¹⁶. Said differently, no “peak oil” was to be feared with renewable energy. From that angle, renewables carry geopolitical advantages, and constitute the predominant reason why the US President issued this target. However, the production of coal in the USA increased to rapidly substitute for the gap left by imported oil, which is not surprising given that renewables (especially solar and wind) were not readily available as an alternative to coal at that time¹⁵¹⁷.

Findings: One critique that may be issued to the US Carter administration is that it did not introduce the target concerning renewables into legislation to make it legally binding. However, the state of the science and the available renewable technologies (i.e., solar and wind) was manifestly not sufficiently advanced to ground a *substantive* CDD duty which required using less fossil fuels, implying potentially a transition to renewables. Therefore, the USA was not in clear conflict with CDD.

While some oil companies, such as Shell, started to invest in solar power¹⁵¹⁸, others, such as the French company Total, invested heavily in coal¹⁵¹⁹. However, akin to the US federal government, companies were certainly not bound back then by a substantive CDD duty to transition to renewables for climate purposes (*substantive* CDD), even though they may have had other good reasons to start the transition to renewables (i.e., the physical oil peak and the geopolitical OPEC crisis).

In 1979, in the USA, “President Carter, in turn, asked the National Research Council, the working arm of the National Academy of Sciences, to investigate the subject.”¹⁵²⁰ The NAS subsequently issued the “Charney Report”, which was covered at the time by the New York Times¹⁵²¹ and referenced by the IPCC in its recent AR6 report (2021-22)¹⁵²². The report first established for the first time that there was a “reasonable” and consistent

1516 Speth G, “Declaration of James Gustave Speth in Support of Plaintiffs [...]”, *op cit*, § 27.

1517 IPCC, Special Report on Renewable Energy Sources and Climate Change Mitigation (SRREN), p 340.

1518 Feit S and Muffett C, *A Crack in the Shell: New Documents Expose a Hidden Climate History*, CIEL, April 2018 p 7.

1519 Bonneuil C, Choquet P-L, Franta B, “Early warnings and emerging accountability: Total’s responses to global warming, 1971–2021”, *Global Environmental Change* 71 (2021) p 4.

1520 According to the Supreme Court in *Massachusetts v EPA*, 549 U. S. (2007), p 4.

1521 A New York Times piece summarised the report (Shabecoff P, “Scientists Warn U.S. of Carbon Dioxide Peril”, *The New York Times*, 10 July 1979).

1522 IPCC, AR6, WG I, Full Report, p 174.

“consensus” within the scientific community on the fact that global *warming* would occur, due to the burning of fossil fuels¹⁵²³. It then carried out a counter-assessment with “distinguished scientists” and found the following:

“The conclusions of this brief but intense investigation may be comforting to scientists but disturbing to policymakers. If carbon dioxide continues to increase, the study group finds no reason to doubt that climate changes will result and no reason to believe that these changes will be negligible. The conclusions of prior studies have been generally reaffirmed. However, the study group points out that the ocean, the great and ponderous flywheel of the global climate system, may be expected to slow the course of observable climate change. A wait-and-see policy may mean waiting until it is too late.”¹⁵²⁴

More precisely, akin to the 1977 study of the Council on Environmental Quality, the report estimated that a doubling of CO₂ would lead to a warming of 2°C to 3.5°C, “with greater increases at high latitude [... and that] none of the model calculations predicted negligible warming.”¹⁵²⁵ Moreover, the summary and conclusions added that “we have tried but have been unable to find any overlooked or underestimated physical effects that could reduce the currently estimated global warming due to a doubling of atmospheric CO₂ to negligible proportions or reverse them altogether.”¹⁵²⁶ The report concluded that global warming “would threaten the stability of food supplies and would present a further set of intractable problems to organized societies” and stated that a “wait-and-see policy” may be inappropriate¹⁵²⁷.

Finding: This study does not flesh out any breach but rather reinforces the procedural applicability of CDD and introduces elements to render its substantive dimension potentially applicable. In fact, since the study clearly asserted that “[a] wait-and-see policy may mean waiting until it is too late”, it provided a strong hook to assess adequate climate mitigation policies

1523 Charney Jule et al (National Research Council), “Carbon Dioxide and Climate: A Scientific Assessment”, *The (US) National Academies Press* (1979), p vii.

1524 *Ibid*, p viii.

1525 *Ibid*, p 1.

1526 *Ibid*.

1527 Speth G, “Declaration of James Gustave Speth in Support of Plaintiffs [...]”, *op cit*, § 23 referring to “Olson Decl., Ex. 5, Climate Research Board, National Research Council, Carbon Dioxide and Climate: A Scientific Assessment (Washington, D.C.: 1979), at 16-17”.

and implement some, such as energy efficiency and the development of renewable energy.

In 1979, the inaugural “World Climate Conference” was held in Geneva, and was organised by the two entities that would subsequently establish the IPCC, the UNEP and the WMO.¹⁵²⁸ The conference brought together experts from many disciplines and countries¹⁵²⁹, who ultimately launched “An Appeal to Nations”:

“Having regard to all-pervading influence of climate on human society and on many fields of human activity and endeavour, the Conference finds that is now urgently necessary for nations of the world:

- (a) To take full advantage of man's present knowledge of climate;
- (b) To take steps to improve significantly that knowledge;
- (c) to foresee and to prevent potential man-made changes in climate that might be adverse to the well-being of humanity.”¹⁵³⁰

These words strongly reflected the need to carry out due diligence in climate matters, as they recommended foreseeing and preventing climate change (i.e., carrying out international *procedural* and *substantive* CDD). It is also worth noting that due diligence was already well established in international law, including in environmental matters (see, among others, the 1941 *Trail Smelter* award¹⁵³¹ cases, and, above, the subsection 1.1.2 on the Stockholm Declaration). However, since this conference was almost exclusively composed of scientists and experts¹⁵³², the implications of this call to exercise CDD may have been, to some degree, limited.

Another important contextual element may be the more conservative position that the scientists took in this forum. There is no finding in the *main* declaration that sea-level rise may cause harmful effects. Only the “Supporting Documents” on page 30 addressed this point, although other studies published in the USA shared this view before¹⁵³³ (note that

1528 WMO, “Declaration of the World Climate Conference”, 1979.

1529 WMO, “Proceedings of the World Climate Conference”, Geneva, 12–23 February 1979, p 765 et seq.

1530 WMO, “Declaration of the World Climate Conference”, 1979; WMO, “Proceedings of the World Climate Conference”, Geneva, 12–23 February 1979, p 713.

1531 *Trail Smelter*, III UN Reports of International Arbitral Awards, 1905 (1941), p 1965.

1532 WMO, “Proceedings of the World Climate Conference”, Geneva, 12–23 February 1979, p 765 et seq.

1533 See, for instance, the 1965 study mandated by the US President, or the 1968 study elaborated by the Stanford Research Institute for the American Petroleum Industry.

US climate scientists are sometimes more “progressive” than international climate groups¹⁵³⁴).

Another worthwhile aspect is that the Appeal to Nations described “the problem”. Although the state of the science was not able to predict the consequences of global warming, the declaration still highlighted the dependency of human societies on climate (food, water, energy, shelter, and health), the vulnerabilities of all countries – especially developing countries – to “climatic variations”, the issue of growing world population, and the dependency on the climate. The declaration repeated that there “is an urgent need for the development of a common global strategy for a greater understanding and a rational use of climate.” Thus, this conference called for a global framework and set up global rules in order to prevent harm to the climate system. It triggered a common requirement for global cooperation and respective individual State duties to do their share.

Finding: This climate conference confirmed the need for the international community and key public and private actors to exercise CDD collectively and individually, at least procedurally (i.e., carry out further research, identify prevention measures and global cooperation rules). One may argue that these scientific findings may even demonstrate the need to carry out *substantive* CDD to a certain extent, such as implementing some climate mitigation measures, i.e., energy efficiency and conservation, the development of alternative energies, etc.

3.1.3.2 No evident CDD breach by the US fossil fuel industry in 1980

According to Franta, the fossil fuel industry began a “disinformation” campaign on global warming in 1980 through the API (“American Petroleum Institute”) to promote fossil fuels¹⁵³⁵.

1534 One of the most prominent example may be the contention between Dr. James Hansen from the NASA and the IPCC, the first pleading in favour of 350 ppm, the IPCC taking a step back by letting governments finding the level of warming which is dangerous (see, as discusses below, the UNFCCC, AR2, AR3, AR4, SRI.5 and Hansen et al study (Hansen et al, Assessing “Dangerous Climate Change”: Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature, Plos ONE, Volume 8, Issue 12, 2013).

1535 See Franta B, “Early oil industry disinformation on global warming”, *Environmental Politics* (2021) Vol 30, No 4, p 663–668 referring to American Petroleum Institute, *Two energy futures: a national choice for the 80s*, Laramie: Library of the University of Wyoming, 1980.

Before Franta's research, a lawyer and historian who is also involved in climate litigation, others (especially Supran and Oreskes) argued that the fossil fuel industry's strategy was to "produce ignorance" by disproportionately underscoring the uncertainties of climate science or by downplaying the threat of climate change¹⁵³⁶. The IPCC described and summarised Supran and Oreskes' findings in its last AR6 report¹⁵³⁷. Although Supran and Oreskes' research corresponds to the period 1977-2014, the first piece that they found expressing doubt about climate change "as real and human caused" dates from 1989¹⁵³⁸. Franta argued that "organized disinformation (false or misleading information promulgated by an organization) about global warming is often understood to commence in 1989 with publications from the George C. Marshall Institute (Brulle Citation2020a) and the founding of the Global Climate Coalition (Brulle Citation2020b)."¹⁵³⁹ He then argued that the 1980 "disinformation" piece he found was also about "disinformation". Could this constitute a CDD breach¹⁵⁴⁰? Let us review Franta's argument on the 1980 piece.

The 1980 document published by the API and comprising 184 pages¹⁵⁴¹ was addressed to experts and policymakers, but certainly not the wider public, compared to the very short advertorials and advertisements that Supran and Oreskes studied. Franta criticised the narrative on the global "cooling" effect of CO₂ alongside the increase in albedo (i.e. Earth reflectivity, increasing through desertification and deforestation). Franta argued that the API misrepresented Dr Carl Sagan's view, and more generally, on the state of science at the time¹⁵⁴². This PhD will dive deeper into the evolution of the knowledge on albedo and aerosols in the "Box Technical Briefing 1" below.

1536 *Ibid*; see as well Supran G and Oreskes N, "Assessing ExxonMobil's climate change communications (1977–2014)", *Environmental Research Letters* 12 (2017) 084019.

1537 IPCC, AR6 (2021-23), WG III, Chapter 13, p 1374 – 1377; See also Chapter 16, p 1649.

1538 Supran G and Oreskes N, "Addendum to 'Assessing ExxonMobil's climate change communications (1977–2014)'" , *Environmental Research Letters* 15 (2020) 119401 referring to "Exxon 1989 FUEL (Advertisement, industry sponsors possibly include Exxon) N.Y. Times Mag.

1539 Franta B, "Early oil industry disinformation on global warming", *op cit*.

1540 *Ibid*.

1541 American Petroleum Institute, *Two energy futures: a national choice for the 80s*, Laramie: Library of the University of Wyoming, 1980.

1542 Franta B, "Early oil industry disinformation on global warming", *op cit*.

Box Technical Briefing 1 on the evolution of the scientific understanding of the global cooling effect of albedo and aerosols

Concerning the Earth's "albedo"¹⁵⁴³: the question is to what extent an increase in albedo – which can be due to desertification and deforestation – leads to global cooling? Firstly, it is important to recognise that deforestation emits considerable GHG and reduces the net carbon sinks, which is counterproductive from a climate point of view¹⁵⁴⁴. Additionally, although previous publications discussed the cooling effect of increased albedo, it appears that, from the 1965 study of the US President's Science Advisory Committee discussed above¹⁵⁴⁵, the global warming effect of carbon dioxide was considered more plausible.

Later on, all IPCC reports, including the ARI (1990), concluded that global warming was likely, meaning that the IPCC never considered that the albedo could counteract the effect of GHGs¹⁵⁴⁶. In ARI (1990), the IPCC only described the effect of albedo by saying it "affects the amount of solar energy absorbed at the Earth's surface", without questioning its findings on the likelihood of past and future global warming¹⁵⁴⁷. In AR4 (2007), when the IPCC famously found that "[w]arming of the climate system is unequivocal"¹⁵⁴⁸, the IPCC asserted with very high confidence (meaning at least a 9 out of 10 chance of being correct) that the increase in albedo could not have a more potent cooling effect than GHG¹⁵⁴⁹. In the AR4 (2007), the IPCC nonetheless stated that "although the principle of the albedo feedback is simple, a quantitative understanding of the effect is still far from complete."¹⁵⁵⁰ In AR5 (2014), the IPCC confirmed that

1543 According to the IPCC Glossary of SRI.5, 2018, the term albedo means "The fraction of solar radiation reflected by a surface or object, often expressed as a percentage. Snow-covered surfaces have a high albedo, the surface albedo of soils ranges from high to low, and vegetation-covered surfaces and the oceans have a low albedo. The Earth's planetary albedo changes mainly through varying cloudiness and changes in snow, ice, leaf area and land cover." (SRI.5, Annex I: Glossary, p 542).

1544 IPCC, ARI, WG I, SPM, p xxxii "It is estimated that each year about 2 Gt of carbon (GtC) is released to the atmosphere due to tropical deforestation". The 2022 Emissions Gap Report estimates roughly similar figures, see UNEP, "Emissions Gap Report 2022: The Closing Window", 2022, p 6, table 2.1 and subsection 2.2.3.

1545 President's Science Advisory Committee, "Restoring the Quality of Our Environment: Report of the Environmental Pollution Panel", November 1965, p 123 - 124.

1546 See the IPCC findings on the radiative forcing in IPCC, AR6 (2021-23), WG I, Chapter 1, p 178. "Like all previous IPCC reports, AR5 assessed that total radiative forcing has been positive at least since 1850–1900, leading to an uptake of energy by the climate system, and that the largest single contribution to total radiative forcing is the rising atmospheric concentration of CO₂ since 1750".

1547 IPCC, ARI (1990), WG I, SPM, p 15 ; in combination with IPCC, ARI (1990), WG III, Overview (SYR), § 1.0.3 – 1.0.5.

1548 IPCC, AR4 (2007), WG I, SPM, p 5.

1549 *Ibid*, p 3.

1550 *Ibid*, Chapter 1, p 110.

"[I]and albedo change does not appear to be able to produce a large counter radiative forcing."¹⁵⁵¹

Additionally, there is another cooling effect due to "aerosols", which are airborne fine particles partly emitted in the course of fossil fuel combustion, such as sulphite oxide, or black carbon¹⁵⁵². The 1965 report noted the need to research further "countervailing measures", including the spread of fine particles. The 1968 SRI addendum report commissioned for API stated that there was uncertainty as to whether the CO₂ or aerosols effect overrode the other¹⁵⁵³, while noting that "the potential damage to our environment could be severe"¹⁵⁵⁴. The Geneva Conference of 1979 noted on its end that the effect of aerosols "appear[s] to be small"¹⁵⁵⁵. As the IPCC explained retrospectively in AR6, aerosols remained a significant source of uncertainty, particularly from the 1970s onwards and until ARI:

the radiative effects of anthropogenic aerosols did not receive sustained study until around 1970 (Bryson and Wendland, 1970; Rasool and Schneider, 1971), when their potential as cooling agents was recognized [...] All IPCC reports have assessed the total RF as positive when considering all sources. However, due to the considerable variability of both natural and anthropogenic aerosol loads, FAR characterized total aerosol RF as 'highly uncertain' and was unable even to determine its sign (positive or negative). Major advances in quantification of aerosol loads and their effects have taken place since then, and IPCC reports since 1992 have consistently assessed total forcing by anthropogenic aerosols as negative (IPCC, 1992, 1995a, 1996). However, due to their complexity and the difficult of obtaining precise measurements, aerosol effects have been consistently assessed as the largest single source of uncertainty in estimating total RF (Stevens and Feingold, 2009; IPCC, 2013a).¹⁵⁵⁶

According to the most recent IPCC findings, aerosols significantly counter the greenhouse gas effect by almost a half on average:

A.1.2 The *likely* range of total human-caused global surface temperature increase from 1850–1900 to 2010–2019 is 0.8°C–1.3°C, with a best estimate of 1.07°C. Over this period, it is *likely* that well-mixed greenhouse C8, gases (GHGs) contributed a warming of 1.0°C–2.0°C and other human drivers (principally aerosols) contributed a cooling of 0.0°C–0.8°C, natural (solar and volcanic) drivers changed global surface temperature by –0.1°C to +0.1°C, and internal variability changed it by –0.2°C to +0.2°C.¹⁵⁵⁷

1551 IPCC, AR5 (2014-15), SYR, Topic 3, 2014.

1552 IPCC, ARI (1990), WG I, SPM, p 15.

1553 Robinson E and Robbins R C, "Sources, Abundance, and Fate of Gaseous Atmospheric Pollutants", Stanford Research Institute, February 1968, p 109.

1554 *Ibid*, p 24 - 25.

1555 WMO, "Declaration of the World Climate Conference", 1979.

1556 IPCC, AR6 (2021-23), WGI, Chapter 1, p 179 – 180.

1557 IPCC, AR6 (2021-23), SYR, SPM, 2023, § A.1.2.

As the paragraph shows, the current uncertainty surrounding the magnitude of global warming is mainly due to the effect of aerosols¹⁵⁵⁸, even though the IPCC considers it is “unequivocal” that global warming occurred from 2007 onwards¹⁵⁵⁹.

The uncertainties back then around the quantification and effect of aerosols show the fine lines and intricacies of the criticism against fossil fuel producers in the 1980s, since there was – and still is, to some degree – uncertainty around the exact effect of albedo and aerosols.

Finding: The line of evidence shows that Franta’s disinformation argument is not enough to support a CDD breach for two reasons: i) the importance and the impact of the API publication Franta commented on is unclear; ii) there was substantial uncertainty around the effect of albedo and aerosols from the 1960-90s as the box above shows. In any case, further research seems necessary to know whether the fossil fuel industry deliberately misled policymakers in the 1980s, and, therefore, breached CDD. To do so, one should further compare the communication of the fossil fuel industry with the state of knowledge.

3.1.3.3 Potential first CDD breaches in the period 1980-88 by the USA

In January 1981, at the end of US President Carter’s term of office, the Council on Environmental Quality (CEQ) of the USA issued a special report on “Global Energy Futures and the Carbon Dioxide Problem”¹⁵⁶⁰. In the foreword, the CEQ’s chair – Gus Speth – recommended making “[e]very effort [...] to ensure that nations are not compelled to choose between the risks of energy shortages and the risks of CO₂. This goal requires making a priority commitment here and abroad to energy efficiency and to renewable energy resources”¹⁵⁶¹. In other words, the former environmental expert body of the White House recommended the implementation of

1558 IPCC, AR6 (2021-23), WGI, TS, p 103: “The magnitude of the cooling effect of aerosols remains the largest uncertainty in the effect of SLCFs in future climate projections.” IPCC, AR6 (2021-23), WGI, Chapter 1, p 179 – 180: “However, due to their complexity and the difficult of obtaining precise measurements, aerosol effects have been consistently assessed as the largest single source of uncertainty in estimating total RF (Stevens and Feingold, 2009; IPCC, 2013a).”

1559 IPCC, AR4 (2007), WG I, SPM, p 5.

1560 US Council on Environmental Quality, “Global Energy Futures and the Carbon Dioxide Problem report”, 1981.

1561 *Ibid.*

substantive CDD measures (i.e., make every effort to prioritise renewables and energy efficiency).

Finding: This report should have prompted the USA to pay more attention to climate mitigation by intensifying efforts to develop renewable energy resources, among other things.

When Reagan came to power in February 1981 until 1989, independent agencies or members of them continued to issue notable warnings on global warming in a political context in which the new US President Reagan, as opposed to the former, advocated in favour of deregulation and market freedom: “In this present crisis, government is not the solution to our problem; government is the problem”¹⁵⁶².

Reagan adopted the famous Executive Order 12291, which systematically required a cost-benefit analysis of all impactful regulations to ensure that they would not harm the economy, but instead foster economic growth¹⁵⁶³. In line with this *leitmotiv*, Reagan tried to amend the Clean Air Act in 1981 to provide more flexibility to companies. However, this effort did not result in substantial changes due to significant opposition within Congress and beyond¹⁵⁶⁴. If this attempt had succeeded, the energy efficiency of motorised vehicles would have clearly suffered.

Concerning solar energy, the Reagan administration began to “dismantle much of the Federal solar energy program as it existed under the Carter administration” by reducing federal expenditure¹⁵⁶⁵. The rationale was “that the market [...] should be, the final arbiter in commercial solar energy development.”¹⁵⁶⁶ Another piece published back then in *Science* asserted that “[t]he Administration has clearly abandoned the goal of producing 20 percent of the nation’s energy needs with renewables within two decades”¹⁵⁶⁷.

1562 Reagan R, “Inaugural Address 1981”, *Reagan Library*, <https://reaganlibrary.gov/archives/speech/inaugural-address-1981>, last accessed 19 October 2025.

1563 US Executive Order 12291, 17 February 1981, appear at 46 FR 13193, 3 CFR, 1981 Comp., p 127. Note that the initial Executive Order a President usually aims to set the tone of its mandate.

1564 Shabecoff P, “Reagan Order on Cost-Benefit Analysis Stirs Economic and Political Debate”, *The New York Times*, 7 November 1981.

1565 Moore J Glen, “Solar Energy and the Reagan Administration”, *Congressional Research Service, Science Policy Research Division*, Mini Brief MB81265, 23 September 1982.

1566 *Ibid.*

1567 See concurring source: Walsch J, “Reagan Outlines Non proliferation Policy”, *Science* (1981) Vol. 213, Issue 4507, pp. 522–523.

Finding: Although Reagan's pro-economic stance was the subject of many critiques, the question of whether his political approach was compatible with CDD is entirely different. It is also different from the general debate that arose between Reagan's ideas and environmentalists, who claimed that constant growth faces significant environmental limits (i.e., before the 1970s, science promoted technological and economic progress, but since the 1970s onwards, the opposite has happened¹⁵⁶⁸). Regarding climate change, the current best available science from the IEA and IPCC does not ascertain that economic growth is incompatible with CDD. In fact, Paris-compatible scenarios forecast today almost as much growth as "business as usual" scenarios (see below the box "Technical Briefing 2"). While conditions in the 1980s were different (i.e., the decarbonisation technologies were not as widely available as today, hence, reducing GHGs may have meant the reduction of economic development), Reagan's political doctrine cannot be classified as a CDD breach.

Nonetheless, it may be argued that the Reagan administration breached CDD, since it attempted to weaken the Clean Air Act Amendments (thereby diluting energy efficiency) and to remove the corresponding preexisting state aid for solar energy. Although Reagan's administration "contended that the marketplace can achieve the commercial introduction of solar technologies more efficiently and effectively than the Government", this stance clearly contradicts the past recommendations that called for accelerating their development. Further, the solar industry warned the government that these amendments would have been detrimental to its development¹⁵⁶⁹. It seems arguable that it was foreseeable that government assistance was necessary, already in 1981, to speed up the development of the technology. History also proved it: in 2023, solar panels are produced by 80% in China, which massively subsidises the production, as opposed to the USA¹⁵⁷⁰. Thus, the removal of the subsidies for solar energy, combined with a lack of GHG reduction policies, or climate mitigation objectives, may constitute a CDD breach.

1568 Dunlap RE and Aaron M McCright, "Climate Change Denial: Sources, Actors, and Strategies", in Constance Lever-Tracy (ed), *Routledge Handbook of Climate Change and Society* (UK, Routledge, 2010) p 241 – 243.

1569 Moore J Glen, "Solar Energy and the Reagan Administration", *Congressional Research Service, Science Policy Research Division*, Mini Brief MB81265, 23 September 1982.

1570 IEA, WEO 2023, p 37: "China is far and away the largest, with the capacity to produce solar modules with an output of over 500 GW every year, equivalent to 80% of world manufacturing capacity."

Box Technical Briefing 2: Is economic growth compatible with CDD?

The IEA indicates in its 1.5°C Net Zero Emissions (NZE) scenarios that its 1.5°C NZE scenario ensures “economic growth”¹⁵⁷¹ due to the necessary “clean energy investment boom [which] lifts global economic growth”¹⁵⁷². However, the world must “avoid growth in energy demand” in order to achieve the 1.5°C goal of the Paris Agreement. To achieve this, it is necessary to improve energy efficiency, increase the use of electricity and encourage behavioural changes¹⁵⁷³. Additionally, the 2023 World Energy Outlook of the IEA shows no difference in terms of global economic growth between the 2.4°C Stated Policies Scenario (STEPS) and the 1.5°C NZE scenario¹⁵⁷⁴. Therefore, for the IEA, there is no contradiction between economic growth and CDD (i.e., note, however, the IEA was created after the OPEC crisis in 1974 “to ensure the security of oil supplies” and to ultimately foster economic growth¹⁵⁷⁵).

The recent IPCC AR6 (2021-23) report provides a similar response, noting that there are not only little differences between the current policies scenario and Paris-aligned pathways, but also that the models do not account for the economic benefits resulting from the avoided loss and damages due to the overshoot of the Paris goals¹⁵⁷⁶. The IPCC already insisted in ARI (1990) that the most effective short-term response strategies are those that are “flexible”, “economically efficient”, and even “compatible with economic growth and the concept of sustainable development”¹⁵⁷⁷.

Note that, as the Chairman of the Council on Environmental Quality, Gustave Speth already argued in 1981 that there is a need to reduce energy growth by improving energy efficiency without intending to reduce economic growth¹⁵⁷⁸.

In 1983, the Environmental Protection Agency (EPA) issued two prominent reports on the need to regulate climate change. The first report, “Can We Delay Greenhouse Warming?” projected a 2°C warming by 2040, which would cause substantial climatic consequences. It “recommended eliminating coal combustion and banning oil shale as the best policy options for

1571 IEA, “Net Zero by 2050: A Roadmap for the Global Energy Sector”, 2021, p 13.

1572 *Ibid*, p 22.

1573 *Ibid*, p 13; also see IEA, WEO 2022, p 155 – 156; IEA, “Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach”, 2023 Update, p 73.

1574 See IEA, WEO 2023, Table A.5b, p 275 and Table A.5c, p 281.

1575 See IEA, “Net Zero by 2050: A Roadmap for the Global Energy Sector”, 2021, p 3; also, see the evolution of its mandate described by the IEA itself: IEA, “From oil security to steering the world toward secure and sustainable energy transitions”, 26 October 2023, <https://www.iea.org/about/history>, last accessed 29 October 2025.

1576 IPCC, AR6 (2021-23), WG III, SPM, § C.12.

1577 IPCC, ARI (1990), WG III, Overview (SYR), § 3.2.

1578 Speth G, *Global Energy Futures and the Carbon Dioxide Problem*, summary and recommendations, Environmental Affairs, VOL. 9:1, p 11.

delaying a 2 degrees C temperature increase¹⁵⁷⁹. The second report, “Projecting Future Sea Level Rise: Methodology, Estimates to the Year 2100, and Research Needs”, found fossil fuels to be the main drivers of man-made warming and affirmed the need to change the energy mix by confirming the rejection of the “wait and see” approach¹⁵⁸⁰.

In 1985, two scientists of the Department of Energy (DOE) published extensive research for the “Carbon Dioxide Research Division”, stating among other things that the “[h]uman effects on atmospheric composition and the size and operations of the terrestrial ecosystems represent major excursions that may yet overwhelm the life-support system crafted in nature of billions of years.”¹⁵⁸¹

Internationally, the second international climate conference happened in 1985 in Villach, Austria. The scientists who gathered at this conference stated that there is a consensus that global warming would occur in the 21st century, and that warming may increase to 1.5°C – 4.5°C by 2030¹⁵⁸². Additionally, the scientists stated that these levels of warming “could have profound effects on global ecosystems, agriculture, water resources and sea ice”¹⁵⁸³. Ultimately, the scientists recommended controlling GHG emissions, encouraging energy efficiency in developing countries, and potentially developing a global convention¹⁵⁸⁴.

Finding: The Villach Conference does not support a breach finding, as the scientists only suggested considering a global climate convention, rather than recommending its enactment. However, the recommendation made to developed states to control their GHG emissions may have prompted a *substantive* CDD duty to reduce GHGs, which was at least not observed by the USA in the 1980s and *potentially* by other States as well.

In 1986, the Reagan Administration removed the solar panels installed on the White House during the Carter Administration, reduced funding

1579 Speth G, “Declaration of James Gustave Speth in Support of Plaintiffs’ Response in Opposition to Defendants’ Motion for Summary Judgment”, *Juliana v USA*, Case 6:15-cv-01517-TC, Document 298, 28 June 2018, § 32.

1580 *Ibid*, § 33.

1581 See US Department of Energy Office of Scientific and Technical Information (DOE), “Carbon Dioxide Research Division, Atmospheric carbon dioxide and the global carbon cycle”, DOE/ER-0239 ON: DE86006222, 1985, p 300.

1582 WMO, “International Conference of the Assessment of the Role of Carbon Dioxide and of Other Greenhouse Gases in Climate Variations and Associated Impacts”, 9–15 October 1985, p 1.

1583 *Ibid*, p 1.

1584 *Ibid*.

formerly devoted to R&D in solar energy technologies and repealed tax credits¹⁵⁸⁵. These policy changes removed some incentives to develop renewables in the short term¹⁵⁸⁶ and favoured fossil fuels.

Finding: numerous scientific reports established at that point that global warming was happening with harmful – if not catastrophic – implications (1965 study, 1979 Charney Report). The 1981 CEQ annual report underlined the need to develop alternative, low-carbon energies, and in addition to consuming less and more energy efficient, the former Carter Administration even set a target of producing 20% renewables by 2020. In light of what precedes, it seems arguable that the Reagan Administration contravened its *procedural* and, even, *substantive* CDD since (i) it did not study the impacts of his energy policies on the climate, (ii) it manifestly delayed the development of solar energy despite knowing the need to mitigate global warming; and/or (iii) did not appear to consult other States to support climate mitigation, especially R&D in renewable energy (CDD breach in its international form – duty to cooperate dimension).

This thesis does not rule out similar findings for other developed countries, such as EU Member States and private actors, depending on the evidence (i.e., note that no historical research was carried out).

3.1.4 Provisional conclusion on CDD's applicability and violations before 1990

Subpart 3.1 illuminated how CDD became *procedurally* applicable from the 1960s onwards and substantively after 1980. The first CDD breach that this thesis identified with a sufficient level of confidence is the abandonment of the solar power incentives in the USA during Reagan's term in office in the 1980s. This thesis did not find any potential wrongful conduct before due to the following elements:

- The uncertainty linked to the physical scientific findings on man-made climate change:

There was some uncertainty on whether the cooling effect of aerosols and albedo compensated for that of CO₂ itself, particularly until 1979 (Charney

1585 Biello D, "Where Did the Carter White House's Solar Panels Go?", *Scientific American*, 2010.

1586 Moore J Glen, "Solar Energy and the Reagan Administration", *Congressional Research Service, Science Policy Research Division*, Mini Brief MB81265, 23 September 1982.

Report in the USA, and the WMO Geneva Conference), and the first IPCC reports. Additionally, there was no sign of noticeable global warming (in the sense of slow-onset events attributable to climate change, such as sea-level rise or melting glaciers) until the 1990s to the end of the 2000s. Precise climate-related impacts (or potential harms) were equally difficult to identify, except for sea-level rise and (potentially significant) climate-related disruptions in weather patterns. Nonetheless, these facts do not mean that CDD was not applicable from a *procedural* angle (i.e., identifying further climate-related risks and individual GHG emissions to understand one's contribution to the issue, developing prevention measures, including technological decarbonisation measures).

- The magnitude of the problem:

While climate change is a global issue, studies as early as the 19th century identified that *fossil fuels* specifically may lead to significant global warming (see Arrhenius piece quoted in Section 3.1.1). Scientists consistently confirmed this finding afterwards until the latest IPCC reports AR6 (2021-23). Thus, it was clear to States, fossil fuel companies, and businesses that rely heavily on fossil fuels (carmakers, some industrial actors) that they were contributing to a global environmental problem.

- The lack of low-carbon alternatives:

Although States and business enterprises may use some arguments to defend themselves, such as the lack of manifest low carbon alternatives, or the belief that emissions may be reduced even with fossil fuels by enhancing energy efficiency and technologies, this PhD asserts that *procedural* CDD requires, in principle, the identification of decarbonisation technologies, and other reasonable steps to change one's conduct. As this subpart 3.1 showed, states and fossil fuel companies could have acknowledged the dangers and collaborated to find or develop alternatives at reasonable costs, especially solar and other decarbonisation technologies relevant outside the energy sector (batteries, electric cars, insulation for houses, hydrogen, etc). As it appears today, the lack of adequate CDD in the past, beyond the pursuit of mere emission reduction, manifestly caused significant delays in the fight against global warming. Thus, a violation of CDD became likely in the 1980s, when the USA opposed any type of climate mitigation strategy, including the development of alternative decarbonised technologies.

Consequently, the scientific evolution made the *foreseeability* of global warming sufficiently plausible, in addition to clarifying that fossil fuels

were the main anthropogenic factor, thereby triggering *general* CDD duties to find measures and strategies to reduce emissions and the use of fossil fuels. While this thesis did not find sufficient evidence to establish another breach in Subpart 3.1, further research on the evidence may illuminate additional CDD violations, including, potentially, those by fossil fuel actors in Europe and the USA.

3.2 1988 – 2015: Inadequate collective and individual measures resulting in widespread substantive CDD breaches

Section 3.2.1 finds that the period between the creation of the IPCC and the adoption of the first climate convention, the UN Framework Convention on Climate Change (UNFCCC), resulted in the first *potential* collective shortcoming, as the latter convention misaligns with the previous scientific recommendations (i.e., the Toronto call). Alternatively, since the first IPCC report (1990) does not encompass as stringent scientific recommendations as the Toronto call, it considers that the UNFCCC may be sufficient; however, since developed countries did not issue any domestic climate policies, and since industrial actors hampered climate action, it argues that this period certainly resulted in parallel *individual* breaches by Global North actors.

Section 3.2.2 classifies the period between the UNFCCC and the Paris Agreement of 2015, marked with the adoption of the Kyoto Protocol (KP) in 1997, as a period of collective formal *procedural* compliance, tainted though, with serious individual substantive breaches, given that no developed country respects the UNFCCC and KP binding obligations on their territorial level. Additionally, since the USA and industrial actors opposed the KP, resulting in serious individual CDD violations, an alternative treaty should have been negotiated sooner.

The last, Section 3.2.3, finds collective and individual breaches in the period between AR4 and the adoption of the Paris Agreement, based on conclusions of the Dutch courts in *Urgenda* (later on confirmed by the Brussels Appeals Court, and the ECtHR), as the world did not successfully negotiate any alternative to the KP, and as developed countries did not enact measures to reduce their GHGs by at least 25% by 2020, either individually or jointly.

3.2.1 The IPCC and UNFCCC establishments (1988-92): substantive CDD shortcomings despite procedural progress

3.2.1.1 The potential beginning of collective substantive CDD breaches

In 1988, three notable events happened. The IPCC, which was established by the UN General Assembly (UNGA), is arguably the most significant one. However, before the UNGA resolution, two further very notable events also occurred.

Firstly, Dr Hansen of NASA testified for the *third* time before Congress on the reality of man-made climate change, confirming the causal relationship between GHG and global warming, including its dangerous nature¹⁵⁸⁷.

Finding: This warning reconfirms CDD's applicability in the USA and may aggravate the corresponding substantive breach of the Reagan Administration (1981-88), which rolled back the support to solar energy (see the subsection 1.1.3.3 just above). Given the multiple climate-related warnings, both domestically and internationally, the USA should have expanded its mitigation efforts.

Secondly, the Toronto Conference on the Changing Atmosphere took place in June 1988. This conference, mainly composed of scientists, followed those organised in Geneva in 1979 and in Villach in 1985¹⁵⁸⁸. Interestingly, while noting the lack of a climate-related treaty, the Toronto Statement described the evolution of international environmental law, referencing the *Trail Smelter* case and the 1972 Stockholm Declaration, thereby further developing CDD¹⁵⁸⁹. More substantively, the Toronto Statement called on States to ratify the 1987 Montréal Protocol on ozone-depleting substances (since they are also GHG)¹⁵⁹⁰, and to reduce by 20% global

1587 Speth G, "Declaration of James Gustave Speth in Support of Plaintiffs' Response in Opposition to Defendants' Motion for Summary Judgment", *Juliana v USA*, Case 6:15-cv-01517-TC, Document 298, 28 June 2018, § 35.

1588 "Proceedings, World Conference, Toronto, Canada, 27–30 June 1988: *The Changing Atmosphere – Implications for Global Security*", Appendix 5, List of conference participants, p 459 et seq.

1589 *Ibid*, p 296.

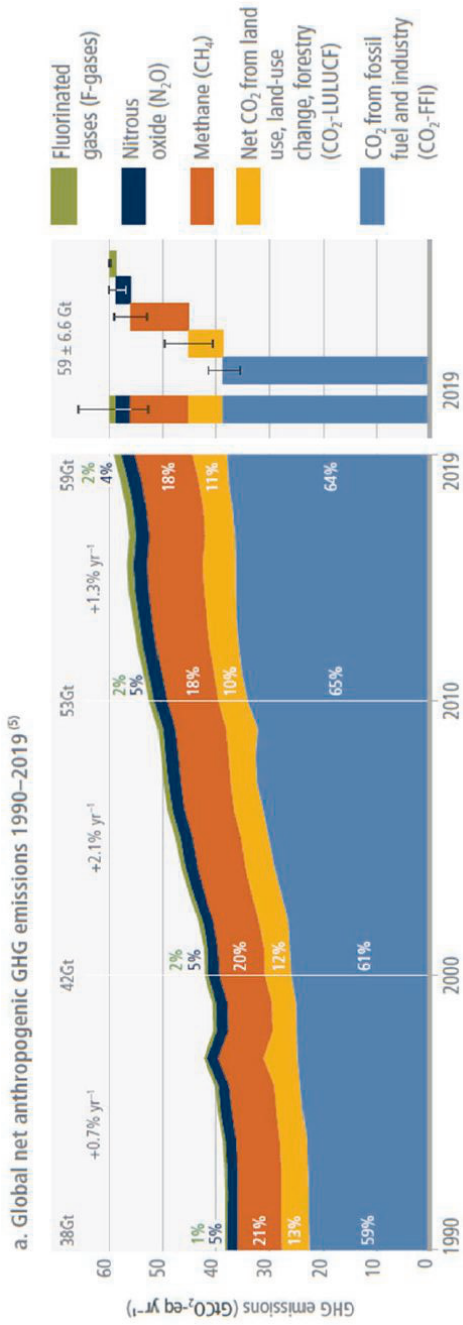
1590 The fight against ozone-depleting substances remains one of the significant victories in environmental protection. See IPCC, AR6 (2021-23), WG I, Chapter 1, p 180: "In the 1970s and 1980s, scientists established that synthetic halocarbons (see Glossary), including widely used refrigerants and propellants, were extremely potent greenhouse gases (Sections 2.2.4.3 and 6.2.2.9; Ramanathan, 1975). When these chemicals were also found to be depleting the stratospheric ozone layer, they

GHG emissions by 2005 compared to 1988, specifying that “the industrialized nations have a responsibility to lead the way”¹⁵⁹¹.

Finding: The Toronto conference reinforces the previous finding on international CDD applicability, due to its due diligence references and precise GHG reduction recommendations. Since the Toronto recommendation to reduce GHGs by 20% by 2005 compared to 1988 was never implemented (i.e., global GHGs increased by 50% by 2019 compared to 1990 – see below), *collective* and *individual* CDD breaches, especially by Global North countries, may have begun with this conference.

were stringently and successfully regulated on a global basis by the 1987 Montreal Protocol on the Ozone Layer and successor agreements (Parson, 2003).”

1591 “Proceedings, World Conference, Toronto, Canada, 27–30 June 1988: *The Changing Atmosphere – Implications for Global Security*”, p 296.



Source: IPCC, AR6, WG III, TS, Figure TS2, p. 59.

Thirdly, the UN General Assembly (UNGA) created the IPCC in December 1988 with the resolution “43/53 Protection of global climate for present and future generations of mankind”¹⁵⁹², and recalled that global warming “could be disastrous for mankind if timely steps are not taken at all levels”¹⁵⁹³. This step is significant since the IPCC has issued the most important policy-relevant reports worldwide since its creation, thanks to its international organisation character composed of 195 Member States, which select scientists, review the science, and establish so-called summaries for policymakers (SPM). Thus, the value of the information contained in SPMs is both scientifically and politically consensual, making it even more relevant for climate policies and litigation¹⁵⁹⁴.

Finding: One may infer *procedural* compliance with the IPCC establishment, but still argue the beginning of different *substantive* breaches since the international community has not implemented the Toronto conference’s main recommendation (i.e., reduce global GHG by 20% by 2005 compared to 1988). In fact, the UNFCCC, adopted in 1992, remained much more elusive in terms of substantive requirements than the Toronto call. The Kyoto Protocol, which stipulates a clear obligation for developed states to reduce GHG by 5% by 2012 compared to 1990, which is considerably less demanding than the Toronto call (see below), and was furthermore never accepted by the USA; lastly, although, the 2015 Paris Agreement sets a global and long-term temperature target (LTTG), it does not prescribe any specific GHG reduction obligation, and States remain unaligned with the PA’s LTTG (i.e., current policies lead to 2.4 to 3°C of warming instead of 1.5°C / well-below 2°C).

Nevertheless, one might question whether failing to adopt domestic and global GHG reduction targets in line with the Toronto call was a breach since the IPCC ARI (1990) only estimated that it was “desirable” to adopt GHG reduction targets (nonetheless, the IPCC also recommended a whole range of measures)¹⁵⁹⁵. On the other hand, the IPCC may have tended to be more conservative because it was created by States through a UNGA

1592 UNGA, Resolution 43/53, “Protection of global climate or present and future generations of mankind”, 70th Plenary meeting, 6 December 1988.

1593 *Ibid.*, § 5

1594 More precisely, the IPCC released six assessment reports (AR), addressed below and numerous methodological and special reports (including the already quoted SRI.5). <https://www.ipcc.ch/about/>.

1595 IPCC, ARI (1990), WG III, Overview (SYR), § 3.2: “One option that governments may wish to consider is the setting of targets for CO₂ and other greenhouse gases”.

resolution, and because its reports are reviewed by States¹⁵⁹⁶. However, since the international community largely failed to curb global emissions and to reach the peak of global emissions, a corresponding collective CDD violation still remains possible.

In 1989, the industry formed the Global Climate Coalition to highlight the uncertainties of climate science publicly¹⁵⁹⁷. According to Supran and Oreskes, “between 1989–2004, Mobil and ExxonMobil Corp advertorials overwhelmingly expressed doubt about AGW [anthropogenic global warming] as real and human-caused, serious, and solvable”.¹⁵⁹⁸

Finding: The absence of any climate consideration associated with the public undermining of climate science by fossil fuel actors in the USA from 1989 onwards, especially ExxonMobil, may have constituted the beginning of a CDD breach.

3.2.1.2 The 1990 First Assessment Report (AR)

3.2.1.2.1 The WG I confirmation of the “natural greenhouse effect” and likely man-made global warming

The findings of WG I are particularly important for climate cases and CDD as they establish, *with certainty*, the “natural greenhouse effect” and the fact that additional *anthropogenic* GHGs increase their natural concentration in the atmosphere¹⁵⁹⁹. The IPCC also found *with confidence* that CO₂ emissions are the main *anthropogenic* drivers of global warming¹⁶⁰⁰. This finding is still right today.

1596 For concurring opinions, see, for instance: Bagley Katherine, Scientists Call for Overhaul of IPCC Climate Panel, Inside Climate News, 30 Sept 2013; Hansen J, Anderson Kevin, IPCC’s conservative nature masks true scale of action needed to avert catastrophic climate change, The Conversation, 24 March 2023.

1597 Franta B, Early oil industry disinformation on global warming, Environmental Politics 2021, Vol. 30, No. 4, pp 663 – 668; Joselow M, “Exclusive: GM, Ford knew about climate change 50 years ago”, *E&E News*, 26 October 2020.

1598 Supran G and Oreskes N, “Addendum to ‘Assessing ExxonMobil’s climate change communications (1977–2014)’”, *Environmental Research Letters* 15 (2020) 119401.

1599 IPCC, AR1 (1990), WG III, Overview (SYR), § 1.0.1.

1600 *Ibid*, § 1.0.2.

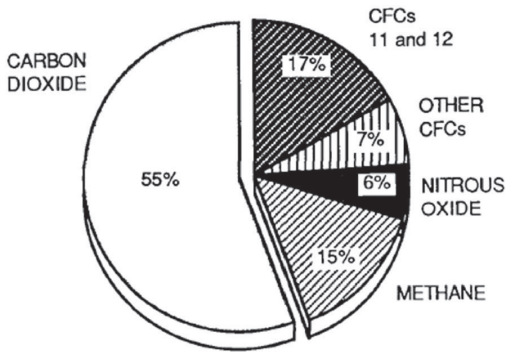


Figure 7: The contribution from each of the human-made greenhouse gases to the change in radiative forcing from 1980 to 1990. The contribution from ozone may also be significant, but cannot be quantified at present.

Source: IPCC, ARI (1990), WG I, Overview (SYR), p. xx, Figure 7.

More precisely, the IPCC elaborated the “greenhouse warming potential” (GWP) of each GHG by benchmarking them against CO₂ emissions. In this regard, some GHGs are considerably more potent than CO₂ emissions, which are, however, widespread. Furthermore, CO₂ emissions remain long in the atmosphere, even if natural land vegetation and the sea (oceans) incrementally absorb them. Regarding the ozone-depleting Halogen emissions (CFCs), which are also very potent GHGs, the 1987 Montreal Protocol successfully curbed them¹⁶⁰¹.

Next, the IPCC found “with confidence” that additional GHGs significantly disbalance the global environment¹⁶⁰², resulting “in a likely increase in the global mean temperature of about 1°C above the present value by 2025” in the “Business-as-Usual” Scenario¹⁶⁰³. This calculation was accurate, as it corresponds to the current estimation of global warming. The best estimate of the recent levels of warming is 1.07°C in 2019, according to AR6 (2021-23)¹⁶⁰⁴.

1601 See “Box Technical Briefing 3” of this thesis for further information, or AR6 (2021-23), WG I, Chapter 1, p 180.

1602 IPCC, ARI (1990), WG III, Overview (SYR), § 1.0.2.

1603 *Ibid*, § 1.0.3.

1604 IPCC, AR6 (2021-23), SYR, § A.1.2.

The IPCC also foresaw that the *unequivocal* finding of man-made global warming would not occur until ten years later¹⁶⁰⁵, as the AR6 report (2021-23) first reached this finding¹⁶⁰⁶. In 2007 (AR4), the IPCC only recognised that global warming is “*unequivocal*”, but this level of confidence was not related to human influence¹⁶⁰⁷. Notably, in AR1 (1990), there was still some uncertainty about the effect of aerosols and albedo, but their warming effect was still considered much more likely¹⁶⁰⁸.

Finding: This AR1 WGI contribution confirmed the need to investigate further the risks at that moment (i.e., CDD’s *procedural* applicability).

3.2.1.2.2 The WG II potential findings on the climate impacts

To introduce this subsection, one should recall the WG I finding, according to which numerous predictions were uncertain, “particularly with regard to the timing, magnitude and regional patterns of climate change, especially changes in precipitation”¹⁶⁰⁹. Despite the uncertainties, the IPCC estimated that climate change may provoke the following issues in 1990:

“2.2.1 Natural terrestrial ecosystems could face significant consequences as a result of the global increases in the atmospheric concentrations of greenhouse gases and the associated climatic changes. [...].

2.4.1 The most vulnerable human settlements are those especially exposed to natural hazards, e.g. coastal or river flooding, severe drought, landslides, severe wind storms and tropical cyclones. The most vulnerable populations are in developing countries, in the lower-income groups: residents of coastal lowlands and islands, populations in semi-arid grasslands, and the urban poor in squatter settlements, slums and shanty towns, especially in megacities. In coastal lowlands such as in Bangladesh, China and Egypt, as well as in small island nations, inundation due to sea-level rise and storm surges could lead to significant movements of people. Major health impacts are possible, especially in large urban areas, owing to changes in availability of water and food and increased health problems due to heat stress spreading of infections.

1605 *Ibid*, § 1.0.5.

1606 IPCC, AR6 (2021-23), WG I, SPM, § A.1 – A.1.3.

1607 IPCC, AR4 (2007), SYR, SPM, p 2.

1608 IPCC, AR1 (1990), WG I, SPM, p xv and xxvii.

1609 *Ibid*, § 1.0.4.

2.5.1 Global warming will accelerate sea-level rise, modify ocean circulation and change marine ecosystems, with considerable socioeconomic consequences. These effects will be added to present trends of rising sea-level, and other effects that have already stressed coastal resources, such as pollution and over-harvesting. A 30–50 cm sea-level rise (projected by 2050) will threaten low islands and coastal zones. A 1 m rise by 2100 would render some island countries uninhabitable, displace tens of millions of people, seriously threaten low-lying urban areas, flood productive land, contaminate fresh water supplies and change coastlines. All of these impacts would be exacerbated if droughts and storms become more severe. Coastal protection would involve very significant costs.”¹⁶¹⁰

Finding: The same conclusion as the subsection just below (contribution of the WGI) applies here. In fact, the IPCC plainly spells out the dangers, further contributing to CDD’s applicability.

3.2.1.2.3 The WG III findings on the need to transition

While WG III warned that the mitigation policies’ cost-benefits and their effectiveness are still poorly understood¹⁶¹¹, the IPCC still “recommends” the development and implementation of a global climate mitigation programme as a wait-and-see policy approach may be too late: “A major dilemma of the issue of climate change due to increasing emission of greenhouse gases in the atmosphere is that actions may be required well before many of the specific issues that are and will be raised can be analyzed more thoroughly by further research.”¹⁶¹²

On causation, supplementing the WG I findings, the IPCC recognised that “[t]he single largest anthropogenic source of radiative forcing is energy production and use.”¹⁶¹³ More precisely,

“It is noted that emissions due to fossil fuel combustion amount to about 70–90% of the total anthropogenic emissions of into the CO₂ atmosphere, whereas the remaining 10–30% is due to human use of terrestrial ecosystems. A major decrease of the rate of deforestation as well as an increase in afforestation would contribute significantly to

1610 *Ibid*, § 2.2.1 – 2.5.1.

1611 *Ibid*, § 3.0.1.

1612 *Ibid*, § 3.0.2.

1613 *Ibid*, § 3.0.2.

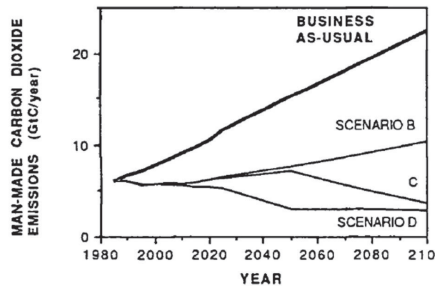
slowing the rate of CO₂ concentrations increase in the atmosphere; but it would be well below that required to stop it.”¹⁶¹⁴

Therefore, one may infer a need to reduce energy production and consumption, especially fossil fuels, in addition to stopping deforestation. This stance also concords with the final recommendations of WG III in ARI (see below). Before addressing those, it is also worth noting that the IPCC developed four main emissions scenarios:

- Scenario A (Business-as-Usual)
- Scenario B (Low Emissions Scenario)
- Scenario C (Control Policies Scenario) and
- Scenario D (Accelerated Policies Scenario).

While scenario A assumes continued use of fossil fuels and deforestation, scenario B foresees the development of natural gas as a transitional fuel and greater energy efficiency, as opposed to the lower emissions scenarios being scenarios C and D, which outline a more or less rapid transition to renewable and “safe” nuclear energy¹⁶¹⁵.

Figure 1 Projected man-made CO₂ emissions (Billion or 1000 million tonnes carbon per year)



Source: IPCC, ARI, SYR, p. 61, Figure 1 and 2.¹⁶¹⁶

The IPCC then calculated that mitigation policies (i.e., scenarios-C and D) would “slow global warming from the presently predicted value of about 0.3°C per decade to about 0.1 °C per decade”¹⁶¹⁷. For the IPCC, despite the

1614 *Ibid*, § 3.0.2.

1615 *Ibid*, Appendix, p 62.

1616 For the sake of comparison, the recent AR6 (2021-23) findings show significant discrepancies in the identification of the yearly emitted global CO₂ (for the year 1990, approximately 7 GtCO₂/year were identified in ARI, whereas 28 GtCO₂/y for AR6), highlighting the uncertainties in the identification of worldwide GHG in 1990 (source: IPCC, AR6 (2021-23), 2022, TS, p 62, Figure TS.3).

1617 IPCC, ARI (1990), WG III, Overview (SYR), § 1.0.3 and § 3.2.

uncertainties in 1990, the seriousness of climate change impacts justified the immediate adoption of GHG reduction strategies, including¹⁶¹⁸:

- “phasing out of CFC emissions” (see the 1987 Montréal Protocol);
- energy efficiency and *conservation* (i.e., improving technology and curbing consumption, by encouraging “behavioural change” in transportation and housing);
- “use of cleaner, more efficient energy sources” (i.e., developing renewables);
- manage forests sustainably by stopping deforestation and expanding afforestation;
- “review of agriculture practices”¹⁶¹⁹.

Additionally, the IPCC stated that “there is no single quick-fix technological option” and that international cooperation was appropriate for developing some technologies, such as cleaner energies¹⁶²⁰.

The IPCC thus considered that “[a] comprehensive strategy addressing all aspects of the problem and reflecting environmental, economic and social costs and benefits is necessary.”¹⁶²¹ This need, which was scientifically established in 1990, significantly aligns with the obligations laid out in the ECtHR *KlimaSeniorinnen* judgment¹⁶²².

However, as seen above, no State implemented such a comprehensive strategy individually. The USA, more specifically, fell short in this respect, as its government rolled back incentives and state aid for solar energy, despite being aware of the climate-related risks (see subsection 3.1.3.3). Thus, developed States, including the USA, may have begun to breach CDD by that time.

Concerning the GHG reduction targets, the IPCC deemed them *desirable*¹⁶²³. This recommendation conflicted with the Toronto call to reduce GHG by 20% by 2005 compared to 1988. Nonetheless, this stance did not hamper the IPCC from recommending a comprehensive strategy and insisting on the need to implement effective short-term response strategies

1618 *Ibid*, § 3.2.

1619 *Ibid*, § 3.2.

1620 *Ibid*, § 3.2.

1621 *Ibid*, § 3.2.

1622 ECtHR, *KlimaSeniorinnen et al v Switzerland*, no. 53600/20, 9 April 2024, § 550 (among others).

1623 IPCC, ARI (1990), WG III, Overview (SYR), § 3.2: “One option that governments may wish to consider is the setting of targets for CO₂ and other greenhouse gases”.

that are “flexible” and “economically efficient”, such as the measures laid out above. Lastly, the IPCC recommended that governments deepen global climate science research programmes to reduce uncertainties, and review “planning in the fields of energy, industry, transportation, urban areas, coastal zones and resource use and management”¹⁶²⁴.

The WG III then drew a line between “industrialised and developing countries [which] have common but varied responsibility”¹⁶²⁵. The IPCC thereby laid the scientific basis for the equity and the CBDRRC principle in the climate conventions (the common but differentiated responsibilities and the respective capabilities), but also the fact that developed States “should take the lead in two ways”¹⁶²⁶. In the view of the IPCC, these principles mean, more precisely, that:

“i) A major part of emissions affecting the atmosphere at present originates in industrialized countries where the scope for change is greatest. Industrialized countries should adopt domestic measures to limit climate change by adapting their own economies in line with future agreements to limit emissions.

ii) To co-operate with developing countries in international action, without standing in the way of the latter’s development by contributing additional financial resources, by appropriate transfer of technology, by engaging in close co-operation in scientific observation, analysis and research, and finally by means of technical co-operation geared to forestalling and managing environmental problems.”¹⁶²⁷

The IPCC then stated that “sustainable development” must be achieved by systematically integrating environmental protection into all economic and development plans and that developed countries must assist their developing counterparts “without hindering their economic development”.

An ultimate section addressed the need to enhance international cooperation by establishing a “framework convention”. The international community implemented this recommendation two years later, with the adoption of the United Nations Framework Convention on Climate Change (UNFCCC).

Findings: This ARI report confirms the beginning of a global CDD *substantive* duty – and breach – since the world community failed to duly

1624 *Ibid*, § 3.2.2.

1625 *Ibid*, § 3.1.

1626 *Ibid*, § 3.1.

1627 IPCC, ARI (1990), Overview (SYR), § 3.1.

consider the fact that fossil fuels are the main cause of anthropogenic CO₂ emissions, and the corresponding recommendation to *develop* the transition to cleaner energies and reduce energy consumption. In the land use sector, no public or private actor succeeded in ending or significantly reducing deforestation, nor in reviewing agricultural practices at the required scale.

Lastly, developed countries did not seem to have taken the lead in the fight against climate change, as none have enacted specific domestic mitigation policies in the 1990s, including the EU¹⁶²⁸, nor have they sufficiently assisted developing countries. Hence, despite finding no need to prescribe precise GHG reductions, like in the Toronto call, this IPCC report clearly seems sufficient to find the beginning of both *collective* and *individual* breaches.

3.2.1.3 Despite the 1992 UNFCCC, individual CDD violations due to a lack of GHG reduction measures

In 1990, the USA refused to negotiate a treaty on GHG controls even though other nations were in favour¹⁶²⁹. Thus, only the international community of States adopted the Framework Convention (UNFCCC) in 1992 (see below), which does not contain any *unambiguous* climate mitigation reduction target, unlike the Toronto call.

At the same time, the US EPA concluded that “it lacked statutory authority over greenhouse gases”, as Congress refused to empower it to regulate GHG emissions¹⁶³⁰ despite its 1990 report recommending a stabilisation of GHGs at 350 ppm, which was considered back then to enable a limitation

1628 For instance, concerning the EU, the first specific climate-related measure was adopted in 2003 with the “ETS Directive” (2003/87/EC of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC). While the amended Directive 96/61/EC of 1996 concerning integrated pollution prevention and control also addressed energy efficiency, it left entire margins of appreciation to the Member States in this respect, besides eight years to implement it after its entry into force (see corresponding Article 5). See subsection 3.2.1.3 below for further analysis.

1629 Speth G, “Declaration of James Gustave Speth in Support of Plaintiffs’ Response in Opposition to Defendants’ Motion for Summary Judgment”, *Juliana v USA*, Case 6:15-cv-01517-TC, Document 298, 28 June 2018, § 39 underpinned by footnote 9.

1630 SCOTUS, *Massachusetts v EPA*, 549 U. S. (2007), Opinion of the Court, p 9.

of global warming to 2°C¹⁶³¹. The EPA justified this by relying on the residual scientific uncertainty about the causal relationship between GHGs and global warming¹⁶³² and on the significant implications of the mitigation measures, requiring an *explicit* mandate from Congress. The EPA further justified its point by showing that the Clean Air Act Amendments of 1990 only provided for “further investigation into climate change” and the regulation of ozone-depleting substances¹⁶³³. As already addressed, the US Supreme Court found in *Massachusetts v EPA* (2007) that the EPA has a duty to regulate GHGs, which it later limited in *West Virginia et al v EPA* (2022).

Findings: The refusals to mitigate global warming contradict past scientific reports. However, given that the EPA refused to act for certain reasons, the political branches should have acted. This domestic issue does not absolve the USA of its *general* CDD duty to adequately mitigate warming.

Similarly, the EU also refused to introduce a carbon tax at the beginning of the 1990s, particularly because of the USA’s refusal to regulate GHGs¹⁶³⁴. Although one may interpret the US refusal as an attenuating circumstance for finding a CDD breach for the EU, due to the carbon leakage effects described in the introduction (see section 0.1.3), the EU remained a key player internationally, especially concerning climate mitigation, and should have tackled climate mitigation independently of the USA’s policies, by adopting, for instance, the carbon tax in 1990, or alternative reasonable measures, as it could have still influenced the course of events. Thus, the EU *may* have breached its individual CDD obligations already by 1990.

Concerning the responsibility of fossil fuel actors, according to Bonneuil and others, the fossil fuel producers in Europe – especially Total and the former Elf (now TotalEnergies) – used the scientific and policy uncertainties to their advantage to lobby against the introduction of the eco-tax, which, according to the former director of strategy and economy at Elf (Francis Girault), also “undermined Europe’s position at the Rio summit, contributing to limiting the scope and ambition of the UN process”¹⁶³⁵. The lobbying activities of fossil fuel companies like Total, Shell and others may

1631 Speth G, “Declaration in Support of Plaintiffs”, *op cit*, § 39.

1632 SCOTUS, *Massachusetts v EPA*, 549 U. S. (2007), Opinion of the Court, p 10.

1633 *Ibid*, p 9.

1634 Bonneuil C, Choquet P-L, Franta B, “Early warnings and emerging accountability: Total’s responses to global warming, 1971–2021”, *Global Environmental Change* 71 (2021), p 6.

1635 *Ibid*.

also constitute CDD breaches as they hindered the enactment of sufficiently ambitious and specific GHG regulations.

In 1992, governments adopted the UNFCCC, the first climate-related international treaty.

As addressed in subsection 1.1.2.1.1, Article 2 lays out the core objective of this framework convention, which is to prevent dangerous climate change. It requires the reduction of GHG “within a time-frame sufficient to allow ecosystems to adapt naturally to climate change”, it also states this objective shall not threaten “food production” and “economic development”. In other words, the UNFCCC core Article requires State Parties to balance interests and tackle climate change without impeding the economy, which should “proceed in a sustainable manner”. While the remainder of the UNFCCC remains loose in terms of concrete rights and obligations of state parties, the UNFCCC still requires State parties to take precautionary measures against climate change by sharing the global burden equally and without imposing any disproportionate burden.

Article 4 sets out the corresponding State obligations: Report domestic emissions; Implement national climate mitigation measures, including decarbonisation; Preserve natural carbon sinks; Embed climate change consideration in all “relevant social, economic and environmental policies” through “for example impact assessments” (*procedural* and *substantive* due diligence). “Promote and cooperate in scientific, technological, technical, socio-economic and other research”, etc.

According to Article 4 (2), developed country Parties (Annex I countries¹⁶³⁶) also bear additional specific obligations in terms of mitigation. Developed countries (Annex I) “*shall* adopt national policies and take corresponding measures on the mitigation of climate change”, showing that they “are taking the lead”¹⁶³⁷. More concretely, developed countries must communicate “detailed policies” information on the measures and

1636 “Annex I: Australia Austria Belarus a/ Belgium Bulgariaa/ Canada Czechoslovakia a/ Denmark European Economic Community Estonia a/ Finland France Germany Greece Hungary a/ Iceland Ireland Italy Japan Latvia a/ Lithuania a/ Luxembourg Netherlands New Zealand Norway Poland a/ Portugal Romania a/ Russian Federation a/ Spain Sweden Switzerland Turkey Ukraine a/ United Kingdom of Great Britain and Northern Ireland United States of America _____ a/ Countries that are undergoing the process of transition to a market economy.”

1637 This provision (Article 4 (1) lit a) also underscores the need to consider the different domestic circumstances and the “need to maintain strong and sustainable economic growth”.

policies to “return individually or jointly to their 1990 levels”¹⁶³⁸ before 2000. According to Prof Maljean-Dubois, quoting Professors Faure, Nollkaemper and Voigt, it “arguably could be the basis of a liability claim”¹⁶³⁹. However, Article 4 (2) remains a reporting obligation, and in Speth’s view, this provision was not enforceable, notably due to the US position:

“In U.S. Department of State Memorandum entitled PRD-12/Global Climate Change Policy Decision Paper, the Department of State made the following statements: “While many nations sought to set firm ‘targets and timetables’ for reducing greenhouse gas emissions, U.S. objection to firm commitments resulted in an agreement that sets a non-binding goal for developed countries to return emissions to 1990 levels by the end of the decade.”

Additionally, paragraphs 3 – 9 of Article 4 require developed State Parties to assist, including financially, developing and vulnerable countries in mitigating and adapting to global warming. Paragraph 4 stipulates that parties from the Global North “shall also assist developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects. Paragraph 7 makes clear that the “extent to which developing countries will effectively implement their commitments [...] will depend on the [...] financial resources and transfer of technology” of the developed country Parties. These articles set out, in principle, strong expectations for industrialised nations, as agreed by the legal literature¹⁶⁴⁰, notably Professor Sands, who commented that Article 4 (4) “amounts to an implicit acceptance of responsibility for causing climate change”¹⁶⁴¹.

Opposed to such an interpretation, the USA stated in the context of the Rio Declaration that it “does not accept any interpretation of principle 7 that would imply a recognition or acceptance by the United States of any international obligations or liabilities, or any diminution of the responsibil-

1638 Article 4 (1) lit b).

1639 Maljean-Dubois S, “Climate Change Litigation” (2019) *Max Planck Encyclopedia of Procedural Law* § 17.

1640 Verheyen R, “Climate Damage and International Law: Prevention Duties and State Responsibilities”, *Martinus Nijhoff*, Leiden, 2005 p 153.

1641 Sands P, “The United Nations Framework Convention on Climate Change” (1992) 1 *RECIEL* p 270.

ities of developing countries under international law”¹⁶⁴². In a similar vein, it is argued by Zahar that the concept of climate historical responsibility is a “political propaganda” by developing States, such as Brazil and China, as the process of industrialisation was welcomed by them¹⁶⁴³. Nonetheless, the USA’s and Zahar’s positions clearly contradict the UNFCCC obligation and the interpretation of *general* CDD by this thesis, which is shared by many international, regional and domestic judicial bodies (ITLOS, ECtHR, ICJ, domestic courts; see Part 2 above).

Findings: Firstly, given the obligations set out in Article 4 UNFCCC (i.e., implement national mitigation measures, decarbonise, preserve natural carbon sinks, etc), *substantive* CDD was manifestly universally applicable from 1992 onwards in a global and polycentric manner. In fact, the UNFCCC, a *specific* agreement, laid out international obligations close to *general* due diligence in climate matters (see for further analysis section 1.1.2), made *general* CDD applicable without the shadow of a doubt, at least for States (see corresponding findings by domestic courts and the ECtHR in section 2.3.2), but very probably for high-emitting private actors too.

Secondly, as prominent authors from the literature suggest (Maljean-Dubois, Voigt, Rajamani, Mayer, Noellkamper, and others), some provisions of the UNFCCC – and/or their entirety, read in conjunction with due diligence norms – “could be the basis of a liability claim” (i.e., developed States must take measures to “return individually or jointly to their 1990 levels”¹⁶⁴⁴ before 2000). This PhD fully aligns with these authors. While the obligation to return below 1990 levels by 2000 for developed countries in Article 4 (2) does not seem in line with the Toronto conference call to reduce global GHG by 20% by 2005 compared with 1988, this obligation was still far-reaching. Compliance with it would have prompted significant changes in favour of climate mitigation.

In addition to the Article 4 general mitigation obligation of the UNFCCC, the IPCC AR4 stressed the need for a corresponding “comprehensive strategy.”¹⁶⁴⁵ However, the EU and US failed to adopt any domestic climate mitigation measures such as supporting renewables, curbing energy

1642 51. U.S. interpretive statement on World Summit on Sustainable Development declaration, <https://2009-2017.state.gov/s/1/38717.htm>, last accessed 31 October 2025.

1643 Zahar A, “Two Arguments Against Historical Responsibility for Climate Change”, 2021, p 13 – 14.

1644 UNFCCC, Article 4 (1) lit b).

1645 IPCC, ARI (1990), WG III, Overview (SYR), § 3.2.

consumption and deforestation until 2001 and 2009/21, contradicting the obligations set out in Article 4 UNFCCC. The lack of any framework or action at that time likely constituted a breach. Indeed, as Part 2 showed, the ECtHR interpreted human rights protection and the flowing due diligence standard in line with the UNFCCC in *KlimaSeniorinnen*¹⁶⁴⁶. The ICJ also interpreted the UNFCCC and due diligence as a single set of compatible rules¹⁶⁴⁷.

Concerning private actors, one may argue that the lobbying efforts by private fossil fuel actors and others constitute CDD violations since they dissuaded States from setting up climate action.

3.2.2 The occurrence of additional breaches during the period of the Kyoto Protocol

3.2.2.1 The 1995 IPCC AR2 confirmation of CDD's substantive applicability

After the UNFCCC adoption, the IPCC issued its AR2 in December 1995.

As to the physical science of global warming (WGI contribution):

In AR2, the IPCC reconfirmed that global warming was manifestly occurring, as it found that the 1995 CO₂ concentration in the atmosphere had increased from 280 ppm¹⁶⁴⁸ by 1750 to around 360 ppm in 1995, leading to a warming¹⁶⁴⁹ of 0.3 to 0.6°C¹⁶⁵⁰. According to current knowledge, scientists consider that a CO₂ concentration of 350 ppm corresponds to approximately 1°C of global warming after the full-time lag effect of CO₂¹⁶⁵¹. Furthermore, the IPCC observed that “global sea level has risen by between 10 and 25 cm over the past 100 years and much of the rise may be related to

1646 ECtHR, *KlimaSeniorinnen et al v Switzerland*, no. 53600/20, 9 April 2024, § 550 (among others).

1647 ICJ, *Obligations of States in respect of Climate Change*, Advisory Opinion, 23 July 2025, § 310.

1648 The acronym ppmv stands for “particles per million by volume”. I will use “ppm” from here on, as it is the most widespread convention.

1649 IPCC, AR2 (1995), SYR, p 4, § 2.2.

1650 *Ibid*, p 5, § 2.4.

1651 Hansen J, Kharecha P, Sato M, Masson-Delmotte V, Ackerman F et al, “Assessing ‘Dangerous Climate Change’: Required Reduction of Carbon Emissions to Protect Young People, Future Generations and Nature”, *PLoS ONE* 8(12): e81648, 3 December 2013.

the increase in global mean temperature”, thus supporting the likelihood of man-made global warming¹⁶⁵².

Some predictions were moreover conservative, compared to current knowledge. AR2 underestimated the projected rise in temperatures if CO2 emissions would rise until 2030 or 2050, as it considered global warming would reach 2°C by the end of the century in the “mid-range emission scenario”¹⁶⁵³ (see 550 ppm and 650 ppm scenarios on the graph below). Updated findings predict higher levels of warming if emissions follow a 550 ppm path (around 3°C or more):

- AR3 (2001) considered a 550 ppm path would rather lead to 3°C of warming¹⁶⁵⁴. Instead, from AR3 onwards, the 450 ppm scenario is considered as the likely 2°C scenario.
- AR4 (2007) confirmed that 550 ppm would lead to 3°C or more¹⁶⁵⁵.
- AR5 (2014) stated that a 550 ppm path would lead to 3 to 4°C of warming¹⁶⁵⁶.
- AR6 (2021-23) confirmed the AR3-AR5 findings¹⁶⁵⁷.

With regard to the respective weight and impact of different GHGs, the IPCC has clearly made progress in this area, as it found that CO2 contributes around 60% to warming, a finding that has been confirmed by recent IPCC publications¹⁶⁵⁸.

Finding: The somewhat underestimation of the warming does not change anything with respect to the previous substantive CDD applicability finding. On the contrary, AR2 reconfirms the different chains of causation, being the contribution by man to global warming through the burning of fossil fuels¹⁶⁵⁹, which leads to global warming.

Regarding the impacts of global warming (WGI and WGII contributions):

As to non-slow onset events, the IPCC stated that more severe droughts and floods will occur in some regions, but also that there is a possibility of more intense rainfalls¹⁶⁶⁰. It was not in a position, however, to predict

1652 IPCC, AR2 (1995), SYR, p 5, § 2.4.

1653 IPCC, AR2 (1995), SYR, p 5, § 2.7.

1654 *Ibid*, p 20, Figure SPM -6.

1655 IPCC, AR6 (2021-23), WG III.

1656 IPCC, AR5 (2014), SYR, p 22, Table SPM.1.

1657 IPCC, AR6 (2021-23), WG III, SPM, § C.1.

1658 IPCC, AR6, WG III, TS, Figure TS2, p 59.

1659 IPCC, AR2 (1995), SYR, p 5, § 2.2.

1660 *Ibid*, p 6, § 2.11.

whether tropical storms would become more intense and frequent¹⁶⁶¹, which has since been confirmed¹⁶⁶². The IPCC also addressed the possibilities of large-scale non-linear surprising events in the climate system (such as the irreversible tipping points, a hot topic in climate science nowadays¹⁶⁶³), but was unable to predict anything in this regard due to the prevailing uncertainties¹⁶⁶⁴.

Forests would undergo major changes, releasing “large amounts of carbon”¹⁶⁶⁵. The SPM of the WG II contribution even stated prominently that warming beyond 1°C will endanger forests¹⁶⁶⁶. Furthermore, it identified losses of mountain glaciers¹⁶⁶⁷ and a large potential release of methane due to permafrost thawing¹⁶⁶⁸ (one of the tipping points that could be triggered above 1.5°C according to the SRI.5¹⁶⁶⁹).

As to the impacts on humans, the IPCC identified that the “world’s poorest people” may face increased risks of “hunger and famine [especially in...] subtropical and tropical areas”.¹⁶⁷⁰ Sea level rise would “increase the vulnerability of some coastal populations to flooding” and cause as well “[e]stimated land losses range from 0.05% in Uruguay, 1.0% for Egypt, 6% for the Netherlands and 17.5% for Bangladesh to about 80% for the Majuro Atoll in the Marshall Islands, given the present state of protection systems.”¹⁶⁷¹

More generally, the IPCC considered that “significant loss of life” is *likely* to occur due to more intense and frequent heat waves, and vector-borne infectious diseases such as malaria¹⁶⁷². These kinds of personal harms trigger numerous CDD human-rights-related lawsuits nowadays (see the subpart 2.1 on standing).

Finding: The above findings show the dangerousness of climate change and its related risks of damage, which can only reinforce the applicability of substantive CDD.

1661 *Ibid.*

1662 IPCC, AR6 (2021-23), SYR, 2023, B.1.4.

1663 *Ibid.*, B.3.1.

1664 IPCC, AR2 (1995), SYR, p 6, § 2.12 and § 3.5.

1665 *Ibid.*, p 7, § 3.7.

1666 IPCC, AR2 (1995), SPM, WG II, p 29.

1667 *Ibid.*, p 7, § 3.11.

1668 *Ibid.*, p 7, § 3.12.

1669 IPCC, SRI.5, Chapter 3, p 262.

1670 IPCC, AR2 (1995), SYR, p 7, § 3.13.

1671 *Ibid.*, p 8, § 3.14.

1672 *Ibid.*, p 8, § 3.15.

Regarding GHG reduction pathways (WG III):

In 1995, *policymakers* faced the challenge of determining what constitutes dangerous levels of warming. The IPCC underlined some challenges in this respect, including the scientific uncertainties, the “irreversible damages or costs, a very long planning horizon, long time lags between emissions and effects, wide regional variations in causes and effects, an irreducibly global problem, and a multiple of greenhouse gases and aerosols to consider”, and the need for international cooperation.¹⁶⁷³ Although there is almost no scientific uncertainty remaining today, and, on the contrary, a common sense of urgency, the global nature of the climate issue and the related need for international cooperation remain significant hurdles.

The IPCC started to set out different GHG reduction pathways to limit global warming by taking cumulative CO₂ concentration as the relevant proxy, ranging from 450 ppm to 1000 ppm¹⁶⁷⁴. The concentration of 450 ppm was therefore the most ambitious and equated to 1°C of warming according to the IPCC back then. As Figure 1 (b) of AR2 SYR shows, this pathway foresaw an emissions peak before 2015 and carbon neutrality around 2040, which is indeed significantly more ambitious than average 1.5°C pathways identified in the 2018 SRI.5 and 2022 AR6 reports. Current scientific knowledge informs us that 450 ppm pathways lead to approximately 2°C of warming (see, among others, the AR4 and AR5 results about 450 ppm). This discrepancy between the former and the current knowledge calls into question the applicability of substantive CDD.

1673 *Ibid*, p 4, § 1.9.

1674 See the graph below stemming from IPCC, AR2 (1995), SYR, p 10, Figure 1 (a).

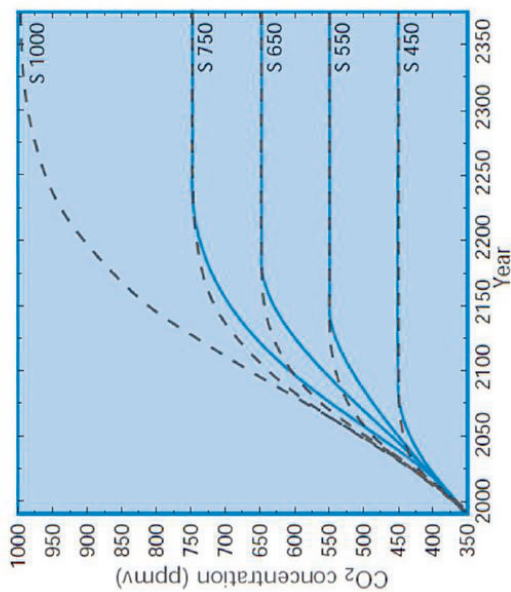


Figure 1 (a). Carbon dioxide concentration profiles leading to stabilization at 450, 550, 650 and 750 ppmv following the pathways defined in IPCC (1994) (solid curves) and for pathways that allow emissions to follow IS92a until at least the year 2000 (dashed curves). A single profile that stabilizes at a carbon dioxide concentration of 1000 ppmv and follows IS92a emissions until at least the year 2000 has also been defined. Stabilization at concentrations of 450, 650 and 1000 ppmv would lead to equilibrium temperature increases relative to 1990¹⁴ due to carbon dioxide alone (i.e., not including effects of other greenhouse gases (GHGs) and aerosols) of about 1°C (range: 0.5 to 1.5°C), 2°C (range: 1.5 to 4°C) and 3.5°C (range: 2 to 7°C), respectively. A doubling of the pre-industrial carbon dioxide concentration of 280 ppmv would lead to a concentration of 560 ppmv and doubling of the current concentration of 358 ppmv would lead to a concentration of about 720 ppmv.

Source : IPCC, AR2 (1995), SYR, p. 10, Figure 1 (a).

Next, with regard to the GHG reduction measures and technologies, the IPCC stated that those “are technically possible and can be economically feasible.”¹⁶⁷⁵ Firstly, 10-30% gains in energy efficiency were considered “feasible at negative to zero cost”, and almost 50-60% gains were considered feasible by using the best technologies available at the time. These efficiency gains concerned “end-use sectors” namely industry, transportation, commercial/residential and required improving energy efficiency, recycling materials, developing processes that use less energy and materials, building smaller and more efficient automotive vehicles, including electric vehicles, and insulating better houses, etc¹⁶⁷⁶. All these means remain necessary today.

However, due to population growth, the IPCC considered that even replacing former technologies with more efficient ones would still lead to higher absolute emissions¹⁶⁷⁷. One may logically infer the *need* to carry out an *energy* transition in the supply sector – the AR2 conclusion also called on the world to go beyond “no-regrets measures” – also called “measures worth doing anyway” – such as energy efficiency¹⁶⁷⁸. The IPCC also considered this transition to be possible within the next 50 to 100 years “in step with the normal timing of investments to replace infrastructure and equipment as it wears out or becomes obsolete”¹⁶⁷⁹. The IPCC then set out the following “promising approaches” – which remain relevant today¹⁶⁸⁰:

- replace coal with natural gas,
- develop carbon capture and storage (CCS) for producing hydrogen,
- reduce fugitive emissions such as methane in the fossil fuel production,
- switch to non-fossil fuel sources of energy: nuclear or renewables.

In the land-use sector, the IPCC suggested using biomass instead of fossil fuels, but also slowing deforestation, planting trees, and promoting agroforestry¹⁶⁸¹.

1675 IPCC, AR2 (1995), SYR, p 12, § 5.2.

1676 *Ibid*, § 5.5.

1677 *Ibid*, § 5.5.

1678 *Ibid*, p 15, footnote 18.

1679 *Ibid*, p 12, § 5.6.

1680 IPCC, AR6 (2023), SYR, § B.6.3. and C.3 – C.3.3.

1681 IPCC, AR2 (1995), SYR, p 13, § 5.12.

The IPCC also stated that “mitigation depends on reducing barriers to the diffusion and transfer of technology”¹⁶⁸², meaning it considered State intervention as necessary. The IPCC suggested the following measures:

- energy price strategies, subsidies removal for fossil fuels,
- market-based emission permits,
- programs negotiated with industry,
- demand-side management programs,
- regulatory programs such as energy efficiency standards,
- stimulating R&D,
- renewable energy incentives¹⁶⁸³.

All these proposed policies remain relevant today, due to the substantial delays in enacting them.

As to the equity issues in the SR2:

Firstly, the IPCC recognised equity as “an important aspect of climate change policy”¹⁶⁸⁴ and found two types of issues: one related to the differences between developed and developing countries, and the other between present and future generations, by qualifying the latter as intertemporal aspects¹⁶⁸⁵ akin to the German Constitutional Court in its 2021 decision¹⁶⁸⁶. These issues are, of course, still fully relevant nowadays since mitigation measures – beyond the “no regrets measures” – have costs. Hence, the IPCC recalled that the initial intention of the UNFCCC parties to ascribe GHG reduction targets only to developed countries (Annex I Parties) is a “collective first step”¹⁶⁸⁷. The IPCC then outlined several equity metrics, including equal per capita, historical responsibility, emission intensities, and economic output, wealth, energy structures, etc. As this thesis discusses in detail, these global equity and fair share considerations are still highly relevant today, a statement with which the IPCC recently agreed, stating: “Equity remains a central element in the UN climate regime, notwithstanding shifts in differentiation between states over time and challenges in assessing fair shares.”¹⁶⁸⁸

1682 *Ibid*, p 13-14, § 5.13.n t

1683 *Ibid*, p 13-14, § 5.13.

1684 *Ibid*, p 14, § 6.1.

1685 *Ibid*, § 6.3 - 6.6.

1686 Constitutional Court of Germany, 1 BvR 2656/18, 24 March 2021.

1687 IPCC, AR2 (1995), SYR, p 15, § 6.6.

1688 IPCC, AR6 (2021-23), WG III, SPM, § D.3.2.

Lastly, the IPCC addressed in its SYR “economic development to proceed in a sustainable manner”, by briefly reviewing the costs and benefits of mitigation and adaptation. The IPCC considered that the “social costs of climate change” (meaning impacts on humans and the environment) are very uncertain, but could reach a “few per cent of world GDP”, while also noting that developing countries would be harder hit¹⁶⁸⁹. Although “substantial reductions below 1990 CO₂ emissions level could be as high as seven per cent of GDP” for OECD countries, the IPCC stated that there were other, more optimistic studies¹⁶⁹⁰. It clearly stated that mitigation could avoid both “climate change damages and adaptation costs” and trigger other co-benefits (less polluted air, higher biodiversity)¹⁶⁹¹. Concerning developing countries, the IPCC stated that there were emissions reduction opportunities in the short term but that “Stabilization of carbon dioxide emissions is likely to be costly.”¹⁶⁹²

Overall, the IPCC concludes that scientific uncertainties should not prevent the adoption of “no regrets” opportunities, and given the risks of climate change, policymakers should devise “precautionary” and “prudent” strategies “beyond “no regrets””, while being “carried out with care”, in order to ultimately achieve “sustainable development for all peoples and nations”¹⁶⁹³. This wording suggests a comprehensive application of CDD.

Findings: All these indications confirm CDD’s substantive applicability back then and may be the basis for further breach findings. In fact, after the EU and the USA failed to regulate GHG by 1990, it does not appear that they enacted any *substantive* climate-related measures in the meantime. Governments joined efforts to enact the Kyoto Protocol by 1997; however, the precise reduction obligation started to apply only by 2008 and merely required a very moderate reduction figure until 2012 (5% compared to 1990). Although the evidence in AR2 does not clearly show that the KP’s reduction obligation is insufficient, the fact that the USA never ratified this treaty, and that numerous, if not all, developed countries did not comply with the reduction obligation, may justify further CDD breach findings (see subsection 1.2.2.2 on the KP and corresponding non-compliance findings).

Regarding the EU, aside from energy efficiency measures, it only enacted its first *substantive* climate policies between 2001 and 2003 (see the Direc-

1689 IPCC, AR2 (1995), SYR, p 15, § 7.3.

1690 *Ibid*, p 16, § 7.9.

1691 *Ibid*, p 16, § 7.4.

1692 *Ibid*, p 16, § 7.11.

1693 *Ibid*, p 17, § 8.1 - 8.4.

tives on the promotion of renewable energy¹⁶⁹⁴ and the already mentioned European Trading System ETS¹⁶⁹⁵). These measures came more than 10 years after the eco-tax was discussed at the European level. Meanwhile, emissions rose, or remained stable, in “Western European countries”¹⁶⁹⁶. This delay suggests a period of CDD non-compliance, but more research on the evidence is required to assess potential CDD breaches by the EU and its Member States.

The USA, on the other hand, only started to address GHGs much later. The *Massachusetts* judgment by the Supreme Court was issued in 2007 due to a lack of specific federal regulations in the USA. More concretely, the so-called “Clean Power Plan” was implemented during the Obama Administration, but rolled back in 2019 by the Trump Administration. This plan was subsequently considered to be incompatible with the “major questions doctrine” by the US Supreme Court in *West Virginia*¹⁶⁹⁷. The remaining operational climate mitigation mechanism is the Inflation Reduction Act of 2022, which allocates substantial funding for climate-related mitigation and enables a reduction in US territorial GHG emissions of between 33% to 40% by 2030 compared to 2005 levels¹⁶⁹⁸. Although it is manifestly not enough to contribute adequately to the Paris Agreements’ LTTG, this legislation is also challenged by the second Trump Administration. US hesitation has led to considerable time being lost in the fight against climate change. As shown above, the IPCC already identified the main required measures in 1990. All those measures remain relevant nowadays. Hence, it appears possible that the USA breached their CDD.

In 1996, the EU Council of Ministers recognised for the first time the need to reduce global warming to 2°C. This political determination does not seem unreasonable in light of the IPCC findings in AR2:

1694 Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market(1) OJ L 283, 27.10.2001, p 33. and Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport.

1695 Directive 2003/87/EC of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.

1696 France’s, Italy’s, The Netherland’s emissions remained roughly stable between 1990 and 2005; while Spain’s emissions rose, see <https://eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer>

1697 SCOTUS, *West Virginia v EPA*, 597 U. S. ____ (2022).

1698 US Congressional Research Service, *Inflation Reduction Act of 2022 (IRA): Provisions Related to Climate Change*, updated 26 October 2023.

“Given the serious risk of such an increase and particularly the very high rate of change, the Council believes that global average temperatures should not exceed 2 degrees above pre-industrial level [...] In this context the Council believes that the precautionary principle has to be applied [...] the Council notes that the IPCC considers that significant reductions in greenhouse gas emissions are technically possible, and can be economically feasible. It also notes that significant "no-regrets" opportunities are available; and that there is a rationale, on the basis of potential risk, for action beyond no-regrets.”¹⁶⁹⁹

The Council of the EU reaffirmed the relevance of the 2°C target in 2005, after the publication of AR3 (2001)¹⁷⁰⁰; and the EU Commission at the British G8 in 2006, and in 2007¹⁷⁰¹. Eventually, the international community agreed in Copenhagen in 2009 that global warming should be limited to 2°C¹⁷⁰², before recognising the “well-below 2°C” and “1.5°C” targets in the legally binding Paris Agreement in 2015.

Findings: the commitment to limit warming to 2°C by the EU enabled a concretisation of the UNFCCC article 2 core objective, which, as such, did not seem unreasonable in light of the scientific evidence at that time. Therefore, this step complied with CDD. Nonetheless, although this step was important for the development of international policies, including the Paris Agreement’s LTTG, one should not forget that the EU rejected the carbon tax proposal in 1992 and 1994¹⁷⁰³; and did not start to enact proper climate mitigation measures until 2002-03. As some scientific articles have pointed out, some lobbying activity, especially from the private fossil fuel industry, may have contributed to hindering the enactment of the proposed EU eco-taxes¹⁷⁰⁴. Nonetheless, by not initiating substantive climate mitigation policies in due time, the EU may have breached its CDD and

1699 European Commission, “Community strategy on climate change – Council conclusions”, 1996, p 7, § 6.

1700 Council of the EU, Information note 7242/05 Climate Change: - Medium and longer term emission reduction strategies, including targets, Council conclusions, 11 March 2005.

1701 European Commission, “Limiting global climate change to 2°C: The way ahead for 2020 and beyond”, COM/2007/0002 final, Brussels, 10 January 2007.

1702 Randalls S, “History of the 2°C target”, *WIREs Climate Change* 1 (July/August 2010) p 602.

1703 Bonneuil C, Choquet P-L, Franta B, “Early warnings and emerging accountability: Total’s responses to global warming, 1971–2021”, *Global Environmental Change* 71 (2021), p 6.

1704 *Ibid.*

UNFCCC obligations. What's more, the lobbying of the fossil fuel industry may also constitute a corresponding violation.

3.2.2.2 Additional CDD breaches linked to the 1997 Kyoto Protocol

The Kyoto Protocol (KP) has failed to reduce global emissions. The USA certainly bears a significant share of responsibility for this failure since it refused to ratify the treaty after negotiating it, despite being the richest, most powerful and most polluting state. But what about the other actors?

3.2.2.2.1 The Kyoto Protocol's main provisions and discussion on its sufficiency

In 1997, the international community adopted the Kyoto Protocol, which prescribed in its article 3 (1) that developed countries reduce their GHG, "individually or jointly, [...] by *at least* 5 per cent below 1990 levels in the commitment period 2008 to 2012." This "top-down" approach (i.e., in the sense that the international law prescribes mandatory minimum reduction obligations for developed countries)¹⁷⁰⁵ was generally considered the appropriate and necessary vehicle to go forward, as it obliged collective action on climate mitigation, thereby avoiding the risks of free-riding and carbon leakage¹⁷⁰⁶. Thus, the Encyclopaedia Britannica reports that the KP was "widely hailed as the most significant environmental treaty ever negotiated, though some critics questioned its effectiveness."¹⁷⁰⁷ The KP contained indeed some weak points, which this thesis addresses below in the subsequent subsection (i.e., the US refusal to ratify the KP, and the insufficiency of the specific reduction obligation).

In fact, in case of failure, State Parties would have been held responsible according to paragraphs 5 and 6 of Article 4, which mandated the COP to set out corrective measures in case of non-compliance (see Article 17

1705 Bodansky D, "Climate Change Transnational Legal Order or Disorder?" in Terence C Halliday and Gregory Shaffer (eds), *Transnational Legal Orders* (Cambridge University Press 2015), p 302.

1706 See section 0.1.3 of the introduction on the issue of free riding and carbon leakage issues, or the glossary of this thesis.

1707 The Editors of Encyclopaedia, "Kyoto Protocol", *Encyclopaedia Britannica*, 16 January 2025.

KP). According to a 2005 COP decision on the “Procedures and mechanisms relating to compliance under the Kyoto Protocol”, the KP set up a “compliance committee”, which contained a “facilitative branch” and an “enforcement branch”¹⁷⁰⁸. The latter was tasked with “the restoration of compliance to ensure environmental integrity”¹⁷⁰⁹, which, to fulfil its goal, could have imposed an enhanced commitment period after 2012 (with a 30% deduction of the reduction done so far), a compliance action plan, and the suspension of the right to use emission reduction transfers through the clean development mechanism or any other instrument¹⁷¹⁰. These binding enforcement procedures clearly had a preventive angle to ensure the GHG reduction objectives were met.

Even if it is not explicitly stated so, the KP emission reduction obligation should have, in theory, required due diligent conduct to achieve it. In fact, to bring down GHG under the level of 1990, and to reduce them thereafter even more in the long run, article 2 (1) (a) obliged each Annex I Party to introduce system-wide measures to (i) enhance energy efficiency; (ii) protect and preserve forests and oceans as carbon sinks; (iii) promote sustainable agriculture ; (iv) promote and develop renewable energy, carbon dioxide sequestration technologies (now framed as carbon capture and sequestration; CCS) and other innovative, environmentally sound technologies; (v) progressively phase out “market imperfections, fiscal incentives, tax and duty exemptions and subsidies in all greenhouse gas emitting sectors”; (vi) promote policies of GHG reduction (vii) reduce emissions in the transportation sector; (viii) limit and reduce methane in the waste and energy sector. Additionally, Article 2 (1) (b) stresses the importance of cooperation in the implementation of those points. Article 2 (2) obliges Global North Parties to address international aviation and marine emissions, while paragraph (3) recalls the need to “minimise adverse effects on [...] international trade”. In other words, this article lists in a comprehensive manner all the measures a State should enact to mitigate global warming, akin to the basic expectation of due diligence, which requires, under general international law, to “use all the means at its disposal”¹⁷¹¹.

1708 Decision 27/CMP.1, “Procedures and mechanisms relating to compliance under the Kyoto Protocol”, FCCC/KP/CMP/2005/8/Add.3, 9th plenary meeting, 9–10 December 2005, p 93, “II. Compliance Committee”.

1709 *Ibid*, p 93 and 96, “V Enforcement Branch”.

1710 *Ibid*, p 102, “XV Consequences applied by the Enforcement Branch”.

1711 ICJ, *Pulp Mills*, para 101.

Article 12 furthermore established a “clean development mechanism” (CDM), enabling developed country parties from Annex I or Annex B to use certified emission reductions from projects outside to reduce their own emissions. The official UNFCCC website gave a renewable energy project and an energy efficiency project as examples. However, the GHG reductions resulting from the project must be “additional to any that would occur in the absence of the certified project activity”, meaning that the reductions must not happen without the project. Therefore, although the reduction obligation in Article 3 (1) only concerned developed countries, the idea was to still get the Global South involved through potential common projects and funding. This mechanism was largely used, but the latest IPCC assessment concluded that it produced “mixed” results (i.e., rather positive in terms of capacity building, but negative in terms of overall outcome and effectiveness, especially the absence “additional emissions cuts in host countries, meaning that the overall effect of CDM projects was to raise global emissions”¹⁷¹²).

Regarding the alleged general insufficiency of the reduction obligation of the KP:

Small island states declared in 1998, slightly after the KP’s adoption, that they consider the KP’s target “inadequate to prevent dangerous anthropogenic interference with the climate system” and that it does not preclude the applicability of general international law¹⁷¹³. This dissertation concurs with this stance as to the applicability of CDD; however, the inadequacy of KP’s reduction obligation is not as easy to characterise (see the compliance analysis below).

The climate litigator Dr Roda Verheyen – who did one of the very first PhD in law on climate responsibility – responded negatively to this question in her thesis by arguing that the -5% reduction goal for developed countries was not sufficient as such to reach a global peak in worldwide emissions and to reduce them thereafter, nor was it considered in line with the 450 ppm scenario or the 2°C objective¹⁷¹⁴.

1712 IPCC, AR6 (2021-23), WG III, Chapter 14, p 1476.

1713 Declaration by the Governments of the Cook Islands, Niue, Kiribati, Nauru, Fiji, Independent State of Papua New Guinea, see Status of ratification of UNFCCC and its Kyoto Protocol, Distr. GENERAL FCCC/CP/1999/INF.2, 22 October 1999, <https://unfccc.int/cop5/resource/docs/cop5/inf02.htm>, last accessed 19 January 2025.

1714 Verheyen R, “Climate Damage and International Law: Prevention Duties and State Responsibilities”, *Martinus Nijhoff*, Leiden, 2005 p 111, 120 and 191.

Mayer – a remarkable criticiser of the *Urgenda* outcome¹⁷¹⁵ and climate litigation in general¹⁷¹⁶ – agreed with this stance in his 2018 book on “International Law Climate Change”, by stating the KP “certainly did not suffice to bring all States, or arguably any States, into compliance with their obligations under the no-harm principle”¹⁷¹⁷. Interestingly, despite Mayer’s critical views on climate litigation, Mayer recognises that the international no-harm principle, linked to the obligation of due diligence, is applicable in the realm of climate change mitigation¹⁷¹⁸.

Hence, was the commitment period ambitious enough to follow CDD?

Findings: Independently of the above opinions, the insufficiency of the KP is not as easy to characterise as it seems at first sight, at least at its time of adoption in 1997.

The KP’s obligation seems rather consistent with the IPCC’s AR2 (1995) indications, which relied on the UNFCCC (1992) having imposed on developed countries the goal of returning below 1990 emissions (see article 4 (2)). However, numerous developed countries did not respect this obligation (USA, Canada, Australia, New Zealand, Japan, Norway) and/or significantly struggled to do so (EU) (see compliance analysis in subsection 3.2.1.3 above). Either way, as stated above, the UNFCCC remained at odds with the Toronto call to reduce emissions by 20% by 2005 compared to 1988 (see above, subsection 3.2.1.1).

Regarding Roda Verheyen’s allegation that the 5% GHG reduction obligation was not in line with the 2°C objective: this critique was far from obvious in 1997. Firstly, AR2 (1995) associated a 2°C level of warming with the 650 ppm scenario, and 1°C with 450 ppm. The EU then stated that limiting global warming to below 2°C with the 550 ppm scenario, and the EU (1996) associated a limitation of global warming to below 2°C with the 550 ppm scenario. Yet, the 550 ppm scenario modelled a rise in CO₂ emissions from 1995 until 2030, and the 650 ppm scenario until 2050. Hence, the evidence from AR2 does not seem to indicate a CDD breach if one applies the 2°C scenario as the legal benchmark.

1715 Mayer B, “The Contribution of *Urgenda* to the Mitigation of Climate Change” (2023) 35(2) *Journal of Environmental Law*.

1716 See, for instance, Mayer B and van Asselt H, “The Rise of International Climate Litigation” (2023) *RECIEL*; Mayer B, “Climate Change Mitigation as an Obligation under Human Rights Treaties?” (2021) 115(3) *American Journal of International Law* DOI: 10.1017/ajil.2021.9.

1717 Mayer B, *The International Law on Climate Change* (Cambridge University Press 2018) p 236.

1718 *Ibid*, p 269.

If one considers more updated science (AR3/AR4) as Roda Verheyen or Benoit Mayer manifestly did, the KP 5% GHG reduction obligation by 2012 compared to 1990 seemed insufficient to be on track with the required 25% cut by 2020 compared to 1990 for developed countries (i.e., the IPCC AR4 identified the 25% reduction figure, the COP 13 in Bali recognised its political relevance or need, and eventually the Dutch Courts interpreted the figure to be the CDD minimum GHG reduction obligation by for developed countries such as The Netherlands, including the Supreme Court in *Urgenda*). Therefore, as soon as AR3 and/or AR4 came out, higher GHG reduction obligations should have been imposed, at least.

Still, in 1997, it does not seem possible to label the KP's reduction obligation in clear violation of CDD given the conflicting evidence between AR2 and AR1 and/or Toronto's call (i.e., while Toronto called for a reduction of global GHG of 20% by 2005, and while AR1's low emissions scenario foresaw a stabilisation of GHG from 1990 onwards until 2010, AR2 rather foresaw an increase in global GHG reduction in all its assessed scenarios, including the low emission scenario 450 and 550 ppm; the IPCC manifestly found in AR2 the impossibility of curbing or stabilising emissions by 1995, as neither the UNFCCC and nor any states domestically enacted sufficient GHG reduction goals after 1988 – see above, section 3.2.1).

3.2.2.2.2 The opposition of US public and private actors to the Kyoto Protocol

Although the KP imposed a rather accessible reduction obligation, the USA refused to ratify it. The Supreme Court of the United States laid out the reasons in *Massachusetts* of the USA's refusal to access the KP:

“[b]ecause those targets did not apply to developing and heavily polluting nations such as China and India, the Senate unanimously passed a resolution expressing its sense that the United States should not enter into the Kyoto Protocol. See S. Res. 98, 105th Cong., 1st Sess. (July 25, 1997) (as passed). President Clinton did not submit the protocol to the Senate for ratification.”¹⁷¹⁹

1719 SCOTUS, *Massachusetts v EPA*, 549 U. S. ____ (2007), 2 April 2007, p 6. See the IPCC's confirmation of this fact as well: IPCC, AR6 (2021-23), WG III, Chapter 1, p 172 - 173.

Thus, the lack of any precise reduction obligations for developing non-Annex I countries – one of the weak aspects of the KP, but which did not seem contrary to the IPCC AR2 indications, nor the UNFCCC principles, nor the ARI (see above) – led to the refusal of the USA to access the treaty¹⁷²⁰.

On the other hand, when the KP was drafted in 1997, achieving a GHG reduction peak and a further 5% reduction was certainly understood as a challenge by developed states, as the IPCC stated in its AR2 that that, for OECD countries, “substantial reductions below 1990 CO₂ emissions level could be as high as seven per cent of GDP” while noting other more optimistic studies¹⁷²¹. These costs were highly controversial, and some perceived the KP as a threat to economic growth (see the positions just below by Exxon and the industry, and/or Canada’s position in subsection 3.2.3.2). Still, the IPCC AR2 showed that a 10-30% gain in energy efficiency was already considered possible without any costs and that going beyond “no-regrets measures” was advisable.

In the meantime, ExxonMobil and the industry continued to advocate against the adoption of the Kyoto Protocol, exaggerating the lack of scientific certainty, disproportionately highlighting the economic costs of joining the treaty, the loss of American “today’s lifestyle”, the displacement of industries and jobs (i.e., “carbon leakages”); and stating that the global warming issue is a “very long term phenomenon”¹⁷²².

“ADVERTORIALS 1997 [92] What is not moderate is the call [by the US government and other countries in the run up to UN Kyoto negotiations] to lower emissions to 1990 levels. A cutback of that size would inflict considerable economic pain . . . Committing to binding targets and timetables now will alter today’s lifestyles and tomorrow’s living standards. Flexibility will be constrained. Carpooling in; sport utility vehicles out. High fuel and electric bills. Factory closures. Job displacement. And could businesses and consumers cut their energy consumption by 30 percent without some form of tax or carbon rationing? Probably not.”

1720 The USA never ratified the KP and later withdrew, see United Nations, “Marking the Kyoto Protocol’s 25th Anniversary”, official website, 11 December 2022.

1721 IPCC, AR2 (1995), SYR, p 16, § 7.9.

1722 Supran G and Oreskes N, “Assessing ExxonMobil’s climate change communications (1977–2014)”, *Environmental Research Letters* 12 (2017) 084019, p 11 and tables 3–5.

The wider oil and gas industry and companies from other sectors certainly made similar claims through the API, or the so-called Global Climate Coalition¹⁷²³.

Later on, the US federal government under the Bush Administration (2001-09) definitively dismissed the Kyoto Protocol and downplayed the risks of climate change¹⁷²⁴. The USA's emissions further increased until 2007¹⁷²⁵, and the fact that the USA never joined the KP also did "serious damage to the overall international process aimed at protecting the climate system"¹⁷²⁶.

Findings: Although the USA and Canada remain free under international law to access or withdraw from a certain treaty, it could be argued that their move violated international customary CDD, since it hindered the effectiveness of international cooperation on climate mitigation¹⁷²⁷.

Moreover, the first two IPCC reports (AR1 and AR2) justified the need for developed countries to move first and to assist developing countries in their GHG reductions. Therefore, the fact that KP obliged developed states to "take the lead" was not at all contrary to the scientific recommendations.

As to the responsibility of corporate actors, they may also be found in violation of their duties, as they attempted to influence public opinions against the ratification of the KP.

1723 David A, "Oil industry targets EU climate policy", *The Guardian*, 7 December 2005.

1724 See, among, others: Borger Julian, "Bush kills global warming treaty", *The Guardian*, 29 March 2001; Speth G, "Declaration of James Gustave Speth in Support of Plaintiffs' Response in Opposition to Defendants' Motion for Summary Judgment", *Juliana v USA*, Case 6:15-cv-01517-TC, Document 298, 28 June 2018, § 65.

1725 Source: US Energy Information Administration, "Total Carbon Dioxide Emissions From All Sectors, All Fuels for United States [EMISSCO2TOTVTTTTOUSA]", retrieved from FRED, Federal Reserve Bank of St. Louis, 4 December 2023.

1726 Speth G, "Declaration of James Gustave Speth in Support of Plaintiffs, *op cit*, § 55.

1727 See concurring opinion: Mayer B, *The International Law on Climate Change* (Cambridge University Press 2018); see as well Verheyen (2008), *op cit*.

3.2.2.2.3 The non-compliance of the developed countries with general CDD, despite formal compliance with the KP

As already mentioned in the subsections above, some countries, such as the USA, Japan, Canada, Australia¹⁷²⁸, New Zealand and Norway did not comply with the reduction figure of the KP in 2020, if only *territorial* emissions are considered (GHG in those countries continued to increase from 1990 until 2019 for the USA and Japan; and as to the others, they still remain higher than 1990 by 20-40%). Otherwise, if all the flexibilities are considered (reduction overseas through the clean development mechanism (CDM) and the LULUCF sector), all countries complied with KP¹⁷²⁹.

Canada withdrew on 15 December 2011 from the KP, allegedly fearing sanctions, and certainly to signal a political stance opposed to climate mitigation. Canada's Environment Minister stated that Canada's retraction is due to the USD 14 billion in penalties ensuing from the country's failure to achieve its reduction commitment, but also the lack of reduction obligations for the USA, China and the rest of the world¹⁷³⁰. However, these statements seem to be exaggerations: the compliance committee manifestly cannot impose any penalties if one reads its competencies, but only an enhanced commitment period, combined with a possible restricted access to emission reduction transfers. Canada's Environment Minister may have exaggerated his public statement to label the KP as a disproportionate instrument to justify its repudiation.

Findings:

Canada's withdrawal, combined with public statements discrediting the KP, may constitute breaches of *general* CDD, as it further damaged the international cooperation, in a similar vein to the USA.

As for the other developed countries which did not reduce their domestic emissions by 5% by 2012 (Australia, New Zealand, Norway, and Japan), despite having formally complied with the reduction obligation by using the

1728 See the specific issue concerning Australia, how it received a "special treatment" under the KP: Hamilton C, "Australia hit its Kyoto target, but it was more a three-inch putt than a hole in one", *The Conversation*, 2015.

1729 IPCC, AR6 (2021-23), WG III, Chapter 14, p 1462.

1730 Canada committed to a 6% reduction under the first period of the KP (Federal Court of Ontario (Canada), *Daniel Turp v Canada*, 2012 FC 893, 17 July 2012, § 4 and. See *The Guardian*, "Canada pulls out of Kyoto Protocol: Ministers argue process does not cover US and China – the two biggest emitters – and that Canada cannot meet targets", 13 December 2011.

existing flexibilities¹⁷³¹, it could be argued that they still breached *general* CDD, based on a reasoning analogous to that of *Urgenda*, which states that developed countries must carry out a certain minimum amount of GHG reductions *domestically* through the reduction of *territorial* emissions¹⁷³². In fact, how can one State be deemed in compliance if its own territorial emissions did not stop growing? This conduct is all the opposite of the one researched by the Kyoto Protocol, which required State parties to implement different mitigation actions on the domestic level according to its Article 2 (see above, subdivision 3.2.2.2.1). Hence, a breach of the Protocol itself cannot be ruled out from the outset. Additionally, the contribution of the CDM to climate mitigation is unclear and disputed¹⁷³³. The States that have used the CDM should have done it properly, in compliance with the additionality requirement. Some studies even challenged the overall contribution of the KP to global GHG reductions¹⁷³⁴.

As for the EU-27, its emissions went down between 2005/8 and 2012¹⁷³⁵, and were ultimately below the 1990's levels by 2012. However, it is worth noting the following facts:

- One should recall that the accession to the EU by former Soviet republics contributed to substantial GHG reductions between 1990 and 2010, as laid out above¹⁷³⁶.
- The emissions of the core EU countries individually remained approximately stable between 1990 and 2005, but were reduced in the commit-

1731 IPCC, AR6 (2021-23), WG III, Chapter 14, p 1462.

1732 Supreme Court of the Netherlands, *Urgenda*, 19/00135, 20 December 2019, § 7.3.1 – 7.3.6; nonetheless, the Supreme Court may have considered it admissible to use some flexibilities, such as reductions overseas, like the CDM of the KP.

1733 IPCC, AR6 (2021-23), WG III, Chapter 14, p 1476.

1734 *Ibid*, p 1475.

1735 European Environment Agency, “EEA Greenhouse Gases”, <https://www.eea.europa.eu/en/analysis/maps-and-charts/greenhouse-gases-viewer-data-viewers>, last accessed 19 January 2025.

1736 A significant portion of the former USSR's industrial activity ceased after 1990, leading to almost 50% of GHG reductions in some former USSR countries. Note that “West Germany” merged with “East Germany” in 1991; in 2004 the following countries accessed the EU: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia; in 2007: Bulgaria, Romania; and in 2013: Croatia. See concurring opinion: Rosen A M, “The Wrong Solution at the Right Time: The Failure of the Kyoto Protocol on Climate Change”, *Politics & Policy* (Wiley Online Library, 2015).

ment period between 2005 and 2012 (EU-6: France, Italy, Belgium, the Netherlands, and Germany¹⁷³⁷).

- Some European countries from the “South” (Cyprus, Greece, Spain, and Portugal) saw their emissions rise between 1990 and 2005 and then fell from 2005/08 onwards. However, Spain reached its 1990 levels by 2021 (therefore, individually not in compliance with the KP), and Cyprus is still above its 1990 levels in 2021. Only Portugal and Greece are now below their 1990 levels and may be considered individually compliant with the KP reduction obligation.
- Other EU countries – or former EU countries – complied, including the UK and Scandinavian EU countries (Denmark and Sweden).

One may legitimately ask oneself what the point is of all these climate treaties if the duty bearers can easily avoid compliance without incurring any sanctions, or fulfil them by using external factors without any link to climate mitigation, as it turned out to be for the EU (i.e., the some former USSR States joined the EU without in the 2000s which led to a reduction of GHGs as explained above)?

In general, the KP “built national capacity for GHG accounting, catalysed the creation of GHG markets, and increased investments in low-carbon technologies” according to a recent ex post IPCC assessment¹⁷³⁸. However, the effectiveness of the KP in terms of GHG reductions is far from uncontroversial. While two studies found that the KP led to a reduction of 7 to 10% compared to business as usual in developed countries, another study found no “significant and lasting emissions reductions”¹⁷³⁹. The results regarding the KP’s market mechanisms are even more mixed, as noted above¹⁷⁴⁰.

For the EU, more particularly, the KP led it to issue some framework regulations on the reduction of GHG, namely the 2003 European Trading System (ETS)¹⁷⁴¹, a “cap and trade” mechanism for the whole industrial sector of the EU. The EU also promoted renewables from 2001 onwards¹⁷⁴².

1737 European Environment Agency, “EEA Greenhouse Gases”, *op cit*.

1738 IPCC, AR 6 (2021-23), WG III, TS, p 132.

1739 *Ibid*, Chapter 14, p 1475.

1740 *Ibid*, p 1476.

1741 Directive 2003/87/EC of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, paragraph 5 recita.

1742 The EU introduced some directives on the promotion of renewable energy in 2001 (Directive 2001/77/EC of the European Parliament and of the Council of 27

The EU argued that it designed these legislative measures in a cost-effective manner with wide-ranging effects, i.e., a 35% reduction between 2021 and 2005¹⁷⁴³. Note, however, that these figures are partially contested, since numerous experts – ranging from the IPCC to the EU itself – alleged that carbon leakages occurred, i.e., a displacement of emissions to foreign jurisdictions¹⁷⁴⁴.

Whereas one may argue that these regulations came too late, it is also necessary to recall that the European Commission abandoned its domestic proposals due to the US refusal to regulate GHGs and the pressure of the fossil fuel industry. More research on the evidence may be required to assess potential *general* CDD breaches by the EU and its Member States. However, CDD only requires best efforts, and, in light of the global difficulties in reaching a useful collective target (UNFCCC, KP, non-accession by the USA), the EU's conduct seems somewhat less problematic as it still enacted *some* measures, but not in due time. In any case, while the EU numerically complied with the KP, including through domestic emissions, and restricted the use of CDM to avoid misuses by 2012¹⁷⁴⁵, it was helped by exogenous factors such as the deindustrialisation of the ex-USSR countries.

Findings:

- The level of ambition of the KP's reduction obligation was relatively low but not manifestly insufficient according to the IPCC science available back then (see the discussion in the subdivision 1.2.2.2.1 above).
- The USA's refusal to ratify the treaty likely constitutes a breach of *general* CDD, notably because it significantly damaged international cooperation. It furthermore does not seem implausible that, in a counterfactual scenario in which the USA would have joined the KP and respected

September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market(1) OJ L 283, 27.10.2001, p 33. and Directive 2003/30/EC of the European Parliament and of the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport).

1743 More information on the status of the directive on the official website of the EU: https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en; according to the IPCC, “The EU ETS avoided emitting about 1.2 GtCO₂ between 2008 and 2016 (3.8%), almost half of what EU governments promised to reduce under their Kyoto Protocol commitments (Bayer and Aklin 2020)” (see: IPCC, AR 6 (2021-23), WG III, Chapter 2, p 270).

1744 The EU even enacted anti leakage legislation amendments within the EU ETS; see the Directive 2009/29/Ec Of The European Parliament And Of The Council Of 23 April 2009 amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading scheme of the Community.

1745 IPCC, AR6 (2021-23), WG III, Chapter 14, p 1476.

it (by respecting its former CDD duties), country parties would have complied with the KP's obligations.

- Likewise, Canada's withdrawal further damaged international cooperation on that front.
- In any case, the lack of domestic reductions and the *territorial* non-compliance with Article 3 KP by all the developed countries may constitute *general* CDD breaches, as it requires States to carry out some minimal reductions domestically (see, notably, the *Urgenda* outcome, or the recent ITLOS advisory opinion).
- The KP's left aside all other developing nations, which was the main argument advanced by the US Senate to reject the KP. The IPCC reports at the time did not seem to point to an absolute need for developing countries to reduce their GHGs, though. Hence, the KP was only a first concretisation of the UNFCCC, but a very insufficient one. It is problematic that this multilateral instrument did not work out, despite its very moderate, if not insufficient ambition.

3.2.2.3 The 2001 IPCC AR3 Report showing the need for technological development while highlighting the costs of short-term aggressive mitigation

The IPCC AR3 (2001) report further contributed to the applicability of CDD as the physical evidence became more robust. To avoid repetitions with the subsections above on AR1 and AR2, this thesis briefly presents the main results of AR3 to highlight the main scientific evolutions and mainly focuses on the discussed mitigation measures (questions 6 and 7, usually addressed by WG III) to understand the reasonably expected conduct (i.e., substantive CDD) back then.

For the publication of AR3, the IPCC decided, for the first time, to formally establish a Synthesis Report for policymakers that would be “policy-relevant, but not policy-prescriptive”¹⁷⁴⁶. In this sense, the IPCC responded to nine questions posed by governments.

Concerning the first question (dangerous climate change¹⁷⁴⁷), the IPCC gave a very general and abstract response. It did not state whether a specific

1746 IPCC, AR3 (2001), SYR, p 2.

1747 The main part of the question reads as follows: “what constitutes dangerous anthropogenic interference with the climate system as referred to in Article 2 of the Framework Convention on Climate Change?”

concentration of CO₂ or GHG in the atmosphere is dangerous, nor did it position itself on the issue of whether 1.5°C, 2°C or any other global average temperature is hazardous. It mainly stated it can provide “essential information and evidence” to establish such a finding, which would entail “value judgements determined through socio-political processes, taking into account [...] uncertainties and risk.” This response, including consideration of the introduction, clearly invites policymakers to determine the level of dangerous anthropogenic interference. In this regard, the EU estimated in 1996, and confirmed in 2005, that warming beyond 2°C is dangerous and that, correspondingly, a 550 ppm path is needed to keep global temperatures below that threshold¹⁷⁴⁸. AR3 may have reinforced this position, as question 7, presented below, gives strong arguments in favour of the 550 ppm scenario due to the high GDP losses with a more ambitious scenario, such as the 450 ppm one, despite AR3 classifying the 550 ppm one as a 3°C scenario.

To question 2 (evidence of anthropogenic global warming), the IPCC responded that “There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities”¹⁷⁴⁹. However, the IPCC did not yet classify its findings on ongoing global warming as *unequivocal* but as *very likely* (90-100% certainty)¹⁷⁵⁰.

Concerning question 3 (the consequences of climate change), the IPCC projected that a CO₂ concentration increase of at least 540 ppm should occur, leading to an average of 1.4°C to 5.8°C increase in global temperatures¹⁷⁵¹. The IPCC stated with medium confidence that the more global warming increases, the more severe the adverse impacts will be¹⁷⁵². It would also exacerbate threats to human health and water shortages, particularly in vulnerable and poor countries, and small islands¹⁷⁵³.

As to question 4 (extreme weather events), the IPCC mainly responded that it projects an increase in extreme events, including more extreme temperatures such as heat waves everywhere (*very likely*), intense precipitations

1748 See European Commission, “Community strategy on climate change – Council conclusions”, 1996, p 7 under point 6, 1996 no.188, exhibit 129”. Council of the EU, Information note 7242/05 Climate Change: - Medium and longer term emission reduction strategies, including targets = Council conclusions, 11 March 2005.

1749 IPCC, AR3 (2001), SYR, § Q2.9-11.

1750 *Ibid*, § Q2.9-19.

1751 *Ibid*, § Q3.3-5 and Q3.6-7 & Q3.11.

1752 *Ibid*, § Q3.16.

1753 *Ibid*, § Q3.17 – 3.33.

everywhere (*very likely*), droughts over most mid-latitudes and continental interiors (*likely*), cyclones in the tropics (*likely*), intensified El Niño (*likely*), increased summer monsoons (*likely*), increased intensity of storms, etc¹⁷⁵⁴. Additionally, the IPCC also stated that large-scale and high-impact events become more likely as global warming intensifies (so-called tipping points, which may arise after the 1.5°C threshold is crossed according to current best available science).

Concerning question 5 (time lags and climate inertia): here, the IPCC made clear that there is a need to follow a certain mitigation pathway to prevent the harshest climate-related impacts, as they may be irreversible¹⁷⁵⁵. Moreover, safety margins must be considered when setting strategies and targets¹⁷⁵⁶.

Concerning question 6 (the effect of GHG reductions, as responded to by the WG III), the IPCC recalled that mitigation would “reduce damages”¹⁷⁵⁷, especially if low mitigation pathways such as the 450 ppm scenario were followed¹⁷⁵⁸. Furthermore, as was noted above in the subsection on AR2 (subsection 1.2.2.1), AR3 gave more reliable information on the impact of emission pathways on global average temperatures, finding that the 450 ppm scenario actually corresponds to warming around 2°C (but slightly above), and 550 ppm scenario around 3°C, and 650 ppm around 3,5°C (see graph below). Note, however, that these indications only considered the impact of CO₂ emissions, meaning that other GHGs such as methane, black carbon and others were left aside.

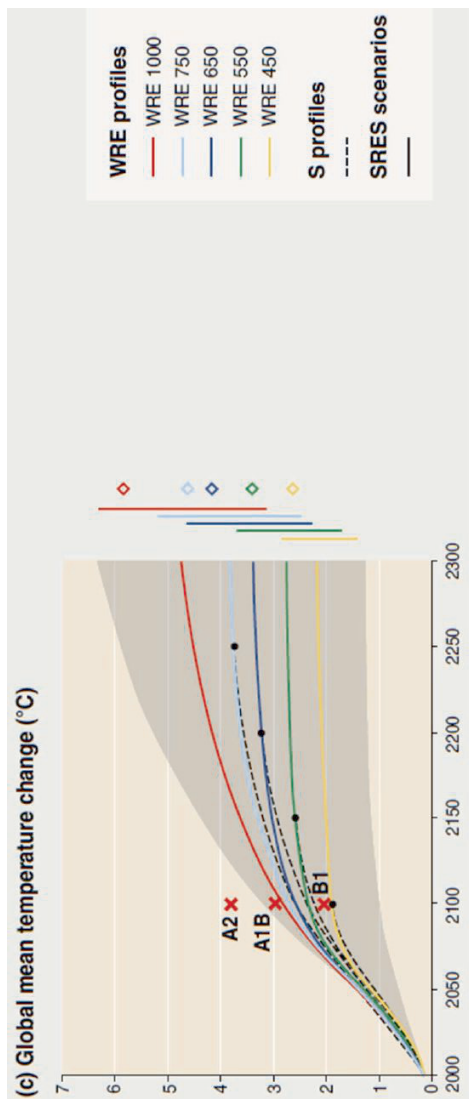
1754 *Ibid*, Table SPM-2.

1755 *Ibid*, § Q5.1-4, Q5.8, Q5.10-12, & Q5.14-17.

1756 *Ibid*, § Q5.18-20 & Q5.23.

1757 *Ibid*, § Q6.9.

1758 *Ibid*, § Q6.11.



Source: IPCC, AR3 (2001), SYR, p. 20, Figure SPM -6.

While the IPCC calculated the costs of mitigation (see below – question 7), it did not calculate the benefits and losses related to global warming in economic terms. Thus, no economic study could demonstrate the *net* economic effect of mitigating global warming.¹⁷⁵⁹

¹⁷⁵⁹ *Ibid*, § Q6.12.

The IPCC furthermore stated that mitigation “raises an important issue of equity”, but that it can, “if appropriately designed, advance sustainable development and equity both within and across countries and between generations.”¹⁷⁶⁰

Regarding the cost estimates of mitigation measures (question 7): Firstly, the IPCC noted the technological progress made concerning renewable energy (market introduction of wind turbines, advancement of cell technology – so, hydrogen –, demonstration of underground CO₂ storage, development of carbon removal and storage (CCS))¹⁷⁶¹.

Next, the IPCC addressed the costs of mitigation. It stated it could have been possible to bring global emissions by 2010 or 2020 below the year 2000, though the costs may have been substantial¹⁷⁶².

Concerning specifically the economic impact of the implementation of the Kyoto Protocol, the IPCC displayed GDP losses, which may have caused a chilling effect on climate mitigation. More precisely, the KP 5% GHG reduction obligation below 1990 levels by 2012 would have led to GDP losses “of about 0.2 to 2%” but only 0.1 to 1.1% of projected GDP with “full emissions trading”. One may infer the economic need to develop emissions trading schemes, as the EU did in 2003.

As we retrospectively know, the USA refused to ratify this treaty (see above subsection 1.2.2.2 on the KP). The Figure SPM-8 might have caused some reluctance in this regard, as it showed higher costs for the USA (0.91 to 1.96% GDP losses) and Canada, Australia (1.14 to 2.02% GDP losses) than the EU (0.81 to 1.50% GDP losses) and Japan (0.45 to 1.20% GDP losses). Furthermore, the IPCC reported that emission reduction measures in developed countries, such as higher carbon prices, may lead to “spill-over” effects, such as technology transfer to the global South, but also counterproductive effects, such as relocations of industries in the Global South, leading to “carbon leakage” in the order of 5-20%¹⁷⁶³. More generally, the IPCC showed significantly higher GDP reductions for the 450 ppm scenario until 2050 (1 to 4.5% GDP loss) than for the 550 ppm or higher scenario (0 to 1.8% GDP loss; see Figure SPM-9 just below).

1760 *Ibid*, § Q6.16-18.

1761 *Ibid*, § 7.3.

1762 *Ibid*, § Q7.15 & Q7 Table 7-1.

1763 *Ibid*, § Q7.19.

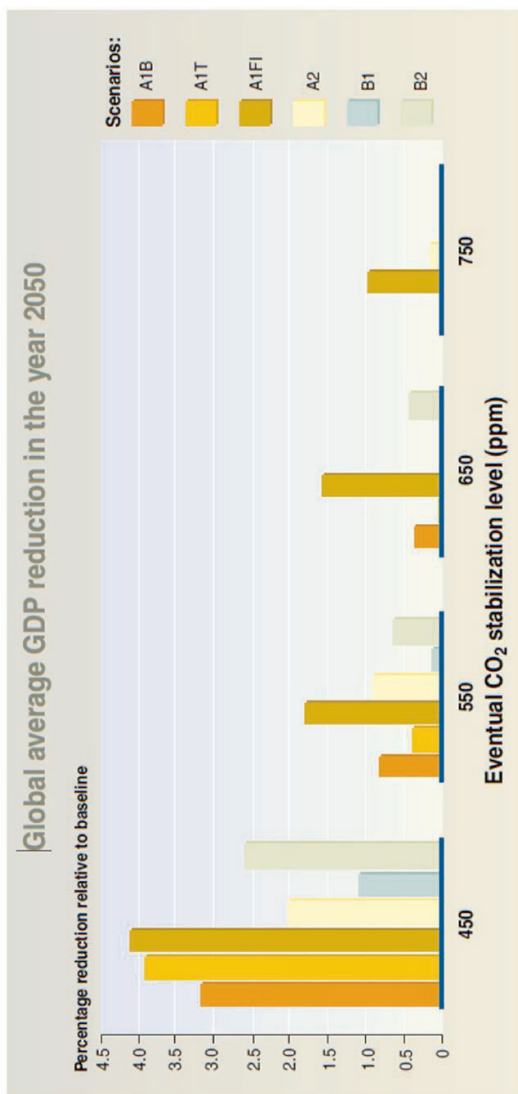


Figure SPM-9: Indicative relationship in the year 2050 between the relative GDP reduction caused by mitigation activities, the SRES scenarios, and the stabilization level. The reduction in GDP tends to increase with the stringency of the stabilization level, but the costs are very sensitive to the choice of the baseline scenario. These projected mitigation costs do not take into account potential benefits of avoided climate change.

Source: IPCC, AR3 (2001), SYR, p. 20, Figure SPM-9.

Commenting on this chart, the IPCC specified that long-term GDP should continue to grow in the long term. Additionally, it further noted that these economic studies did not consider the deployment of some decarbon-

isation technologies, such as CCS, and policies significantly incentivising technological innovation¹⁷⁶⁴.

Hence, the IPCC provided a weighty argument in favour of the 550 ppm scenario, as it labelled this latter scenario as a more balanced one, given the risks and uncertainties of climate-related impacts on one hand, and the benefits and costs of mitigation on the other. The fact that the climate literature in AR3 mainly assessed 550 ppm scenarios is another element showing the influence of the IPCC findings, according to which 550 ppm seems to be a more balanced and realistic scenario¹⁷⁶⁵. However, the publication of AR4 (2007) redirected arguments in favour of the 450 ppm scenarios due to the clear risks of overstepping 2°C, which would certainly materialise if the world exceeds 450 ppm.

It is interesting to note that, since AR4 (2007), climate mitigation is not seen as hindering economic and GDP growth anymore. The most recent IPCC and the IEA assessments even consider that climate mitigation (including 1.5°C pathways) will lead to as much growth as business-as-usual scenarios (see above, Box 2)¹⁷⁶⁶. These different figures on GDP impacts may be explained by the wider availability of low-emissions technologies today, as the IPCC economic studies assessed for AR3 did not consider these, as noted just above¹⁷⁶⁷. Were States right to comply with the KP back then?

Findings: The AR3 showed that 450 ppm scenarios, particularly short-term mitigation policies, led to high economic costs and GDP losses. This finding seems to reasonably advocate in favour of either delayed GHG reduction achievements, pending the availability of mitigation technologies, or alignment with 550 ppm scenarios, which were considered back then as less costly (but insufficient from AR4 (2007) onwards). One may, therefore, question whether the USA's refusal to access the KP should still be evaluated by 2001 as a CDD breach.

1764 *Ibid*, § Q7.25.

1765 The IPCC AR4 SYR table SPM.6 shows that the IPCC considered 118 scenarios corresponding to 485 – 570 ppm scenario, whereas only 45 scenarios for lower levels of concentration. See as well Den Elzen M and Höhne N, “Reductions of greenhouse gas emissions in Annex I and non-Annex I countries for meeting concentration stabilisation targets: An editorial comment”, *Climatic Change* (2008) 91, p 259.

1766 See “Box Technical Briefing 2” of this thesis; referencing notably IPCC, AR6 (2021-23), WG III, SPM, § C.12, and IEA, WEO 2023, Table A.5c, p 281.

1767 IPCC, AR3 (2001), SYR, § Q7.25.

Despite this nuanced economic evidence, AR3 still stated that the more ambitious pathway is less risky in terms of climate-related losses and damages and incurred costs. It further highlighted the strong economic advantages of complying with the KP through full emissions trading schemes, in addition to the general need for developing mitigation technologies¹⁷⁶⁸. It also stated that “near-term action [...] may stimulate more rapid deployment of existing low-emissions technologies and provide near-term strong incentives to future technological changes.”¹⁷⁶⁹ Although the availability of groundbreaking low emissions technologies is expected for the mid to long run, measures incentivising them appear nonetheless even more useful than mere compliance with short-term GHG reduction targets.

In light of these findings, should the compliance analysis of substantive CDD restrict itself to the efforts by one actor to develop GHG reduction technologies, rather than complying with GHG reduction targets? Focusing solely on GHG reduction targets may lead to leakage and high costs if poorly implemented. Thus, while GHG reduction targets still seem necessary to keep track of the progress and the alignment with a given emissions scenario, it seems clear at this stage of the analysis that technological development is one of the top priorities a state or a private actor can undertake to comply with substantive CDD.

3.2.3 2007 - 2014: Lack of 2°C consistent action: the probable individual and collective CDD breaches

3.2.3.1 The 2007 AR4 “Bali-box”, pointing to a CDD duty to limit global warming to 2°C

In 2007, the IPCC released AR4.

The first and certainly one of the most prominent findings of AR4 is that “[w]arming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level”¹⁷⁷⁰. The IPCC cleared any remaining uncertainty about man-made climate change, and estimated that temperature increases reached 0.74 [0.56 to

1768 *Ibid*, § Q5.10-13 ; Q5.22 ; § Q7.9 - Q7.12 ; Q7.23 - 7.27.

1769 *Ibid*, § Q7.24.

1770 *Ibid*, p 2.

0.92]°C in 2005¹⁷⁷¹. Large-scale data collection on the evolution of global temperatures enabled the observation of their gradual increase, in addition to the observation of some changes, such as sea-level rise and retreats of glaciers (“so-called” slow onset events), clearly *attributable* to the causal effect of the accumulation of GHG.

However, the IPCC did not state in 2007 that anthropogenic GHGs are unequivocally the cause of global warming, but only that it is very likely the case¹⁷⁷². More precisely, concerning the physical causes of climate change, AR4 found that anthropogenic GHG increased by 70% between 1970 and 2004 “due primarily to fossil fuel use, with land-use change providing another significant but smaller contribution”¹⁷⁷³. More precisely, fossil fuel use caused approximately 66% of the GHG (56.6 of CO₂ emissions and a significant part of methane (CH₄)), whereas deforestation, decay of biomass and other land use changes caused 17.3% of the global GHG emissions¹⁷⁷⁴. Furthermore, the IPCC found that CO₂ concentrations reached 379 ppm in 2005, approximately 100 ppm above pre-industrial times¹⁷⁷⁵.

Concerning climate impacts, the IPCC found that global temperatures will continue to rise due to the lack of mitigation policies, causing further larger system-wide changes, including:

“Arctic late-summer sea ice disappears almost entirely by the latter part of the 21st century [...] very likely increase in frequency of hot extremes, heat waves and heavy precipitation [...] likely increase in tropical cyclone intensity [...] likely precipitation decrease in most subtropical land regions.”¹⁷⁷⁶

Finding: The physical science in AR4 became even stronger than AR3 (2001), thereby contributing to the full applicability of CDD, without any need to rely on the precautionary principle, given the removal of almost any uncertainty as to ongoing global warming caused by anthropogenic GHGs. In plain words, this finding repelled any excuse to remain inactive.

The IPCC WG II gave numerous examples of climate-related impacts for all the regions and continents of the world (see below) by issuing “very high confidence or high confidence statements [..., specifying that the]

1771 *Ibid*, p 2.

1772 IPCC, AR4 (2007), SYR, p 5.

1773 *Ibid*.

1774 *Ibid*, Figure SPM.3, p 5.

1775 *Ibid*, SYR, p 5.

1776 *Ibid*, p 8.

magnitude and timing of impacts that will ultimately be realised will vary with the amount and rate of climate change¹⁷⁷⁷. The following reproduces some impacts that made some climate-related harms foreseeable from that specific moment in time:

- For Africa, the IPCC foresaw that “[b]y 2020, between 75 and 250 million of people are projected to be exposed to increased water stress due to climate change”. Furthermore, concerning sea-level rise only, African countries could spend 5 to 10% of GDP by the end of the 21st century adapting to it.
- For Asia, changes in the hydrological cycle could cause floods and droughts in East, South and South-East Asia, generating other consequences such as “mortality due to diarrhoeal disease” and, more generally, lack of freshwater availability.
- For Australia and New Zealand, “[b]y 2020, significant loss of biodiversity is projected to occur in some ecologically rich sites, including the Great Barrier Reef” and increased droughts and fires in other regions.
- For Europe, the IPCC expected “increased risk of inland flash floods and more frequent coastal flooding [... and] health risks due to heat waves and the frequency of wildfires.” Besides, “[m]ountainous areas will face glacier retreat, reduced snow cover and winter tourism, and extensive species losses”.
- For Latin America, the IPCC anticipated that “[b]y mid-century, [...] gradual replacement of tropical forest by savanna in eastern Amazonia.”
- For North America, the IPCC estimated that “Coastal communities and habitats will be increasingly stressed”.
- For Polar Regions, the IPCC projected that the reduction of glaciers and ice will cause numerous detrimental effects on wildlife and indigenous communities.
- For Small Islands, the IPCC estimated that “[s]ea level rise is expected to exacerbate inundation, storm surge, erosion and other coastal hazards, thus threatening vital infrastructure.”¹⁷⁷⁸

With regard to heat waves, the IPCC stated they will most affect “elderly, chronically sick, very young and socially isolated” persons¹⁷⁷⁹.

1777 *Ibid*, Table SPM.2., p 11.

1778 *Ibid*, Table SPM.2., p 11 - 12.

1779 *Ibid*, Table SPM.3.

As to the assessment of which levels of warming are dangerous, the IPCC responded, as in AR3, that it unavoidably “involves value judgements”, but that “Science can support informed decisions on this issue, including by providing criteria for judging which vulnerabilities might be labelled ‘key.’” The IPCC reinforced this non-prescriptive policy position with other statements, considering that ecosystems (plant and animal species, biodiversity hotspots more generally) face significant extinction risks if global warming exceeds 1.5°C¹⁷⁸⁰. If warming remains beyond 2°C, the sea level will rise by 7 meters¹⁷⁸¹. The IPCC stressed the particular dangers of overlapping vulnerabilities arising from climate change and “current climate hazards, poverty and unequal access to resources, food insecurity, trends in economic globalisation, conflict and incidence of diseases such as HIV/AIDS”.¹⁷⁸²

Finding: These multiple statements, classified as *likely* or even *very likely*, already showed in 2007 how harmful global warming can be for both the environment and humans if the 1.5°C or 2°C thresholds are crossed. It is therefore arguable that CDD required limiting global warming to 2°C after the AR4 report.

3.2.3.2 The precise AR4 indications on 2°C pathways taken up politically by States, specifying CDD requirements

The IPCC displayed the results concerning the economic effects of mitigation in a considerably different manner: in AR4 (2007), the IPCC found that “there is *high agreement* and *much evidence* of substantial economic potential for the mitigation of global GHG emissions over the coming decades that could offset the projected growth of global emissions or reduce emissions below current levels”¹⁷⁸³; whereas in AR3 (2001), the IPCC rather emphasised the substantive GDP reduction in cases of ambitious mitigation such as in the 450 ppm scenario (see above, subsection 3.2.2.3 on AR3). Nevertheless, AR4 also identified some GDP reductions for ambitious pathways such as the 450 ppm, albeit less than AR3¹⁷⁸⁴. The WG III SPM even found that the Kyoto Protocol’s implementation will lead to fewer

1780 *Ibid*, p 13.

1781 *Ibid*, p 12.

1782 *Ibid*, p 18.

1783 *Ibid*, p 14.

1784 *Ibid*, p 21.

negative economic impacts than those predicted in AR3¹⁷⁸⁵. More precisely, AR4 stated that numerous different low-emissions technologies need to be developed, which could lead to significant reductions by 2030 “with net negative costs”¹⁷⁸⁶. However, the IPCC concluded that significant net additional investments of 5–10% in low-carbon technologies would be required to return GHG emission levels to those of 2005 by 2030¹⁷⁸⁷.

The IPCC also identified the main state policies and obstacles to implementing climate mitigation. For instance, for the energy transition from fossil fuels to renewables and other lower-carbon energies, the IPCC stated, it should be accompanied by the phase-out of harmful subsidies and the phase-in of incentives for renewables. However, as the IPCC rightly predicted, the transition has faced “resistance by vested interests”, such as the fossil fuel companies¹⁷⁸⁸. With regard to the necessary technological developments in other sectors, the IPCC recommended the development of advanced electric vehicles with reliable batteries, solar photovoltaics in the building sector, and CCS for cement, ammonia and iron manufacture, while noting that cooperation between government and industry may be necessary.

Regarding the most effective climate mitigation measures, the IPCC cited “carbon price signal” combined with “induced technological change”¹⁷⁸⁹. Moreover, the IPCC deemed “with high confidence and much evidence” that mitigation benefits to health, thereby offsetting mitigation costs.

The IPCC also asserted that mitigation by developed countries “may affect the global economy and global emissions, although the scale of carbon leakage remains uncertain”¹⁷⁹⁰. The SPM of the WG III gave more details and confirmed the AR3 finding of likely carbon leakage resulting from the implementation of the KP of 5 – 20%, “which would be less if competitive low-emissions technologies were effectively diffused”.¹⁷⁹¹ As in AR3 (2001), this finding highlighted the need to i) develop the right technologies and ii) to adequately disseminate them.

Additionally, the IPCC estimated with a “*high agreement* but *medium evidence* that changes in lifestyle”, such as reducing individual energy con-

1785 IPCC, AR4 (2007), WG III, SPM, p 21 § 25.

1786 IPCC, AR4 (2007), SYR, p 14.

1787 *Ibid*, p 15.

1788 *Ibid*, p 16, Table SPM.5.

1789 *Ibid*, p 18.

1790 *Ibid*, p 16.

1791 IPCC, AR4 (2007), WG III, SPM, p 12, § 9.

sumption, may be useful to climate mitigation too¹⁷⁹². This finding also supports the need to mandate individual change to a certain degree.

Lastly, the IPCC noted the need and the significant advantages of cooperating internationally to tackle climate change, with the aim of making it effective and reducing costs, leakage, etc¹⁷⁹³. It also insisted multiple times on early investments in low-emissions technologies, including their worldwide diffusion and commercialisation¹⁷⁹⁴.

Concerning climate mitigation pathways:

The IPCC readjusted the AR3 results regarding the equivalence of global warming of ppm and found that:

- 450 ppm CO₂eq (all GHGs considered) scenario leads to global warming of around 2°C (or more), which means that a CO₂ concentration of about 350 ppm;
- 550 ppm CO₂eq (all GHGs considered) scenario leads to 3° or more, meaning that the CO₂ concentration is about 450 ppm;
- 650 ppm CO₂eq (all GHGs considered) scenario leads to 4°C or more, meaning that the CO₂ concentration is about 530 ppm;

Table SPM.6. Characteristics of post-TAR stabilisation scenarios and resulting long-term equilibrium global average temperature and the sea level rise component from thermal expansion only^a (Table 5.1)

Category	CO ₂ concentration at stabilisation (2005 = 379 ppm) ^b	CO ₂ -equivalent concentration at stabilisation including GHGs and aerosols (2005 = 375 ppm) ^b	Peaking year for CO ₂ emissions ^{c,e}	Change in global CO ₂ emissions in 2050 (percent of 2000 emissions) ^{d,e}	Global average temperature increase above pre-industrial at equilibrium, using 'best estimate' climate sensitivity ^{d,*}	Global average sea level rise above pre-industrial at equilibrium from thermal expansion only ^f	Number of assessed scenarios
	ppm	ppm	year	percent	°C	metres	
I	350 – 400	445 – 490	2000 – 2015	-85 to -50	2.0 – 2.4	0.4 – 1.4	6
II	400 – 440	490 – 535	2000 – 2020	-60 to -30	2.4 – 2.8	0.5 – 1.7	18
III	440 – 485	535 – 590	2010 – 2030	-30 to +5	2.8 – 3.2	0.6 – 1.9	21
IV	485 – 570	590 – 710	2020 – 2060	+10 to +60	3.2 – 4.0	0.6 – 2.4	118
V	570 – 660	710 – 855	2050 – 2080	+25 to +85	4.0 – 4.9	0.8 – 2.9	9
VI	660 – 790	855 – 1130	2060 – 2090	+90 to +140	4.9 – 6.1	1.0 – 3.7	5

Source: IPCC, AR4 (2007), SYR, p. 20, Table SPM.6.

More precisely, as to the so-called “Bali Box”, included in the AR4 full report, which spilt over to the COP 13 decision (Bali Action Plan):

1792 IPCC, AR4 (2007), SYR, p 18.

1793 *Ibid*, p 18.

1794 *Ibid*, p 20.

The “Bali Box” is an IPCC table¹⁷⁹⁵ from the full WG III report (863 pages) and technical summary, which became politically and judicially relevant and, to some extent, controversial¹⁷⁹⁶. It influenced international climate mitigation policies, especially the 2020 target for developed States, and ultimately constituted the scientific basis for the initial EU 2020 targets, and the *Urgenda* judgement¹⁷⁹⁷ - later confirmed in *Klimatzaak*¹⁷⁹⁸ and *KlimaSeniorinnen*¹⁷⁹⁹. More precisely, this box indicated what developed and developing countries need to do to achieve certain CO2 scenarios, indicating GHG reductions for developed countries in the scale of 25-40% by 2020 compared to 1990, to achieve the 450 ppm scenario (2°C scenario).

Although this table was not part of the SPM or SYR, the 2007 COP decision held in Bali referenced it in a footnote of its fourth paragraph, which recalled the need for deep and urgent emission cuts to achieve the ultimate objective of the Convention (see the quote just below). According to some authors of the scientific and political literature, “[w]hen these negotiations started at COP 13 [2007] in Bali, the box played such a prominent role that it came to be known among negotiators and observers as the “Bali Box”¹⁸⁰⁰.

“Recognizing that deep cuts in global emissions will be required to achieve the ultimate objective of the Convention and emphasizing the urgency to address climate change as indicated in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. [...] (footnote 1: Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Technical Summary, pages 39 and 90, and Chapter 13, page 776).”¹⁸⁰¹

1795 The official name of the table is “Box 13.7”, available at IPCC, AR4 (2007), WG III, Chapter 13 p 776, or in the Technical Summary on pages 39 and 90.

1796 Winkler H et al, “Who picks up the remainder? Mitigation in developed and developing countries”, *Climate Policy* 9 (2009) p 638; Lahna B and Sundqvist G, “Science as a ‘fixed point’? Quantification and boundary objects in international climate politics”, *Environmental Science & Policy* 67 (2017).

1797 District Court of The Hague, *Milieudefensie v Shell*, 26 May 2021, C/09/571932 / HA ZA 19-379; Court of Appeal of The Hague, *Netherlands v Urgenda Foundation*, Case No 200.178.245/01, 2018, § 41 and 73; see as well: Supreme Court of the Netherlands, *Urgenda*, 19/00135, 20 December 2019.

1798 Court of Appeal of Brussels, *Klimatzaak*, 2021/AR/1589, 2022/AR/737 et 2022/AR/891, 30 November 2023, p 90.

1799 ECtHR, *KlimaSeniorinnen et al v Switzerland*, no. 53600/20, 9 April 2024, § 558.

1800 Lahna B and Sundqvist G, “Science as a ‘fixed point’? Quantification and boundary objects in international climate politics”, *Environmental Science & Policy* 67 (2017) p 9.

1801 See the first footnote of the fourth paragraph of the Bali Action Plan.

See below as well the so-called IPCC table:

Box 13.7 The range of the difference between emissions in 1990 and emission allowances in 2020/2050 for various GHG concentration levels for Annex I and non-Annex I countries as a group^a

Scenario category	Region	2020	2050
A-450 ppm CO ₂ -eq ^b	Annex I	-25% to -40%	-80% to -95%
	Non-Annex I	Substantial deviation from baseline in Latin America, Middle East, East Asia and Centrally-Planned Asia	Substantial deviation from baseline in all regions
B-550 ppm CO ₂ -eq	Annex I	-10% to -30%	-40% to -90%
	Non-Annex I	Deviation from baseline in Latin America and Middle East, East Asia	Deviation from baseline in most regions, especially in Latin America and Middle East
C-650 ppm CO ₂ -eq	Annex I	0% to -25%	-30% to -80%
	Non-Annex I	Baseline	Deviation from baseline in Latin America and Middle East, East Asia

Notes:

^a The aggregate range is based on multiple approaches to apportion emissions between regions (contraction and convergence, multistage, Triptych and intensity targets, among others). Each approach makes different assumptions about the pathway, specific national efforts and other variables. Additional extreme cases – in which Annex I undertakes all reductions, or non-Annex I undertakes all reductions – are not included. The ranges presented here do not imply political feasibility, nor do the results reflect cost variances.

^b Only the studies aiming at stabilization at 450 ppm CO₂-eq assume a (temporary) overshoot of about 50 ppm (See Den Elzen and Meinshausen, 2006).

Source: See references listed in first paragraph of Section 13.3.3.3

Source: IPCC, AR4 (2007), WG III, Chapter 13 p. 776; also available in the corresponding Technical Summary on pages 39 and 90.

Although the Bali Box prominence seems at first sight rather positive, it also caused many inconveniences, akin to those encountered around the KP's negotiations and implementation:

- Firstly, the USA refused to integrate the table indications directly into the negotiating text¹⁸⁰².
- Secondly, developed countries criticised the fact that no specific reduction was indicated for developing countries¹⁸⁰³.
- Thirdly, developing countries also complained that the Box required too important efforts from them, as the authors of the Box specified in a subsequent clarification publication that “a substantial deviation from baseline in all regions” means a 15 – 30% reduction by 2020. The EU then used this paper to request the Global South to carry out these reductions, which they eventually refused, as they believed these

1802 Lahna B and Sundqvist G, “Science as a ‘fixed point’? *op cit* (2017), p 12.

1803 *Ibid.*

results came too close to the reductions Western countries needed to implement¹⁸⁰⁴.

With some distance, developing countries may have misunderstood these findings, as the IPCC authors clarified that they did not have to bear the financial burden themselves regarding the indicated 15-30% reduction. Instead, they argued that Annex I countries need to meet the indications either way (whether domestically or through funding reductions overseas¹⁸⁰⁵) and that they should also take care of the indicated reduction in the developing world, through climate finance. In other words, if Annex I countries fund the reductions for Non-Annex I regions (through the Clean Development Mechanism of the Kyoto Protocol or other mechanisms), they can only come in addition to their own proper reductions.¹⁸⁰⁶

In 2009, the COP 15 Copenhagen Accord officially established that, to avoid dangerous levels of warming, the increase should not exceed 2°C¹⁸⁰⁷. Does this political-diplomatic recognition mean a need to limit global warming to 2°C? This doctoral thesis agrees since the COP interpreted the core objective of the UNFCCC, which is enshrined in Article 2. Furthermore, since then, the “2°C target” has been considered as an official target, requiring “deep cuts”. The Copenhagen Accord also called for equity consideration in this context, and even mentioned the 1.5°C limit¹⁸⁰⁸.

However, at COP 15, negotiators failed to draft a follow-up binding agreement to the KP, as the commitment period was planned to end in 2012. Thus, State parties did not agree on precise and adequate GHG reduction objectives.

In 2010, COP 16 adopted the Cancun agreements, which “urged” developed countries to reduce their emissions by 25% by 2020 compared to 1990 to limit global warming to 2°C, by referencing the Bali Box directly in the decision¹⁸⁰⁹.

1804 *Ibid*, p 15.

1805 Den Elzen M and Höhne N, “Reductions of greenhouse gas emissions in Annex I and non-Annex I countries for meeting concentration stabilisation targets: An editorial comment”, *Climatic Change* (2008) 91, p 263.

1806 *Ibid*, p 271.

1807 COP 15 Decision (Copenhagen Accord), *FCCC/CP/2009/II/Add.1*, 18 December 2009, p 5, § 1.

1808 *Ibid*, p 7, § 12.

1809 COP 16 Decision, *The Cancun Agreements*, Decision 1/CMP.6, 2010 (including “Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol at its fifteenth session”).

The relevant legal question for this thesis is as follows: does CDD require developed States to reduce GHG emissions by at least 25% by 2020 compared to 1990 jointly and/or individually, given that AR4 highlighted some harmful impacts beyond 1.5°C and 2°C, but also since the COP 13 (2009) recognised the necessity to limit global warming to 2°C, and since COP 16 urged countries to reduce their emissions by 25%?

Findings: Although one needs to remember that the Cancun Agreements were not binding, State parties still recognised the need to reduce developed countries' emissions by 25%. The recent COP 28 decision also found that the IPCC “had earlier indicated that developed countries must reduce emissions by 25–40 per cent below 1990 levels by 2020”¹⁸¹⁰. The Cancun COP decision was sufficient to make this target legally relevant under *general* CDD, as the Dutch courts confirmed in the *Urgenda* case, the Brussels Appeals Court in *Klimatzaak* and the Grand Chamber of the ECtHR in *Klimasenioren*¹⁸¹¹. In any case, CDD is required to adequately mitigate global warming by setting the right policies to advance and share technological progress, cooperate internationally, incentivise behavioural conduct and control GHGs. However, individual actors seem to have omitted the implementation of these measures. To ascertain this with more confidence, one needs to undertake further research to assess the adequacy of specific individual measures over time (see, however, the complementing analyses regarding compliance with GHG reduction obligations of the UN-FCCC, KP and Bali Box above).

Furthermore, in 2011, a *climate advisory opinion* was discussed within the UN and the legal literature. The Republic of Palau attempted to request such an opinion by initiating a campaign on that issue around 2011¹⁸¹². After having introduced the debate, the USA “blackmailed” Palau by letting it understand that it would stop foreign development aid if the small island Pacific State had gone forward with its request¹⁸¹³.

1810 COP 28, “First Global Stocktake”, FCCC/PA/CMA/2023/L.17, 13 December 2023, § 17.

1811 Supreme Court of the Netherlands, *Urgenda*, 19/00135, 20 December 2019; Court of Appeal of Brussels, *Klimatzaak*, 2021/AR/1589, 2022/AR/737 et 2022/AR/891, 30 November 2023, p 90; ECtHR, *KlimaSeniorinnen et al v Switzerland*, no. 53600/20, 9 April 2024, § 558.

1812 Maljean-Dubois S, “Climate Change Litigation” (2019) *Max Planck Encyclopedia of Procedural Law* § 14.

1813 Mayer B, *The International Law on Climate Change* (Cambridge University Press 2018).

This manifestation of power is unacceptable. Since the USA knew – or should have known – that its CDD obligation was manifestly being breached due to its several withdrawal of climate mitigation measures (i.e., the reduction of subsidies directed to the solar energy industry in the 1980s; see Part 3 for further analysis), its opposition to international cooperation (i.e., its refusal to negotiate a carbon tax before the UNFCCC adoption, the rejection of the Kyoto Protocol, see Part 3 for further analysis), the blackmailing of Palau may be interpreted as a further *aggravated* violation of the due diligence obligation, namely its duty to cooperate in good faith component. Beyond the USA, developed state representatives “repeatedly opposed any discussion of the general legal principles applicable to climate change, arguing that such discussion would hinder international negotiations.”¹⁸¹⁴ In any event, the UNGA resolution 2023 requesting this opinion seems, therefore, a welcome development¹⁸¹⁵. In any case, the misuse of power by the USA – or others – which tried to hinder international legal developments, within the political realm of the COP, the UNGA, or the ILC, may also constitute a CDD breach¹⁸¹⁶.

3.2.3.3 The 2012 refusal of numerous developed countries to recommit under the Doha Amendment

In 2012, State Parties to the KP aimed to define another commitment period for 2012 – 2020.

Some European countries recommitted, including the EU Member States in addition to European countries (Iceland, Liechtenstein, Norway and Switzerland). Furthermore, some former Soviet Republics also recommitted

1814 Mayer quotes the following examples (Mayer B, “The Applicability of the Principle of Prevention to Climate Change: A Response to Zahar” (2015) 5 *Climate Law* p 21, footnote 107): Petr Válek (Czech Republic), in the summary record of the 18th meeting of the Sixth Committee of the un General Assembly’s 68th session, un Doc. a/c.6/68/sr.18 (2013), para. 102; and Andrea Tiriticco (Italy), and Todd Buchwald (United States), in the summary record of the 19th meeting of the Sixth Committee of the un General Assembly’s 68th session, un Doc. a/c.6/68/sr.19 (2013), paras. 10 and 118.

1815 Maljean-Dubois S, “Climate Change Litigation” (2019) *Max Planck Encyclopedia of Procedural Law* § 14.

1816 See the ILC’s mandate for this work (ILC, sixty-fifth session, Supplement No. 10 (A/68/10), (6 May–7 June and 8 July–9 August 2013).

(Belarus, Kazakhstan, Ukraine), including those which later joined the EU¹⁸¹⁷, except Russia (see footnote 16 of the Doha Amendment).

Australia stated that it would only have recommitted under certain conditions (see footnote 3 of the Doha Amendment).

Other industrialised countries, such as Canada, Japan, and New Zealand, did not recommit (see footnote 13 – 15 of the Doha Amendment), which is not surprising, as they were not complying with the KP reduction obligation (see above, subsection 1.2.2.2 on the KP). Regarding the USA, it previously refused to ratify the Kyoto Protocol, allegedly due to the lack of concrete obligations for developing country parties. Therefore, the USA did not participate in negotiations on the Doha Amendment¹⁸¹⁸.

All the former Soviet Republics, which recommitted under the Doha Amendment, including those which joined the EU, did not have to carry out any climate measures for this purpose. In fact, a significant part of their industrial activity ceased after 1990, especially numerous high-emitting industrial activities. This economic breakdown led to substantial GHG reductions between 1990 and 2010 (almost 50% of GHG reductions in the former USSR countries¹⁸¹⁹).

Hence, the Doha Amendment essentially recommitted European States working with the EU under the ETS to *jointly* achieve a 20% reduction in GHG by 2020 compared to 1990 (footnote 4 of the Doha Amendment). However, this target is below the indications of the Bali-Box, requiring at least -25%, and it was particularly easy to achieve it for the EU, as the former Soviet Republics, which joined the EU, and whose industries broke

1817 Poland, Hungary, Romania, Bulgaria, Slovenia, Slovak Republic, Czechia, Croatia, Estonia, Lithuania, and Latvia.

1818 See the IPCC's confirmation of this fact as well: IPCC, AR6 (2021-23), WG III, Chapter 1, p 172 - 173.

1819 See the respective data of each country on the website of the IEA at this address: <https://www.iea.org/countries/russia>; See how emissions fell after 1990 for former USSR countries: Climate Action Tracker (CAT), Kazakhstan, <https://climateactiontracker.org/countries/kazakhstan/>, last accessed 19 January 2025; CAT, Russian Federation, <https://climateactiontracker.org/countries/russian-federation/>, last accessed 19 January 2025; CAT, Ukraine, <https://climateactiontracker.org/countries/ukraine/2021-12-13/>, last accessed 19 January 2025.; see more generally this piece of the scientific literature: Schierhorn F et al, "Large greenhouse gas savings due to changes in the post-Soviet food systems", *Environmental Research Letters* 14 065009 (2019).

down, artificially reduced the EU GHGs for the reasons noted above¹⁸²⁰. Notably, the EU would have committed to -30% if other developed countries had committed to similar reduction levels and if developing countries had “contribute[d] adequately according to their responsibilities and respective capabilities” (see footnote 7 of the Doha Amendment). Iceland, Liechtenstein, and Switzerland laid out similar incentives (see footnotes 8 – 11 of the Doha Amendment). Norway even proposed a GHG reduction target of -40% if “major emitting Parties agree on emission reductions in line with the 2°C target” (see footnote 10 of the Doha Amendment), despite not even complying with the KP in 2020¹⁸²¹.

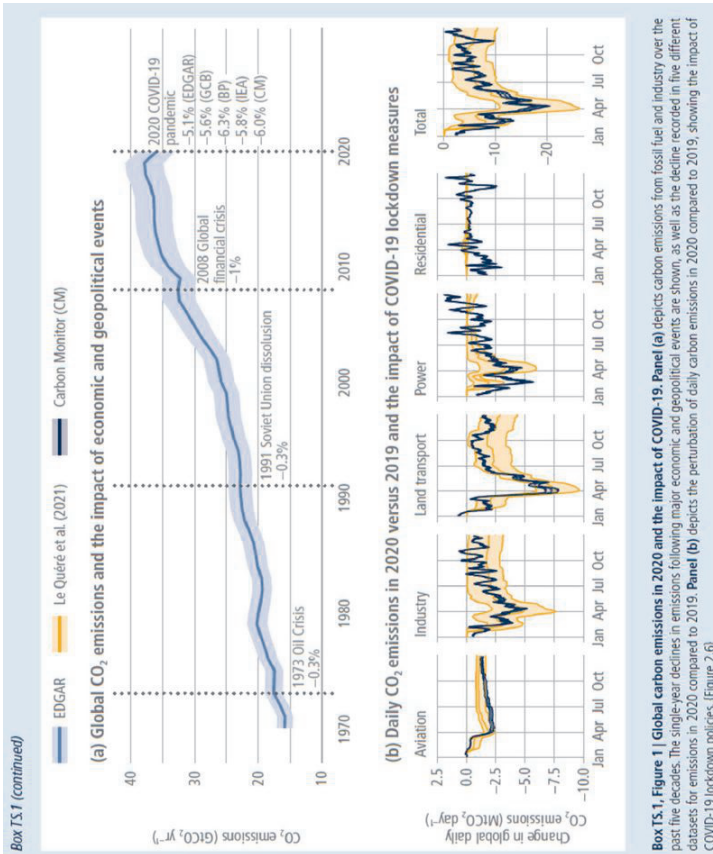
Even though the EU met its 20% reduction commitment according to the most recent and official data (the EU actually even achieved a 30% reduction by 2021¹⁸²²), one needs to remind that the exogenous factors such as the USSR breakdown in 1989, the financial crisis in 2008 and the COVID-19 pandemic in 2020-22¹⁸²³ significantly contributed to these reductions. These events even impacted global emissions, but more acutely the EU (see below).

1820 “West Germany” merged with “East Germany” in 1991, and in 2004 the following countries accessed the EU: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia; in 2007: Bulgaria, Romania; and in 2013: Croatia.

1821 See the GHG reduction profile of Norway by the CAT: <https://climateactiontracker.org/countries/norway/>, last accessed 19 January 2025.

1822 European Environment Agency, “EEA Greenhouse Gases”, *op cit*.

1823 See concurring opinion: Mayer B, “Construing International Climate Change Law as a Compliance Regime” (2018) 7(1) *Transnational Environmental Law* p 130 referring to : I. Shishlov, R. Morel & V Bellassen, ‘Compliance of the Parties to the Kyoto Protocol in the First ‘Commitment Period’ (2016) 16(6) *Climate Policy*, pp 768–82. Economic studies, however, suggest that the developed state parties to the Kyoto Protocol have, on average, emitted 7% or 8% less GHG than other states during that period: N. Grunewald & I. Martinez-Zarzoso, ‘Did the Kyoto Protocol Fail? An Evaluation of the Effect of the Kyoto Protocol on CO2 Emissions’ (2015) 21(1) *Environment and Development Economics*, pp 1–22; R. Aichele & G. Felbermayr, ‘Kyoto and the Carbon Footprint of ‘Nations’ (2012) 63(3) *Journal of Environmental Economics and Management*, pp 336–54.



Source: IPCC, AR6, WG III, TS, Box TS.1.

Were the developed countries obliged to achieve at least 25% emissions reductions by 2020 under any circumstances, including individually, as Dutch courts found in *Urgenda*, and as the Brussels Court of Appeal and the ECtHR have broadly confirmed it? Did the refusal to recommit and the low and conditional commitments under the Doha Amendment breach CDD obligations?

Findings:

One might argue that the 25% reduction figure for all EU countries individually was a bare minimum since the wider EU benefited from numerous different facilitating exogenous factors (i.e., the EU enlargement through the former Soviet Republics, the 2008 financial crisis, and the 2020 COVID crisis). In particular, it seems arguable that the initial members of the EU (France, Germany, Belgium, the Netherlands, Luxembourg, and Italy), in

addition to other very wealthy EU countries (Denmark, Sweden, and the UK), which have high economic capabilities and a rich industrial past, must at least have achieved a 25% reduction individually following the *Urgenda* outcome.

However, CDD goes far beyond simply requiring numerical compliance with this figure. It is indeed necessary to show the effective implementation of substantive and effective mitigation measures (i.e., development and use of low-carbon technologies) to comply with Article 4 UNFCCC and Article 2 KP, and ultimately CDD. Given that Spain, Portugal, Greece, Cyprus, and the former USSR countries had to go through economic difficult times, their individual CDD requirements were likely lower. Nevertheless, they must show that they did everything they could to reduce their GHG since 1990 while pursuing more sustainable industrialisation, like other EU countries. Although more granular and individual breach findings are out of the scope of this thesis, this PhD can add that the entire EU may be found in violation of CDD because it formally adopted its first mitigation measures only by 2001 (promotion of renewables) and 2003 (EU ETS), and because some countries may have remained inactive individually.

Regarding the other developed countries, the COP 28 confirmed that developed countries in general did not reduce their emissions by at least 25%, as indicated in the Bali Box¹⁸²⁴. There are compelling reasons to believe that the *Urgenda* outcome is equally applicable to other developed countries, as the IPCC and the COP did not restrict their indications to solely the EU. Moreover, all developed countries – except the EU – did not meet their KP's reduction obligations territorially. Since CDD arguably required domestic reductions in priority, further CDD breaches could be argued. Moreover, numerous developed countries did not recommit under the Doha Amendment, nor did they enact enough substantive mitigation measures. Thus, breaches of Article 4 UNFCCC, Article 2 KP and CDD seem as likely – or even more likely – for those countries.

Concerning Russia and all other former USSR countries, which numerically complied with the 25% reduction figure by 2020, they still may have breached CDD over time due to a lack of implementation of substantive mitigation measures as well. Thus, breaches of Article 4 of the UNFCCC, Article 2 of the KP and CDD appear likely for these countries as well.

1824 COP 28, “First Global Stocktake”, FCCC/PA/CMA/2023/L.17, 13 December 2023, § 17.

Note that this compliance analysis is restricted in this subsection to States concerning domestic mitigation measures for territorial emissions. It did not consider the State's extraterritorial emissions at all (see UN-HRTB obligations in Part 2.2, which is likely part of CDD as well), nor the obligations to assist developing countries in mitigation and adaptation (enshrined in paragraphs 3 – 9 of Article 4 of the UNFCCC and part of the CDD concept), nor the conduct of private actors, which certainly also violated their CDD obligations due to their ongoing lobbying activities, greenwashing, lack of substantive mitigation measures and other failures¹⁸²⁵.

Lastly, the international community should have started concrete negotiations on an alternative framework, as it was clear that the USA and other countries like Canada were dismissing any international cooperation in the framework of the KP or the Doha Amendment. Given that the COP did not develop a substitute for the KP until the adoption of the PA in 2015, all States may be found in violation of CDD due to a lack of individual and collective efforts to solve the issue.

3.2.4 Provisional conclusion on CDD's historical shortcomings between 1988 and 2015

This period saw the publication of the first IPCC reports and climate conventions, but numerous implementation shortcomings, which potentially violated climate treaties and *general* CDD. In fact, the international community did not implement the 1988 Toronto call for a 20% cut in CO₂ emissions by 2005 compared to 1988. Instead, global emissions rose significantly, by more than 50% until 2019¹⁸²⁶. This situation may characterise the first substantive *collective* and *individual* failures.

Additionally, the first IPCC report in 1990, although very important, could only confirm the “natural greenhouse effect”¹⁸²⁷. Nonetheless, it has still recommended international and domestic efforts to reduce GHGs (see subsection 3.2.1.2.3).

1825 Supran G and Oreskes N, “Addendum to ‘Assessing ExxonMobil’s climate change communications (1977–2014)’”, *Environmental Research Letters* 15 (2020) 119401; Bonneuil C, Choquet P-L, Franta B, “Early warnings and emerging accountability: Total’s responses to global warming, 1971–2021”, *Global Environmental Change* 71 (2021), p 6.

1826 IPCC, AR6, WG III, TS, Figure TS2, p 59.

1827 IPCC, ARI (1990), WG III, Overview (SYR), § 1.0.1.

Despite this recommendation, the US federal government and Environmental Protection Agency (EPA) refused to regulate GHGs by pointing, among others, to the lack of certainty concerning anthropogenic warming in the years 1990 and 2000¹⁸²⁸, and to the reluctance of developing country parties to reduce their own emissions¹⁸²⁹. In parallel, many important industrial actors in the USA highlighted the uncertainty of climate physical science while publicly calling against climate regulations¹⁸³⁰. These different refusals to take climate action, or opposition to it, likely constitute individual *general* CDD breaches.

Additionally, although the European Commission proposed a carbon tax in the 1990s, the EU ultimately dismissed it, allegedly because of the US refusal to regulate this sector, and the lobbying of the fossil fuel industry¹⁸³¹. While the USA's refusal may count as a diminishing factor, *general* CDD still requires individual action as long as it is reasonable and proportionate. Instead of putting its regulation entirely on hold, the EU and its Member States *could* have led by example, by pressuring the US more, or at least by adopting further unproblematic “non-regret” measures not at risk of any carbon leakage, such as incentives and programs to develop low-carbon alternatives, which occurred only in 2001. Similarly, the private industry in Europe should not have lobbied against the proposed European eco-tax and further regulations¹⁸³². The USA enacted corresponding measures only by 2022, with the so-called “Inflation Reduction Act” setting up a large corresponding program to fund the development and implementation of decarbonisation techniques. Thus, one may use the evidence to argue CDD breaches by the USA, the EU, and private actors who lobbied against those regulations.

In 1992, the international community adopted the UNFCCC, the first climate convention and, in 1997, the Kyoto Protocol. The adoption of both international instruments may correspond to a period in which the global community approached collective compliance with CDD. However, the re-

1828 SCOTUS, *Massachusetts v EPA*, 549 U. S. (2007), p 10.

1829 *Ibid.*

1830 Supran G and Oreskes N, “Addendum to ‘Assessing ExxonMobil’s climate change communications (1977–2014)’”, *Environmental Research Letters* 15 (2020) 119401; Franta B, “Early oil industry disinformation on global warming”, *Environmental Politics* (2021) Vol 30, No 4, p 663–668

1831 Bonneuil C, Choquet P-L, Franta B, “Early warnings and emerging accountability: Total’s responses to global warming, 1971–2021”, *Global Environmental Change* 71 (2021).

1832 *Ibid.*

duction obligations of these instruments were, in terms of ambition, below those of the Toronto conference. Additionally, individual breaches tainted this period, notably those by the USA, which never ratified the Kyoto Protocol. The USA even refused to regulate GHGs in the 1990s, after having repealed or significantly reduced solar energy support in the 1980s. Private actors, including fossil fuel businesses, and business associations such as the API and the Global Climate Coalition, also opposed climate action in the USA and beyond. These actions undoubtedly prompted the US to reject the Kyoto Protocol, seriously damaging international cooperation, and very likely constituting further CDD breaches. Moreover, no developed countries (except the former USSR countries) respected the UNFCCC obligation to bring down their emissions below 1990 by 2000, constituting a further ground to seek their shared and individual responsibility, including under the UNFCCC¹⁸³³. What's more, many developed countries (USA, Canada, Australia, New Zealand, Japan¹⁸³⁴) did not cut their *territorial* emissions by 5% by 2012; they profited from the available flexibilities under the so-called Clean Development Mechanism¹⁸³⁵ of the Kyoto Protocol. These issues may result in *general* CDD breaches. Lastly, numerical compliance with the Kyoto Protocol's reduction obligation was particularly easy for the EU, since the former USSR States, which experienced significant GHG reductions after a deindustrialisation process in the 1990s, joined the EU¹⁸³⁶. The lack of proper and sufficient mitigation policies in the EU may further ground CDD breaches.

In AR4 (2007), the IPCC removed any uncertainty surrounding the existence of global warming as it found *with very high confidence* that humans were responsible for it¹⁸³⁷. Moreover, the AR4 and its so-called “Bali box”, in addition to the subsequent COP decisions (Bali, Copenhagen,

1833 Maljean-Dubois S, “Climate Change Litigation” (2019) *Max Planck Encyclopedia of Procedural Law* § 17.

1834 Note that all countries complied formally with the Kyoto Protocol's reduction obligation, but only by using its flexibilities, as GHGs continued to grow in those countries well beyond 2012 (and still today for some); see IPCC, AR6 (2021-23), WG III, Chapter 14, p 1462.

1835 IPCC, AR6 (2021-23), WG III, Chapter 14, p 1476.

1836 A significant portion of the former USSR's industrial activity ceased after 1990, leading to almost 50% of GHG reductions in some former USSR countries. See concurring opinion: Rosen A M, “The Wrong Solution at the Right Time: The Failure of the Kyoto Protocol on Climate Change”, *Politics & Policy* (Wiley Online Library, 2015).

1837 IPCC, AR4 (2007), WG I, SPM, p 3.

Cancun), made clear that there was a need to go way beyond the reductions prescribed by the Kyoto Protocol by recommending a reduction of GHGs by at least 25% in 2020 compared to 1990 for developed countries. Nonetheless, developed states neither complied individually nor jointly with those figures according to the Global Stocktake of the COP 28¹⁸³⁸, with very rare exceptions (the EU only achieved numerical compliance thanks to external factors such as the joining by former USSR countries, the 2008 financial crisis and the 2020 COVID crisis). Note that this scientific basis (“Bali-box”) constituted the evidence of the injunction against the Netherlands in the *Urgenda* case.

Numerous developed countries (Canada, Japan, New Zealand, and the USA) did not recommit under the Doha Amendment to the Kyoto Protocol, except the EU, which did not seem to act enough, though. Overall, global emissions kept on rising, aggravating the ongoing individual CDD breaches found above, and therefore showing a need to find a replacement to the Kyoto Protocol to ensure global GHG reductions.

3.3 2014 – 2025: *The persisting individual and collective substantive insufficiencies after the Paris Agreement’s adoption*

Section 3.3.1 addresses AR5 (2014), which reinforced the CDD duty to accelerate substantive climate mitigation efforts in order to hold global warming well under 2°C, if not 1.5°C.

Section 3.3.2 finds that the global community returned to compliance with *procedural* CDD by adopting the PA; nonetheless, since the world was not – and still is not – on track to achieve the PA’s LTTG (4°C of warming was projected in 2015 and 2.4°C in 2023), and since best efforts to limit warming to 2°C were not carried out, the international community and key individual actors presumably remain in *substantive* non-compliance with CDD.

Section 3.3.3 argues furthermore that the international community complied with *procedural* CDD after COP 21 requested that the IPCC issue a special report on the consequences of overstepping the 1.5°C threshold, leading to a general recognition that it is necessary to limit global warming to 1.5°C, ultimately creating a momentum in favour of reinforced climate

1838 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 17.

action. However, humanity's actions still conflict with substantive CDD, as its concrete objectives lead in 2023 to roughly 2.4°C.

The last section 3.3.4 briefly touches upon the recent decisions of the COP in the years 2018-23 on the so-called Paris Rulebook, climate finance, loss and damages, and private actors, compares them with the latest AR6, and finds additional collective and individual CDD breaches.

3.3.1 The 2014 IPCC AR5 laying out high risks if the 2°C threshold is overstepped

The AR5 foreword directly addressed the most pressing issue by stating that “stabilizing temperature increase to below 2°C relative to pre-industrial levels will require an urgent and fundamental departure from business as usual.”¹⁸³⁹ This statement showed right at the beginning of the IPCC report that there was a political and scientific consensus on the need to limit global warming to 2°C and that the measures back then were drastically insufficient, as they were leading to 4°C of warming¹⁸⁴⁰.

CDD collective breach finding: Thus, right at the beginning of this report, the IPCC clarifies the evidence to find collective non-compliance with substantive CDD.

Concerning climate-related impacts (WG I):

The IPCC reaffirmed that “[w]arming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen.”¹⁸⁴¹

As to the causes of climate change, the IPCC stated that human activities are “*extremely likely*” responsible for it:

“Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system

1839 IPCC, AR5 (2014), p v.

1840 *Ibid*, SYR, SPM, p 13 and 18.

1841 IPCC, AR5 (2014), SYR, SPM, p 2.

and are *extremely likely* to have been the dominant cause of the observed warming since the mid-20th century.”¹⁸⁴²

A worrying development was the continued increase of GHG “despite a growing number of climate change mitigation policies”.¹⁸⁴³

The IPCC further determined that climate change “caused impacts on natural and human systems on all continents and across the oceans.”¹⁸⁴⁴ In addition, global warming triggered “many extreme weather and climate events have been observed since about 1950”¹⁸⁴⁵. For instance, heat waves more than doubled in some locations.

Concerning future climate-related risks and impacts (WG II):

To introduce the WG II Work, the IPCC recalled one of its main findings as to the causes of warming and the measures to mitigate the risks: “Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks.”¹⁸⁴⁶

The IPCC also compared the main global warming risks between past levels (2014), near-term levels (2030 – 2040) and long-term (comparison between 2°C and 4°C)¹⁸⁴⁷. While the chart sets out lower risks for 2°C levels of warming than 4°C, it still shows substantially higher risks for 2°C compared to present or near-term levels.

The IPCC underlined the inequalities due to economic differences between countries, and people in the same country: “Climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development.”¹⁸⁴⁸

More precisely, concerning the risks on the ecosystems as such, the IPCC indicated that “[a] large fraction of species faces increased extinction risk due to climate change during and beyond the 21st century, especially as

1842 *Ibid*, p 4.

1843 *Ibid*, p 5.

1844 *Ibid*, p 6.

1845 *Ibid*, p 8.

1846 *Ibid*, p 7.

1847 *Ibid*, p 14 Figure SPM.8.

1848 *Ibid*, p 12.

climate change interacts with other stressors (high confidence)¹⁸⁴⁹. This statement underlined the risks of species extinction on both plant and animal life (*fauna* and *flora*). In addition, it also hinted at the combined risks with other factors, leading to “cascading impacts”. In other words, climate change often increases some risks.

Concerning the risks to the population¹⁸⁵⁰, the IPCC highlighted the issue of water scarcity and food security due to the problems with ecosystem services, especially fisheries. Concerning the productivity of some basic crops (wheat, rice and maize), the IPCC determined that almost all regions will face significant challenges with a 2°C warming without adaptation, but that 4°C of warming, “combined with increasing food demand, would pose large risks to food security globally (*high confidence*)”.

In addition, the IPCC also recalled that global warming undermines global poverty reduction and economic growth¹⁸⁵¹. This factor underlines the need for climate mitigation since the UNFCCC and the Paris Agreement (2015) called for sustainable development and the fight against poverty (see notably, Article 4 (7) UNFCCC, Article PA). This finding should have even led to climate action in the developing world, although the UNFCCC labels economic development and poverty reduction as overriding priorities for developing countries in Article 4 (7).

Lastly, the IPCC stated that extreme weather events and other climate-related impacts will substantially increase climate migration, by associating this finding with “medium evidence, [but with] high agreement”. It also stated with less confidence, though, that this kind of event “can indirectly increase risks of violent conflicts”¹⁸⁵².

Concerning climate mitigation (WG III):

The IPCC started its summary by recalling the core findings on the benefits of climate mitigation to reduce the warming risks: “Substantial emissions reductions over the next few decades can reduce climate risks in the 21st century and beyond, increase prospects for effective adaptation, reduce the costs and challenges of mitigation in the longer term and contribute to climate-resilient pathways for sustainable development.” More precisely, on balance, the IPCC makes the case for GHG reductions by finding more “pros” than “cons”:

1849 *Ibid*, p 12.

1850 *Ibid*, p 13.

1851 *Ibid*, p 16.

1852 *Ibid*, p 16.

“Without additional mitigation efforts beyond those in place today, and even with adaptation, warming by the end of the 21st century will lead to high to very high risk of severe, widespread and irreversible impacts globally (high confidence). Mitigation involves some level of co-benefits and of risks due to adverse side effects, but these risks do not involve the same possibility of severe, widespread and irreversible impacts as risks from climate change, increasing the benefits from near-term mitigation efforts.”¹⁸⁵³

The IPCC stressed here that adaptation as such is not enough, reinforcing the narrative on the need for global emission reductions.¹⁸⁵⁴ Still, the IPCC also issued at the same time something akin to a disclaimer on the unavoidable risks even in the case of sustained mitigation, as “some risks from climate damages are unavoidable, even with mitigation and adaptation.”

Concerning the global emission reduction pathways to “below 2°C”, the IPCC stated that they are feasible but also challenging¹⁸⁵⁵. The IPCC stated that these challenges are of technological, economic, social and institutional order, which only increase if those measures are delayed. The common characteristic of those pathways is that they “require substantial emissions reductions over the next few decades and near zero emissions of CO₂ other long-lived greenhouse gases by the end of the century.”

Then, the scientists recalled that if the international community does not reduce emissions, global temperatures may reach 4°C, which would entail serious dangers, as shown above¹⁸⁵⁶. More precisely:

“global emissions growth is expected to persist, driven by growth in global population and economic activities. Global mean surface temperature increases in 2100 in baseline scenarios—those without additional mitigation—range from 3.7°C to 4.8°C above the average for 1850–1900 for a median climate response. They range from 2.5°C to 7.8°C when including climate uncertainty.”¹⁸⁵⁷

The IPCC studied 2°C scenarios due to the political consensus around them at that time (see the previous discussions on the Bali Box). The so-called 2°C scenarios are generally consistent with 450 ppm CO₂eq sce-

1853 *Ibid*, p 17.

1854 *Ibid*, p 19.

1855 *Ibid*, p 20.

1856 *Ibid*, p 13.

1857 *Ibid*, p 20.

narios (CO2 eq refers to the CO2 and other GHG concentrations in the atmosphere).

Table SPM.1 | Key characteristics of the scenarios collected and assessed for WGIII AR5. For all parameters the 10th to 90th percentile of the scenarios is shown^a. [Table 3.1]

CO ₂ -eq Concentrations in 2100 (ppm CO ₂ -eq) ^f Category label (conc. range)	Subcategories	Relative position of the RCPs ^d	Change in CO ₂ -eq emissions compared to 2010 (in %) ^c		Likelihood of staying below a specific temperature level over the 21st century (relative to 1850–1900) ^{e*}					
			2050	2100	1.5°C	2°C	3°C	4°C		
<430	Only a limited number of individual model studies have explored levels below 430 ppm CO ₂ -eq ^g									
450 (430 to 480)	Total range ^{a,5}	RCP2.6	-72 to -41	-118 to -78	More unlikely than likely	Likely	Likely	Likely		
500 (480 to 530)	No overshoot of 530 ppm CO ₂ -eq		-57 to -42	-107 to -73	Unlikely	More likely than not				
	Overshoot of 530 ppm CO ₂ -eq		-55 to -25	-114 to -90		About as likely as not				
550 (530 to 580)	No overshoot of 580 ppm CO ₂ -eq		-47 to -19	-81 to -59		More unlikely than likely ¹				
	Overshoot of 580 ppm CO ₂ -eq		-16 to 7	-183 to -86						
(580 to 650)	Total range	RCP4.5	-38 to 24	-134 to -50						
(650 to 720)	Total range		-11 to 17	-54 to -21		Unlikely			More likely than not	
(720 to 1000) ^h	Total range	RCP6.0	18 to 54	-7 to 72		Unlikely ^h			More unlikely than likely	
>1000 ^h	Total range	RCP8.5	52 to 95	74 to 178		Unlikely ^h			Unlikely	More unlikely than likely

Source: IPCC, AR5 (2014), SYR, Table SPM.1, p. 22.

Although the IPCC indicated that many pathways exist to limit global warming to 2°C, it still underscored in a larger and bold font the associated “substantial technological, economic, social and institutional challenges”¹⁸⁵⁸. In its more precise statements, the IPCC even indicated that the economic costs generally “increase with the stringency of mitigation”.¹⁸⁵⁹ Besides, the IPCC stated that 2°C scenarios “entail losses in global consumption”, increasing in time by 1.7% by 2030 to 4.8% in 2100. Clearly, these indications may affray governments again, after the delicate indications of AR3. In addition, the IPCC specified that the lack of “mitigation technologies” (meaning CCS and BECCS (bioenergy combined with CCS), but also nuclear, wind/solar) increases the transition costs. The IPCC even indicated that “[m]any models could not limit likely warming to below

1858 *Ibid*, p 20.

1859 *Ibid*, p 24.

2°C if bioenergy, CCS and their combination (BECCS) are limited (high confidence)¹⁸⁶⁰.

On the other hand, the IPCC also highlighted the “co-benefits” of climate mitigation, improving air quality, ecosystem protection, and energy security. The IPCC also stated that the CCS availability may reduce the financial risks (including stranded asset risks) for fossil fuel companies.¹⁸⁶¹

The IPCC shortly highlighted the great risks of using geoengineering techniques, or SRM [Solar Radiation Management], which aim to spread aerosols and increase the albedo effect to cool down the weather. For the IPCC, they “entail numerous uncertainties, side effects, risks and shortcomings and ha[ve] particular governance and ethical implications. SRM would not reduce ocean acidification. If it were terminated, there is high confidence that surface temperatures would rise very rapidly, impacting ecosystems susceptible to rapid rates of change.”¹⁸⁶²

The IPCC eventually issued a subsection in its SYR on the “Common enabling factors and constraints for adaptation and mitigation responses”, which pretty much constitutes a recommendation on making climate policies effective. In this section, the IPCC underscored its findings that no single adaptation and mitigation measure “is sufficient by itself”. The IPCC highlights in a larger and bold font that “[e]ffective implementation depends on policies and cooperation at all scales”¹⁸⁶³. Thus, as identified in the introduction, tackling climate change requires a high level of polycentricity, meaning a holistic and systemic set of policies, like a spider’s web.

Moreover, the IPCC believes “[w]ell-designed systemic and cross-sectoral mitigation strategies are more cost-effective in cutting emissions than a focus on individual technologies and sectors, with efforts in one sector affecting the need for mitigation in others (medium confidence).” Beyond the cross-sectoral energy sector, there is also the land-use sector, whose carbon sinks need to increase. More generally, “[m]itigation options are available in every major sector”¹⁸⁶⁴; improvements in terms of “coordination and cooperation in governance” on the domestic and international level are helpful; and significant investments are needed to limit global warming to 2°C¹⁸⁶⁵. Thus, it is necessary to tackle both energy supply and

1860 *Ibid*, p 24.

1861 *Ibid*, p 25.

1862 *Ibid*, p 26.

1863 *Ibid*, p 26.

1864 *Ibid*, p 28.

1865 *Ibid*, p 30.

demand, meaning “reduce energy use and the greenhouse gas intensity of end-use sectors”, i.e., decarbonisation, energy efficiency and behavioural changes¹⁸⁶⁶.

To carry out this holistic and polycentric approach, numerous means can be deployed. For instance, to combat “the inertia in many aspects of the socio-economic system [...] innovation and investments in environmentally sound infrastructure and technologies can reduce GHG emissions and enhance resilience to climate change (very high confidence)”¹⁸⁶⁷. Furthermore, the general culture influences the social acceptability of climate policies, showing the need for “regionally appropriate changes in lifestyle or behaviours”¹⁸⁶⁸. Concerning this latter point, the IPCC used here the term “incentivising” instead of “mandating”. An important debate in democracies, especially after the COVID pandemic, concerned the extent to which the State should intervene in triggering these changes. The “ecological dictatorship” or “eco-authoritarianism” crystallised significant attention¹⁸⁶⁹.

In the “energy supply sector”, the share of low-carbon energy (renewables, bioenergy, CCS, BECCS, nuclear) must significantly increase¹⁸⁷⁰. The IPCC indicated that no fossil fuel without CCS can remain in a 2°C scenario by 2100. Concerning energy demand, its reduction is “an important element” as it enabled flexibility in the management of the energy transition, “avoid[ing] lock-in to carbon-intensive infrastructures” and providing multiple other advantages¹⁸⁷¹.

Regarding global equity, the IPCC addresses this topic in a more elusive manner, and only in the full report. Although it explains the methodology for assessing national fair shares, the full report does not provide precise

1866 *Ibid*, p 26.

1867 *Ibid*.

1868 *Ibid*.

1869 This term arises in numerous political contexts and adoption of policies (the debate on reducing energy and meat consumption can trigger strong social opposition (see the yellow vest movement in 2018-19 in France or the debate about reducing meat consumption in Germany); the issue on the need to safeguard employments also led to the conceptualisation of the term just transitions for workers). Even lawyers increasingly address the need to safeguard basic liberties when implementing climate policies (Mayer Mayer B, “Climate Change Mitigation as an Obligation under Human Rights Treaties?” (2021) 115(3) *American Journal of International Law* DOI: 10.1017/ajil.2021.9; Hautereau-Boutonnet M, “La lutte contre le réchauffement climatique ferme la porte à tout débat sur l’atteinte aux libertés individuelles à laquelle elle conduit” (2023) *Le Monde*).

1870 IPCC, AR5 (2014), SYR, SPM, p 28.

1871 *Ibid*, p 29.

reduction indications, akin to those in AR4, leaving this matter to the political process. Thus, compared to the previous edition, the IPCC restricted its indications, although numerous equity results were available in the literature.

Finding: When it issued AR5, the IPCC clarified that there was almost no uncertainty concerning man-made global warming anymore. It also made clear that warming beyond 2°C would be very dangerous. There was, therefore, a CDD *general* duty to limit global warming to well below 2°C (see corresponding findings by the Dutch courts in *Urgenda*, the Brussels Appeals Court in *Klimatzaak*). Collectively, the world was not on track with a 2°C pathway, thus leaving the door open for finding individual violations of this duty (see also the previous breach findings for individual developed states and other private actors in the subsections on the UNFCCC, KP, and Doha Amendment above).

3.3.2 The 2015 Paris Agreement, not enough to ensure substantive compliance with CDD

The international community adopted the Paris Agreement (PA) in 2015. Currently, 194 States have ratified the treaty, making it almost universally applicable.

As opposed to the KP, which is a top-down agreement that directly sets out the emission reduction targets for some State parties¹⁸⁷², the PA is taking a somewhat bottom-up approach as it does not impose any short-term GHG reduction obligations but only a long-term temperature target (LTTG), therefore, leaving – *inadmissible?* – room for manoeuvre for its State Parties¹⁸⁷³.

1872 Bodansky D, “Climate Change Transnational Legal Order or Disorder?” in Terence C Halliday and Gregory Shaffer (eds), *Transnational Legal Orders* (Cambridge University Press 2015), p 302.

1873 Voigt C and Ferreira F, “Dynamic Differentiation: The Principles of CBDRRC, Progression and Highest Possible Ambition in the Paris Agreement”, *Transnational Environmental Law*, 5(2), 2016.

3.3.2.1 The absence of alignment with the PA's objectives, potentially constituting substantive CDD violations

Certainly, the most quoted provision of the PA is its Article 2, which lays out the temperature goal (LTTG):

“This Agreement [...] aims to strengthen the global response to the threat of climate change [...] 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) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;
- (c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.”

As the quoted article shows, the PA's objectives do not only encompass the LTTG on climate mitigation (i), but also adaptation (ii), and finance (iii), and this, for mitigation and adaptation. This triptych structures the procedural and substantive obligations of the remainder of the agreement.

Moreover, paragraph 2 of Article 2 recalls on its end the equity and CBD/RRCC principle, by stating that the PA's implementation will reflect those. This provision establishes a general expectation without imposing any concrete obligation¹⁸⁷⁴.

The cross-cutting Article 3 then makes the junction with the remainder of the treaty's expectations, providing that State Parties will implement the agreement in an ambitious manner (i), by constantly progressing (ii), including by supporting developing countries.

Findings: While the PA's general mitigation goals seem adequate in light of the AR5 findings, the adoption of the PA might result in collective *procedural* compliance with CDD. However, the world is not substantively on track with these goals (i.e., current projections rather lead the world to 2.1 – 2.8°C according to the COP itself¹⁸⁷⁵). This finding may ground *individual* treaty or CDD breaches, as individual State and corporate actors

1874 See the concurring opinion in the IPCC commentary, which quotes Rajamani (IPCC, AR6 (2021-23), WG III, Chapter 14, p 1464).

1875 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 2 and 18.

may not carry out their best efforts to achieve those targets (see findings in subsection 3.3.2.2 just below). However, since Article 2 PA only sets out global objectives, it cannot constitute a legal base as such to establish liability. Thus, the international community, notably through the COP, must find measures to achieve collective compliance; as long as it does not perpetuate its ongoing breach, which started when it was clear that the KP would not work out.

3.3.2.2 The PA's mitigation provisions and the insufficient commitments

The architecture of the PA's mitigation dimension mainly rests on articles 2 and 4. Read in combination, they require State Parties to set emissions targets by communicating nationally determined contributions (NDCs) to reduce emissions and, thereby, achieve the LTTG enshrined in Article 2 (1), being the limitation of “the temperature increase to 1.5 °C”, and, in any case, “to well below 2 °C”.

Regarding Article 2 (1) (a) and the interpretation of the LTTG: the IPCC considered the different interpretations in the literature with respect to the two mentioned goals¹⁸⁷⁶, and the issue of only having a long-term target, which may leave too much discretion to State parties in the short term¹⁸⁷⁷. While the formulation of the LTTG is certainly not very straightforward and clear-cut, it still recognises the reduced risks and benefits of limiting global warming to 1.5 °C. This is explicitly confirmed by the IPCC since its 2018 special report on 1.5°C (SR1.5) (see subsection 3.3.3.1 below for further information). Given the PA's LTTG and the 2018 scientific results showing the dangers of overstepping 1.5°C, one may, therefore, infer from that point in time a proper need to limit global warming to 1.5°C (see the CDD 1.5°C duty applicability finding from 2018 onwards, notably discussed in subsection 3.3.3).

Regarding Article 4 – the communication obligations and substantive expectations: the PA also spells out that State Parties “*will*” exhibit progression and their “highest possible ambition” in their successive NDCs, reflecting their CBDRRC, as provided by Article 4 (3). Further, developed Parties “*should* continue taking the lead by undertaking economy-wide absolute emission reduction targets”, as set out in Article 4 (4). While those

1876 IPCC, AR6 (2021-23), WG III, Chapter 14, p 1464.

1877 *Ibid.*

substantive provisions do not exhibit any strict legally binding expectations, the modal verbs “will” or “aim to” still indicate an expectation that needs to be realised, thus an obligation¹⁸⁷⁸. In the last quoted provision, the modal verb “should” is used, meaning no legal obligation as such, but only a legitimate expectation.

Moreover, in line with the LTTG and the equity principles, Article 4 (1) provides that “Parties aim to reach global peaking of greenhouse gas emissions as soon as possible” while recognising that achieving this objective “will take longer for developing countries”. This provision operationalises the equity principle between the global North and South.

Article 4 expects reaching net zero GHG emissions “in the second half of the century”, which allows reaching net zero between 2050 and 2099. To do that, and follow a 1.5°C pathway, the IPCC found that CO₂ emissions should be neutralised by 2050 and all other GHGs by 2070, implying a roughly halving of CO₂ emissions by 2030 compared to 2010¹⁸⁷⁹.

Moreover, NDCs shall meet the standards of “clarity, transparency and understanding” (Article 4 (8)) and be submitted every five years (Article 4 (9)). This provision uses the modal verb “shall” and thereby establishes unambiguous legal obligations.

Findings: In 2022, 88 State Parties, covering 79% of global emissions, committed to reaching net zero emissions between 2050 and 2070¹⁸⁸⁰. However, the world is still heading towards 2.4°C according to IEA’s WEO 2023¹⁸⁸¹, which is not consistent with the LTTG. This state of affairs was officially confirmed by COP 28 itself in its 2023 global stocktake¹⁸⁸², which shows that States are collectively not on track to achieve the LTTG. A ray of hope came from scenarios foreseeing the full implementation of NDCs, conditional NDCs, and proposed policies. In that case, the IEA estimate global warming may be limited to 1.7-1.8 °C. However, this scenario was

1878 For a similar opinion, see Rajamani L, “Due Diligence in International Climate Change Law” in Heike Krieger, Anne Peters and Leonhard Kreuzer (eds), *Due Diligence in the International Legal Order* (OUP 2020) p 172, p 169.

1879 IPCC, AR6 (2021-23), WGIII, Chapter 14, p 1465.

1880 According to the UNEP Emissions Gap Report 2022, p XXII.

1881 IEA, WEO 2023, p 22.

1882 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 2 and 18.

deemed unrealistic¹⁸⁸³ and still incompatible with the PA's objectives by the IEA director¹⁸⁸⁴.

Indeed, as has been mentioned several times, global emissions are still rising¹⁸⁸⁵, in almost all countries, except in the EU since 1990¹⁸⁸⁶, in the USA since 2007¹⁸⁸⁷ and in Japan since 2013¹⁸⁸⁸. Other developed country parties (Australia, Canada, New Zealand, Norway) did not achieve a peak in their GHG emissions. The COP 28 decision confirmed that developed countries overall did not reduce their emissions by at least 25%, as indicated in the Bali Box¹⁸⁸⁹.

More generally, countries – especially those of the Global North – most likely do not carry out their *highest* possible ambition or their “best efforts” following *general* due diligence standards, neither over time (see above the previous non-compliance findings with the UNFCCC, KP, and CDD), nor with regard to global equity (see – notably – the CAT's analyses, which can be used as one *indicator* to demonstrate clear inconsistency and the *lacunae* with respect to compliance with CDD¹⁸⁹⁰).

Regarding transparency, while an individual compliance assessment of State NDCs is out of the scope of this thesis, a first glance of the NDCs submitted so far (see, for instance, the one of the EU) shows that country parties do not provide much specific information¹⁸⁹¹.

1883 UNEP Emissions Gap Report 2022, foreword; IEA, WEO 2022, p 106-107.

1884 Fatih B, “C.O.P. 26 climate pledges could help limit global warming to 1.8°C, but implementing them will be the key”, *Commentary*, IEA Website, 4 November 2021.

1885 IPCC, AR6, WG III, TS, Figure TS2, p 59.

1886 The decrease from 1990 to 2000 is mainly due to the dismantlement of the industrial sector in former USSR countries; emissions started to decrease in other countries by 2005 (see findings in subsections 3.2.1.3 on the UNFCCC and 3.2.2.2 on the KP above).

1887 Climate Action Tracker, USA, <https://climateactiontracker.org/countries/usa/>, last accessed 19 January 2025.

1888 Climate Action Tracker, Japan, <https://climateactiontracker.org/countries/japan/>, last accessed 19 January 2025.

1889 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 17.

1890 See the “*Klimaseniorinnen v Switzerland*” case (n° 53600/20) and the *Duarte Agostinho v 32 States* case (n° 39371/20); both cases rely on the CAT's analyses; however, they tried to directly enforce the CAT indications.

1891 The European Scientific Advisory Board on Climate Change was established by the European Climate Law of 2021. Its mandate is to serve as a point of reference for the EU on scientific knowledge relating to climate change. This body has confirmed that the EU has not met the requirements, see: European Scientific Advisory Board on Climate Change, “Scientific advice for the determination of an

In all those respective points, the non-consistency of the ongoing collective and individual conduct may characterise *substantive* general due diligence breaches.

Regarding State responsibility beyond territorial emissions and required support for developing countries: the PA states that each State party “shall be responsible for its emission level” (Article 4 (17)), certainly meaning territorial emissions. The IPCC elaborated in 2006 precise guidelines to account for and report domestic emissions directly stemming from the domestic territories¹⁸⁹², which were updated and refined afterwards. The COP also validated these IPCC accounting methods¹⁸⁹³. Although neither the IPCC guidelines nor the COP decisions are binding, States widely adopted these reporting mechanisms. While this accounting system means that countries are not required to account for extraterritorial emissions (such as consumption-based emissions, export-related emissions, emissions linked to transnational corporations, value chains and financial transactions, etc), the PA does not limit the breadth of its objectives and mandates to territorial emissions.

Article 6 of the Paris Agreement provides State parties with further flexibility by allowing them to use “internationally transferred mitigation outcomes towards NDCs”. This provision, akin to Article 12 KP, aims to provide flexibility to country parties by allowing the attribution of some reduction of emission levels in one country – even carried out by a private party – for the benefit of another, and “to deliver an *overall* mitigation in global emissions” (Article 6 (4) (d)).

More generally, the PA sets a global LTTG, and correlated finance flows target in its Article 2 (1), thereby touching upon State parties’ collective, and individual, including *transnational* emissions. While no provision specifies

EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050”, 15 June 2023.

1892 IPCC, “Guidelines for National Greenhouse Gas Inventories”, Institute for Global Environmental Strategies, 2006, Vol. 1: General Guidance and Reporting; see concurring opinion on the fact that those guidelines are restricted to territorial emissions: Mayer B, “The Contribution of Urgenda to the Mitigation of Climate Change” (2023) 35(2) *Journal of Environmental Law*.

1893 Decision 18/CMA.1, ‘Modalities, Procedures and Guidelines for the Transparency Framework for Action and Support Referred to in Article 13 of the Paris Agreement’ (19 March 2019), UN Doc. FCCC/PA/CMA/2018/3/Add.2, para 20: “Each Party shall use the 2006 IPCC Guidelines, and shall use any subsequent version or refinement of the IPCC guidelines.”

that Article 2 (1) (c) encompasses extraterritorial emissions¹⁸⁹⁴, one may logically infer from the concept of financial flows that they are, by nature, to a very large extent, borderless, making extraterritorial emissions *de facto* part of the PA.

Moreover, to increase the chance of global emissions reductions, Article 4 (5) posits that “[s]upport *shall* be provided to developing country Parties for the implementation of this Article, in accordance with Articles 9, 10 and 11, recognizing that enhanced support for developing country Parties will allow for higher ambition in their actions.” Although the preceding paragraph concerned the legitimate expectations due by developed countries with respect to their mitigation actions (the “taking the lead” provision), this paragraph implicitly imposes an obligation on them to deliver support to developing states.

Specifically, the PA also requires developed country parties to contribute to climate finance, capacity building, and technology transfer for the benefit of developing countries’ mitigation and adaptation measures (see commentaries of Articles 9 – 11 of the PA below). These provisions are part of a global cooperation system and may also be interpreted as an extended responsibility for developed countries to ensure that global and overseas emissions in developing countries are curbed.

In any case, neither the PA nor the UNFCCC explicitly limit the responsibility of State parties to their domestic territorial emissions. This openness seems consistent with CDD, which is not restricted to territorial emissions or direct emissions (for more information, see subpart 2.2 on causation and attribution of indirect and extraterritorial emissions).

Findings: The COP 28 Global Stocktake in Dubai estimates that developing countries need USD 5.8–5.9 trillion for the pre-2030 period. However, the support given to developing countries does not even reach USD 100 billion annually¹⁸⁹⁵. This support does not seem sufficient to meet the developed country parties’ climate finance obligations.

These COP 28 findings are in concord with the CAT’s assessments, which found that no developed country sufficiently reduced its domestic emissions, nor that they compensated for their domestic failures with suffi-

1894 Article 4 requests State parties to submit and implement NDCs to operationalise the LTTG in Article 2 (1) (a); one may read this latter provision as encompassing finance flows as well. Also, Article 3 PA cross-references Article 2 in a general manner, meaning that Article 3 demands “ambitious” measures to address Article 2 (1) (c), including financial flows.

1895 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 67 and 80.

cient climate finance (i.e., by spending grants or using them in conjunction with market-based mechanisms such as internationally transferred mitigation outcomes). Thus, as long as developed States do not carry out their individual best efforts to mitigate global warming and/or contribute to climate finance sufficiently, they likely breach their PA and/or their *general* due diligence obligations.

As for the goal of addressing finance flows, which had been a blind spot until COP 26 in Glasgow and COP 27 in Sharm-El-Sheikh¹⁸⁹⁶, State Parties eventually recognised the need for a complete overhaul of the financial system (see below, the work of Glasgow financial alliance in the following COP 26 “Glasgow Climate Pact” subsection and COP 27 decision)¹⁸⁹⁷. Either way, the level of climate finance for mitigation remains well below what’s needed.

In any case, those elements suggest that the lack of sufficient climate finance can be framed as individual and collective breaches, in a context in which a court of law may interpret the PA in conjunction with preexisting due diligence norms, as specified above. The PA places the burden on States to show the consistency of their approach (as the ECtHR does, see *KlimaSeniorinnen* analysis in subsection 2.3.2.5). And given the dissensus on the required level of mitigation and climate finance, there is difficulty in imposing clear-cut obligations on each individual actor based on general due diligence. Thus, both the treaty-based and the general or customary due diligence rules place the burden on States to demonstrate the consistency of their approach regarding mitigation and related financial assistance.

3.3.2.3 The PA’s provisions on adaptation, loss and damage and the resulting questions on State responsibility

As mentioned in the first subsection of the PA above, Article 2 (1) (c) of the treaty establishes the global adaptation goal by recalling the concurrent LTTG and food production goal¹⁸⁹⁸.

1896 Bodle R and Noens V, “Climate Finance: Too Much on Detail, Too Little on the Big Picture?” (2018) 3 *Carbon and Climate Law Review (CCLR)* p 250–252.

1897 COP 27, “Sharm el-Sheikh Implementation Plan”, *FCCC/CP/2022/L.19*, 20 November 2022, §30-31.

1898 Article 2 (1) (c) PA.

On its end, Article 7 operationalises adaptation. The first paragraph recalls the adaptation goal alongside the sustainable development goal¹⁸⁹⁹, while the second points to the universality of the adaptation challenge, stressing that the most pressing issues occur in developing countries, which are particularly vulnerable to climate-related impacts¹⁹⁰⁰.

Article 8 addresses “loss and damage”. The Warsaw Mechanism, which was put in place in 2013, will be responsible for operationalising this PA provision. Note that the COP 27 and COP 28 decisions at Sharm-El-Sheikh in 2022 and Dubai in 2023 accepted the establishment of loss and damage funding arrangements (see below the corresponding subsection).

Although “adaptation” is separated from “loss and damage”, the incurred measures and costs may overlap. The PA does not provide any criteria to distinguish between them. Two different hypotheses exist:

- Given the LTTG, it may be argued that as long as it is not overstepped, the corresponding climate impacts are lawful, thus requiring adaptation measures, whereas all the impacts arising beyond 2°C are undoubtedly unlawful, therefore, constituting “losses and damages”¹⁹⁰¹. In any case, Article 7 (4) recognises that “greater levels of mitigation can reduce the need for additional adaptation efforts”, making the case for climate mitigation again as an overarching priority. Prioritising mitigation seems particularly useful as some territories may reach “adaptation limits” where “no adaptive actions are possible to avoid intolerable risks”¹⁹⁰².
- Nonetheless, the LTTG is not necessarily an adequate criterion to separate adaptation from loss and damage, since climate-related impacts and harms already arise with the current warming levels and will only worsen. Thus, another distinction is possible and needed, namely that adaptation could have a preventative purpose while loss and damage aim to characterise definite losses. For example, in cases of floods, exacerbat-

1899 Article 7 (1) PA.

1900 Article 7 (2) PA.

1901 This position also reflects roughly the IPCC estimations on the risks, see, among others: IPCC, AR5 (2014), SYR, Box 2.4 “Reasons For Concern Regarding Climate Change”, p 72. According to the AR5 Glossary (p 126), Reasons For Concern (RFCs) are “Elements of a classification framework, first developed in the IPCC Third Assessment Report (IPCC, 2001b), which aims to facilitate judgments about what level of climate change may be dangerous (in the language of Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC)) by aggregating impacts, risks and vulnerabilities.”

1902 The IPCC defines “Adaptation limits” as follows in its SRI.5, Glossary, p 542.

ed by global warming, two different types of costs arise: first, adaptation costs, to better protect the surroundings against the flood risks or to relocate to another safer place if necessary (such as the transfer of the whole city of Jakarta due to sea-level rise, erosion and other factors¹⁹⁰³); and second, if property losses occur, compensation for the loss and damages may be needed. This distinction may be relevant to separate Article 7 climate impacts from Article 8. The IPCC also endorses this view¹⁹⁰⁴. Yet, while the distinction between adaptation and loss and damages may remain somewhat difficult in practice, the question of the responsibility (who carries out the adaptation measures) and of “who pays” seems even more difficult to answer.

Concerning the responsibility for adaptation, all countries are, in principle, responsible with respect to their own territories. Article 7 (9) imposes on State parties a proper obligation to “engage in adaptation planning processes and the implementation of actions”. The German Constitutional Court¹⁹⁰⁵ and the UN Human Rights Commission in the *Torres Island* case¹⁹⁰⁶ furthermore pronounced that States are responsible for adapting their territories to climate-related impacts. In addition, note that Benoit Mayer and Alexander Zahar, who are both very sceptical as to the use of climate litigation in the human rights field, still consider that States have

1903 Brown H, “Indonesia unveils construction site of new capital city. Will it be a ‘massive ecological disaster?’”, *Euronews*, 2023.

1904 See the definition of the IPCC of “Loss and Damages” and “losses and damages” (without capital letters) as such: Research has taken Loss and Damage (capitalized letters) to refer to political debate under the UNFCCC following the establishment of the Warsaw Mechanism on Loss and Damage in 2013, which is to ‘address loss and damage associated with impacts of climate change, including extreme events and slow onset events, in developing countries that are particularly vulnerable to the adverse effects of climate change.’ Lowercase letters (losses and damages) have been taken to refer broadly to harm from (observed) impacts and (projected) risks (see Mechler et al, in press). (See SRL5, Glossary, p 553).

1905 Constitutional Court of Germany, Climate Protection Law, 1 BvR 2656/18, 24 March 2021, § 181.

1906 Human Rights Committee, *Torres Islands case (Daniel Billy et al v Australia)*, Views adopted by the Committee under article 5 (4) of the Optional Protocol, concerning communication No. 3624/2019, CCPR/C/135/D/3624/2019, 22 September 2022.

a human rights duty to protect their inhabitants against climate-related damages¹⁹⁰⁷.

The PA complements this State obligation concerning adaptation with regard to their own territories by setting out extraterritorial (finance) obligations for developed countries. Paragraphs 10 – 13 of Article 7 recommend submitting adaptation communications as regularly and exhaustively as possible to properly prevent harm and coordinate international support, especially for developing country Parties. While State parties remain free to choose the suitable measures (Article 7 (9)), paragraph 13 asserts that “[c]ontinuous and enhanced international support shall be provided to developing country Parties” for adaptation. The rationale behind this basic principle is that adaptation costs can be very high (for instance, 5 to 10% of the GDP in Africa might have to be spent there to adapt to sea level rise by the end of the 21st century, according to AR4 – see above), and that developed countries have considerably more contributed to global warming and benefited from industrialisation than their developing counterparts. Article 9 also obliges developed country parties to financially support their developing counterparts regarding mitigation and adaptation (see just below). Nonetheless, no provision establishes a precise quantified obligation or any precise effort-sharing mechanism. Thus, the individual obligations remain very much unclear¹⁹⁰⁸, and important questions remain unanswered:

- Article 7 (13) PA and the provisions on Loss and Damages (under current operationalisation by the COP since COP 27 at Sharm-El-Sheikh) obligate developed countries to provide (financial) support to their developing counterparts, or to compensate them for their losses and damages. However, it is unclear how much support for adaptation and compensation they must provide, and whether the amounts can be objectively determined rather than purely voluntary.
- What is the difference between providing finance for adaptation and funding or compensation for losses and damages? Must developed countries only provide monetary contributions for losses and damage if they commit faults, i.e., if they breach specific PA obligations or general CDD?

1907 Zahar A, “The Urgenda Appeal Decision and the Argument from Physical Necessity”, 2018; Mayer B, “Climate Change Mitigation as an Obligation under Human Rights Treaties?” (2021) 115(3) *American Journal of International Law* p 415.

1908 Bodansky D, “The Paris Climate Change Agreement: A New Hope?” (2016) 110 *American Journal of International Law* p 288.

Is this question of liability only relevant for finding secondary obligations to compensate for loss and damages?¹⁹⁰⁹

- What about private actors? Must they financially contribute to adaptation, as the applicant *Lliuya* requested against RWE in this German climate case? Do carbon majors have a duty to compensate for the costs of building dams to protect US cities against sea-level rise?¹⁹¹⁰ Or will they be obliged to contribute to general compensation funds, set up by the COP, and for which each State determines the funding rules?

3.3.2.4 The PA's finance provisions and the insufficient commitments

The important Article 9 sets out in its first paragraph a proper obligation for developed state parties to support their developing counterparts “with respect to both mitigation and adaptation” (since it uses the modal verb “shall”). While the second paragraph only encourages “other parties” (certainly meaning emergent countries such as China, Brazil, and South Africa) to contribute voluntarily, the third paragraph expects the global north “to take the lead [in] mobilizing climate finance from a wide variety of sources” and to make progress over time (this expectation is linked with the verb should). These obligations remain, however, very general and do not specify the required quantitative contribution of any individual country, which is problematic as it remains unclear what individual States must do¹⁹¹¹.

Paragraphs 3 and 4 of Article 9 underscore again the important equity aspect of considering the needs of the most vulnerable countries, such as the least developed countries and small island developing States. Paragraph 5 also concretises the general obligation by requiring developed country parties to biennially disclose “quantitative and qualitative information” related to those latter paragraphs. In other words, these provisions aim to ensure that these latter countries have access to mitigation and adaptation finance.

1909 For a summary of the corresponding current debate by a leading legal scholar, see: Bodansky D, “The Forever Negotiations” (EJIL: Talk!, 2022).

1910 US District Court for the Northern District of California (William Alsup), *City of Oakland v BP et al*, 25 June 2018, p 15; Deva S, “Climate Change: Looking Beyond Human Rights Due Diligence?” (*Nova Centre on Business, Human Rights and the Environment Blog*, 7 May 2021).

1911 Bodansky D, “The Paris Climate Change Agreement: A New Hope?” (2016) 110 *American Journal of International Law* 288.

Article 9 (3) recognises the “significant role of public funds”, a contrasting position with the purpose of some climate lawsuits, which directly seek monetary compensation from private enterprises (so-called carbon majors) based in the global North.

As noted above, the COP 27 committed to creating the loss and damages funding arrangements, which the COP 28 concretised in 2023, complementing the already existing funds on mitigation and adaptation¹⁹¹². This achievement represents a breakthrough in international climate policies¹⁹¹³, but quantified individual obligations aimed at determining how much one State must contribute remain absent. The question remains whether these general PA provisions suffice to comply with *general* due diligence.

Findings: This PhD assumes that CDD requires effective prevention (mitigation by reducing GHGs), effective protection against climate-related impacts (adaptation) and compensation for losses and damages. Even if a breakthrough occurred concerning the loss and damage fund, one needs to remember that the developed countries still have not delivered on their COP 21 pledge to jointly mobilise USD 100 billion per year for mitigation and adaptation¹⁹¹⁴. This promise has not yet met and, in any case, is significantly behind what is necessary to enable developing countries and the most vulnerable countries to cope with climate change¹⁹¹⁵:

- Only 20% of UNFCCC climate finance is in the form of grants, with the remainder being loans. This distribution is hugely problematic since loans must be repaid, sometimes with interest, and therefore mostly concern mitigation (power generation projects) rather than mitigation¹⁹¹⁶.

1912 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, footnotes 7 and 8.

1913 UNFCCC Website, “COP27 Reaches Breakthrough Agreement on New “Loss and Damage” Fund for Vulnerable Countries”, *Press Release*, 20 November 2022: <https://unfccc.int/news/cop27-reaches-breakthrough-agreement-on-new-loss-and-damage-fund-for-vulnerable-countries>, last accessed 29 October 2025.

1914 COP 21 Decision (Paris), *FCCC/CP/2015/L.9/Rev.1*, 12 December 2015, §54 and §115; The COP 27 Decision notes this failure at its paragraph 33: COP 27, “Sharm el-Sheikh Implementation Plan”, *FCCC/CP/2022/L.19*, 20 November 2022, § 33.

1915 COP 26 decision, “Glasgow Climate Pact”, *FCCC/PA/CMA/2021/10/Add.1*, 13 November 2021, § 43.

1916 Editorial, “Global climate action needs trusted finance data: An agreed system for measuring funding of green projects in poorer nations will be vital to achieving action on climate change in 2021”, *Nature*, 6 January 2021.

- Some distrust exists in the mechanism because of a lack of transparency on both sides, namely between developed and developing countries¹⁹¹⁷.
- The COP 28 in 2023 estimated that developing countries need “USD 5.8–5.9 trillion for the pre-2030 period” to reach their mitigation commitments (NDCs) and “USD 215–387 billion annually up until 2030” for adaptation, clearly showing the gap between the commitment and what’s needed¹⁹¹⁸. The closure of this immense gap “will require a transformation of the financial system and its structures and processes, engaging governments, central banks, commercial banks, institutional investors and other financial actors” as the COP 27 Decision lucidly noted it¹⁹¹⁹. The UNEP’s director, Inger Andersen, stated in the editorial of the Emissions Gap Report that the global community has “missed the opportunity to invest in a low-carbon recovery from the COVID-19 pandemic.”¹⁹²⁰
- And, while the COP 28 ended up recognising the *need* to establish a “new climate finance goal” at COP 29, in 2024¹⁹²¹, the global community still lags behind any pertinent consensus on this front.

Thus, one may interpret this state of affairs as ongoing collective CDD violations, leaving the door open to find instances of *individual* treaty or CDD breaches, akin to the findings with respect to mitigation and adaptation.

Lastly, regarding Article 10 PA on technologies development and transfer: this article is mainly about cooperation, and the importance of sharing relevant technologies. This component could be important since decarbonisation involves the deployment of numerous technical innovations and technologies (renewable energy, hydrogen, CCS, etc). Paragraph 5 recognises this importance by stating that technology development and transfer “is critical for an effective, long-term global response to climate change and promoting economic growth and sustainable development.” To implement this article, paragraph 6 expresses an implicit obligation for developed

1917 *Ibid.*

1918 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 67 – 68.

1919 COP 27, “Sharm el-Sheikh Implementation Plan”, *FCCC/CP/2022/L.19*, 20 November 2022, § 31.

1920 UNEP, “Emissions Gap Report 2022: The Closing Window”, 2022.

1921 UNFCCC Website, “COP28 Agreement Signals ‘Beginning of the End’ of the Fossil Fuel Era”, *Press Release*, 13 December 2023, <https://unfccc.int/news/cop28-agreement-signals-beginning-of-the-end-of-the-fossil-fuel-era>, last accessed 19 October 2025.

country Parties as it grounds a right for their counterparts to obtain “support, including financial support” in order to receive and develop technology. Paragraphs 3 and 6 mention collaborative global mechanisms to facilitate this article’s purpose (Technology Mechanism and Financial Mechanism). Nonetheless, these provisions contradict the purpose of intellectual property, and thus, may encounter large opposition in their implementation. The COP 28 decision highlights these barriers¹⁹²².

Finding: To ensure collective compliance with CDD, there is a need to make the WTO rules and other trade-related rules compatible with the need for climate requirements, including technology transfer. This is manifestly not the case.

3.3.2.5 The PA’s soft compliance mechanisms, insufficient as such

While the KP took a top-down approach with potential sanctions, the PA leaves leeway to the Parties. For example, its provisions only aim to “facilitate implementation” and “promote compliance”¹⁹²³. More precisely, there are three mechanisms in this regard:

The first is the mechanism enshrined in Article 13 (1), which establishes “an enhanced transparency framework for action and support”. It should be implemented in “a facilitative, non-intrusive, non-punitive manner, respectful of national sovereignty, and avoid placing undue burden on Parties.”¹⁹²⁴ It is aimed at ensuring clarity and progress on mitigation, adaptation, climate finance, and technology transfer.

The second is the mechanism enshrined in Article 14, which sets up the so-called “global stocktake”, which is the official review mechanism of the State commitments with respect to mitigation (NDCs), adaptation and all other objectives. The “First Global Stocktake” took place in December 2023 at COP 28 in the United Arab Emirates, but is in practice conducted almost annually by the COP and other bodies as well (UNEP, IEA etc), as there is a need to keep track of the progress made.

The third is the mechanism enshrined in Article 15, which introduces the compliance committee, another mechanism which “shall be expert-based and facilitative in nature and function in a manner that is transparent, non-

1922 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 103.

1923 These words stem from Article 15 (1) PA.

1924 Article 13 (3) PA.

adversarial and non-punitive”¹⁹²⁵. While this committee should focus more on the substantive aspects of the PA’s implementation, it surely overlaps with the transparency framework of Article 13 since the “transparency arrangements” of the PA are primarily disclosure obligations (NDCs) linked to general standards of conduct close to due diligence (highest possible ambition, CBDRRRC – see below subsection 3.3.2.1 for more information).

Thus, the PA does not provide for the possibility of *directly* sanctioning States for any kind of breach, a common criticism according to some authors quoted by the IPCC¹⁹²⁶. There is an overarching and multidisciplinary question in the literature on what’s better: either voluntary cooperation with significant freedom and flexibility or a top-down approach with binding provisions, enforcement and sanctions capabilities. Does the lack of proper enforcement mechanisms constitute a violation of CDD?

Findings:

For some, the issue is not so much the “power to enforce compliance or sanction non-compliance, but the level of ambition”, as “implementation of specific commitments tends to be high once countries have ratified and a treaty or an agreement is in force (Bodansky 2016; Rajamani 2016).”¹⁹²⁷ Although I could agree with this theory, one can only observe that it does not properly reflect the facts so far.

Firstly, the PA has an ambitious global LTTG (well below 2°C and 1.5°C), but the NDCs are not aligned with it. In fact, as already shown, the concrete measures enacted by States lead to approximately 2.1 – 2.8°C of global warming, which is still way above the Paris LTTG (note, however, that 4°C of warming was projected when the PA was adopted¹⁹²⁸). Thus, in this sense, States still do not set out the necessary measures to be on track with the global LTTG.

Secondly, if States fully comply and implement their NDCs and other domestic climate pledges (numerous State Parties announced in a high-level policy document to achieve net zero emissions by 2050 or some years

1925 Article 15 (2) PA.

1926 IPCC, AR6 (2021-23), WG III, Chapter 1, p 172 - 173.

1927 IPCC, AR6 (2021-23), WG III, Chapter 1, p 172 – 173 referencing Rajamani L and Bodansky D, “The Paris Rulebook: Balancing International Prescriptiveness with National Discretion” (2019) 68 *International and Comparative Law Quarterly* p 1023-1040.

1928 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 18.

later¹⁹²⁹), global warming could be limited to 1.7°C – 1.8°C, which is very close to the upper limit of the PA's LTTG¹⁹³⁰.

Thirdly, the COP 28 decision called on States to issue updated NDCs by 2025 at the latest to fully align with the 1.5°C goal¹⁹³¹. This second fact shows that States do not comply with their long-term domestic targets either, which need to be complemented with consistent short and medium-term targets. In any case, however, the PA relies on the principle of progression over time, by creating a transparency framework, a *de facto* annual global stocktaking process, a capacity-building mechanism, and an international climate finance mechanism (the concrete rules of which were only agreed upon in 2018 – see the Paris Rulebook) etc. Hence, there is still *hope* that State parties will increase their cooperation and ambition and ultimately come along with adequate measures to achieve the PA LTTG, which still remains *physically* possible¹⁹³².

The IPCC noted other the recurrent critiques on the successive COPs, mentioning the “‘organised hypocrisy’ where proclamations are not matched with corresponding action (Egnell 2010).”¹⁹³³ This hypocrisy argument resonates with the fact that numerous state and non-state actors adopted net zero commitments, which today resemble more to greenwashing than anything else, as the concrete measures do not suffice to meet the declared ambition.

The PA does not seem fit to proscribe the “free riding” phenomenon (*passager clandestin*) due to the lack of sanctions. Still, the PA introduced a compliance committee, a global stocktaking process, and transparency mechanisms, to incentivise progress, capacity building, and collaboration, making name and shaming possible (although stigmatisation does not seem to be the spirit of COPs).

Yet, even the PA would foresee sanctions and enforcement proceedings, like the KP, but no one can guarantee that all State parties would remain in it and keep complying. The experience around the KP and the Doha Amendment may illustrate the issue (see the subsection above). On the other hand, the PA mandates its State Parties to constantly progress, so, by

1929 According to the UNEP Emissions Gap Report 2022, p XXII.

1930 IEA, WEO 2022, p 106-107.

1931 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 37 – 39.

1932 See the similar conclusion in Rajamani L and Bodansky D, “The Paris Rulebook: Balancing International Prescriptiveness with National Discretion” (2019) 68 *International and Comparative Law Quarterly* p 1023-1040.

1933 IPCC, AR6 (2021-23), WG III, Chapter 1, p 172 - 173.

setting NDCs which shall reflect their highest possible ambition, equity, etc (see below – on the interpretation of the PA as a due diligence obligation).

Thus, the flexibility and the collaborative spirit in the PA seem more adequate than a top-down instrument, which may lead to full rejection, as the KP experience has shown¹⁹³⁴.

3.3.2.6 Provisional conclusion concerning the PA's sufficiency with respect to CDD

The PA's objectives are in line with the IPCC AR5 (2014) findings, as identified above. And, although the PA may lead to further cooperation and progress, the mere existence of those provisions is unlikely to be self-sufficient to achieve the LTTG and the other objectives in adaptation, finance, and loss and damage. This partial adequacy only leads to compliance with *procedural* CDD. Complementary provisions, measures, and mechanisms may certainly be needed. Introducing strategic climate litigation on the basis of *general* CDD, as shown in Part 2, could reinforce the PA, as it could bolster and catalyse its provisions through lawful and legitimate complementary means.

Box Technical Briefing 3: The success of the Montreal Protocol compared to the climate treaties

The 1987 Montreal Protocol “successfully” regulated HCFCs (including chlorofluorocarbons, halons and hydrochlorofluorocarbons), which are ozone-depleting substances and very potent GHG¹⁹³⁵. According to the IPCC, the result of the Montreal Protocol in terms of emission reduction is “substantially greater than the first commitment period” of the KP¹⁹³⁶.

However, the scale of the climate problem is significantly more complex than that of the ozone-depleting substances. The latter essentially required some marginal fixes in products: the HCFCs were simply replaced with hydrofluorocarbons (HFCs)¹⁹³⁷, which are not ozone-depleting, but are still very potent GHGs. As the graph below shows, CFC + HCFCs decreased substantially, but HFCs + PFCs + SF6 partly “compensated” for this.

1934 For concurring opinions, see Rajamani, Bodansky quoted in IPCC, AR6 (2021-23), WG III, Chapter 1, p 172 – 173; see also Viñuales, ‘The Paris Climate Agreement: An Initial Examination’, in C-EENRG Working Papers, no. 6, 15 December 2015.

1935 IPCC, AR6 (2021-23), WG I, Full Report, p 180.

1936 IPCC, AR6 (2021-23), WG III, Chapter 14, p 1496.

1937 *Ibid*, Chapter 1, p 172 - 173.

3 Secondary obligations due to historical non-compliance

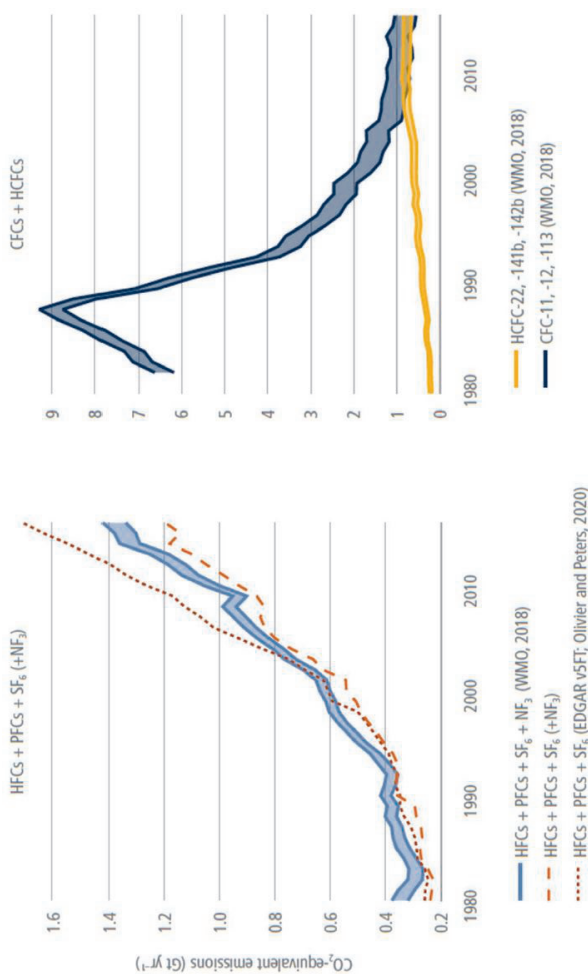


Figure 2.SM.7 | Comparison between top-down estimates and bottom-up EDGAR inventory data on GHG emissions for 1980–2016. Left panel: Total GWP100-weighted emissions based on IPCC AR6 (Forster et al. 2021) of F-gases in Olivier and Peters (2020) (EDGARv5F1) (red dashed line, excluding C₂F₆, C₃F₈ and C₂F₄) and EDGARv6 (purple dashed line) (Crippa et al. 2021) compared to top-down estimates based on AGAGE and NOAA data from WMO (2018) (blue lines; Engel and Rigby (2018); Montzka and Velders (2018)). Right panel: Top-down aggregated emissions for the three most abundant CFCs (–11, –12 and –113) and HCFCs (–22, –141b, –142b) not covered in bottom-up emissions inventories are shown in green and orange. For top-down estimates the shaded areas between two respective lines represent 1 σ uncertainties. Source: Mixx et al. (2021).

Therefore, an amendment to the Montreal Protocol was enacted: the “Kigali Amendment”, which notably requires developed country parties to reduce HFCs by 85% by 2036 compared to 2013¹⁹³⁸; the implementation of which could “reduce future global average warming in 2100 from a baseline of 0.3°C–0.5°C to less than 0.1°C”¹⁹³⁹. Again, these objectives are possible thanks to alternative commercially available and approved technologies¹⁹⁴⁰, such as, for instance, “highly efficient cooling technologies” in refriger-

1938 *Ibid*, Chapter 14, p 1496.

1939 IPCC, AR6 (2021-23), WG III, Chapter 4, p 439.

1940 *Ibid*, See also Chapter 14, p 1496.

ation and air conditioning¹⁹⁴¹. Nonetheless, akin to the KP, the success of the Kigali Amendment depends on the ratification of the USA and key other countries, which is not the case yet¹⁹⁴².

In any case, mitigating global warming in line with the PA's objective involves a full-scale transformation of our societies and economies worldwide. Clearly, the ozone and climate issues are not comparable in that sense.

3.3.3 The focus on the need to limit warming to 1.5°C after the publication of the 2018 IPCC SRI.5

3.3.3.1 The SRI.5: a COP request resulting in procedural CDD compliance but in deeper substantive gaps

In 2015, the COP 21 in Paris requested a special report from the IPCC on the consequences of overstepping the 1.5°C, in the same decision in which it adopted the PA¹⁹⁴³. At this point in time, the 1.5°C target was mentioned relatively marginally in the AR4 and AR5, with the harmful consequences of exceeding the 2°C threshold being specifically highlighted (see *supra*, corresponding subsections 1.2.3 and 1.3.1). On the political and diplomatic level, the Copenhagen Accord¹⁹⁴⁴ and Cancun Agreements¹⁹⁴⁵ briefly mentioned the possibility and necessity to limit the global temperature increase to 1.5°C. Additionally, when some small island states ratified the PA, they stated that the PA's LTTG and provisions do not suffice to protect their interests and keep warming below this threshold¹⁹⁴⁶.

Findings: Requesting a special report on the consequences of overstepping the 1.5°C threshold led the international community of States to comply even more with *procedural* CDD. Nonetheless, as identified and repeated above multiple times, adequately identifying the risks and setting

1941 *Ibid*, see also Chapter 9, p 974.

1942 *Ibid*, Chapter 14, p 1496.

1943 COP 21 Decision (Paris), *FCCC/CP/2015/L.9/Rev.1*, 12 December 2015, § 21.

1944 COP 15 Decision (Copenhagen Accord), *FCCC/CP/2009/11/Add.1*, 18 December 2009, p 7, § 12.

1945 Mayer B, "Editorial: Special Issue – Legal Aspects of the 1.5°C Target" (2018) 1 *Carbon & Climate Law Review (CCLR)* referencing Decision 1/CP.16, paras 4 and 138-139. The Supreme Court of the Netherlands in *Urgenda* also mentions the Cancun Agreements as being the first time ever the COP addressed the 1.5°C target, see Supreme Court of the Netherlands, *Urgenda*, 19/00135, 20 December 2019, § 2.1.

1946 Cook Islands, Marshall Islands, Micronesia, Nauru, Niue, Solomon Islands, Tuvalu, and Vanuatu.

sufficient global targets does not suffice to comply with substantive CDD, which requires corresponding concrete measures to achieve the LTTG. To assess the latter, one can check if the world is on track to achieve the LTTG and the general consistency of the policies in practice, which is not the case today, necessarily showing global non-compliance (see the non-compliance findings of subsection 1.3.2.1.2 on the PA's mitigation provisions).

In 2018, the IPCC delivered its special report on global warming of 1.5°C (SRI.5). There are mainly two reasons why the SRI.5 report can be considered groundbreaking.

Firstly, the IPCC established the significant risks beyond 1.5°C by detailing the threats of crossing the 1.5°C threshold and by comparing the impacts between 1.5°C and 2°C. The IPCC asserted that 1.5°C is more risky than the current levels of global warming, estimated in 2018 at more or less 1°C¹⁹⁴⁷. It becomes clear that limiting to 1.5°C is *significantly safer*, both for human societies (meaning individuals, present, and future generations etc¹⁹⁴⁸) and the environment (global and local ecosystems, biodiversity, wildlife, forests¹⁹⁴⁹).

Secondly, for the elaboration of the SRI.5, the IPCC studied 90 global pathways limiting warming to 1.5°C¹⁹⁵⁰ (so-called “1.5°C pathways”). It concluded that limiting global warming to that level requires unprecedented changes in society and the economy, i.e., “rapid and far-reaching transitions in energy, land, urban and infrastructure”¹⁹⁵¹.

The 1.5°C carbon budget is moreover rapidly depleting. In fact, “[i]t is likely that global warming will reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate (high confidence).”¹⁹⁵²

To avoid this depletion, the world needs to reduce by 45% its CO₂ emissions by 2030 compared to 2010 and achieve CO₂ net zero emissions by 2050. The 2°C scenarios meet those respective milestones around 20 years later¹⁹⁵³.

This data shows the urgency of the matter and the radicality of the action required to achieve a 1.5°C limitation (see the graph next to the text here stemming from the SRI.5, Figure SPM 1 showing the steepness of the pathway).

1947 IPCC, SRI.5 (2018), SPM, § A3.

1948 *Ibid.*, § B1 and B5.

1949 *Ibid.*, § B3.

1950 *Ibid.*, Chapter 2, Supplementary Material, Table 2.SM.II, p 18.

1951 *Ibid.*, SPM, § C2.

1952 *Ibid.*, § A1.

1953 *Ibid.*, § C1.

Finding: Before the SRI.5, the scientific discussion already labelled the 2°C objective as too onerous and burdensome, leading some scientists and other relevant commentators to doubt its actual feasibility¹⁹⁵⁴. The recognition of the need to reinforce efforts to limit global warming to 1.5°C may, thus, appear very surprising. It brought a much-needed sense of urgency to tackle climate change, leading the world to act more rapidly together, but still not sufficiently, as warming may still reach 2.1°C to 2.8°C according to the last official COP estimations¹⁹⁵⁵. Consequently, there is still no substantive compliance with CDD (see the non-compliance findings of subsection 1.3.2.1.2 on the PA's mitigation provisions).

3.3.3.2 The diplomatic reception of the SRI.5, only leading to procedural compliance

In 2018, after the SRI.5 just came out, the COP 24 acknowledged its publication¹⁹⁵⁶. However, COP 24 did not endorse or recognise the SRI.5 main results; it only invited “Parties to make use of the information contained in the [SRI.5] report”¹⁹⁵⁷. Since the time between the SRI.5 release and the COP was just 2 months, it may be understandable that the world community did not react more substantively to the SRI.5 results. In 2019, the COP 25 in Madrid did not address the SRI.5 either. And, in 2020, the COP was cancelled due to the COVID-19 crisis.

In 2021, the COP 26 in Glasgow finally quoted the main results of the SRI.5¹⁹⁵⁸. Concerning the first part on “Science and Urgency”, the COP recognised that “human activities have caused around 1.1 °C of warming

1954 Viñuales, ‘The Paris Climate Agreement: An Initial Examination’, in C-EENRG Working Papers, no. 6, 15 December 2015: “From an equity perspective it seems clear that 1.5 °C would be preferable, but such a target would have complex signalling effects 10 because, scientifically, it looks extremely difficult to achieve and, perhaps unrealistic [referencing in a footnote the following piece: Carraro C and Massetti E, “The Improbable 2°C Global Warming Target”, *Vox*, 3 September 2009; See as well Mayer B, “Editorial: Special Issue – Legal Aspects of the 1.5°C Target” (2018) 1 *Carbon & Climate Law Review (CCLR)* referencing “Victor and Kennel, ‘Climate policy: Ditch the 2 °C warming goal’ (2014) 514 *Nature* 30”.

1955 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 18.

1956 COP 24 Decision (Katowice), *FCCC/CP/2018/10/Add.16*, 19 March 2019, § 27.

1957 *Ibid.*

1958 COP 26 decision, “Glasgow Climate Pact”, *FCCC/PA/CMA/2021/10/Add.1*, 13 November 2021, § 15 – 17.

to date” and that the carbon budgets are rapidly depleting¹⁹⁵⁹. It stressed moreover “the urgency of enhancing ambition and action in relation to mitigation, adaptation and finance in this critical decade to address the gaps in the implementation of the goals of the Paris Agreement”¹⁹⁶⁰. The specific subsection on mitigation eventually highlighted the importance of limiting warming to 1.5°C and found that:

“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;

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;

23. Also recognizes that this requires accelerated action in this critical decade, on the basis of the best available scientific knowledge and equity, reflecting common but differentiated responsibilities and respective capabilities in the light of different national circumstances and in the context of sustainable development and efforts to eradicate poverty.”¹⁹⁶¹

The COP 27 and 28 in Sharm-el-Sheikh and Dubai recalled similar findings¹⁹⁶². The focus on limiting warming to 1.5°C is a source of numerous scientific and policy debates, as the carbon budgets are depleting rapidly, even for the 2°C scenario, as recognised by the COP¹⁹⁶³. In light of these difficulties, the global community of States merely found the need to reinforce the “efforts to limit the temperature increase to 1.5 °C”, without declaring this temperature threshold as the only admissible one¹⁹⁶⁴. In other words, the COP manifestly formulated a best-efforts obligation for 1.5°C, but not an obligation of results.

Notably, France argued before the ITLOS that the court should consider the COP 26 decision when interpreting the PA, and the due diligence

1959 *Ibid*, § 3.

1960 *Ibid*, § 4.

1961 *Ibid*, § 15 – 17.

1962 COP 27, “Sharm el-Sheikh Implementation Plan”, *FCCC/CP/2022/L.19*, 20 November 2022, § 4, 11, 12; COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 4, 25 – 28.

1963 COP 26 decision, “Glasgow Climate Pact”, *op cit*, § 15 – 17.

1964 *Ibid*.

norm contained in UNCLOS¹⁹⁶⁵, by quoting the ICJ, which has stated in another case that consensual recommendations “may be relevant for the interpretation of the Convention”¹⁹⁶⁶.

Given the COP decisions, Mayer and Van Asselt argue that the global community knows in principle very well what needs to be done and that if an international or domestic court only recalls the need to limit global warming to 1.5°C, by associating it with due diligence, its outcome would be merely redundant¹⁹⁶⁷. This PhD thesis partially disagrees for the following reasons. COP decisions are not binding as such and are drafted in a global context. In other words, COP decisions do not necessarily reflect individual State ambitions or intentions. Therefore, even though the information on what an alignment with 1.5 requires is widely available and accepted on the international level politically, the decision makers at the national levels (members of Parliaments, domestic, regional institutions and so on) may not be on the same page, let alone individual citizens, who cannot necessarily follow these developments. And since numerous countries, especially developed ones, are democracies based on free markets, it is even more important to inform citizens, as they have some leverage as voters, consumers, or affected individuals. They can notably vote for politicians in favour of climate action, reduce their energy consumption, switch to alternative fuels, eat less meat, take legal action based on CDD (see subpart 3.1 on standing), choose to engage professionally in the development of low-carbon technologies, and so on. Thus, given this need for coordination and synchronisation, there is no harm if international, regional or domestic legal actions address climate mitigation and ultimately lead to decisions which specify the best efforts requirements to achieve 1.5°C alignment.

1965 France, Written Statement Of France, International Tribunal for the Law Of the Sea, Request for an Advisory Request submitted by the Commission Of Small Island States on Climate Change and International Law, (Case No. 31), 16 June 2023, § 103 – 113: “France concludes that the “CMA’s decisions are therefore relevant for the purposes of interpreting the Paris Agreement; specifically, they strengthen the scope of the objective of limiting temperatures to 1.5°C relative to the letter of the Paris Agreement and emphasize the urgency of taking action.”

1966 ICJ, Judgment, 31 March 2014, Whaling in the Antarctic (*Australia v Japan: New Zealand intervening*), I.C.J. Reports 2014, p 248, § 46: “[t]hese recommendations, which take the form of resolutions, are not binding. However, when they are adopted by consensus or by a unanimous vote, they may be relevant for the interpretation of the Convention”.

1967 Mayer B, “International Advisory Proceedings on Climate Change” (2023) 44 *Michigan Journal of International Law* p 49-50. ; see also Mayer B and van Asselt H, “The Rise of International Climate Litigation” (2023) *RECIEL* p 8.

Analysts and legal experts such as Mayer should recall the very nature of the climate problem, which is a “highly polycentric issue”¹⁹⁶⁸, meaning that everyone needs to act at all levels in order to harmoniously prioritise climate action in the different governance and legal systems, with the ultimate aim to achieve the LTTG and overall CDD compliance. Furthermore, there is a necessity to spell out for each systemic actor the minimum level of CDD compliance.

It is also remarkable that the COP started to address private parties and climate finance more prominently from COP 26 onwards (see below). However, numerous initiatives have voiced critiques on the insufficiency of private actors’ actions, and no legal framework exists to compel private actors to achieve the PA’s LTTG. This state of affairs justifies relying on CDD to ensure that corporate actors deploy best efforts to be on track with the LTTG, or at least, not hinder its achievement.

Findings: The COP started to implement the SRI.5 results from 2021 onwards, but still failed to bring the world on the 1.5°C track, as it is on course to 2.1°C – 2.8°C according to COP 28. Thus, the COP only achieves procedural CDD conformity and must carry out much more substantive effort to achieve substantive compliance, by addressing equity, climate finance, private actors’ commitments, adaptation, losses and damages, etc.

The implications of a 1.5°C scenario alignments are “extraordinarily ambitious”, almost a “revolution” as Mayer labelled it¹⁹⁶⁹, which is even more the case for developed countries when one takes into account equity aspects. While courts may be reluctant to enforce specific GHG reduction figures linked to the 1.5 objective, they can still verify whether states (or other private actors) did everything they could to attain individual 1.5 alignments. The dynamics that climate litigation introduced, next to the incremental PA implementation, may spur progress. It is, however, entirely unclear whether the PA and general CDD may ultimately suffice to avoid the worst climate-related impacts.

1968 Mayer B and van Asselt H, “The Rise of International Climate Litigation” (2023) *RECIEL* p 4.

1969 Mayer B, “Editorial: Special Issue – Legal Aspects of the 1.5°C Target” (2018) 1 *Carbon & Climate Law Review (CCLR)* p 3.

3.3.4 The insufficient progress achieved by COP 26 – 28

Beyond inferring some broad objectives from the SRI.5, the COPs did not appear to achieve significant breakthroughs.

In fact, the so-called “Paris Rulebook”, which intends to specify how some PA provisions ought to be interpreted, still leaves a considerable margin of appreciation¹⁹⁷⁰. For instance, concerning mitigation and equity, which are at the core of the climate conventions architecture, the Paris Rulebook did not achieve further specification¹⁹⁷¹. While developing countries argued in favour of an exhaustive equity approach, including in the global stocktake, developed States dismissed it, arguing that there is no international consensus on the equity criteria yet¹⁹⁷². The Global North position reflects some “organised hypocrisy” as there was and is some irrefutable amount of consensus since AR4 in this regard (see Bali-Box).

Findings: The persistent refusal by developed state parties to agree to implement best efforts towards achieving more mitigation efforts and equity constitutes a significant hurdle in advancing climate mitigation, and could aggravate their CDD breaches, which potentially began from the first IPCC report onwards, or the 1992 adoption of the UNFCCC (see above).

In 2021-23, the IPCC published AR6. It published first the WG I report on the physical science basis, which confirmed that there is no uncertainty at all anymore on the front of anthropogenic warming findings (i.e., this finding is unequivocal, thus the precautionary principle does not need to apply at all anymore)¹⁹⁷³. The AR6 WG II further emphasised the dangers of global warming exceeding 1.5°C by notably showing that loss and damages already occurred and will worsen soon¹⁹⁷⁴.

In 2022, the COP 27 in Sharm-El-Sheikh achieved a significant development regarding loss and damage, notably creating corresponding funding arrangements¹⁹⁷⁵. To justify this stance, it notably relied on the AR6 report, which shows “the growing gravity, scope and frequency in all regions of

1970 Rajamani L and Bodansky D, “The Paris Rulebook: Balancing International Pre-scriptiveness with National Discretion” (2019) 68 *International and Comparative Law Quarterly* p 1023-1040.

1971 *Ibid*, p 1031.

1972 *Ibid*.

1973 IPCC, AR6 (2021-23), WG I, SPM, § A.1 – A.1.3 – A.1.

1974 See, for instance, IPCC, AR6, SYR, SPM, § A2: “A.2.

1975 COP 27, “Sharm el-Sheikh Implementation Plan”, *FCCC/CP/2022/L.19*, 20 November 2022, § 24.

loss and damage associated with the adverse effects of climate change, resulting in devastating economic and non-economic losses, including forced displacement and impacts on cultural heritage, human mobility and the lives and livelihoods of local communities¹⁹⁷⁶. The COP 27 also expressed its “deep concern” for developing countries, which face growing debts and other vulnerabilities¹⁹⁷⁷.

In 2023, the COP 28 operationalised the loss & damage funding arrangement¹⁹⁷⁸. Some already contributed to the fund, as stated in the official press release¹⁹⁷⁹, but the COP decision itself “[a]cknowledges the significant gaps, including finance, that remain in responding to the increased scale and frequency of loss and damage, and the associated economic and non-economic losses”.¹⁹⁸⁰

Findings: While the creation of funding arrangements is a welcome development in international climate law, and responds to the AR6 findings, the loss and damage fund still needs to be filled by further relevant and steady or increasing contributions to adequately compensate for the damages, notably by developed states, and certainly some private actors which historically delayed climate mitigation (see above, corresponding non-compliance findings for private actors). Thus, the state community followed the same pattern as previously, achieving partial compliance on the procedural level, but not substantively.

As to private pledges, the UN Secretary General brought together an expert group, the so-called High-Level Expert Group on the Net-Zero Emissions Commitments of Non-State Entities (HLEG), which issued a report at COP 27 (2022)¹⁹⁸¹, setting out climate expectations for all non-state actors – especially large multinational business enterprises from the Global North, including financial actors. More precisely, the report sets out criteria to make the businesses compatible with a 1.5°C world, including combating greenwashing, as climate pledges, especially net-zero ones, were trending.

1976 *Ibid*, § 22.

1977 *Ibid*, § 23.

1978 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, footnotes 7 and 8.

1979 UNFCCC Website, “COP28 Agreement Signals ‘Beginning of the End’ of the Fossil Fuel Era”, *Press Release*, 13 December 2023: “Commitments to the fund started coming in moments after the decision was given, totalling more than USD 700 million to date.”

1980 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 128.

1981 COP 27, “Sharm el-Sheikh Implementation Plan”, *FCCC/CP/2022/L.19*, 20 November 2022, § 60.

Additionally, the COP 26 Decision called on private, public and multilateral banks “to accelerate the alignment of their financing activities with the goals of the Paris Agreement”¹⁹⁸², and, therefore, facilitated the launch of the Glasgow Financial Alliance on Net Zero (GFANZ)¹⁹⁸³.

More generally, an overhaul of the functioning of the financial system is required, as the COP acknowledged¹⁹⁸⁴.

Findings: These steps and measures are welcome but are late, not legally binding, and do not ensure any implementation by private parties¹⁹⁸⁵. Obliging private actors to do their fair share is necessary as they are not on track to achieve the LTTG, nor are they manifestly implementing best efforts¹⁹⁸⁶. As UN-HRTB clarified, the obligations to protect HR require state parties to implement binding due diligence regulations on corporate groups, including multinationals. Consequently, as long as States do not require private actors to do their part to achieve the LTTG for private actors, they will not comply with CDD.

3.3.5 Provisional conclusion on CDD’s violations after 2015

When the international community adopted the PA, commentators deemed that a breakthrough was achieved despite the elusive character of many

1982 COP 26 decision, “Glasgow Climate Pact”, *op cit*, § 55.

1983 GFANZ was launched in April 2021 by UN Special Envoy on Climate Action and Finance Mark Carney and the COP26 presidency, in partnership with the UNFCCC Race to Zero campaign, to coordinate efforts across all sectors of the financial system to accelerate the transition to a net-zero global economy. [...] GFANZ was founded for two equally important purposes: to expand the number of net zero-committed financial institutions and to establish a forum for addressing sector-wide challenges associated with the net-zero transition, helping to ensure high levels of ambition are met with credible action. GFANZ brings together independent, sector-specific Alliances to tackle net-zero transition challenges and connects the financial community to the Race to Zero campaign, climate scientists and experts, and civil society.

1984 COP 27, “Sharm el-Sheikh Implementation Plan”, *FCCC/CP/2022/L.19*, 20 November 2022, §31.

1985 Five UN human rights treaty bodies, Joint Statement on “Human Rights and Climate Change”, *op cit*, 16 September 2019, § 3 and 5.

1986 No significant multinational is aligned with the Paris Agreement target, despite having considerable carbon footprints according to numerous assessments, according to the following: Climate Action 100, “Progress-Update: Five years of Climate Action 100+”, (2022) and the World Benchmarking Alliance, “Oil and Gas Benchmark”, 2023.

provisions (i.e., the PA is a so-called bottom-up agreement requiring iterative implementation by State parties)¹⁹⁸⁷. Certainly, the Agreement may be seen as the best possible mechanism because of the dismissal by the majority of States of binding reduction commitments. In addition, one may consider the COP 21 order to commission a study by the IPCC on the impacts of global warming beyond 1.5°C as an adequate CDD measure to identify dangerous global warming. Therefore, this period may be partially classified as a *collective* compliance period, but only from a *procedural* angle since the specific GHG reduction measures in place do not suffice to achieve the temperature goals, nor do they *manifestly* reflect best individual efforts (see the outcomes of the corresponding case law in Part 2).

More precisely, despite some uncertain progress, the global community is not on track to achieve the Paris Agreement's temperature target: the IPCC estimated in AR5 (2014) that warming would reach 3.7°C - 4.8°C by 2100¹⁹⁸⁸, and in 2023 the COP 28 decision estimated that the world's current measures would lead to 2.1-2.8°C by 2100. If all countries achieve their conditional NDCs and pledges announced by 2022, global warming could be limited to 1.8°C by the end of the century¹⁹⁸⁹. However, this scenario was not considered credible in 2022¹⁹⁹⁰. Since the USA withdrew for a second time from the Agreement and deregulated important domestic climate policies¹⁹⁹¹, the projections will likely worsen by the end of 2025. Either way, beyond the USA, these collective insufficiencies are due to numerous *individual* ongoing failures by many States¹⁹⁹² and private actors¹⁹⁹³, which *manifestly* do not carry out their best efforts, thus likely characterising generalised *individual* CDD breaches.

Furthermore, given the lack of mitigation, there is a need to increase adaptation. Developed countries bear a specific responsibility towards de-

1987 Viñuales Jorge E, "The Paris Climate Agreement: An Initial Examination", *C-EEN-RG Working Papers*, no 6, 15 December 2015.

1988 IPCC, AR5 (2014), SYR, SPM, p 20.

1989 IEA, WEO 2022, p 20 – 21.

1990 *Ibid*, p 32.

1991 Popli N, "What Happened the Last Time Trump Left the Paris Agreement", *TIME*, January 2025.

1992 See the CAT analyses for states – especially developed states: Climate Action Tracker, Countries Assessments, <https://climateactiontracker.org/countries/>, last accessed 30 October 2025.

1993 See the numerous assessments showing the insufficiency of climate action by systemic private parties, by Climate Action 100+, a broad coalition of investors: Climate Action 100, "Progress-Update: Five years of Climate Action 100+", (2022). the World Benchmarking Alliance, "Oil and Gas Benchmark", (2023).

veloping countries in this regard, too, especially as regards climate finance. Nonetheless, they have not delivered any sufficient support so far, as subdivisions 3.3.2 - 3.3.4 show.

Lastly, if the world recently managed to negotiate global loss and damage funds, they remain at this stage underfunded. Developed countries and their business enterprises should logically contribute to these funds to compensate for their past historical failures to comply with CDD.

Overall, even if some progress in terms of mitigation was achieved, some important rollbacks occurred. So far, the Paris Agreement has not put the international community on track with its LTTG. There is a need to go further to prevent dangerous global warming. Initiating climate litigation based on CDD before domestic and international courts is one possible avenue to bolster action. Notably, a judicial body may carry out this type of historical compliance analysis to question the need to impose “secondary obligations”, to know, among others whether systemic Global North actors (i.e., developed States and multinational corporations) must reinforce climate mitigation to compensate for the past failures (see below, interim conclusion), or provide for adaptation and compensation for loss and damage.

3.4 Interim Conclusion on the potential secondary obligations

In a nutshell, Part 3 found that the overarching due diligence duty to identify and prevent serious harm to others and the environment, including climate change, became applicable in the late 1960s. Additionally, it fleshed out that the USA and private actors headquartered there (such as Exxon) are particularly responsible for climate inaction since they refrained from implementing climate mitigation measures despite significantly developing and accessing scientific knowledge about global warming. The USA’s actions may also have had a bearing on the international community, which did not implement adequate and proportionate substantive measures either. This finding does not alleviate CDD failures by other systemic Global North actors (i.e., developed States and multinational corporations) from the 1990s onwards, as they also had a significant influence on the course of the events, especially the EU, and private corporations headquartered in this region, including Shell and TotalEnergies.

Given those findings, a judicial body may carry out this type of analysis to question and ground the existence of “secondary obligations” linked to non-compliance with *general* CDD, such as:

- (i) Reinforcing mitigation measures to redress past shortfalls.
- (ii) Providing compensation for loss and damages.

The question is whether both redress shall be provided or only one. Under UK nuisance law, courts review whether the injunction is a more adequate, fair and just solution than providing monetary compensation¹⁹⁹⁴. Other judges could also consider this question, especially if they are faced with those two types of requests. If so, the following considerations may unfold.

3.4.1 The secondary obligation to reinforce mitigation to make up for historical responsibility

As this thesis demonstrated in length, especially in Parts 1 and 2, every person needs to reduce GHG emissions, even if they are not significant, as recognised by the US Supreme Court in *Massachusetts*¹⁹⁹⁵, the Dutch Supreme Court in *Urgenda*¹⁹⁹⁶, the German Constitutional Court with respect to its climate law¹⁹⁹⁷, or the Hague District Court in a case against a private company Shell¹⁹⁹⁸. Said differently, there is a primary general *individual* and *collective* CDD duty to limit global warming as much as possible by carrying out best efforts¹⁹⁹⁹.

Injunctions to mitigate warming are thus needed to prevent the contribution to the aggravation of the harm as much as possible, even if the world oversteps the 1.5°C threshold, or even the 2°C threshold²⁰⁰⁰. In fact, only the reduction of GHGs can safely mitigate the aggravation of warming, without having recourse to dangerous technologies such as geo-engineering, which aims to artificially control the global weather²⁰⁰¹. Thus, mitigation remains an overarching priority in light of the hard adaptation limits²⁰⁰², which, if crossed, would consequently imply even more losses and

1994 UK Supreme Court, *Coventry v Lawrence*, [2014] UKSC 13, 26 February 2014, § 121.

1995 SCOTUS, *Massachusetts v EPA*, 549 U. S. ____ (2007), p 22.

1996 Supreme Court of the Netherlands, *Urgenda*, 19/00135, 20 December 2019, § 6.3.

1997 Constitutional Court of Germany, 1 BvR 2656/18, 24 March 2021, § 99.

1998 District Court of The Hague, *Milieudefensie v Shell*, 26 May 2021, C/09/571932 / HA ZA 19-379, § 4.4.49.

1999 ECtHR, *KlimaSeniorinnen et al v Switzerland*, no. 53600/20, 9 April 2024, § 545.

2000 WMO, “WMO confirms 2024 as warmest year on record at about 1.55°C above pre-industrial level”, Press Release, 10 January 2025.

2001 IPCC, AR5 (2014), SYR, SPM, p 26.

2002 IPCC, AR6 (2021-23), SYR, § B.4.2.

damages. In other words, it is necessary to grant enhanced climate mitigation obligations, including as an overarching secondary obligation, aimed at remedying the historical shortcomings as much as possible.

3.4.1.1 Increasing climate mitigation by considering historical responsibilities

While an increased ambition in terms of mitigation is, in principle, necessary to remedy a wrongful mitigation shortfall, the precise amount to be compensated may remain unclear. The quantification of historical responsibility in fair share studies is one way of determining the more precise amount of compensation, as these studies use various criteria to calculate shortfall²⁰⁰³. However, Part 2 found that judicial bodies do not impose any precise reduction obligations in the absence of consolidated scientific and political consensus. Accordingly, when imposing secondary obligations to remedy past shortfalls, it may be necessary to leave a margin of appreciation or some discretion²⁰⁰⁴.

Following this approach, courts could still impose secondary obligations on States to require demonstrating the consistency of their mitigation ambition in the light of their historical shortcomings. Thereby, States would keep some discretion on the overall mitigation ambition and its implementation. The report of the European Scientific Advisory Board on Climate Change, created by the European Climate Law²⁰⁰⁵, illustrates this approach

2003 Rajamani L, Jeffery L, Höhne N, Hans F, Glass A, Ganti G and Geiges A, “National ‘Fair Shares’ in Reducing Greenhouse Gas Emissions within the Principled Framework of International Environmental Law” (2021) 21(8) *Climate Policy* p 1; see as well: Robiou du Pont Y and Meinshausen M, “Warming assessment of the bottom-up Paris Agreement emissions pledges”, *Nature Communications* 9 (2018) 4810; see as well Kemp-Benedict E, Holz C, Baer P, Athanaisou T and Kartha S, *The Climate Equity Reference Calculator* (Berkeley and Somerville: Climate Equity Reference Project (EcoEquity and Stockholm Environment Institute), 2019), [Online], available at: <https://calculator.climateequityreference.org>, last accessed 31 October 2025.

2004 See ECtHR, *KlimaSeniorinnen et al v Switzerland*, no. 53600/20, 9 April 2024, § 569 - 571. See as well for companies: Court of Appeal, *Shell*, ECLI:NL:GHDHA:2024:2100, 200.302.332/01, 12 November 2024; and CSDDD.

2005 The European Scientific Advisory Board on Climate Change was established by the European Climate Law of 2021. Its mandate is to serve as a point of reference for the EU on scientific knowledge relating to climate change. The Board has confirmed that the EU has not met the requirements, p 9.

by calculating the EU's fair share, including its historical responsibility, and subsequently confirming that it is necessary to increase ambition in mitigation²⁰⁰⁶. While official studies do not exist for each developed State, the *procedural* dimension of due diligence should require the elaboration of those studies. Meeting this duty before any judicial condemnation could enable state actors to compensate for their historically insufficient and wrongful mitigation actions by preparing enhanced future mitigation ambition.

This logic should apply to private actors as well, as there is no reason in principle to exonerate them from a secondary obligation to remedy their historical wrongful conduct²⁰⁰⁷.

Given what precedes, a secondary obligation may arise in case of past wrongful conduct aimed at ceasing the negligence and/or to repair it by increasing the ambition of GHG reductions. More precisely:

- The cessation obligation could take the form of stopping the potentially continuing unlawful contribution to the harm, including by offering “appropriate assurances and guarantees of non-repetition”, such as through the establishment of an effective and credible 1.5°C transition plan and corresponding measures.
- The compensation must be supported by more stringent future GHG reductions, which are deemed adequate and proportionate to remedy the past mitigation insufficiencies²⁰⁰⁸.

3.4.1.2 Financially supporting emission reductions overseas

Compensating for historical shortcomings may pose questions of feasibility given the need to close wide emissions gaps, which are particularly demanding for developed countries. To solve this problem, scientific and legal experts argued that providing financial resources to third parties to

2006 *Ibid*, p 14.

2007 See the somewhat concurring opinion regarding the need for companies to do their fair share: UN High-Level Expert Group on the Net Zero Emissions Commitments of Non-State Entities, “Integrity Matters: Net Zero Commitments by Businesses, Financial Institutions, Cities and Regions”, 2022, p 15.

2008 This may be achieved by compelling the consideration of the historical responsibility criterion of the fair share literature when setting out mitigation measures to *increase* the ambition of current mitigation measures (see, for more details, subpart 3.4).

ensure GHG reductions may be an acceptable method for complying with domestic reduction obligations²⁰⁰⁹. For example, the European Scientific Advisory Board on Climate Change recommended that:

“The EU must therefore ensure that it does the following. 1. Aim for the highest level of ambition in domestic emission reductions and carbon dioxide removals, [...] 2. Contribute to direct emission reductions outside the EU, in the light of the shortfall identified between the feasible pathways and fair share estimates.”²⁰¹⁰

The Dutch Supreme Court has also considered that reductions overseas *could* have been relevant in meeting the domestic fair share if the state had been able to demonstrate the precise quantities of GHG reductions achieved overseas²⁰¹¹. Furthermore, the climate regime authorises States to fund emissions reduction overseas, notably through Article 6 of the Paris Agreement. Consequently, reducing emissions directly overseas seems to be an acceptable measure to compensate for a lack of territorial emissions if implementation domestically is not possible or would cause significant hardship. Similar conclusions should apply to private actors.

Can measures other than *direct* emission reduction transfers (such as the mechanism provided under Article 6 of the Paris Agreement or Article 12 of the Kyoto Protocol) satisfy the CDD (primary or secondary) duty to make its fair share?

For instance, the provision of “climate finance” was once proposed by the scientific literature to meet the individual fair shares²⁰¹². However, the notion of climate finance does not seem compatible with the legal notion of compensation, which allows loans. Indeed, it is estimated that loans account for as much as 80% of climate finance²⁰¹³. Furthermore, providing

2009 See, among others, Rajamani L, Jeffery L, Höhne N, Hans F, Glass A, Ganti G and Geiges A, “National ‘Fair Shares’ in Reducing Greenhouse Gas Emissions within the Principled Framework of International Environmental Law” (2021) 21(8) *Climate Policy* p 18.

2010 European Scientific Advisory Board on Climate Change, “Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050”, 15 June 2023, p. 15.

2011 Supreme Court of the Netherlands, *Urgenda*, 19/00135, 20 December 2019, § 7.3.5.

2012 Climate Analytics, *Achieving the 1.5°C Limit of the Paris Agreement: An Assessment of the Adequacy of the Mitigation Measures and Targets of the Respondent States in Duarte Agostinho v Portugal and 32 other States*, 7 January 2022: p 44.

2013 Editorial, “Global climate action needs trusted finance data: An agreed system for measuring funding of green projects in poorer nations will be vital to achieving action on climate change in 2021”, *Nature*, 6 January 2021.

climate finance is manifestly an outstanding primary obligation according to Article 9 of the Paris Agreement (see section 3.3.2.4). Thus, reducing domestic emissions responds to a different obligation than providing climate finance, a separate requirement for developed countries.

Otherwise, can extraterritorial emissions (including regulatory measures instead of direct emission reduction transfers) satisfy individual *domestic* fair shares? For instance, can the EU legitimately argue that it is doing its fair share by relying on its extraterritorial legislation, which is ultimately aimed at reducing greenhouse gases overseas (see CBAM or the CSDDD)? In the view of this thesis, the response should be negative. The ECtHR specified that the territorial and extraterritorial obligations found in *KlimaSeniorinnen* are *primary* duties²⁰¹⁴, which corresponds with the UN Committee's view²⁰¹⁵. Consequently, territorial and extraterritorial obligations should be tackled in tandem as primary obligations: States must do their fair share with respect to domestic or territorial emissions, which includes compensating for the lack of fair share through funding reductions overseas, and, in parallel, regulate extraterritorial emissions. In other words, akin to the duty to provide climate finance, reducing extraterritorial emissions is a self-standing primary obligation, which should not count towards the lack of doing its domestic fair share regarding territorial emissions²⁰¹⁶.

Given the above, direct emission reductions overseas seem the only measure to compensate for a lack of fair share domestically.

3.4.2 The secondary obligations to provide monetary compensation in case of loss and damage

While it is difficult to estimate the extent to which compensation for loss and damage must be provided and whether courts can grant compensation requests, this thesis does not rule out these possibilities for the following reasons.

2014 See ECtHR, *KlimaSeniorinnen et al v Switzerland*, no. 53600/20, 9 April 2024, § 287; see as well, the individual opinion of partly concurring partly dissenting opinion of Judge Eicke, § 5.

2015 See, among others, Five UN human rights treaty bodies, Joint Statement on “Human Rights and Climate Change”, *op cit*, 16 September 2019.

2016 Furthermore, the control over territorial emissions is not the same as over extraterritorial emissions; therefore, it seems impossible to equate corresponding obligations.

Despite significant difficulties in attributing emissions *exclusively* to one actor due to the shared responsibility dimension in the context of global warming²⁰¹⁷, it is not impossible to attribute climate-related actions or omissions to public and private actors (i.e., GHG emissions, or other acts, such as opening up fossil fuels, lobbying etc.). Furthermore, these acts become legally relevant if they have a bearing on the courses of the events, i.e., if they caused a loss of opportunity to remain unharmed or if their absence “could have had a real prospect of altering the outcome or mitigating the harm”, as the ECtHR has put it²⁰¹⁸. Thus, individual systemic actors, such as States or corporate groups, must do their part to limit global warming as much as possible, and face liability risks if they do not comply with this standard.

Although the amounts of the climate-related losses and damages are likely to be significant and may be partly unrecoverable²⁰¹⁹, no reparation or compensation at all is not an option either, as it may constitute a denial of justice, an aggravated violation of rights and a disregard for the principle of (shared) responsibility. Nonetheless, it seems rather clear that the application of the principle of joint and several liability (or full liability “*in solidum*”) is problematic, as it could ultimately be unfair to the condemned actor to bear the entire compensation costs, given that it is in any case only *partially* responsible for the current levels of global warming (see in subsection 2.2.1 the exception of the State duty to protect at the territorial level, as applied in the *Torres Islands* case, in which the Australian State was found responsible for bearing the entire costs for adapting its territory to climate change, given the *full* applicability of the duty to protect in territorial circumstances²⁰²⁰).

2017 See causation, subpart 2.2: i.e., the territorial emissions that States can regulate are directly emitted by private persons – in turn, direct emissions of private companies are, in principle, allowed and regulated by democratic decision-making institutions.

2018 See section 2.3.2 and Part 3 for more analysis and especially, ECtHR, *KlimaSeniorinnen*, n°39371/20, 9 April 2024, § 444.

2019 Additionally, the required funding for adaptation is equally considerable: the COP 28 in 2023 estimated that developing countries need “USD 215–387 billion annually up until 2030” for adaptation (see COP 28, “First Global Stocktake”, FCCC/PA/CMA/2023/L.17, 13 December 2023, § 67 – 68).

2020 Human Rights Committee, *Torres Islands case (Daniel Billy et al v Australia)*, Views adopted by the Committee under article 5 (4) of the Optional Protocol, concerning communication No. 3624/2019, CCPR/C/135/D/3624/2019, 22 September 2022. See the following for some relevant lessons of tort law in comparative law:

On the other hand, providing monetary compensation in a casuistic manner to only some litigants in pending cases does not seem to be a satisfactory *modus operandi* in a context in which an infinite number of climate-related losses and damages are occurring²⁰²¹. Moreover, granting damages to specific plaintiffs in proportion to the share of responsibility of any respondent(s) actor(s) would only redress the harm of those *specific* plaintiffs in a very incomplete fashion.

Given the need for systemic solutions, courts could order States to set up corresponding regulatory frameworks for compensation, such as the creation of domestic climate-related funds²⁰²², and/or, in a similar vein, order the State do its part to ensure that the recently created international funds work adequately²⁰²³. At the end of the day, there is a need to ensure that every potential climate-related victim is compensated and that every GHG contributor contributes to repairing the loss and damages. Liability without fault (strict liability) should also be considered further, an opinion echoed by the recognition in the Paris Agreement of “the significant role of public funds” in tackling those issues²⁰²⁴, the literature²⁰²⁵, as well as the ICJ advisory opinion²⁰²⁶. Having said that, it is particularly important that private actors contribute adequately to loss and damages funds. The CDD’s

Spier J (ed), *The Limits of Liability: Keeping the Floodgates Shut (Principles of European Tort Law Set)*, Kluwer Law International, 22 December 1995.

- 2021 One US judge stated for instance that climate change is a worldwide problem that “deserves a solution on a more vast scale than can be supplied by a district judge” (see US District court For the Northern District of California (William Alsup), *City of Oakland v BP et al*, 25 June 2018, p 15).
- 2022 Can a court order the creation of such a fund in a case against the State or private actors?
- 2023 COP 27, “Sharm el-Sheikh Implementation Plan”, *FCCC/CP/2022/L.19*, 20 November 2022, § 24.
- 2024 See Article 9 (3) of the PA, which notes “the significant role of public funds” with respect to climate finance, for which “developed country Parties should continue to take the lead”.
- 2025 Deva S, “Climate Change: Looking Beyond Human Rights Due Diligence?” (*Nova Centre on Business, Human Rights and the Environment Blog*, 7 May 2021); see as well, Mougeolle P, “Business and Human Rights Symposium: Climate Change Litigation Against Corporations and the Role of Civil Liability” (2021) *Opinio Juris*.
- 2026 ICJ, *Obligations of States in respect of Climate Change*, Advisory Opinion, 23 July 2025, § 160.

duty to regulate private persons and the “polluter pays” principle form the basic principles underpinning these considerations²⁰²⁷.

Last but not least, the applicable margin of appreciation in case of lack of consensus concerning the required measure may represent a further difficulty in the context of calculating damages (see subpart 2.3, especially the *KlimaSeniorinnen* ruling). Note that, until now, contributions to climate finance and loss and damage were given on a voluntary basis on the international level (see section 3.3.2 and section 3.3.4). This voluntary system is not working properly because the commitments are neither delivered nor sufficient²⁰²⁸. Thus, it may be necessary to leave aside the “margin of appreciation” when potentially awarding monetary compensation, as the provided leeway may be too close to the voluntary system. As a solution, a lump sum may be calculated by using a standardised method of determining the share of responsibility, i.e., taking into account the direct and indirect emissions of the concerned actor, the extent of the wrongful conduct, and the available financial means of the responsible persons. It is noteworthy that the ICJ concluded its climate advisory opinion on a similar note, arguing the usefulness of providing “global sums” in this context²⁰²⁹.

2027 Five UN human rights treaty bodies, Joint Statement on “Human Rights and Climate Change”, *op cit*, 16 September 2019; Administrative High Court of Justice of London, *Plan B. Earth & Others v The Prime Minister & Others*, [2021] EWHC 3469 (Admin), § 3.

2028 COP 28, “First Global Stocktake”, *FCCC/PA/CMA/2023/L.17*, 13 December 2023, § 67 and 80.

2029 ICJ, *Obligations of States in respect of Climate Change*, Advisory Opinion, 23 July 2025, § 454.

