INTER-AMERICAN COURT OF HUMAN RIGHTS

REQUEST FOR AN ADVISORY OPINION ON THE CLIMATE EMERGENCY AND HUMAN RIGHTS FROM THE REPUBLIC OF COLOMBIA AND THE REPUBLIC OF CHILE

JOINT AMICUS CURIAE SUBMISSION FROM (1) CENTRO MÉXICO DE DERECHO AMBIENTAL, (2) NUESTROS DERECHOS AL FUTURO Y MEDIO AMBIENTE SANO, A.C, (3) INICIATIVA CLIMÁTICA DE MÉXICO, (4) COMITÉ CAMPESINO DEL ALTIPLANO, AND (5) UNIÓN VERAPACENSE DE ORGANIZACIONES CAMPESINAS

18 DECEMBER 2023

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I. Introduction

Overview

1. This *amicus curiae* brief is jointly submitted by Centro México de Derecho Ambiental ('**CEMDA**'), Nuestros Derechos al Futuro y Medio Ambiente Sano, A.C., ('**Nuestro Futuro A.C.**'), Iniciativa Climática de México ('**ICM**'), the Comité Compesino Del Altiplano ('**CCDA**') and the Unión Verapacense de Organizaciones Campesinas, ('**UVOC**') ('**Partner Organisations**') in the matter of the Request for an Advisory Opinion submitted by the Republic of Colombia and the Republic of Chile to the Inter-American Court of Human Rights ('**IACtHR**') regarding the Climate Emergency and Human Rights ('**AO or Advisory Opinion**'). The Partner Organisations are grateful for this opportunity to make representations to the Court and would value the opportunity to make further oral submissions at any hearings in line with Article 24.1 of the Court's Statute, and Article 73.4 of the Court's Rules of Procedure.

2. This submission is intended to provide a focused analysis of issues relating to short-lived climate pollutants and methane emissions in the context of the Advisory Opinion. It is hoped that this submission will assist the Court in developing its understanding of State obligations under the American Convention on Human Rights ("**Convention**") in the context of climate change. The observations contained in this brief have been informed by the expertise of the Partner Organisations, who collectively work in the fields of climate change, environmental law, indigenous rights and customary law, human rights law, and climate science.

3. **CEMDA** is a nongovernmental organization founded 30 years ago that works in the legal defence of the environment and natural resources. The focus of CEMDA's work is to strengthen, consolidate, harmonize, promote enforcement, and assure compliance with the environmental legal system. CEMDA's mission is to promote and defend the right to a healthy environment in México, with a multidisciplinary and collective approach for the protection of people and natural heritage. CEMDA envisions a Mexico where the right to a healthy environment is respected and guaranteed, and people can live in harmony with the environment.

4. **Nuestro Futuro** is an organization founded in September 2020 that defends and promotes actions to mitigate climate change, build climate justice in Mexico and protect the fundamental right to a healthy environment for all people, especially younger generations, as well as ecosystems themselves. Nuestro Futuro began as a collective of

young people concerned about the effects of climate change on the environment and the repercussions of this global phenomenon on their lives and on the lives of all Mexican youth. Nuestro Futuro was one of the first organizations in Mexico to bring climate litigation to defend the rights of younger generations.

5. Nuestro Futuro promoted several climate lawsuits in defence of the right to a healthy environment, and a safe, habitable and sustainable climate. It developed a large number of public and national advocacy activities to protect this right, and to promote actions to mitigate and adapt to climate change. [1] It also raises awareness and engages in advocacy initiatives with other organizations in order to underline the urgency of addressing climate change in the context of pursuing sustainable development in Mexico.

6. **ICM** is a non-profit civil society organization, created to promote the implementation of policies, programs and mitigation projects to confront the climate emergency and promote comprehensive low-carbon and socially inclusive development. ICM acts as a donor and as a generator and disseminator of technical and scientific information relevant to decision-making. ICM offers pro-bono technical advice to federal and state government institutions, civil society organizations, public and private universities, and youth groups interested in helping solve the problem of climate change. ICM's mission is to catalyse international climate policy at the national and city levels to reduce emissions of greenhouse gases and compounds and to promote low-carbon growth in Mexico.

7. **CEMDA, Nuestro Futuro** and **ICM** are all part of the *Observatorio Mexicano de Emisiones de Metano* ('**OBMEM**' by its Spanish acronym), which seeks to advance Mexico's climate policy towards a sustainable future. OBMEM's key objective is to improve monitoring

[1] Some notable activities include:

- filing a petition before the Inter-American Commission on Human Rights, asking for the recognition of the legal standing of young people to sue States when it comes to measures to combat climate change.
- presenting several amicus curiae before the Mexican Supreme Court of Justice, for example, on the legitimacy of NGOs to defend the right to a healthy environment.
- participating in various national and international forums on environment, climate change and human rights to make visible the importance of the perspective of intergenerational equity and climate justice. These include national and international multi-stakeholder dialogue roundtables.
- carrying out community and outreach activities on the adverse effects of climate change in communities. The most notable campaign in which Nuestro Futuro has participated is the case of "El Bosque, in the municipality of Centla, Tabasco". Nuestro Futuro A.C. organised a press conference on 7 November 2022, where the community of El Bosque in Centla requested that the Mexican authorities implement a planned, fair and dignified relocation of their community, which has been displaced due to flooding caused by coastal erosion.
- Together with 25 other environmental organizations, signing a Letter to Leaders in the framework of the Great Climate Change Summit, which also included a media strategy in Mexico and the United States.

of and to promote compliance with international commitments and national regulations regarding the reduction of methane emissions from the oil and gas sector in Mexico.[2]

8. **CCDA** is a Guatemalan indigenous and campesino organisation. It has fought for indigenous land justice since its inception in 1981 in the midst of the violent internal armed conflict, during which its members were subjected to systematic human rights violations; during the ensuing peace process and through to today. Its Verapaces wing currently provides organisational and advocacy support to around 150 Maya Q'eqchi and other indigenous communities in the Alta and Baja Verapaz regions, including in their disputes with private property owners, agricultural and extractive industry representatives, and state agrarian institutions. Its leadership includes women, and it implements a gender focus that aims to promote the participation of women community members in its decision making.

9. The communities CCDA represents live at the front line of the climate crisis. They have suffered assassinations, threats, criminalisation and forced evictions from their ancestral lands, and have been the subject of precautionary measures from the Inter-American Commission of Human Rights (see, for example, the precautionary measures granted to the indigenous Maya Poqomchi' Families of the Washington and Dos Fuentes Communities on 14 October 2020 (MC 306-20), at the CCDA's request). The failure to respect the communities' rights, prime amongst them the right to land, has made such communities highly vulnerable to climate impacts, which CCDA details further below.

10. **UVOC** is an organisation that includes several hundred Maya Q'eqchi' and Poqomchi' communities in Alta Verapaz. It is dedicated to demanding and promoting access to land. Founded in 1980, the UVOC's members suffered intense violence during the internal armed conflict. Its cooperative activities currently include rural development, campaigning for agrarian reform, promoting equality between men and women, youth programmes and organising activities. Its support for communities cuts across three axes: (i) legal advice and representation in respect of land rights, threats to personal integrity and criminalisation; (ii) support in mediation and negotiation processes in conflicts over land tenure, and (iii) training communities in communications, policy and agricultural production techniques and sustainable agroecology. Like the CCDA, the UVOC works daily with communities facing the compounded effects of climate change and land insecurity.

[2] OBMEM is discussed further below. Information about OBMEM can be found here: https://www.obmem.mx/.

11. The preparation of this brief has been generously supported by the **Global Methane Hub**, an organisation set up to support implementation of the 2021 Global Methane Pledge.[3] The expert support provided to the signatories in drafting this amicus by the Leave It In The Ground Initiative (**'LINGO'**) is also gratefully acknowledged.[4]

Summary Advice

12. The following *amicus curiae* brief makes recommendations that are relevant to the following questions posed by the requesting parties:

    12.1. Question IV(A) regarding State obligations derived from the duties of prevention and the guarantee of human rights in relation to the climate emergency;

    12.2. Question IV(B) regarding State obligations to preserve the right to life and survival in relation to the climate emergency in light of science and human rights; and

    12.3. Question IV(E) regarding the Convention-based obligations of prevention and the protection of territorial and environmental defenders, as well as women, indigenous peoples, and Afro-descendant communities in the context of the climate emergency.

13. The advice and recommendations made in this brief can be summarised as follows:

    13.1. **Methane emissions are centrally relevant to State obligations to prevent human rights violations and to guarantee human rights, given the significant impact methane emissions have on near-term warming**. Methane's contribution to near-term warming and the dangerous consequences of near-term warming, as well as the potential provided by methane abatement to ensure greater protection of human rights, are discussed in **Section II**. In summary, continued methane emissions will trigger further near-term warming, contributing to the intensification a host of risks that endanger human rights – from immediate health risks and increases in extreme weather events, to uncertain, but potentially devastating risks tied to the crossing of climate tipping points and the triggering of self-reinforcing feedbacks.

[3] Information about the Global Methane Hub is accessible here: https://www.globalmethanehub.org/.
[4] LINGO is a non-governmental, non-profit organisation whose mission is guided by a simple principle: Leave fossil fuels in the ground and learn to live without them. It considers that the root of the problem with climate change is the burning of fossil fuels. LINGO works to drive an end to the fossil age in order to avoid the worst impacts of climate change, and to achieve complete decarbonization swiftly over the next decade or two. It strongly believes that good living with zero fossils is possible, and its programs of work are geared to that objective. Information about LINGO is accessible here: https://www.leave-it-in-the-ground.org/.

13.2. **Mitigation of methane emissions is possible, and methods to abate methane emissions in the three anthropogenic sectors responsible for most methane emissions – agriculture, energy and waste – are known and available.** These measures are discussed in **Section II**. Notwithstanding the availability of these measures, mitigation of methane is well behind what is required for States to comply with their human rights obligations. Two case studies are provided to illustrate impediments to abating methane emissions experienced in the fossil fuel sector (Mexico) and the agricultural sector (Brazil). A third case study (Guatemala) is provided to illustrate the human rights violations suffered by Indigenous Peoples that are consequent upon State failures to mitigate methane emissions and to ensure fair adaptation measures that enhance the resilience of indigenous communities. These case studies are set out in **Section III**.

13.3. **States have obligations under applicable human rights law to mitigate methane emissions and ensure appropriate adaption to the impacts of climate change and near-term warming.** Applicable legal principles are dealt with briefly, on the understanding that the Court will be well-aware of the principles developed within its own jurisprudence. **Section IV** therefore focuses on the particular relevance of the following principles to the issue of methane abatement and response: (i) the precautionary principle, (ii) the principle of common but differentiated responsibility, (iii) the rights of indigenous peoples and (iv) access to environmental information and access to justice. In summary, the precautionary principle requires heightened obligations on States in relation to the abatement of methane emissions, and, relatedly, to the provision of appropriate access to information and justice. Further, States must recognise and respect indigenous rights to land and address vulnerabilities experienced primarily by indigenous communities (linked, for example, to agrarian conflict, poverty, displacement, discrimination) to ensure maximum methane mitigation and increase resilience in adapting to the near-term consequences of continued methane emissions.

13.4. On the basis of the scientific evidence discussed in **Section II**, country case studies in **Section III** and applicable principles in **Section IV**, a number of detailed and highly **practical recommendations are made in Section V**. These are examples of measures the Court could encourage States take to ensure compliance with their human rights obligations in relation to their response to methane emissions. These recommendations are in three sets – *first*, recommendations relating to measures that States may take in the fossil fuel sector to ensure methane abatement in

compliance with their obligations under the precautionary principle and other applicable legal principles. *Second*, recommendations relating to measures that States may take to ensure heightened access to justice and access to environmental information concerning methane emissions and concerning public and private actions and omissions that influence levels of methane emissions. *Third* and finally, recommendations relating to measures that States may take relating to indigenous rights, to ensure (i) better mitigation of methane emissions in the land use sector and (ii) that indigenous communities have the ability to adapt to the consequences of near-term warming, such as to avoid violations of their rights.

II. Scientific Evidence

Introduction to short-lived climate pollutants and methane

14. This section summarises the key scientific principles relating to methane (CH_4), relevant to understanding the impact of methane emissions on the protection of human rights. It briefly addresses:

    14.1. Methane's contribution to existing and future near-term warming;

    14.2. The consequences of near-term warming;

    14.3. The role of methane abatement in addressing near-term warming;

    14.4. Anthropogenic sources of methane emissions;

    14.5. Existing methods to abate methane emissions and progress in abating emissions to date.

Methane's contribution to existing and future near-term warming

15. Methane emissions caused 0.51°C of the 1.06°C of total observed warming (2010-2019) compared to pre-industrial times.[5] Methane is a potent short-lived climate pollutant ('**SLCP**'): it has a much shorter atmospheric lifetime than carbon dioxide (CO_2), around 12 years compared with centuries;[6] however, over a twenty-year period, it is ca. 80 times more potent at warming than CO_2.[7]

16. Consequently, sustained reductions in methane emissions are key to limit near-term warming, impacting adaptation strategies over the next few decades – which is critical for climate vulnerable countries.

The consequences of near-term warming

17. Increased near-term warming increases the risk that self-reinforcing feedbacks will further accelerate rising temperatures and trigger a cascade of irreversible tipping

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[5] Intergovernmental Panel on Climate Change (2021) *Annex VII Glossary,* in *CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS,* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Masson-Delmotte V., et al. (eds.) **Figure SPM.2.**
See also:
United Nations Environment Programme and Climate & Clean Air Coalition (2022) *Summary for Policymakers,* in *GLOBAL METHANE ASSESSMENT: 2030 BASELINE REPORT,* 5, White House (18 September 2021).
Joint US-EU Press Release on the Global Methane Pledge, *Statements and Releases.*
Hook L. & Campbell C. (23 August 2022) 'Methane Hunters: What Explains the Surge in the Potent Greenhouse Gas?' *FINANCIAL TIMES.*

[6] International Energy Agency, 'Methane and Climate Change' (accessed 17 December 2023), available at: https://www.iea.org/reports/global-methane-tracker-2022/methane-and-climate-change.

[7] United Nations Environment Programme, 'Methane Emissions Are Driving Climate Change: Here's How to Reduce Them' (accessed [date]), available at: https://www.unep.org/news-and-stories/story/methane-emissions-are-driving-climate-change-heres-how-reduce-them.

points. The IPCC defines a climate feedback as "*an interaction in which a perturbation in one climate quantity causes a change in a second and the change in the second quantity ultimately leads to an additional change in the first*." These are "*biogeophysical feedbacks within the system that can maintain it in a given state (negative feedbacks) and those that can amplify a perturbation and drive a transition to a different state (positive feedbacks)*." It defines a climate tipping point ('**CTP**') as "*a critical threshold beyond which a system reorganizes, often abruptly and/or irreversibly*."[8] Climate feedbacks and CTPs interrelate, in that the former can trigger the latter. Feedback processes can become self-perpetuating, resulting in CTPs.[9]

18. Near-term warming induced by anthropogenic climate change is a primary determinant of the likelihood or otherwise of triggering feedbacks and crossing CTPs. Because negative feedbacks – "*notably, carbon uptake by land and ocean systems—are weakening relative to human forcing*,"[10] there is an increased risk that positive feedbacks "*could play an important role in determining the Earth System's trajectory*."[11] The IPCC confirms that "*the probability of crossing uncertain regional thresholds increases with climate change*."[12]

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[8] Examples of negative feedbacks include the ocean's ability to store heat, or the ability of plants and soil to absorb CO2. Examples of positive feedbacks include the melting of ice and corresponding decrease in albedo, or the thawing of permafrost and consequent carbon release.
Examples of CTPs include the collapse of the Greenland Ice Sheet, the dieback of the Amazon Rainforest and the die-off of low-latitude coral reefs.
Intergovernmental Panel on Climate Change (2021) *Annex VII Glossary,* in *CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS,* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Masson-Delmotte V., et al. (eds.). See also:

- Steffen W., et al. (2018) 'Trajectories of the Earth System in the Anthropocene,' *PROC. NAT'L. ACAD. SCI.* 115(33): 8252–8259, at 8254, 8256.
- Canadell J. G., et al. (2021) 'Chapter 5: Global Carbon and other Biogeochemical Cycles and Feedbacks,' in *CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS,* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Masson-Delmotte V., et al. (eds.), 5-78. ("Abrupt change is defined as a change in the system that is substantially faster than the typical rate of the changes in its history (Chapter 1, Section 1.4.5). A related matter is a tipping point: a critical threshold beyond which a system reorganizes, often abruptly and/or irreversibly.").

[9] "Most of the feedbacks can show both continuous responses and tipping point behaviour in which the feedback process becomes self-perpetuating after a critical threshold is crossed; subsystems exhibiting this behaviour are often called 'tipping elements.'"
Steffen W., et al., *op. cit.,* at 8252–8259, 8254, 8256.
[10] Steffen W., et al., *op. cit.,* 8252–8259, 8254, 8256.
[11] Steffen W., et al., *op. cit.,* 8252–8259, 8254, 8256.
Cf. "for some feedback processes, the magnitude—and even the direction—depend on the rate of climate change. If the rate of climate change is small, the shift in biomes can track the change in temperature/moisture, and the biomes may shift gradually, potentially taking up carbon from the atmosphere as the climate warms and atmospheric CO2 concentration increases. However, if the rate of climate change is too large or too fast, a tipping point can be crossed, and a rapid biome shift may occur via extensive disturbances (e.g., wildfires, insect attacks, droughts) that can abruptly remove an existing biome. In some terrestrial cases, such as widespread wildfires, there could be a pulse of carbon to the atmosphere, which if large enough, could influence the trajectory of the Earth System."
[12] Arias P. A., et al. (2021) 'Technical Summary,' in *CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS,* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Masson-Delmotte V., et al. (eds.), TS-71–TS-72.

19. CTPs were first assessed in 2008, and at the time nine potential CTPs were identified. An updated assessment of CTPs in 2022 following major advancements in climate science now suggests that (1) there are sixteen potential CTPs and (2) these CTPs are likely to be crossed at lower temperatures than originally foreseen.[13] Indeed, it is now understood that several tipping points "*have minimum threshold values within the 1.1 to 1.5°C range*."[14] Crucially, this means that CTPs may be crossed at warming below 1.5°C and 2°C. [15]

20. Consequently, alarm has been raised at the risk that feedbacks and CTPs materialise in the near-term, leading to what is referred to in the literature as a "*Hothouse earth*" trajectory, which may become difficult to reverse:

> *a cascade of feedbacks could push the Earth System irreversibly onto a "Hothouse Earth" pathway. The challenge that humanity faces is to create a "Stabilized Earth" pathway that steers the Earth System away from its current trajectory toward the threshold beyond which is Hothouse Earth… A critical issue is that, if a planetary threshold is crossed toward the Hothouse Earth pathway, accessing the Stabilized Earth pathway would become very difficult no matter what actions human societies might take. Beyond the threshold, positive (reinforcing) feedbacks within the Earth System – outside of human influence or control –*

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[13] Armstrong McKay D. I., Staal A., Abrams J. F., Winkelmann R., Sakschewski B., Loriani S., Fetzer I., Cornell S. E., Rockström J., & Lenton T. M. (2022) 'Exceeding 1.5°C global warming could trigger multiple climate tipping points,' *SCIENCE* 377(6611): eabn7950, 1–10, at 7. Accessible at https://climatetippingpoints.info/2022/09/09/climate-tipping-points-reassessment-explainer/

[14] Ibid.

Cf. "*Current warming is ~1.1°C above preindustrial and even with rapid emission cuts warming will reach ~1.5°C by the 2030s (23). We cannot rule out that WAIS and GrIS tipping points have already been passed (see above) and several other tipping elements have minimum threshold values within the 1.1 to 1.5°C range. Our best estimate thresholds for GrIS, WAIS, REEF, and abrupt permafrost thaw (PFAT) are ~1.5°C although WAIS and GrIS collapse may still be avoidable if GMST returns below 1.5°C within an uncertain overshoot time (likely decades).*"

[15] Ibid.

"*This indicates that at current levels of global warming (around 1.1-1.2°C), five climate tipping points are already possible in our assessment ('possible' here meaning above the minimum but below the central threshold estimate). These include Greenland and West Antarctic ice sheet collapse, tropical coral reef die-off, widespread abrupt permafrost thaw, and Labrador-Irminger Sea convection collapse. These are not yet likely, but we cannot rule out that they could still be tipped even if warming stabilised at current levels.*

At 1.5°C – the more ambitious of the Paris Agreement aims, and the minimum warming level possible under the most ambitious emission reduction scenarios – four of these possible tipping points become likely ('likely' being above the central estimate) in our assessment. Another five tipping points become possible by 1.5°C, including AMOC collapse, Barents Sea ice collapse, mountain glaciers loss, boreal forest southern dieback, and boreal forest northern expansion. Labrador-Irminger Sea convection collapse and Barents Sea ice loss also move from possible to likely further moving through the Paris range of 1.5-<2°C"

See also

"*Models suggest that the Greenland ice sheet could be doomed at 1.5 °C of warming, which could happen as soon as 2030. ... The world's remaining emissions budget for a 50:50 chance of staying within 1.5 °C of warming is only about 500 gigatonnes (Gt) of CO2. Permafrost emissions could take an estimated 20% (100 Gt CO2) off this budget, and that's without including methane from deep permafrost or undersea hydrates. If forests are close to tipping points, Amazon dieback could release another 90 Gt CO2 and boreal forests a further 110 Gt CO2. With global total CO2 emissions still at more than 40 Gt per year, the remaining budget could be all but erased already.*"

Lenton T. M., Rockstrom J., Gaffney O., Rahmstorf S., Richardson K., Steffen W., & Schellnhuber H. J. (2019) 'Climate tipping points—too risky to bet against,' Comment, *NATURE* 575(7784): 592–595, at 594.

could become the dominant driver of the system's pathway, as individual tipping elements create linked cascades through time and with rising temperature.[16]

21. Despite the relevance of CTPs, experts acknowledge that "*knowledge about the risks of future abrupt climate shifts is far from robust*," such that it is "*very plausible that yet-undiscovered tipping points can occur in climate models*."[17] However, irrespective of this lack of scientific certainty, there is "*mounting evidence that we are nearing or have already crossed tipping points associated with critical parts of the Earth system, including the West Antarctic and Greenland ice sheets, warm-water coral reefs, and the Amazon rainforest.*"[18]

22. Other than CTP-related risks, near-term warming also poses severe risks to people and ecosystems. In its contribution to the IPCC's Sixth Assessment Report, Working Group II (Impacts, Adaptation and Vulnerability) emphasises that near-term warming, and the consequent increased frequency, severity and duration of extreme events will create high or very high risks of biodiversity loss, encroachments on coastal settlements and infrastructure, potential submergence and loss of low-lying coastal ecosystems, etc. It further notes that such risks are highest where species and people are more heavily vulnerable or exposed to climate impacts. Finally, it notes that two "*transitions from high to very high risk are associated with near-term warming: risks to unique and threatened systems at a median value of 1.5 [1.2 to 2.0]°C (high confidence) and risks associated with extreme weather events at a median value of 2.0 [1.8 to 2.5] °C (medium confidence).*" [19]

23. Importantly, recent studies suggest that the *rate*, as opposed to the *level*, of warming, control the likelihood of record-shattering extreme weather events. What this means is that the probability of extreme weather events occurring increases with the speed of

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[16] Steffen W., et al., *op. cit.,* at 8252–8259, 8254, 8256.

[17] Bathiany S., Hidding J., & Scheffer M. (2020) 'Edge Detection Reveals Abrupt and Extreme Climate Events,' *J. CLIM.* 33(15): 6399–6421, at 6416.
See also:
Canadell J. G., et al. (2021) 'Chapter 5: Global Carbon and other Biogeochemical Cycles and Feedbacks,' in *CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS,* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Masson-Delmotte V., et al. (eds.), 5-78.
And:
Permafrost Pathways, *Course of Action: Mitigation Policy*, Woodwell Climate Research Center (*last visited* 5 February 2023): "*Despite the enormity of this problem, gaps in permafrost carbon monitoring and modeling are resulting in permafrost being left out of global climate policies, rendering our emissions targets fundamentally inaccurate*."

[18] Ripple W. J., Wolf C., Newsome T. M., Gregg J. W., Lenton T. M., Palomo I., Eikelboom J. A. J., Law B. E., Huq S., Duffy P. B., & Rockström J. (2021) 'World Scientists' Warning of a Climate Emergency 2021,' *BIOSCIENCE* 71(9): biab079, 894–898, at 894.

[19] Intergovernmental Panel on Climate Change (2022) 'Summary for Policymakers,' in *CLIMATE CHANGE 2022: IMPACTS, ADAPTATION, AND VULNERABILITY,* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Pörtner H.-O., Roberts D. C., Tignor M., Poloczanska E. S., Mintenbeck K., Alegría A., Craig M., Langsdorf S., Löschke S., Möller V., Okem A., & Rama B. (eds.), SPM-11, SPM-13.

global warming.[20] Consequently, the speed at which one implements methane mitigation matters.[21] Taking rapid action to avoid more rapid heating in the near-term by abating methane emissions is an important measure to seek to prevent and reduce the likelihood of extreme weather events which can have devastating consequences on people and ecosystems, as detailed further below in section III (Guatemala case study). Indeed, implementing all available measures to reduce methane emissions is estimated to avoid circa 0.3°C of warming by the 2040s, thus limiting near-term warming and associated extremes. Avoiding such warming and extremes would "*also, each year, prevent 255 000 premature deaths, 775 000 asthma related hospital visits, 73 billion hours of lost labour from extreme heat, and 26 million tonnes of crop losse*s."[22]

24. In summary, and in accordance with the best available science:

    24.1. Near-term warming creates an increased risk that self-reinforcing feedbacks materialise and that CTPs will be crossed, leading to a "*Hothouse Earth*" pathway;

    24.2. It is difficult to predict how quickly CTPs may be crossed and how severe the consequences of doing so might be;

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[20] "*Quantifying the role of the warming rate: In the following, we show why the expected probability of record-shattering events increases so dramatically and, in contrast to the expected probability of hot extremes defined as anomalies relative to a climatology, does not depend on the level of global warming but rather on the rate of warming….*
We next test how the probability of record-shattering extremes changes with idealized forced responses (Fig. 4c and Supplementary Figs. 3 and 4). In the absence of forced warming, the probability for an event that exceeds the previous record by 1σ after a 150-yr period starting in 1850 would be extremely low (Fig. 4d, light blue line). For a linear warming trend and assuming constant vari- ance, the event probability converges to a constant in time (Fig. 4d, brown line) with higher warming rates implying higher probabil- ity (Supplementary Fig. 3). If a period of no or weak warming is followed by a rapid linear warming period (Fig. 4c, dark blue line) the event probability rapidly increases (Fig. 4d, dark blue line) and converges faster for higher warming rates (Supplementary Fig. 3). For a quadratic warming (Supplementary Fig. 4) similar to the accelerating warming rate in RCP8.5, the probability rapidly and continuously increases (Supplementary Fig. 4), which is consistent with the rapid increase in event probability projected by all models considered (Fig. 3)…
Conclusions… Thus, primarily due to the accelerating warming rate the probability of record-shattering extremes rapidly increases in high-emission sce- narios from low values in the twentieth century to high values by the second-half of the twenty-first century. Instead, if the forced warming were stabilized (for example, consistent with SSP1–2.6 or below), the frequency and intensity of heat extremes would be higher than in the historical periods but the probability of record-shattering extremes would rapidly decline. However, that is unlikely in the next few decades and in intermediate pathways such as SSP2–4.5 the rate of warming will continue to be high and in high to very high pathways (SSP3–7.0, SSP5–8.5 and RCP 8.5) even accelerate for many decades."
E. M. Fischer, S. Sippel, R. Knutti, 'Increasing probability of record-shattering climate extremes.' *Nat. Clim. Chang.* 11, 689–695 (2021).
S. B. Power, F. P. D. Delage, 'Setting and smashing extreme temperature records over the coming century.' *Nat. Clim. Chang.* 9, 529–534 (2019).

[21] See e.g., from Ocko, I. B. et al, '*Acting rapidly to deploy readily available methane mitigation measures by sector can immediately slow global warming*' [2021], https://iopscience.iop.org/article/10.1088/1748-9326/abf9c8. How fast we implement methane mitigation matters: "*On the other hand, slow implementation of these measures may result in an additional tenth of a degree of global-mean warming by midcentury and 5% faster warming rate (relative to fast action), and waiting to pursue these measures until midcentury may result in an additional two tenths of a degree centigrade by midcentury and 15% faster warming rate (relative to fast action)*".

[22] United Nations Environment Programme & Climate & Clean Air Coalition (2021) *GLOBAL METHANE ASSESSMENT: BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 8.

24.3. It is understood that certain CTPs may have already been crossed or are likely to be crossed within 1.5°C warming;

24.4. This likelihood and the number of CTPs at risk of being crossed increase within 2°C warming;

24.5. Near-term warming will significantly increase the risks faced by vulnerable communities in two further respects: in posing risks to unique and threatened systems and in precipitating risks associated with extreme weather events.

The role of methane abatement in addressing near-term warming

25. There is strong scientific consensus around the need to rapidly abate emissions, consistently with the Paris Agreement, to limit near-term warming and avoid a "*Hothouse Earth*" pathway.[23] Given that "*methane is the most powerful driver of climate change among the short-lived substances, mitigation of methane is very likely the strategy with the greatest potential to decrease warming over the next 20 years*."[24] This is confirmed by the IPCC: "*sustained methane mitigation, wherever it occurs, stands out as an option that combines near- and long-term gains on surface temperature (high confidence) and leads to air quality benefits by reducing surface ozone levels globally (high confidence)*."[25]

26. The IPCC's recent Special Report on 1.5°C concludes that "*the evolution of methane and sulphur dioxide emissions strongly influences the chances of limiting warming to 1.5°C*" (as well as 2°C).[26] Limiting warming to 1.5°C with no or limited overshoot requires reducing global human-caused methane emissions by 34% in 2030 and 44% in 2040 relative to

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[23] "*If the world's societies want to avoid crossing a potential threshold that locks the Earth System into the Hothouse Earth pathway, then it is critical that they make deliberate decisions to avoid this risk and maintain the Earth System in Holocene-like conditions. … Stabilized Earth would require deep cuts in greenhouse gas emissions, protection and enhancement of biosphere carbon sinks, efforts to remove CO_2 from the atmosphere, possibly solar radiation management, and adaptation to unavoidable impacts of the warming already occurring*"
Steffen W., et al., *op. cit.,* at 8252–8259, 8254, 8256.
See also
Lenton T. M., Rockstrom J., Gaffney O., Rahmstorf S., Richardson K., Steffen W., & Schellnhuber H. J., *op. cit.,* 592–595, 594.

[24] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 17.

[25] Szopa S., Naik V., Adhikary B., Artaxo P., Berntsen T., Collins W. D., Fuzzi S., Gallardo L., Kiendler-Scharr A., Klimont Z., Liao H., Unger N., & Zanis P. (2021) 'Chapter 6: Short-lived climate forcers,' in *CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS,* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Masson-Delmotte V., et al. (eds.), 6-7.

[26] Rogelj, J., D. Shindell, K. Jiang, S. Fifita, P. Forster, V. Ginzburg, C. Handa, H. Kheshgi, S. Kobayashi, E. Kriegler, L. Mundaca, R. Séférian, and M.V. Vilariño (2018) 'Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development.' In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty,* Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.), Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 93-174, doi:10.1017/9781009157940.004.

modelled 2019 levels, in addition to cutting global CO_2 emissions in half in 2030 and by 80% in 2040, and deep cuts to other short-lived climate pollutants and nitrous oxide.[27]

27. A failure to reduce methane emissions leads, in future, to a heavier burden to reduce emissions, a shrunk carbon budget and the need to heavily rely on negative emissions (i.e., CO_2 removal): "*A seesaw characteristic can be found between near-term emissions reductions and the timing of net zero GHG emissions. This is because pathways with limited emissions reductions in the next one to two decades require net negative CO2 emissions later on.*"[28]

28. Furthermore, failing to reduce methane threatens compliance with the Paris Agreement goals, as a result of the "unmasking" of additional warming that would result from policies that focus exclusively on CO_2 abatement. "Unmasking" refers to the unmasking of additional warming due to the removal of aerosols co-emitted when burning fossil fuels. Such co-emitted aerosols have a cooling effect, thus "masking" additional warming. Policies that reduce CO_2 emissions therefore reduce these co-emitted aerosols as well, cancelling out their cooling effect.[29] Consequently, pursuing a decarbonisation strategy that focuses purely on CO_2 abatement can *increase* warming in the near-term, providing a strong rationale for pursuing strategies that combine CO_2 *and* non-CO_2 abatement.[30]

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[27] Intergovernmental Panel on Climate Change (2022) 'Summary for Policymakers,' in *CLIMATE CHANGE 2022: MITIGATION OF CLIMATE CHANGE*, op cit. See particularly **figures SPM.1 and SPM.3**.
See also IPCC (Intergovernmental Panel on Climate Change). (2018) 'Summary for Policymakers.' In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 3-24, doi:10.1017/9781009157940.001

[28] Rogelj et al., *op. cit.*, pp. 93-174, at 2.3.3.

[29] "In fact, reducing the burning of fossil fuels like coal and diesel also cuts co-emitted cooling aerosols, primarily in the form of sulphates and nitrates. Co-emitted cooling aerosols are reflective particles that currently mask warming of about 0.5C.119 While the accumulated CO2 in the atmosphere will continue to cause warming for decades to centuries, these cooling aerosols fall out of the atmosphere in days to months, and this aerosol unmasking offsets reductions in warming from decarbonization until around 2050 and even adds warming over the first decade or more."
Institute for Governance & Sustainable Development, (2023) *A Primer on Cutting Methane: The Best Strategy for Slowing Warming in the Decade to 2030.*
See also his: Intergovernmental Panel on Climate Change (2022) 'Summary for Policymakers,' in CLIMATE CHANGE 2022: MITIGATION OF CLIMATE CHANGE, *op. cit.*, SPM-31.
("*In modelled global low emission pathways, the projected reduction of cooling and warming aerosol emissions over time leads to net warming in the near- to mid-term. In these mitigation pathways, the projected reductions of cooling aerosols are mostly due to reduced fossil fuel combustion that was not equipped with effective air pollution controls.*").

[30] "*We find that mitigation measures that target only decarbonization are essential for strong long- term cooling but can result in weak near-term warming (due to unmasking the cooling effect of co-emitted aerosols) and lead to temperatures exceeding 2°C before 2050. In contrast, pairing decarbonization with additional mitigation measures targeting short-lived climate pollutants (SLCPs) and N2O, slows the rate of warming a decade or two earlier than decarbonization alone and avoids the*

29. As a result of the combination of (1) methane's potency (and the consequent impact this has on the *rate* of warming, detailed above) and (2) the "unmasking" that is likely to result from policies seeking to reduce CO_2 alone, adopting policies to reduce methane emissions, *together with* policies to reduce CO_2 emissions, has been identified as one of the most effective methods to reduce near-term warming and to avoid the crossing of CTPs and associated catastrophic consequences. Taking Arctic summer ice as an example:

> *While drastic cuts in carbon dioxide emissions will ultimately control the fate of Arctic summer sea ice, we show that simultaneous early deployment of feasible methane mitigation measures is essential to avoiding the loss of Arctic summer sea ice this century. In fact, the benefit of combined methane and carbon dioxide mitigation on reducing the likelihood of a seasonally ice-free Arctic can be greater than the simple sum of benefits from two independent greenhouse gas policies.*[31]

30. Preventing the loss of Arctic sea ice via the *simultaneous* deployment of methane and CO_2 abatement would largely increase the likelihood of tackling climate change in the longer-term – this is because the consequent global radiative heating of a complete disappearance of Arctic sea ice would be "*equivalent to the effect of one trillion tons of CO_2 emissions*."[32]

31. Finally, and as noted above, near-term warming can cause significant harm, particularly to vulnerable communities, as a result of extreme weather events and impacts on threatened ecosystems. On the flip side, "*near-term actions that limit global warming to close to 1.5°C would substantially reduce projected losses and damages* (*very high confidence*)."[33]

32. These include, e.g., avoidable global crop losses caused by the formation of tropospheric O3. Methane is "*an important contributor to the formation of tropospheric O3*" and "*rising CH4 concentrations could be a major driver of increased surface O3 by 2100 under the high-*

2°C threshold altogether. These non-CO2 targeted measures when combined with decarbonization can provide net cooling by 2030, reduce the rate of warming from 2030 to 2050 by about 50%, roughly half of which comes from methane, significantly larger than decarbonization alone over this timeframe."
Dreyfus G. B., Xu Y., Shindell D. T., Zaelke D., & Ramanathan V. (2022) 'Mitigating climate disruption in time: A self-consistent approach for avoiding both near-term and long-term global warming,' *PROC. NAT'L. ACAD. SCI.* 119(22): e2123536119, 1–8, at 1.
Baker M. B., & Smith C. J. (2022) 'Estimating the timing of geophysical commitment to 1.5 and 2.0 °C of global warming,' *NAT. CLIM. CHANGE* 12: 547–552, at 547. ("*Following abrupt cessation of anthropogenic emissions, decreases in short-lived aerosols would lead to a warming peak within a decade, followed by slow cooling as GHG concentrations decline*.")

[31] Sun T., Ocko I. B., Hamburg S. P. (2022) 'The value of early methane mitigation in preserving Arctic summer sea ice,' *ENVIRON. RES. LETT.* 17(4): 044001, 1–11, at 1.

[32] Pistone K., Eisenman I., & Ramanathan V. (2019) *Radiative Heating of an Ice-Free Arctic Ocean*, GEOPHYS. RES. LETT. 46(13): 7474–7480, 7474.

[33] Intergovernmental Panel on Climate Change (2022) *Summary for Policymakers*, *in* CLIMATE CHANGE 2022: IMPACTS, ADAPTATION, AND VULNERABILITY, *Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Pörtner H.-O., Roberts D. C., Tignor M., Poloczanska E. S., Mintenbeck K., Alegría A., Craig M., Langsdorf S., Löschke S., Möller V., Okem A., & Rama B. (eds.), SPM-13..

emission scenario."[34] Tropospheric O3 is harmful to human health: for instance, a recent study suggests that, in 2020, on average 760 respiratory-related deaths were attributable to one million metric tons of methane.[35] It also negatively affects plant growth by causing cellular damage within leaves, which experts estimate can account for "*an estimated $11-$18 billion worth of global crop losses annually*."[36]

33. CEMDA itself has experience of the health consequences of methane emissions, and notes that failing to take decisive action on methane emissions is impacting the health and livelihoods of vulnerable communities living in areas adjacent to oil and gas production fields. As noted by Zavala-Araiza and others, "*there are environmental and health impacts of air pollution from oil and gas operations, in addition to the climate implications of CH_4. Several studies have examined the impacts of emissions of ozone precursors and air toxics that are co-emitted by oil and gas infrastructure. The presence of communities in proximity to Mexican onshore production regions raises health concerns about the potential effects of high emissions, and underscores the need to reduce them*."[37]

34. CEMDA, together with Carto Crítica,[38] recently conducted a study to identify negative impacts in the development of fetuses for proximity to oil and gas facilities in the region of Brugos, Tamapulipas. More than 153,000 births between 2017 and 2021 were analyzed. The study suggests a positive association between the activity of these facilities and genetic malformations.[39] Reducing methane emissions not only helps to address global warming, but also has significant near-term health benefits, especially for those that suffer the worst consequences.

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[34] Mar K. A., Unger C., Walderdorff L. & Butler T. (2022) *Beyond CO2 equivalence: The impacts of methane on climate, ecosystems, and health*, ENVIRON. SCI. POLICY 134: 127–136, 129.
See also
Feng Z., Xu Y., Kobayashi K., Dai L., Zhang T., Agathokleous E., Calatayud V., Paoletti E., Mukherjee A., Agrawal M., Park R. J., Oak Y. J., & Yue X. (2022) *Ozone pollution threatens the production of major staple crops in East Asia*, NAT. FOOD 3: 47–56, 47.
And
Shindell D., Faluvegi G., Kasibhatla P., & Van Dingenen R. (2019) *Spatial Patterns of Crop Yield Change by Emitted Pollutant*, EARTH'S FUTURE 7(2): 101–112, 101.

[35] McDuffie, E. E., Sarofim, M. C., Raich, W., Jackson, M., Roman, H., Seltzer, K., et al. (2023). The social cost of ozone-related mortality impacts from methane emissions. Earth's Future, 11, e2023EF003853. https://doi.org/10.1029/2023EF003853.

[36] Mar K. A., Unger C., Walderdorff L. & Butler T. (2022) *Beyond CO2 equivalence: The impacts of methane on climate, ecosystems, and health*, ENVIRON. SCI. POLICY 134: 127–136, 129.

[37] D. Zavala-Araiza et al., "A Tale of Two Regions: Methane Emissions from Oil and Gas Production in Offshore/Onshore Mexico," *Environmental Research Letters 16, no. 2 (2021), https://doi.org/10.1088/1748-9326/abceeb*.

[38] https://cartocritica.org.mx/

[39] Manuel Llano (6 de junio 2023), Impactos al desarrollo fetal por proximidad a pozos de gas "natural" (fósil): Anomalías congénitas y genéticas en recién nacidos en la provincia petrolera de Burgos 2017 – 2021, CEMDA.

35. Consequently, a "*reduction of tropospheric ozone and black carbon can avoid premature deaths from outdoor air pollution and increases annual crop yields*."[40] The United Nations estimates that "*every million tonnes (Mt) of methane reduced… prevents approximately 1 430 annual premature deaths due to ozone globally*."[41] It has also been found that "*reductions in CH4 emissions lower the global O3 background and improve surface air quality everywhere*."[42]

36. Consequently, and in conclusion, the realisation or otherwise of speedy, aggressive near-term abatement of methane emissions is likely determinative of:

    36.1. whether the severe destabilisation of earth systems can be avoided in the near-term,

    36.2. whether immediate health impacts and loss and damage can be mitigated, and

    36.3. the ability to meet the Paris Agreement long-term temperature goal without creating a need for extensive and uncertain CO2 removal.[43]

Anthropogenic sources of methane emissions

37. Approximately 60% of global methane emissions are estimated to be attributable to anthropogenic sources. [44]Anthropogenic methane emissions come primarily from three

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[40] Mbow C., *et al.* (2019) *Chapter 5: Food Security*, *in* CLIMATE CHANGE AND LAND, *Special Report of the Intergovernmental Panel on Climate Change on Climate Change, Desertification, Land Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems*, Shukla P. R., *et al.* (eds.), 451.

[41] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS, 11.

See also

Turner M. C., Jerrett M., Pope C. A., Krewski D., Gapstur S. M., Diver W. R., Beckerman B. S., Marshall J. D., Su J., Crouse D. L., & Burnett R. T. (2016) *Long-Term Ozone Exposure and Mortality in a Large Prospective Study*, AM. J. RESPIR. CRIT. CARE MED. 193(10): 1134–1142, 1134 ("*We observed significant positive associations between long-term O3 and all-cause, circulatory, and respiratory mortality with 2%, 3%, and 12% increases in risk per 10 ppb, respectively, in this large-scale study with 22 years of follow-up*.").

And

Staniaszek Z., Griffiths P. T., Folberth G. A., O'Connor F. M., Abraham N. L., Archibald A. T. (2021) *The role of future anthropogenic methane emissions in air quality and climate*, NPJ CLIM. ATMOS. SCI. 5(21): 1–8, 2–3 ("*To quantify the air-quality impacts of anthropogenic methane, we calculated the long-term ozone-related mortality for SSP3-7.0 and ZAME for 2050, according to the method in Malley et al.30. We found that the ozone associated with anthropogenic methane is responsible for 690,000 premature deaths per year (456,000–910,000, lower and upper bounds of mortality rate) in 2050: 43% from respiratory causes and 57% from cardiovascular causes. This corresponds to around 1270 annual deaths per million tonnes (Tg) of methane emissions, or 65% higher total (ozone-related) deaths per year compared to ZAME*.").

[42] Fiore A. M., Jacob D. J., Field B. D., Streets D. G., Fernandes S. D., & Jang C. (2002) *Linking ozone pollution and climate change: The case for controlling methane*, GEOPHYS. RES. LETT. 29(19): 1919, 25-1–25-4, 25-1.

[43] In respect of the latter, see Rogelj et al., *op. cit.*, pp. 93-174. ("*Limiting warming to 1.5°C depends on greenhouse gas (GHG) emissions over the next decades, where lower GHG emissions in 2030 lead to a higher chance of keeping peak warming to 1.5°C (high confidence)… Pathways that aim for limiting warming to 1.5°C by 2100 after a temporary temperature overshoot rely on large-scale deployment of carbon dioxide removal (CDR) measures, which are uncertain and entail clear risks*.")

[44] Saunois M., *et al.* (2020) *The Global Methane Budget* 2000-2017, EARTH SYST. SCI. DATA 12(3): 1561–1623, 1561.

sectors: fossil fuels (approx. 35%); agriculture (approx. 40%); and waste (approx. 20%).[45] Each sector will be briefly considered in turn.

Fossil fuels

38. Of the 35% methane emissions for which the energy sector is responsible, 23% are attributable to release during oil and gas production, processing and transport and 12% are attributable to emissions from coal mining.[46] As advised by the International Energy Agency, ~75% of methane emissions in the oil and gas sector could be reduced today and by 2030 with technically and economically feasible solutions.[47]

39. Emissions from coal continue following decommissioning of coal mines – emissions attributable to mining-related activities therefore result from both active and abandoned facilities.[48] Emissions in the oil and gas sector (both conventional and unconventional production) are a combination of intended and unintended processes including direct venting, flaring and equipment leaks.[49]

40. However, methane emissions in the energy sector are likely significantly underestimated in official reporting. Over the past decade a significant number of technologies and approaches have allowed for direct measurements of emissions (e.g., satellites, methane sensors mounted on cars, drones, aircraft), such that it is becoming increasingly possible to accurately measure and monitor methane emissions.[50] As a

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[45] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS, 25.
See also
International Energy Agency (2022) GLOBAL METHANE TRACKER, 4 ("*We estimate that the global energy sector was responsible for around 135 million tonnes of methane emitted into the atmosphere in 2021*.")

[46] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 28
See also
International Energy Agency (2022) GLOBAL METHANE TRACKER, 4 ("*Of the 135 million tonnes of energy- related emissions, an estimated 42 Mt are from coal operations, 41 Mt from oil, 39 Mt are from extracting, processing and transporting natural gas, 9 Mt from the incomplete combustion of bioenergy (largely when wood and other solid biomass is used as a traditional cooking fuel), and 4 Mt leaks from end-use equipment*.")

[47] International Energy Agency (2021) NET ZERO BY 2050: A ROADMAP FOR THE GLOBAL ENERGY SECTOR, 104 ("*In the NZE, total methane emissions from fossil fuels fall by around 75% between 2020 and 2030, equivalent to a 2.5 gigatonne of carbon-dioxide equivalent (GtCO2-eq) reduction in GHG emissions (Figure 3.5)*.").

[48] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 29.

[49] Picard D. (2000) *Fugitive emissions from oil and natural gas activities*, Background Paper in IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories.

[50]Ramón A. Alvarez et al., "Assessment of Methane Emissions from the U.S. Oil and Gas Supply Chain," *Science, 2018, https://doi.org/10.1126/science.aar7204*.
And
D. Zavala-Araiza et al., "*A Tale of Two Regions: Methane Emissions from Oil and Gas Production in Offshore/Onshore Mexico," Environmental Research Letters 16, no. 2 (2021), https://doi.org/10.1088/1748-9326/abceeb*.

result of these developments, it is increasingly understood that real methane emissions are much larger than suggested by national government estimates.[51]

41. Indeed, estimates suggest that methane emissions from the energy sector are about 70% greater than the sum of estimates submitted by national governments.[52] Some examples of this include:

    41.1. Underestimations in overall oil and gas supply chains. For instance, it was recently found that, in the US, natural gas supply chain emissions were ~60% higher than the Environmental Protection Agency inventory estimate.[53] Similarly, oil and gas emissions in Mexico were found to be twice as high than as set out in the national inventory.[54] More granular analyses in Mexico find significant underestimates in Mexico's methane emissions from its most important onshore and offshore oil and gas production regions;[55]

    41.2. Underestimations in annual methane emissions from abandoned wells: these are, for instance, found to be underestimated by 150% in Canada, by 20% in the U.S,[56] and by 1.8 million tonnes in Australia (in 2021).[57]

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[51] See e.g., International Energy Agency (2022) GLOBAL METHANE TRACKER 2022, 6 ("*Globally, our analysis finds that methane emissions from the energy sector are about 70% greater than the sum of estimates submitted by national governments.*"); 16 ("*Accounting for the level of satellite coverage, very large emitting events detected by satellite are estimated to have been responsible for around 3.5 Mt of emissions from oil and gas operations in 2021 (6% of our estimate of oil and gas emissions in the 15 countries where events were detected.*")

[52] International Energy Agency (2022) GLOBAL METHANE TRACKER 2022, 6.

[53] Ramón A. Alvarez et al., "Assessment of Methane Emissions from the U.S. Oil and Gas Supply Chain," *Science, 2018,* https://doi.org/10.1126/science.aar7204.

[54] Lu Shen et al., "Unravelling a Large Methane Emission Discrepancy in Mexico Using Satellite Observations," *Remote Sensing of Environment 260 (July 1, 2021): 112461, https://doi.org/10.1016/j.rse.2021.112461*.

[55] Zavala-Araiza et al. (2021), *op. cit.*
("*Our airborne estimate of the offshore region's emissions is 2800 kg CH4 h−1 (95% confidence interval (CI): 1700–3900 kg CH4 h−1), more than an order of magnitude lower than the Mexican national greenhouse gas inventory estimate. In contrast, emissions from the onshore study region are 29 000 kg CH4 h−1 (95% CI: 19 000–39 000 kg CH4 h−1), more than an order of magnitude higher than the inventory. One single facility – a gas processing complex that receives offshore associated gas – emits 5700 kg CH4 h−1 (CI: 3500–7900 kg CH4 h−1), with the majority of those emissions related to inefficient flaring and representing as much as half of Mexico's residential gas consumption.*")
See also "Experts Reveal Methane Emissions in Mexico Double Official Figures," *El Imparcial,* September 28, 2023, https://www.elimparcial.com/mexico/Expertos-revelan-que-emisiones-de-metano-en-Mexico-duplican-cifras-oficiales-20230928-0170.html.

[56] Williams J. P., Regehr A., & Kang M. (2021) *Methane Emissions from Abandoned Oil and Gas Wells in Canada and the United States*, ENVIRON. SCI. TECHNOL. 55: 563–570, 563.

[57] Assan S. (2022) *Tackling Australia's Coal Mine Methane Problem*, Ember, 5.
See also
Sadavarte P., Pandey S., Maasakkers J. D., Lorente A., Borsdorff T., van der Gon H. D., Houweling S., & Aben I. (2021) *Methane Emissions from Super-emitting Coal Mines in Australia quantified using TROPOMI Satellite Observations*, ENVIRON. SCI. TECHNOL. 55(24): 16537–16580, 16537 ("*Our results indicate that for two of the three locations, our satellite-based estimates are significantly higher than reported to the Australian government. Most remarkably, 40% of the quantified emission came from a single surface mine (Hail Creek) located in a methane-rich coal basin.*"); *discussed in* Clark A. (29 November 2021) *These Australian Coal Mines are Methane Super-Emitters*, BLOOMBERG GREEN.

41.3. Underestimations in the New Mexico Permian: methane emissions from upstream and midstream oil and gas activities in the New Mexico Permian to be 6.5 (+2.4/−2.3) times larger than reported.[58]

42. Furthermore, it appears that the International Petroleum Industry Environmental Conservation Association ('**IPIECA**')'s voluntary (i.e., non-regulatory) industry standards are significantly limiting transparency in respect of the sources and volume of methane emissions from the energy sector. In short, it is suggested that corporates in the oil and gas sector rely on IPIECA's guidelines to justify not reporting emissions from joint ventures they are party to, consequently misleading shareholders and the public.[59] Overall, issues concerning transparency in the reporting of methane emissions have been exhaustively addressed by the UNEP's International Methane Emissions Observatory 2022 Report.[60]

Agriculture

43. Agriculture is the largest source of anthropogenic methane emissions, accounting for around 40% of emissions.[61] Within the agricultural sector, 32% of methane emissions stem from livestock emissions, namely enteric fermentation and manure management, 8-11% from paddy rice cultivation and a smaller percentage from the burning of agricultural waste.[62]

44. Enteric fermentation is a natural digestive process in ruminant animals where microbes decompose food in the stomach, producing methane as a by-product. The type of feed, animal species, and metabolic rate influence the quantity of methane produced. Cattle are the dominant animal causing emissions through enteric fermentation.[63]

45. A connected source of livestock emissions arises from poor manure management. This involves the collection, storage, treatment, and disposal of animal waste in lagoons, pits

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[58] Chen Y., Sherwin E. D., Berman E. S. F., Jones B. B., Gordon M. P., Wetherley E. B., Kort E. A., & Brandt A. R. (2022) *Quantifying Regional Methane Emissions in the New Mexico Permian Basin with a Comprehensive Aerial Survey*, ENVIRON. SCI. TECHNOL. 56(7): 4317–4323, 4321.

[59] Clarke, J. S., 'Big Oil's Dirty Secret,' Unearthed.: https://projects.unearthed.greenpeace.org/big-oil-iraq/?_gl=1*15uis93*_ga*OTgyNzQ0Mjk5LjE2OTM5MDU4OTA.*_ga_KC3Z5NFMSX*MTY5NTk5MTczMC44LjEuMTY5NTk5MjI4Mi4wLjAuMA.

[60] United Nations Environment Programme, *An Eye on Methane: International Methane Emissions Observatory 2022* (Nairobi: United Nations Environment Programme, 2022), https://wedocs.unep.org/bitstream/handle/20.500.11822/40864/eye_on_methane.pdf?sequence=3&isAllowed=y.

[61] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS, 25.

[62] Ibid, 9.

[63] Ibid, 29.

or piles. During this process, anaerobic decomposition of organic matter in manure can produce methane, as well as nitrous oxide. The emissions from manure are influenced by factors like diet, the amount and type of manure, and environmental conditions during storage. Aside from creating methane emissions, poor manure management can also lead to environmental degradation, negative health impacts, and the loss of nutrients useful for soil quality.[64]

46. Outside of livestock emissions, paddy rice cultivation is a meaningful source of agricultural methane globally, and in Latin American countries with high rice production such as Brazil, Peru and Colombia.[65] Paddy rice cultivation involves flooding rice fields, which creates anaerobic conditions where soil microbes decompose organic matter, releasing methane. The amount of methane emitted depends on water management, rice variety, soil type, and fertilizer use.

47. A final source of agricultural methane emissions is agricultural waste burning, which involves the open-field burning of crop residues, which releases pollutants, including methane, into the atmosphere due to incomplete combustion. Smouldering fields harm air quality by emitting the potent short-lived climate pollutant black carbon, while also reducing water retention and soil fertility by 25-30%.[66]

48. Abatement of agricultural methane emissions presents some challenges given that the emissions arise from natural biological processes, such as enteric fermentation and rice cultivation. While specific abatement methods are explored in detail below, it is important to note that mitigation technologies may be difficult to adopt at scale, particularly in developing contexts or for small-scale farmers. Similarly, the widespread and diffuse sources of agricultural methane emissions make monitoring, enforcement and mitigation strategies challenging to implement. Nonetheless, given the scale of agricultural methane emissions, there are still significant and cost-effective mitigation opportunities which should be pursued to ensure compliance with human rights obligations. While the mitigation potential across different sectors varies across regions, it is notable that in Latin America the greatest potential is from the livestock sector.[67]

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[64] Climate and Clean Air Coalition, *Livestock and Manure Management* [URL: https://www.ccacoalition.org/projects/livestock-and-manure-management].
[65] Food and Agriculture Organisation Corporate Statistical Database (FAOSTAT) [URL: https://www.fao.org/faostat/en/#home].
[66] United Nations Environment Programme (2021) *Toxic Blaze: the true cost of crop burning* [URL: https://www.unep.org/news-and-stories/story/toxic-blaze-true-cost-crop-burning].
[67] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 10.

Waste

49. In the waste sector, landfills and wastewater make up around 20 per cent of global anthropogenic emissions. Unlike agricultural methane emissions, there is a large mitigation potential for emissions from waste. The greatest potential is in improved treatment and disposal of solid waste. The economics are also in favour of taking action to address emissions from waste: for example, up to 60 per cent of measures to reduce emissions in the waste sector have either a negative cost or low cost.[68] Existing targeted measures could therefore reduce methane emissions from the waste sector by 29-36 Mt/yr by 2030.[69]

50. In terms of the geographical distribution of methane emissions from waste, unlike fossil fuels and agriculture, emissions from the waste sector are much more evenly distributed around the world. Despite the relatively even distribution of emissions sources, the mitigation potential for waste varies between countries, with Europe and India having the largest mitigation potential globally. In Central and South American, Brazil, Mexico, Argentina and Colombia all have significant sources of methane from landfills, which can be the focus of mitigation measures. One area of particular significance is food production and food loss and waste.

51. Food that ends up in landfills and other forms of solid waste becomes a source of methane. Reducing food loss and waste would drive positive climate, social and economic impacts. Food loss occurs when food is lost during the food supply chain, up to the retail level. Food waste occurs at the retail and consumption levels. The scale of food loss and waste is significant: one third of all food produced for human consumption globally is lost or wasted at some point in the supply chain.[70] The associated methane generated by this food loss and waste is therefore significant, and has been assessed as being at nearly 50 Mt/yr. There are a large number of strategies to reduce food loss and waste at different stages in the production, handling, storage, processing and packaging, distribution and consumption stages. Examples include reducing portion sizes, implementing best practice storage practices, effective use of leftovers, distribution of excess food to charitable groups, facilitating donation of unsold foods from restaurants, improve the cold-storage food chain, and changing food

[68] Ibid, p. 13.
[69] Ibid, p. 13.
[70] Ibid, p.114.

labelling practice. Further examples of available methods to abate methane emissions from the waste sector in general are set out below.

Methods to abate methane emissions exist and are cost-effective

52. It is estimated that *currently available* measures could reduce emissions from all three of the major sectors responsible for anthropogenic methane by approximately 180 Mt/yr, or as much as 45 per cent, by 2030.[71] For example, within the energy sector, "*it is technically possible to avoid over 70% of today's methane emissions from global oil and gas operations*."[72] Further, around 60% of mitigation measures for all sectors have low mitigation costs, with more than 50% of those measures having negative costs, meaning that they pay for themselves.[73] The following are examples of such available measures:

    52.1. In the coal-mining sector: pre-mining degasification; air methane oxidation with improved ventilation and the flooding of abandoned mines,[74] ventilation air methane (VAM) capture and utilization, capture of abandoned mine gas, degasification of surface mines, and predrainage of surface mine.[75]

[71] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 9–10. ("*Analysis of the technical potential to mitigate methane from four separate studies shows that for 2030, reductions of 29–57 Mt/yr could be made in the oil and gas subsector, 12– 25 Mt/yr from coal mining, 29–36 Mt/yr in the waste sector and 6–9 Mt/yr from rice cultivation. Values for the livestock subsector are less consistent, ranging from 4–42 Mt/yr.*")
See also, specifically in respect of the oil and gas sector: International Energy Agency (2021) *Curtailing Methane Emissions from Fossil Fuel Operations: Pathways to a 75% cut by 2030*, 11–13. ("*Under the Net Zero Scenario, total methane emissions from fossil fuels fall by around 75% from 2020 levels by 2030. About one-third of this drop results from overall reduction in fossil fuel consumption. Most of it depends on the accelerated deployment of mitigation measures and technologies leading to the elimination of all technically avoidable methane emissions by 2030.*")
[72] International Energy Agency (2022) GLOBAL METHANE TRACKER 2022, 25.
[73] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 10.
[74] Ibid, 107.
[75] DeFabrizio S., Glazener W., Hart C., Henderson K., Kar J., Katz J., Pratt M. P., Rogers M., Tryggestad C., & Ulanov A. (2021) CURBING METHANE EMISSIONS: *HOW FIVE INDUSTRIES CAN COUNTER A MAJOR CLIMATE THREAT*, McKinsey Sustainability, 22.

52.2. In the oil and gas sector: banning the venting and flaring of methane in all but emergency circumstances[76] and requiring the capture and utilisation of methane;[77] fixing methane leaks, most of which are straightforward to repair (usually via leak detection and repair – LDAR – programmes and technology);[78] retrofitting or replacing pieces of equipment that emit natural gas in their regular course of operations; installing new emissions control devices; and alternative and innovative technologies.

52.3. In the livestock sector: changing cattle management to improve herd health, breeding for improved productivity and a transition to intensive farming systems;[79] changing animal feed to improve digestibility and to include feed supplements which may reduce methane emissions;[80] improving manure management by treating waste in biogas digesters, reducing manure storage time,

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[76] Clean Air Task Force, *Oil and Gas Mitigation Program* (*last visited* 5 February 2023) ("*Venting is even more harmful than flaring, since methane warms the climate so powerfully, and VOC and toxic pollutants are released unabated. Venting of this gas should be prohibited in all cases as an absolutely unnecessary source of harmful air pollution. There are numerous low-cost (and usually profitable) ways to utilize natural gas from oil wells. Flaring should be a last resort: only in the most extreme cases should oil producers be allowed to flare gas, and it should be strictly a temporary measure. Rules prohibiting venting of natural gas can easily reduce emissions by 95%.*").
See also International Energy Agency (2022) GLOBAL METHANE TRACKER 2023: https://www.iea.org/news/methane-emissions-remained-stubbornly-high-in-2022-even-as-soaring-energy-prices-made-actions-to-reduce-them-cheaper-than-ever ("*Stopping all non-emergency flaring and venting of methane is the most impactful measure countries can take to rein in emissions. Around 260 billion cubic metres (bcm) of methane is currently lost to the atmosphere each year from oil and gas operations. Three-quarters of this could be retained and brought to market using tried and tested policies and technologies. The captured methane would amount to more than the European Union's total annual gas imports from Russia prior to the invasion of Ukraine.*")

[77] World Bank (5 May 2022) *Global Flaring and Venting Regulations* ("*Flared and vented gas can replace more-polluting fuels in local communities, cutting emissions and expanding energy access for the poorest. In 2021, an estimated 144 billion cubic meters of associated gas were wastefully flared around the world. If captured and put to productive purposes, this gas could power the entirety of sub-Saharan Africa.*").

[78] Clean Air Task Force, *Oil and Gas Mitigation Program* (*last visited* 5 February 2023) "*Fortunately, most leaks are straightforward to repair (and fixing leaks is paid for by the value of the gas that is saved by repairing them). Further, finding leaks has become efficient with modern technology. The standard approach today is to use special cameras that can detect infrared light (think of night-vision goggles) which are tuned to make methane, which is invisible to our eyes, visible. They allow inspectors to directly image leaking gas in real time, with the ability to inspect entire components (not just connections and other areas most likely to leak) and pinpoint the precise source, making repair more straightforward. And, technology promises to make this process even more efficient (and cheaper) over the coming years. These technologies can be utilized to reduce harmful leak emissions, by using regular inspections as the lynchpin of rigorous "leak detection and repair" (LDAR) programs. These programs require operators to regularly survey all of their facilities for leaks and improper emissions, and repair all the leaks they identify in a reasonable time.*").

[79] While a transition to intensive farming reduces emissions from gases such as methane and nitrous oxide, it is important to note that intensive farming has negative impacts on animal welfare and biodiversity, and may also negatively impact the rights of communities living nearby. See: United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 103.

[80] There has been some evidence that feed supplements offer the potential to drastically reduce methane emissions. For example, adding seaweed has been shown to reduce methane production from enteric fermentation by 80% in sheep and up to 99% in cattle. These studies have not been tested at scale. See United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 103, citing Machado, L., Magnusson, M., Paul, N.A., Kinley, R., de Nys, R. and Tomkins, N. (2016). Dose-response effects of Asparagopsis taxiformis and Oedogonium sp. On in vitro fermentation and methane production. J Appl Phycol., 28, 1443–1452; Machado, L., Tomkins, N., Magnusson, M., Midgley, D.J., de Nys, R. and Rosewarne, C.P. (2018). In Vitro Response of Rumen Microbiota to the Antimethanogenic Red Macroalga Asparagopsis taxiformis, Microb. Ecol., 75, 811–818.

improving manure storage covering and improving housing systems and bedding.[81]

52.4. In the rice cultivation and agricultural waste burning sectors: ban burning of agricultural crop residues; improve water management and drainage for wetland rice; direct wet seeding; compost rice straw; deploy additives to reduce methane production; and using alternative hybrid species.[82]

52.5. In the waste sector: reduction of solid waste through bans on landfill organic waste, source separation with recycling/reuse, collection and flaring of landfill gas, and recycling or treatment with energy recovery; wastewater treatment through anaerobic treatment with biogas recovery and utilisation in both residential and industrial settings and use of wastewater treatment plants instead of latrines and disposal.[83]

53. Such measures have side benefits, including the creation of jobs.[84] Capturing methane emissions from the oil and gas sector carries the economic side benefit resulting from the fact that "*the cost of mitigation is often lower than the market value of the gas that is captured*."[85] Indeed, "*based on average natural gas prices over the past five years, over 40% of methane emissions from oil and gas operations could be avoided at no net cost*."[86] Estimates from 2021 suggest that capturing and marketing methane leaked from fossil fuel operations would have made an additional 180 billion cubic metres of gas available to the market.[87] Consequently, it is noted that "*roughly 60 per cent, around 75 Mt/yr, of available targeted measures have low mitigation costs, and just over 50 per cent of those have negative costs – the measures pay for themselves quickly by saving money*."[88]

54. Countries have recently committed to a collective target of a 30 per cent reduction in human-caused methane emissions below 2020 levels by 2030, via the "Global Methane Pledge" agreed at COP26 in Glasgow.[89] Unfortunately, despite this pledge and the ready

[81] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 16.
[82] Ibid, 16.
[83] Ibid, 16.
[84] Lowe M. & Lowe-Skillern R. (2021) *Find, Measure, Fix: Jobs in the U.S. Methane Emissions Mitigation Industry*, Datu Research, 6
[85] International Energy Agency (2021) *Curtailing Methane Emissions from Fossil Fuel Operations: Pathways to a 75% cut by 2030*, 11–13.
[86] International Energy Agency (2022) GLOBAL METHANE TRACKER 2022, *op cit.*, 25.
[87] Ibid, 4–5.
[88] United Nations Environment Programme & Climate & Clean Air Coalition (2021) GLOBAL METHANE ASSESSMENT: *BENEFITS AND COSTS OF MITIGATING METHANE EMISSIONS*, 10.
[89] Ibid, 10

availability, cost-effectiveness and side benefits of methane abatement measures, methane emissions are continuing to rise.[90]

[90] National Oceanic and Atmospheric Administration (NOAA) (Date of article or webpage) *Greenhouse gases continued to increase rapidly in 2022,* [URL: https://www.noaa.gov/news-release/greenhouse-gases-continued-to-increase-rapidly-in-2022#:~:text=The%202022%20methane%20increase%20was,times%20their%20pre%2Dindustrial%20level].

III. Country Case Studies: Mexico, Brazil and Guatemala

55. This section sets out three brief case studies to illustrate the legal and regulatory obstacles to methane abatement in different sectors, and the impact of methane emissions on people and ecosystems. These case studies form the basis of the practical recommendations as to the measures that are required to abate methane consistently with states' human rights and international obligations, set out below. The country case studies focus on:

    55.1. Mexico, and mitigation in the energy sector;
    55.2. Brazil, and mitigation in the agricultural sector;
    55.3. Guatemala, impacts on people and ecosystems and the importance of mitigation and adaptation policies that target methane emissions.

Mexico: fossil methane

56. In November 2018, Mexico's regulator, the Agencia de Seguridad, Energia y Ambiente ('**ASEA**') published the "Guidelines for the Prevention and Comprehensive Control of Methane Emissions from the Hydrocarbons Sector" ('**Methane Guidelines**' or '**DACGs de Metano**' by their Spanish acronym).[91] To comply with these provisions, ASEA´s regulated entities would be required to:

    56.1. Develop an emission assessment of their facilities, including the quantification and classification of emissions per equipment and components.
    56.2. Establish a program to prevent and control methane emissions, including leak detection and repair, the installation of vapor recovery systems, among other identified best practices.
    56.3. Submit an annual compliance report, accompanied by a technical opinion issued by a third party.[92]

57. Since 2018, the presidential administration of Andrés Manuel López Obrador has also advanced a program of energy reform, involving an increase in domestic oil production

[91] These apply to any project facility where the following activities are carried out:
- Exploration and extraction of hydrocarbons;
- The treatment, refining and storage of petroleum, and
- The processing, compression, liquefaction, decompression and regasification, as well as pipeline transportation, storage and distribution of natural gas.

Cf. Mexican National Observatory of Methane Emissions (OBMEM) (2023) *Cumplimiento de las DACGs de Metano,* https://www.obmem.mx/dacgs-metano.

[92] Climate and Clean Air Coalition (Accessed 17 December 2023) *Reducing methane emissions from Mexico's oil and gas sector,* https://www.ccacoalition.org/projects/reducing-methane-emissions-mexicos-oil-and-gas-sector.

in pursuit of energy independence.[93] The administration's push to achieve energy independence is hindering the regulator's ability to properly enforce the Methane Guidelines and associated regulations in the energy space.[94] There are two obstacles to enforcement:

57.1. First, there is a lack of political will in (a) enforcing the regulations and (b) incentivising methane abatement in the energy sector;

57.2. Second, governmental methods of measuring and monitoring methane emissions are inadequate and access to information in the energy sector is severely limited, decreasing civil society's ability to hold actors to account.

58. These two points are well-illustrated by the example of how the Mexican state regulates Petroleos Mexicanos ('**Pemex**'), the Mexican state-owned petroleum company, and more generally by how it provides information to civil society groups such CEMDA.

59. First, there has been a marked lack of political will in regulating Pemex to require it to reduce methane emissions. In response to Lopez Obrador's policies, Pemex has aimed to increase oil production in recent years. Nonetheless, insufficient maintenance at its aging facilities mean that it has failed to meet the production targets imposed by Lopez

[93] Official Website of the President of Mexico (2023) *Mensaje de AMLO en el cierre de campaña en el Estadio Azteca,* https://lopezobrador.org.mx/2018/06/27/cierre-de-campana-amlo-en-vivo-desde-el-estadio-azteca/.
Peoples Dispatch (March 18, 2023) *Mexico is charting its own path towards energy sovereignty* [URL: https://peoplesdispatch.org/2023/03/18/mexico-is-charting-its-own-path-towards-energy-sovereignty/#:~:text=The%20Energy%20Secretary%20declared%20that,buy%20diesel%20or%20gasoline%20abroad.&text=For%20Hern%C3%A1ndez%2C%20AMLO's%20commitment%20to,the%20country%20was%20on%20previously.]
Dialogo' Chino (February 24, 2022) *Explainer: Why is Mexico reforming its energy sector – again?*, [URL: https://dialogochino.net/en/climate-energy/51387-explained-why-is-amlo-mexico-energy-reform-electricity/].
[94] Dialogo' Chino (January 28, 2022) *Hot air: Mexico lags behind in fight against methane, despite pledges,* https://dialogochino.net/en/climate-energy/50636-mexico-lags-reducing-methane-pledges/

Obrador,[95] that it has been responsible for grave accidents,[96] as well as for a series of methane ultra-emitting events at various Pemex-operated oil fields.[97]

60. Extensive reporting suggests that Pemex has increased flaring and failed to inspect, maintain and repair its infrastructure, including abandoned wells, as required by the Methane Guidelines. For instance, it is noted that "*the volume of gas flared leapt by 50% from 3.9 billion cubic meters (bcm) when Lopez Obrador took office in 2018 to 5.8 bcm in 2020, the data showed, putting Mexico among the world's top 10 flarers.*"[98]

61. This increase in flaring is allegedly due the combination of (i) pressure placed by Lopez Obrador's administration to raise crude production, (ii) glaring under-investment in maintenance and repair of infrastructure, possibly tied to the fact that Pemex is the world's most heavily indebted state oil company,[99] and (iii) Pemex's standing and the

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[95]Reuters (September 28, 2023) *Mexico's Pemex struggles to boost oil refining in August as fuel imports rise,* [URL: https://www.reuters.com/markets/commodities/mexicos-pemex-struggles-boost-oil-refining-aug-fuel-imports-rise-2023-09-28/].

[96] Reuters (August 23, 2021) *EXCLUSIVE Offshore platform fire cuts Mexico oil output by 444,000 bpd,* https://www.reuters.com/business/energy/exclusive-offshore-platform-fire-cuts-mexico-oil-output-by-444000-bpd-document-2021-08-23/

Reuters (July 3, 2021) '*Eye of fire*' *in Mexican waters snuffed out, says national oil company,* https://www.reuters.com/business/energy/fire-offshore-pemex-platform-gulf-mexico-under-control-2021-07-02/

According to some sources, in the last two years, there has been a rise of 152% in the frequency of accidents related to PEMEX.

Cf. Animal Politico (13 July 2023) *Accidentes en Pemex duplican su frecuencia y gravedad, mientras que presupuesto para mantenimiento se redujo* https://www.animalpolitico.com/verificacion-de-hechos/te-explico/accidentes-en-pemex-duplican-su-frecuencia-y-gravedad-mientras-que-presupuesto-para-mantenimiento-se-redujo.

[97] *Satellites Detect a Methane Ultra-emission Event from an Offshore Platform in the Gulf of Mexico*, Itziar Irakulis-Loitxate, Javier Gorroño, Daniel Zavala-Araiza, and Luis Guanter, *Environmental Science & Technology Letters* **2022** *9* (6), 520-525, DOI: 10.1021/acs.estlett.2c00225. Accessible at: https://doi.org/10.1021/acs.estlett.2c00225

See also the following reporting:

Reuters (July 3, 2021) *Scientists find massive methane leak at Pemex Gulf of Mexico oil field -paper,* https://www.reuters.com/business/environment/scientists-find-massive-methane-leak-pemex-gulf-mexico-oil-field-paper-2022-06-09/

European Space Agency (ESA) (9 June 2022), *Methane emissions detected over offshore platform in the Gulf of Mexico,* https://www.esa.int/Applications/Observing_the_Earth/Methane_emissions_detected_over_offshore_platform_in_the_Gulf_of_Mexico

Reuters (June 23, 2022) *EXCLUSIVE Mexico regulator probes Pemex over gas flaring at another giant field -sources,* https://www.reuters.com/business/energy/exclusive-mexico-regulator-probes-pemex-over-gas-flaring-another-giant-field-2022-06-22/

Reuters (September 2, 2022) *Exclusive: Scientists detect second 'vast' methane leak at Pemex oil field in Mexico,* https://www.reuters.com/business/environment/exclusive-scientists-detect-second-vast-methane-leak-pemex-oil-field-mexico-2022-09-02/

[98]Reuters (February 23, 2022) *Up in Flames,* https://www.reuters.com/graphics/MEXICO-PEMEX/FLARING/dwvkrjxagpm/index.html.

[99] Reuters (September 2, 2022) *Exclusive: Scientists detect second 'vast' methane leak at Pemex oil field in Mexico,* https://www.reuters.com/business/environment/exclusive-scientists-detect-second-vast-methane-leak-pemex-oil-field-mexico-2022-09-02/ ("*The share of natural gas that comes to the surface as a byproduct increases as older fields, like the ones in the Gulf of Mexico, are being depleted. Petroleum reservoir geologists said this poses operational challenges - and more natural gas is wasted as a result.*")

contribution it makes to the federal budget, which mean that regulations are not being enforced against it.[100]

62. In respect of the latter:

62.1. A provision of Mexican law caps fines for violations.[101] Consequently, Pemex has been accused of choosing to risk fines rather than addressing regulatory violations because fines are low, quasi "symbolic," and thus an inadequate deterrent of violations.[102] Pemex also runs a low risk of enforcement given the government's lax stance towards it.[103]

62.2. In most circumstances where it is fined, Pemex appeals and delays the enforcement of fines against it.[104] In some circumstances, it allegedly evades the consequences of breaching the regulations altogether.[105] On one occasion, Pemex appears to have evaded liability for wasting 37.7% of the methane emitted from its Ku-Maloop-Zaap oil field, where Mexico's legal limit is 2%.[106] Most recently, the regulator allegedly dropped plans to fine Pemex entirely, following pressure from the government.[107]

62.3. In 2016, Pemex agreed to invest over $3 bn USD to fix its flaring problem and avoid fines, adopting a regulator-approved plan to tackle methane emissions from its operations. Pemex is reported to have abandoned the plan soon after Lopez Obrador's election. In 2021, "*in an effective admission that it would not fulfil the goals of the investment commitment it had made in 2016, Pemex sought regulatory permission*

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[100] Reuters (February 23, 2022) *Up in Flames,* https://www.reuters.com/graphics/MEXICO-PEMEX/FLARING/dwvkrjxagpm/index.html.

[101] Reuters (August 23, 2022), *Exclusive: Pemex fined for failures at top oil field leading to flaring, faces another fine,* https://www.reuters.com/markets/commodities/exclusive-pemex-fined-failures-top-oil-field-leading-flaring-faces-another-fine-2022-08-23/

[102] Reuters (November 7, 2022), *Insight: Mexico's Pemex had a plan to fix its flaring problem, but abandoned it,* https://www.reuters.com/business/energy/mexicos-pemex-had-plan-fix-its-flaring-problem-abandoned-it-2022-11-07/

[103] Reuters (November 17, 2022) *Exclusive: Mexico's Pemex risks fines rather than fix violations,* https://www.reuters.com/business/energy/exclusive-mexicos-pemex-risks-fines-rather-than-fix-violations-sources-2022-11-17/#:~:text=MEXICO%20CITY%2C%20Nov%2017%20(Reuters,to%20two%20senior%20company%20sources

[104] Reuters (September 27, 2022), *Exclusive: Mexican regulator has no record of Pemex reporting methane leak, documents show,* https://www.reuters.com/markets/commodities/exclusive-mexican-regulator-has-no-record-pemex-reporting-methane-leak-documents-2022-09-27/

[105] Ibid. See also: Reuters (September 28, 2022), *Mexican senator files criminal complaint against energy minister, Pemex CEO over methane leak*, https://www.reuters.com/business/energy/mexican-senator-files-criminal-complaint-against-energy-minister-pemex-ceo-over-2022-09-28/

[106] Reuters (November 7, 2022), *Insight: Mexico's Pemex had a plan to fix its flaring problem, but abandoned it,* https://www.reuters.com/business/energy/mexicos-pemex-had-plan-fix-its-flaring-problem-abandoned-it-2022-11-07/

[107] Reuters (July 12, 2023), *Exclusive: Mexico's oil regulator, constrained by government, dropped plans to fine Pemex,* https://www.reuters.com/business/energy/mexicos-oil-regulator-constrained-by-government-dropped-plans-fine-pemex-2023-07-12/

to flare or otherwise waste at the Ku field at an even steeper rate for another decade. It proposed to flare as much as 71.3% of the gas until 2030, public documents reviewed by Reuters show. The regulator approved the plan."[108] Consequently, Pemex has continued flaring up until today. In January 2023, it was reported to have "*illegally burnt off hydrocarbon resources worth more than $342 million in the three years up to August 2022 at two of its most important new fields*"[109] In February 2023, it was reported that flaring at Pemex's "*vast Ixachi field not only continued but increased.*"[110]

62.4. According to documents obtained by requests for access to public information, Pemex is reported to have influenced the energy ministry's attempt to block stricter flaring rules. The documents obtained show a "*concerted effort by the energy ministry to stop Mexico's official gazette from publishing tighter rules drafted by the independent energy regulator.*" Although the stricter rules did eventually become law, it took seven months for that to happen, when it usually takes fifteen days to publish rules in the gazette once these are drawn up.[111]

62.5. Mexico's independent energy regulator, the National Hydrocarbons Commission, has been weakened. As of April 2023, Lopez Obrador's government replaced its chair, Rogelio Hernandez, with a former Pemex official, Agustin Diaz Lastra. This took place soon after the independent regulator's decision to reject a plan presented by Pemex.[112]

62.6. As of March 2023, "*Pemex still lacks a credible plan to reduce emissions.*"[113]

63. Critics underline that the marked increase in methane emissions from the energy sector, allegedly consequent on the lack of political will discussed, is in stark contrast with Mexico's international pledges and obligations, including the World Bank-backed 'Zero

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[108]Reuters (November 7, 2022), *Insight: Mexico's Pemex had a plan to fix its flaring problem, but abandoned it,* https://www.reuters.com/business/energy/mexicos-pemex-had-plan-fix-its-flaring-problem-abandoned-it-2022-11-07/

[109] Reuters (January 18, 2023), *Exclusive: Mexico's Pemex destroyed resources worth $342 million from two top fields,* https://www.reuters.com/business/energy/mexicos-pemex-destroyed-resources-worth-342-million-two-top-fields-2023-01-18/#:~:text=The%20three%20documents%2C%20produced%20by,Quesqui%20field%20in%20two%20years

[110] Reuters (February 28, 2023) *Exclusive: Mexico's Pemex increased gas flaring at top field, despite pledge to stop,* https://www.reuters.com/business/energy/mexicos-pemex-increased-gas-flaring-top-field-despite-pledge-stop-2023-02-28/

[111]Reuters (December 1, 2022) *Exclusive: To protect Pemex, Mexico's energy ministry tried to block stricter flaring rules: documents,* https://www.reuters.com/markets/commodities/protect-pemex-mexicos-energy-ministry-tried-block-stricter-flaring-rules-2022-12-01/#:~:text=MEXICO%20CITY%2C%20Dec%201%20(Reuters,its%20plans%20to%20increase%20production

[112]Reuters (April 28, 2022), *Exclusive: Mexican officials at oil regulator who rejected Pemex plans were pressured to quit – sources,* https://www.reuters.com/business/energy/mexican-officials-oil-regulator-who-rejected-pemex-plans-were-pressured-quit-2023-04-28/

[113]La Politica Online (17 Dicembre, 2023), *Sin un plan tangible, el mercado descarta que Pemex alcance metas de reducción de emisiones,* https://www.lapoliticaonline.com/mexico/energia-mx/sin-un-plan-tangible-el-mercado-descarta-que-pemex-alcance-metas-de-reduccion-de-emisiones/

Routine Flaring by 2030' Initiative, the Global Methane Pledge, the commitment to a 45% reduction in methane emissions made at the North American Leaders Summit, Mexico's own National Determined Contributions and the current president's past commitment to reduce Pemex's methane emissions by 98%.[114] Nonetheless, Mexico "*lags behind in the fight against methane*,"[115] most notably in the regulation of, and provision of finance and incentives to, operators in the energy sector.[116]

64. Second, there is a severe lack of transparency that inhibits access to information, consequently restricting the ability of civil society watchdogs to exercise their functions in holding corporate actors to account. These are as follows:

64.1. Generally, national inventories of emissions are inaccurate because they tend to be based on generic emission factors and simple engineering calculations. Consequently, experts have urged that, "*rather than taking an inventory-based shortcut, government, academia, and industry should collaborate on development of trustworthy methane monitoring standards. In the long run, these standards will be simpler; get faster, cheaper reductions in emissions; and facilitate the development of a market for low-emissions gas that rewards clean producers.*"[117] Specifically, *actual* measurement of methane emissions (via, e.g., satellite-based methane tracking) is

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[114] See, in the order cited:
World Bank (updated September 2021) *Mexico,* https://flaringventingregulations.worldbank.org/mexico#:~:text=Gas%20flaring%20volume%20and%20intensity,Clean%20Air%20Coalition%20(n.d.).
Official Government Website of Mexico (November 3, 2021) *Mexico joins the Global Methane Pledge at COP26,* https://www.gob.mx/sre/prensa/mexico-joins-the-global-methane-pledge-at-cop26?idiom=en
U.S. Department of State (December 4, 2023) *Highlights from 2023 Global Methane Pledge Ministerial*, https://www.state.gov/highlights-from-2023-global-methane-pledge-ministerial/#:~:text=The%20leaders%20of%20Canada%2C%20the,TEAP)%20released%20its%20first%20report.
Gobierno de México, Secretaria del Medio Ambiente y Recursos Naturales (2022) Contribución Determinada a Nivel Nacional Actualización 2022-2030, https://unfccc.int/sites/default/files/NDC/2022-11/Mexico_NDC_UNFCCC_update2022_FINAL.pdf
El Universal (29 October 2022) *AMLO a Kerry: Pemex reducirá 98% de gas metano,* https://www.eluniversal.com.mx/nacion/amlo-kerry-pemex-reducira-98-de-gas-metano/

[115] Dialogo' Chino (January 28, 2022) *Hot air: Mexico lags behind in fight against methane, despite pledges,* https://dialogochino.net/en/climate-energy/50636-mexico-lags-reducing-methane-pledges/
Reuters (26 January, 2023), *Mexican energy companies lag methane emission rules, investigators say,* https://www.reuters.com/business/energy/mexican-energy-companies-lag-methane-emission-rules-investigators-say-2023-01-25/

[116] Forbes (August 16, 2021), *The Key To Reducing Methane Emissions? Actual Measurement*, https://www.forbes.com/sites/thebakersinstitute/2021/08/16/the-key-to-reducing-methane-emissions-actual-measurement/?sh=521b30713b88.

[117] Forbes (August 16, 2021), *The Key To Reducing Methane Emissions? Actual Measurement*, https://www.forbes.com/sites/thebakersinstitute/2021/08/16/the-key-to-reducing-methane-emissions-actual-measurement/?sh=521b30713b88

encouraged. Consequently, actual measurements of methane emissions are being increasingly called for.[118]

64.2. According to OBMEM,[119] only 28% of regulated companies comply with the Methane Guidelines.[120] Furthermore, there is lack of transparency in the provision of information that should be readily accessible by the public: "*la información proporcionada por la ASEA es inconsistente, ya que la lista de empresas que han entregado su reporte anual de cumplimiento no corresponde con la lista de empresas que han entregado su PPCIEM [Programa para la Prevención y el Control Integral de las Emisiones de Metano].*"[121]

64.3. Pemex has denied ultra-emitting events detected via satellite technology, in circumstances where the "*scientists who detected a massive methane leak at an offshore platform run by Mexico's Pemex said Tuesday there was "no way" they had made a mistake, roundly rebutting claims by the state oil company that the emissions were smaller and less polluting*." No action was taken by the government to address disinformation in Pemex's reporting and public communications.[122]

65. CEMDA's experience in seeking to obtain documentation relating to methane emissions in the energy sector is consistent with the above. CEMDA has faced four particular challenges in relation to accessing documentation related to all regulated entities under the Methane Guidelines, as follows:

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[118] For instance, these are being called for by

- The Oil and Gas Methane Partnership 2.0, a voluntary global standard set up by UNEP where companies are required to report emissions using measurement-based approaches. This demonstrates that the industry itself recognizes better monitoring is essential. Cf: https://ogmpartnership.com/
- UNEP's International Methane Emissions Observatory, which is developing a global data platform of measurement-based emission estimates: https://wedocs.unep.org/bitstream/handle/20.500.11822/40864/eye_on_methane.pdf?sequence=3&isAllowed=y
- The US's EPA methane fee, which requires measurement-based, accurate data to establish penalties on high emissions.

[119] https://www.obmem.mx/. The Mexican signatories of this Amicus are all actively involved in OBMEM's activities.

[120] Mexican National Observatory of Methane Emissions (OBMEM) (2023) *Cumplimiento de las DACGs de Metano,* https://www.obmem.mx/mx-ch4.

[121] Official Government Website of Mexico (Accessed 17 December 2023) *Reporte anual de cumplimiento del Programa para la Prevención y el Control Integral de las Emisiones de Metano (PPCIEM) del Sector Hidrocarburos,* https://www.gob.mx/tramites/ficha/reporte-anual-de-cumplimiento-del-programa-para-la-prevencion-y-el-control-integral-de-las-emisiones-de-metano-ppciem-del-sector-hidrocarburos/ASEA8632].

[122] Reuters (September 28, 2022), *Mexico's Pemex denies large methane emissions from Gulf of Mexico platform,* https://www.reuters.com/legal/litigation/mexicos-pemex-denies-large-methane-emissions-gulf-mexico-platform-2022-09-08/

Reuters (September 14, 2022) *Scientists who detected massive Pemex methane leak say 'no way' they made a mistake,* https://www.reuters.com/markets/commodities/scientists-who-detected-massive-pemex-methane-leak-say-no-way-they-made-mistake-2022-09-13/

65.1. A general context of opacity in the energy sector prevails, and open attacks[123] to the National Institute on Access to Information ('**INAI**'), an autonomous constitutional organ, are pervasive. The INAI has been unable to operate because the national congress did not appoint one of three commissioners needed to reach the necessary quorum. This was by direct order from the president but, for months, the INAI was also unable to operate on plenary. Recently the Supreme Court allowed INAI to operate with four commissioners and ordered the congress to appoint the missing ones.[124]

65.2. The use of national security and industrial secrets justifications to deny access to environmental public information.[125] All the information CEMDA requested pertaining to regulated entities' plans under the Methane Guidelines (namely all the public versions of the PPCIEM programs presented by regulated entities as well as the public versions of the programs focusing on detection and repair of facility leaks) was denied by ASEA on the basis of national security and industrial secrets. This is in contravention of international standards on access to information as well as of domestic Supreme Court precedents.[126]

65.3. The route to obtaining methane-related information is immensely and unduly complex, time-consuming and expensive, posing a real practical obstacle to transparency and accountability. CEMDA considers that the information they requested in relation to compliance with the Methane Guidelines should have been accessible by way of a simple, no- or low-cost and efficient administrative

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[123] El País (April 19, 2023) *La presión de López Obrador contra el instituto de Transparencia amenaza la supervivencia del organismo,* https://elpais.com/mexico/2023-04-19/la-cruzada-de-lopez-obrador-contra-el-instituto-de-transparencia-amenaza-la-supervivencia-del-organismo.html.

[124] Supreme Court of Justice of the Nation (23 August 2023) *Comunicados de Prensa: INAI PUEDE SESIONAR PROVISIONALMENTE CON CUATRO PERSONAS COMISIONADAS,* https://www.internet2.scjn.gob.mx/red2/comunicados/noticia.asp?id=7476].

[125] See e.g., Reuters (April 28, 2023), *Exclusive: Mexican officials at oil regulator who rejected Pemex plans were pressured to quit – sources,* https://www.reuters.com/business/energy/mexican-officials-oil-regulator-who-rejected-pemex-plans-were-pressured-quit-2023-04-28/https://www.reuters.com/business/energy/mexican-officials-oil-regulator-who-rejected-pemex-plans-were-pressured-quit-2023-04-28/ ("*Reuters did not have access to the plans for Quesqui, which are protected in Mexico as state secrets.*")
See also,
Reuters (January 18, 2023), *Exclusive: Mexico's Pemex destroyed resources worth $342 million from two top fields,* https://www.reuters.com/business/energy/mexicos-pemex-destroyed-resources-worth-342-million-two-top-fields-2023-01-18/#:~:text=The%20three%20documents%2C%20produced%20by,Quesqui%20field%20in%20two%20years. ("*It has not previously been reported that condensate was also burnt off at the fields. Under Mexican law, documentation around such violations is not made public.*")

[126] All such precedents are accessible here:
Supreme Court of Justice of the Nation (2022) *CUADERNOS DE JURISPRUDENCIA: Contenido y alcance del derecho humano a un medio ambiente sano,* https://www.sitios.scjn.gob.mx/cec/sites/default/files/publication/documents/2023-07/CUADERNO%20CONTENIDO%20Y%20ALCANCE_ELECTRO%CC%81NICO_0.pdf

process. Instead, accessing this information in practice requires extensive litigation in the courts, which is slower, less effective and prohibitively expensive. There is no reason for this.

65.4. CEMDA considers that the current state of environmental awareness within the Mexican federal government underscores a concerning lack of comprehension regarding the critical significance of environmental information, particularly within the pressing context of methane abatement and the wider climate crisis. This deficiency in understanding not only hampers the formulation of effective policies but also inhibits the development of proactive strategies to mitigate and adapt to the rapidly escalating environmental challenges.

Brazil: Agricultural methane emissions

66. This case study considers the relationship between Brazil's agricultural methane emissions, deforestation, and the associated impacts on Indigenous communities living in Indigenous Territories ('**Its**').

67. Brazil is the fifth largest methane emitter in the world.[127] In 2020, Brazil emitted 402 $MtCO_2e$ of methane, with 78% of those emissions coming from agriculture.[128] Livestock, through enteric fermentation and manure, is responsible for 75% of these methane emissions.[129] Brazil is the largest beef exporter in the world, with over 230 million head of cattle, which is roughly 14% of the global herd. Consistent with global trends, Brazil's methane emissions have been growing in recent decades: excluding land use, land-use change and forestry, Brazil's methane emissions increased by 51% between 1990-2019.[130]

68. Cattle ranching is one of the largest drivers of deforestation in Brazil and across the Amazon countries. Estimates show that between 70-90% of deforested land in the

[127] International Energy Agency, "Global Methane Tracker: Overview" (2022) Accessed at: https://www.iea.org/reports/global-methane-tracker-2022/overview

[128]The remainder of Brazil's methane emissions come from waste (19%) and energy (4%): Global Methane Initiative, "Methane Emissions Data: Global Methane Emissions and Projections" (2023) Accessed at: https://www.globalmethane.org/methane-emissions-data.aspx; Climate Transparency, "Climate Transparency Report: Comparing G20 Climate Action (Brazil)" (2022) Accessed at: https://www.climate-transparency.org/wp-content/uploads/2022/10/CT2022-Brazil-Web.pdf.

[129] CRA International (CRA), "The Impact of the Global Methane Pledge on the Brazilian Beef Industry" (2023) Accessed at: https://www.crai.com/insights-events/publications/the-impact-of-the-global-methane-pledge-on-the-brazilian-beef-industry/; Climate Transparency, "Climate Transparency Report: Comparing G20 Climate Action (Brazil)" (2022) Accessed at: https://www.climate-transparency.org/wp-content/uploads/2022/10/CT2022-Brazil-Web.pdf, p. 14.

[130] Climate Transparency, "Climate Transparency Report: Comparing G20 Climate Action (Brazil)" (2022) accessed at: https://www.climate-transparency.org/wp-content/uploads/2022/10/CT2022-Brazil-Web.pdf

Amazon is used for livestock.[131] Cattle ranching is therefore significant as a source of methane from herds, as well being a driver of CO_2 emissions from deforestation.

69. It is well established that deforestation in large and biologically rich areas like the Amazon has catastrophic impacts on nature, Indigenous groups and peasant farmers, and drives climate change. Cutting down forests removes important carbon sinks, and leads to an increase in greenhouse gases through a number of means. First, the absorption capacity of trees is lost – deforestation in the Amazon has reduced its capacity to absorb carbon dioxide by 30% since the 1990s.[132] Second, when trees are felled, they release stored carbon when they either rot or are burned.[133] Third, deforestation disrupts the water cycle by reducing the amount of water vapor in an area, leading to changes in weather patterns. This can lead to a reduction in precipitation, causing a hotter and drier climate. These changes in local climate create conditions for greenhouse gas-emitting forest fires, which can establish a negative feedback loop of increasing temperatures and drier conditions. Finally, the land use that replaces forests, such as crop agriculture or cattle ranching, generates large amounts of greenhouse gas emissions, for example through enteric fermentation or crop burning.

70. Beyond the climate change impacts, deforestation also drives a loss in biodiversity and increases soil erosion and degradation. A loss of biodiversity reduces ecosystem services such as pollination, pest control and genetic resources, which are important for maintaining robust ecosystems and supporting agricultural production. Similarly, without trees to anchor soil and maintain its quality, deforested areas are prone to soil erosion and a loss of fertility, which negatively affects subsistence farmers, and catalyses further deforestation in search of more fertile soil.[134]

71. Deforestation in Brazil has been driven by a combination of corporate interests and government policy. In recent years Brazil has experienced dramatic fluctuations in its rates of deforestation due to changes in federal government policy. For example, under

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[131] Francisco Luis Lima Filho, Arthur Bragança and Juliano Assunçao, "The Economics of Cattle Ranching in the Amazon: Land Grabbing or Pushing the Agricultural Frontier? (2021) Access at: https://www.climatepolicyinitiative.org/publication/the-economics-of-cattle-ranching-in-the-amazon-land-grabbing-or-pushing-the-agricultural-frontier/; see also Unearthed, "JBS admits to buying almost 9,000 cattle from 'one of Brazil's biggest deforesters'" (2022) Accessed at: https://unearthed.greenpeace.org/2022/11/11/jbs-cattle-brazils-biggest-deforester-amazon/.

[132] Carbon Brief, "Amazon rainforest is taking up a third less carbon than a decade ago" (2015) Accessed at: https://www.carbonbrief.org/amazon-rainforest-is-taking-up-a-third-less-carbon-than-a-decade-ago/

[133] Rainforest Alliance, "What is the relationship between deforestation and climate change? (2018) Accessed at: https://www.rainforest-alliance.org/insights/what-is-the-relationship-between-deforestation-and-climate-change/

[134] Ibid.

the regime of President Jair Bolsonaro, deforestation rose by 75.5% compared with the previous decade.[135] The rise was particularly acute in Indigenous Territories, which saw a 195% increase between 2019-2021, compared with rates between 2013-2018.[136] Just as the Bolsonaro government was characterised by a rollback of environmental protections and the promotion of policies that favoured agribusiness, by contrast the current government under President Luiz Inacio Lula da Silva has seen a drop in deforestation levels due to targeted legislative, policy and enforcement measures. For example, in July 2023 deforestation in the Amazon was 60% lower compared with July 2022.[137] Having presided over a decrease in deforestation during his previous term in government between 2003-2010, which led to an 84% reduction in deforestation in 2012 compared to the historical peak in 2004,[138] President Lula has employed many of the same methods to reverse the rise in deforestation seen under President Bolsonaro. While these interventions are not sufficient to address the issue entirely, they provide a useful model for other States across the region and should be considered in turn.

72. An important aspect of Brazil's current approach is adopting strong international commitments. Brazil has pledged to end illegal deforestation by 2028, and all deforestation by 2030.[139] Coupled with Brazil hosting COP30 in 2025, the Environment Minister Marina Silva has noted that the presence of strong deforestation reduction targets has provided impetuous to domestic and regional policy and enforcement measures.[140] The Action Plan for the Prevention and Control of Deforestation in the Amazon ("**PPCDAm**") is the cornerstone of the government's approach, and establishes a coordinated policy spanning more than a dozen federal government ministries up to 2027. The plan seeks to increase the use of intelligence and satellite imagery to track and

[135] Al-Jazeera, "Brazilian Amazon Deforestation up 150% in Bolsonaro's last month" (2023) Accessed at: https://www.aljazeera.com/news/2023/1/7/brazilian-amazon-deforestation-up-150-in-bolsonaros-last-month
[136] Celso Silva-Junior et al., "Brazilian Amazon indigenous territories under deforestation pressure" (2023) *Science Reporter* 13(5851) p. 1, Accessed at: https://www.nature.com/articles/s41598-023-32746-7#citeas
[137] The Guardian, "Amazon deforestation falls over 60% compared with last July, says Brazilian minister" (2023) Accessed at: https://www.theguardian.com/environment/2023/aug/02/amazon-deforestation-falls-over-60-compared-with-last-july-says-brazilian-minister
[138] Silva-Junior, C. H. L. et al. "The Brazilian Amazon deforestation rate in 2020 is the greatest of the decade" (2021) *Nat. Ecol. Evol.* 5, pp. 144–145.
[139] UNFCCC, "Brazil Nationally Determined Contribution at COP26" (2021) Accessed at: https://unfccc.int/sites/default/files/NDC/2022-06/Updated%20-%20First%20NDC%20-%20%20FINAL%20-%20PDF.pdf
[140] The Guardian, "Amazon deforestation falls over 60% compared with last July, says Brazilian minister" (2023) Accessed at: https://www.theguardian.com/environment/2023/aug/02/amazon-deforestation-falls-over-60-compared-with-last-july-says-brazilian-minister ("*the main reason is the decision of Lula to aim for zero deforestation. Since then, we have created new conservation units and indigenous territories that have produced some* results").

enforce environmental crimes; the regularization of land title; and the use of a rural registry to monitor the management of forests in sensitive areas.[141]

73. The government has also adopted more proactive enforcement measures: between January and May 2023, the Brazilian Institute of Environment and Renewable Natural Resources ('**IBAMA**'), Brazil's environmental police, levied 2 billion reais ($406 million USD) in fines, which was a 160% increase on the annual average figure for the same period under the Bolsonaro government.[142] IBAMA also placed embargoes on 2,255 farms for environmental breaches. Other measures seen as important in reducing deforestation include a greater willingness from banks to deny credit to landowners involved in land clearing,[143] and a chilling effect on deforestation driven by the new European Union Deforestation Regulation, which requires companies to conduct rigorous supply chain due diligence.[144]

74. The creation of new conservation areas and recognition of indigenous land title have also been key aspects of the government's policy and legislative approach.[145] The emphasis on recognising land rights for indigenous communities reflects research which states that ensuring indigenous land title would decrease deforestation by 66%.[146] Given the important human rights impacts on indigenous communities of deforestation – which is driven in order to facilitate methane-intensive cattle ranching – it is relevant to briefly consider deforestation in Indigenous Territories in further detail.

75. Over 700,000 indigenous people live in ITs in Brazil, with half residing within the Amazon.[147] These territories include more than one million square kilometers of rainforest, which act as vitally important carbon sinks and are sources of unparalleled biodiversity and socio-cultural diversity amongst indigenous communities.[148]

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[141] Reuters, "Brazil's Lula unveils plan to stop deforestation in Amazon by 2030" (2023) Accessed at: https://www.reuters.com/world/americas/brazils-lula-launches-plan-stop-deforestation-amazon-by-2030-2023-06-05/

[142] Reuters, "Deforestation in Brazil's Amazon falls nearly 10% in May" (2023) Accessed at: https://www.reuters.com/business/environment/deforestation-brazils-amazon-falls-nearly-10-may-2023-06-07/

[143] The Guardian, "Amazon deforestation falls over 60% compared with last July, says Brazilian minister" (2023) Accessed at: https://www.theguardian.com/environment/2023/aug/02/amazon-deforestation-falls-over-60-compared-with-last-july-says-brazilian-minister

[144] European Commission, "Deforestation-free products" (2023) Accessed at: https://environment.ec.europa.eu/topics/forests/deforestation/regulation-deforestation-free-products_en

[145] The Guardian, "Amazon deforestation falls over 60% compared with last July, says Brazilian minister" (2023) Accessed at: https://www.theguardian.com/environment/2023/aug/02/amazon-deforestation-falls-over-60-compared-with-last-july-says-brazilian-minister

[146] Baragwanath, K. & Bayi, E. "Collective property rights reduce deforestation in the Brazilian Amazon" (2020) *Proc. Natl. Acad. Sci*, 20495–20502, p. 117.

[147] Silva-Junior et al., "Brazilian Amazon Indigenous Territories Under Deforestation Pressure" (2023) Accessed at: https://www.nature.com/articles/s41598-023-32746-7.

[148] Ibid.

Indigenous Territories are essential for maintaining indigenous connection to ancestral lands, customary practices, and ways of life, and are therefore key to protecting the human rights of indigenous groups. These rights are enshrined in the Brazilian constitution under Articles 231 and 232, which recognises indigenous title to traditional lands, and also ensures the protection of indigenous social organisation, customs, language, beliefs, and traditions. While the 2007 UN Declaration of the Rights of Indigenous Peoples ('**UNDRIP**') post-dates the 1988 Brazilian Constitution, its principles largely align with the constitutional protections afforded by Articles 231 and 232, notwithstanding the fact that UNDRIP has not been entrenched domestically through legislation or otherwise.

76. However, despite a clear constitutional basis for the protection of indigenous rights, illegal deforestation increased by 129% within Indigenous Territories in the Amazon between 2013-2021.[149] As such, there is a direct relationship between increased deforestation coinciding with a decrease in the protection and enforcement of indigenous rights.

77. An example of this regulatory and enforcement failure can be seen in the conduct of large multinational corporations such as JBS, the world's biggest meat company. JBS has been implicated in a vast array of corruption scandals, human rights abuses, and allegations of environmentally destructive practices.[150] JBS claims to have rigorous due diligence processes to prevent cattle from illegally cleared rainforest from entering their supply chains. The company is a signatory to the legally binding Terms of Adjustment of Conduct ('**TAC**'), which prohibit the sale of meat from properties involved in illegal deforestation. The TAC applies to a range of companies dealing in animal products, including meat packers, tanneries, and shoe manufacturers. Companies are required to ensure compliance with environmental and social requirements from their suppliers, with the scheme to be monitored by IBAMA.

78. However, despite these protections, JBS recently admitted to buying almost 9,000 cattle from "one of Brazil's biggest deforesters" between 2018-2022 and has routinely been accused of sourcing meat from deforested areas.[151] As such, there is a significant enforcement gap between regulatory obligations and current corporate practice, which

[149] Ibid.
[150] Rainforest Action Network, "Wall Street: Steer Clear of JBS – NGOs warn financiers of risks ahead of meatpacker giant's NYSE listing" (2023) Accessed at: https://www.ran.org/press-releases/jbs-wall-street-risk-forest-destruction/
[151] Unearthed, "JBS admits to buying almost 9,000 cattle from 'one of Brazil's biggest deforesters' (2022) Accessed at: https://unearthed.greenpeace.org/2022/11/11/jbs-cattle-brazils-biggest-deforester-amazon/

must be met by increased funding for federal agencies responsible for environmental protection and indigenous rights. These and other recommendations aimed at breaking the nexus between methane-intensive cattle ranching, deforestation, and infringement of indigenous rights, are set out below in Part IV.

Guatemala, and impacts on Indigenous peoples and ecosystems

79. The CCDA and UVOC support Indigenous communities in Guatemala who are being severely affected by near-term climate change. Aggressively mitigating methane emissions *globally* in coming years is necessary to protect and prevent avoidable harm to frontline communities, such as those in Guatemala, caused by the increased frequency and intensity of climate impacts tied to increased near-term warming. Furthermore, it is essential that the Guatemalan state respects Indigenous rights, particularly land rights, to ensure that communities can build resilience to adapt to climate change. This is equally applicable to all states whose populations include Indigenous peoples.

80. This case study sets out:

80.1. General observations about Guatemala's extreme vulnerability to changing weather patterns and extreme weather events;

80.2. Examples of recent instances of devastating extreme weather in the country that have impacted Indigenous communities;

80.3. The CCDA and UVOC's experience working with communities affected by climate change, and the link between climate adaptation and the defence of Indigenous rights.

Guatemala's vulnerability to climate change

81. Almost half of the Guatemalan population is Indigenous. Its rural population is mostly Indigenous, and the overwhelming majority are poor, and poorer than the non-indigenous population.[152]

82. Guatemala ranks ninth *in the world for level of risk to the effects of climate change*." It has "*low capacity to manage natural disaster risks*" and is "*extremely affected by climate and weather events*" to which "*its poorer populations are particularly vulnerable*". Existing vulnerabilities are compounded by recent unsustainable development, which has seen

[152]Inter-American Development Bank (2022) *Pueblos Indígenas en Guatemala: Desafíos Demográficos, Lingüísticos y Socioeconómicos,* https://publications.iadb.org/es/pueblos-indigenas-en-guatemala-desafios-demograficos-linguisticos-y-socioeconomicos-analisis#:~:text=Pese%20a%20ese%20leve%20crecimiento,(57%25%20versus%2043%25).

"*widespread deforestation and land degradation, slash-and-burn subsistence agriculture and overexploitation of water resources.*" Guatemalans rely on degraded natural resources and lands with low productivity, limited access to suitable water and health services, in the context of widespread poverty.[153]

83. Guatemala is also disproportionately exposed to extreme weather events. It "*ranks in the top* five *countries in the world most affected by floods, hurricanes and earthquakes, with 40.8% of the population exposed to five or more threats simultaneously*," with 83.3% of Guatemala's gross domestic product located in at-risk areas.[154] Guatemala ranks 16th in the 2021 Global Climate Risk Index for 2000-2019, which indicates the level of its exposure and vulnerability to extreme events.[155] Guatemala is part of an area of Central America dubbed the "Dry Corridor," which is marred by failed harvests and food insecurity from unpredictable rain patterns that cause both severe drought and flooding.[156]

84. In summary therefore, and as detailed further in subsequent paragraphs, Guatemala is suffering from (i) changing weather patterns and associated consequences (e.g., increasingly unpredictable rain patterns, droughts, food insecurity, etc.) and (ii) devastating extreme weather events, which are increasing in frequency and severity.

85. The effects of climate change, including the decreased predictability of rainfall, drought and flooding in rapid succession, and the drying up of rivers, affect Indigenous peoples to a disproportionate extent.[157] Disparities faced by indigenous groups in Guatemala "*acutely affect the indigenous Mayan majority who are oftentimes excluded from the political and social mainstream, making this group especially vulnerable to climate change and the*

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[153] World Bank (Accessed 17 December 2023) *Guatemala Country Profile: Climate Change Overview,* https://climateknowledgeportal.worldbank.org/country/guatemala#:~:text=Guatemala%20is%20extremely%20affected%20by,the%20effects%20of%20climate%20change
See also: Climate Links, USAID (2019-05-07) *Guatemala | Global Climate Change,* https://www.climatelinks.org/countries/guatemala.

[154] World Bank, *Guatemala Country Profile: Risk,* https://climateknowledgeportal.worldbank.org/country/guatemala/vulnerability.

[155] David Eckstein, Vera Künzel, Laura Schäfer, 'Global Climate Risk Index 2021: Who Suffers Most from Extreme Weather Events? Weather-Related Loss Events in 2019 and 2000-2019' (2021), Accessible at: https://reliefweb.int/report/world/global-climate-risk-index-2021.

[156] Revista (Harvard Review of Latin America), Marcy J, Tyson A, 'Broken Land, Climate Change and Migration in Guatemala' (26 May 2022). Accessible at: https://revista.drclas.harvard.edu/brokenland/

[157] Baird R, 'The Impact of Climate Change on Minorities and Indigenous Peoples' (Minority Rights Group International, April 2008), available at: https://www.minorityrights.org/wp-content/uploads/old-site-downloads/download-524-The-Impact-of-Climate-Change-on-Minorities-and-Indigenous-Peoples.pdf
Rainforest Foundation US, 'Climate Change Impacts hit Hard in the Rainforest: Indigenous Communities are already Experiencing Climate Scientists' Warnings of Water Scarcity and Human Vulnerability' (21 March 2022), Accessible at: https://rainforestfoundation.org/climate-change-water-scarcity/.

frequent natural hazards that plague the region."[158] Indigenous communities are most affected, in part because "*the closeness of indigenous peoples' communities to the natural environment, on which their livelihoods depend, however, makes them particularly vulnerable to extreme weather.*"[159] For instance, "*crop failure due to adverse weather and climate change disproportionally affect poor indigenous children who already face food shortages. Malnutrition rates run around 70 percent in these groups, which is double the rate for non-indigenous children.*"[160]

Recent Instances of Climate Harm

86. The vulnerability of indigenous groups to extreme and unpredictable weather patterns is becoming increasingly evident, although likely underreported on, due to pervasive and intensifying attacks on journalists and civil society in Guatemala.[161] However, some recent examples include:

86.1. Since the beginning of the rainy season in May 2023, heavy rainfall and strong winds have been affecting most of Guatemala, causing floods, landslides and a number of severe weather-related incidents that resulted in casualties and damage. As of 13 July, according to the National Coordination for Disaster Reduction (CONRED), 15 people died (across eight departmental territories), four have been injured, 2,248 people have been evacuated and almost 801,000 people affected.[162]

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[158] World Bank. Protecting and Expanding Opportunities for Vulnerable Groups in Guatemala, 2010, Accessible here: https://documents.worldbank.org/en/publication/documents-reports/documentdetail/418131468194998634/guatemala-protecting-and-expanding-opportunities-for-vulnerable-groups.
Reuters (4 May 2019), The poorest in Guatemala bear brunt of climate change, research says, By Anastasia Moloney, https://www.reuters.com/article/idUSKCN1SA023/

[159] World Food Programme, 'In Guatemala, Indigenous is ingenious when it comes to climate change' (8 August 2022) ReliefWeb https://reliefweb.int/report/guatemala/guatemala-indigenous-ingenious-when-it-comes-climate-change?gad_source=1&gclid=CjwKCAiA1fqrBhA1EiwAMU5m_6aglMOzWeSVKFplzjxWeUuLRh08pPNCezh4BXqxNISK6K071HCufRoC1R0QAvD_BwE.

[160] Jeremy P Haggar, 'Impact of Climate Change on coffee farming households in Central America and steps for adaptation in the future' in Proceedings of International Workshop on Modelling Agroforestry Systems, CATIE, Costa Rica, 2008 (2009), accessible at: https://www.academia.edu/5810834/Impact_of_Climate_Change_on_coffee_farming_households_in_Central_America_and_steps_for_adaptation_in_the_future
See also a more recent report on small coffee producing indigenous communities: Isaac Rigby, 'Global Health Equity, Indigenous Climate Justice in Rural Guatemala', Health Sciences/Ivey, Accessible at: https://ghe.uwo.ca/blog/posts/indigenous_climate_justice_in_rural_guatemala.html.

[161] See e.g., Kahn G, 'Meet the journalists defying a widening crackdown on press freedom in Guatemala' (25 May 2023) Reuters Institute https://reutersinstitute.politics.ox.ac.uk/news/meet-journalists-defying-widening-crackdown-press-freedom-guatemala accessed 17 December 2023.

[162] OCHA, 'Guatemala: Migrantes/Movilidad Humana - Informe de Situación No. 1 (al 25 de septiembre 2023)' (28 September 2023), https://reliefweb.int/report/guatemala/guatemala-migrantesmovilidad-humana-%20informe-de-situacion-no-1-al-25-de-septiembre-2023.

86.2. In September 2023, six people were reported dead and twelve missing (with six homes reportedly having been swept away by the swollen Naranjo River) as a result of heavy rains and consequent landslides.[163]

86.3. In June 14, 2022, fifteen people were reported dead, and half a million impacted by heavy rains.[164]

86.4. In November 2020, indigenous communities were hit with devastating consequences by Hurricanes Eta and Iota. Millions were affected in Central America, with at least 120 lives lost across the region and many more people missing and presumed dead. In Guatemala, the impacts on the Ixil village of Palop, for instance, were as follows: an overflowing river washed away houses and people, four bodies were recovered, two of them 20 kilometres downriver, while four people were still missing at the time of reporting. In another community, Xeucalvitz, a landslide affected 80 of 220 families, damaging homes and burying four people.

The communities felt forgotten: "*It's abandonment; it's irresponsibility; and it's a lack of interest in these communities," said María Chipel, a Maya K'iche member of the Tz'ununija' Indigenous Women's Movement.*"[165]

Similarly, Zoila Choc Coy, member of the indigenous Poqomchi Mayan community and member of the Semarac Cooperative in Alta Verapaz, was reported as "*still rebuilding her life one year on from the devastation caused by Hurricanes Eta and Iota.*"[166]

86.5. One particularly severe, impact of climate change is the role it has in pushing indigenous Guatemalans to migrate northwards, which entails a number of physical and mental health risks, and consequent human rights violations, for

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[163] Al Jazeera, 'Three dead, 15 missing in Guatemala landslides after heavy rain' (25 September 2023), https://www.aljazeera.com/news/2023/9/25/three-dead-15-missing-in-guatemala-landslides-after-heavy-rain. See also Al Jazeera, "Three dead, 15 missing in Guatemala landslides after heavy rain," September 25, 2023, https://www.aljazeera.com/news/2023/9/25/three-dead-15-missing-in-guatemala-landslides-after-heavy-rain.

[164] "Dead, 1 million affected by heavy rains in Guatemala," Phys.org, June 14, 2022, https://phys.org/news/2022-06-dead-million-impacted-heavy-guatemala.html.

[165] The New Humanitarian, 'The Ixil helping the Ixil': Indigenous people in Guatemala lead their own Hurricane Eta response: it's abandonment, it's irresponsibility; and it's a lack of interest in these communities. Guatemala's Indigenous Response to Hurricane Eta' (10 November 2020), https://www.thenewhumanitarian.org/news-feature/2020/11/10/guatemala-hurricane-eta-indigenous-response

[166] Trocaire, 'COP26 may be over. But in Guatemala indigenous people like Zoila still battle the impacts of climate change every single day: Zoila Choc Coy is still rebuilding her life one year on from the devastation caused by Hurricanes Eta and Iota. Indigenous communities in Guatemala are on the breadline, suffering devastating losses as a result of extreme weather events.' (19 November 2021), https://www.trocaire.org/news/people-like-zoila-still-battle-the-impacts-of-climate-change-every-single-day/.

affected communities.[167] Recent reporting (2022) notes that the number of unaccompanied minors migrating to the United States from Guatemala has risen in recent years, in part due to climate change's role in causing crop failures and environmental disasters.[168]

CCDA and UVOC's Experience; the Link between Adaptation and Indigenous Rights

87. CCDA and UVOC raise two primary concerns relating to land insecurity and the adaptive capacity of indigenous communities in Guatemala. These are tied to the issues of (i) displacement of indigenous communities from their ancestral lands and (ii) their criminalisation for defending their rights to land.

88. As has been extensively reported, although Guatemala has a large indigenous population, it suffers from a history of violence, dispossession, and human rights abuses against its indigenous peoples, rooted in its legacy of colonialism, its internal armed conflict, its ongoing agrarian conflict and the failure to make indigenous communal land rights effective at the domestic level. These concerns are extensively documented in official reports and have most recently been summarised by an independent delegation of international lawyers ('**IDIL**'), which was called on by CCDA and UVOC to carry out a fact-finding mission to Guatemala and to make recommendations to the Guatemalan state on redressing its violations of indigenous rights and international obligations.[169]

89. As is extensively discussed in the IDIL's report, indigenous communities suffer criminalisation for offences such as trespass to land, and displacement from their ancestral lands, consequent on a lack of legal certainty as regards their communal land rights. These issues are driven by exploitation and extractivism, which contribute, *inter alia*, to high methane emissions in the agricultural and energy sectors. In contrast, the practices of indigenous communities whom CCDA and UVOC represent are not highly emissive, contribute to natural systems of carbon storage and provide the best stewardship of land and natural resources.

[167] La Union – The Guardian, Nina Lakhani 'So many have gone': storms and drought drive Guatemalans to the US border: The climate crisis has made life in many villages more precarious, leading some to risk joining an exodus' (1 November 2021), https://www.theguardian.com/world/2021/nov/01/guatemala-storms-drought-climate-migrants.
[168] Revista (Harvard Review of Latin America), Marcy J, Tyson A, 'Broken Land, Climate Change and Migration in Guatemala' (26 May 2022). Accessible at: https://revista.drclas.harvard.edu/brokenland/.
[169] Independent Delegation of International Lawyers (2023) "We Are Not Trespassers: This Is Our Land" Agrarian Conflict and Indigenous Peoples' Rights in Alta Verapaz, Report by the Independent Delegation of International Lawyers to Guatemala, September 2023. Accessible at: https://peacebrigades.org.uk/news/idilguatelaunch.

90. UVOC highlights that the crises felt by the communities it supports have interlocking causes: weak or inexistent land rights, combined with extractivist and exploitative developments which are exacerbating the effects of climate change and consequent insecurity for indigenous peoples. These can be summarised as follows:

90.1. The extractivist model that mars Latin America has led to extensive land grabbing. In 2016, Oxfam reported that "*a third of land granted in concessions for mining, oil, agro-industrial or forestry exploitation in Latin America – and other regions of the world – belongs to indigenous peoples.*"[170] Consistently with this finding, the indigenous communities UVOC supports continue to face difficulties in gaining communal access, title or tenure to their ancestral lands in the context of a complex and corrupt domestic legal system, whereas private property rights are unlawfully awarded to landowners with business interests, perpetuating historical injustices and leading to land conflicts.

90.2. Violence and criminalization persist against indigenous peoples fighting to defend their lands and territories. Approximately 59% of human rights defenders killed in 2021 in the region worked on defending land, the environment and indigenous peoples' rights.[171]

90.3. UVOC's experience of violence and criminalisation is consistent with this finding, particularly in the high-risk areas of Alta and Baja Verapaz and Izabal. UVOC has felt, in particular, the consequences of violence and displacement caused by the expansion of oil palm monocultures and mining.[172]

90.4. UVOC further underlines that severe racial discrimination against indigenous peoples intensifies the consequences of land insecurity. UVOC experiences this first hand when supporting communities that are subjected to forced evictions, other forms of gratuitous violence and the criminalization of indigenous people defending their lands.

90.5. This systematic oppression of indigenous peoples is concerning to UVOC, in circumstances where indigenous groups occupy about 35% of Latin America's

[170] Oxfam [2016], 'Unearthed: Land, Power and Inequality in Latin America', November 2016. Accessible at: https://www-cdn.oxfam.org/s3fs-public/file_attachments/bp-land-power-inequality-latin-america-301116-en.pdf.

[171] Frontline Defenders [Year], 'Global Analysis 2021', Accessible at: https://www.frontlinedefenders.org/sites/default/files/2021_global_analysis_-_final_-_update_3_feb_2023.pdf

[172] For instance, UVOC points to the deteriorating resolve and mental health of members of the Chintún community, who are engaged in an ongoing dispute with the Santa Teresa hydroelectric company and Agropecuaria Shintún, S.A. At the behest of the companies, community representatives have been criminalised and held in inhumane pretrial detention conditions before being exonerated by the criminal court; they have also been forcibly evicted from their ancestral lands, notwithstanding that the companies' rights to the land remain unproved.

forests, with over 80% of their areas covered in forests,[173] and where it is accepted that indigenous peoples implement the most effective systems of sustainable governance of land.[174]

91. CCDA's experience is aligned with UVOC's and suggests that the issues set out above also fundamentally prevent indigenous communities from adapting to climate change, for the following (non-exhaustive) reasons:

91.1. Indigenous peoples are amongst the poorest in Guatemala, and there is extensive, structural inequality, which sees indigenous rights displaced by private corporate interests (particularly in the agribusiness sector).

91.2. Communities do not enjoy long-term, secure land rights. Communities cannot subsist on their traditional lands, according to their customs and traditions, and are instead at risk of eviction and criminalisation, living in a constant state of insecurity. As a result, indigenous communities do not have capacity to adapt. CCDA has worked extensively with communities left stranded by extreme weather events – such as the torrential rains experienced when hurricanes Eta and Iota hit the country (see above) – and with communities who are unable to adapt to excess heat and drought, which are increasingly causing extensive crop failures across the country.

91.3. On the other hand, indigenous communities are "collateral damage" to the steps taken by private interests to adapt to climate change and generate profits. Having been deprived of their right to live on their traditional lands, indigenous peoples are left with no choice but to work, often for very low wages, for private companies that are at the root of the agrarian conflict. Whereas the companies themselves adapt to climate change, converting land to uses that are more able to withstand the effects of climate change while generating profits, indigenous peoples are "collateral damage," made to move between whichever opportunities for employment allow them to provide for their families. This further decreases their capacity to take their own adaptation measures.

91.4. The consequence of criminalisation of indigenous communities and consequent displacement from land pushes many indigenous people with whom CCDA works to migrate. Furthermore, CCDA witnesses on a daily basis the devastating

[173] Food and Agriculture Organization, 'Forest food systems and their contribution to food security and nutrition: Defining priorities for the sustainable use of forest plants, fungi and insects in Latin America and the Caribbean', Held from 10 to 12 May 2023. Accessible here: https://www.fao.org/3/cc7214en/cc7214en.pdf.
[174] FAO, 'New report shows Indigenous and Tribal Peoples 'best guardians' of forests' (25/03/2021), https://www.fao.org/in-action/territorios-inteligentes/noticias/detalle/en/c/1392821/.

impacts that the combination of criminalisation, displacement and climate harm has on indigenous peoples – these range from severe mental and physical health issues, the loss of cultural rights that are founded upon indigenous communities' intimate connection to land and the intensification of the extreme poverty and inequality that mars Guatemala.

91.5. All of this threatens the existence of indigenous communities as such, given that their indigenous identities are inexorably tied to their ancestral lands, territories and the environments those comprise.

92. CCDA and UVOC's experiences are testament to the fact that Guatemala is not equipping its indigenous peoples with the tools they require to respond and adapt to the near-term climate impacts which are disproportionately caused by methane emissions. Guatemala's own environmental abuses, driven by a "*short-sighted economic growth [that] has incentivized the destruction of the Earth's resources… make the soil and land less resilient to the effects of climate change*."[175] Furthermore, the legacy of colonialism, which "*still affects land ownership and agricultural production today as smaller Indigenous farmers are often displaced by large agricultural businesses and extractive companies*,"[176] makes it incredibly difficult, if not impossible, for indigenous Guatemalans to build resilience and adapt to climate change, consistently with their own cultures and beliefs.

93. CCDA and UVOC believe there is an urgent and drastic need to support the issue of territorial rights for indigenous and local communities, acknowledging their role in mitigating climate change, protecting biodiversity and ensuring future resilience for people and ecosystems. Increasing the resilience and adaptive capacity of indigenous peoples and all those who depend upon the ecosystems they steward must be a key part of the global efforts to reverse deforestation and land degradation by 2030. Consequently, CCDA and UVOC urge the Court to adopt the recommendations set out below in order to address the issue of regularization and strengthening of the land rights of indigenous peoples. Analysing the rights to land and territories of indigenous people and other local communities, delving into the specificities of these rights, including procedures for access, demarcation, titling, registration, and other aspects that ensure legal security and social legitimacy, are necessary steps that all regional governments must take as a key measure to mitigate and adapt to climate change.

[175] Revista (Harvard Review of Latin America), Marcy J, Tyson A, 'Broken Land, Climate Change and Migration in Guatemala' (26 May 2022). Accessible at: https://revista.drclas.harvard.edu/brokenland/.
[176] Ibid.

94. Consequently, the following two points can be drawn from Guatemala's experience in relation to the mitigation of methane and near-term warming and to adaptation to near-term warming and associate climate impacts:

94.1. As discussed above (section II), mitigating methane emissions is likely the most effective way to reduce near-term warming in the next decade. Reducing near-term warming is necessary to prevent the avoidable increase in frequency and intensity of extreme weather events. Mitigating methane is therefore necessary to prevent avoidable further impacts on vulnerable communities such as Guatemala's indigenous communities. Further, empowering indigenous communities and respecting their rights to land[177] is likely one of the most effective measures which countries with large indigenous populations could take to mitigate climate change in general, and methane emissions in particular.

94.2. Adapting to climate change requires recognising and protecting indigenous rights, and particularly long-term rights to land. The issues addressed by the IDIL Report are therefore fundamentally relevant to Guatemalan indigenous communities' vulnerability (or resilience) to their changing climate and to the increase in frequency and intensity of extreme weather events. Without addressing these underlying structural issues, indigenous people will continue to suffer the worsening effects of climate change, with limited ability to adapt and self-determine their future.

[177] Importantly, this is an issue that should concern non-indigenous countries just as much as indigenous countries. As noted in Independent Delegation of International Lawyers (2023), *op cit*. para 66-73, one of the primary causes of human rights abuses in Guatemala appears to be the significant demand for products and commodities sold to European and American markets. Consequently, the Court is encouraged to ensure that its recommendations are cognisant of the globalist and capitalist context which drives inadequate responses to methane mitigation and abatement, and which creates profound inequality amongst states.

IV. Applicable Legal Principles

State obligations to protect human rights in response to climate change

95. In recent years, courts, tribunals and human rights bodies – including both the Inter-American Court of Human Rights, and the Inter-American Commission of Human Rights[178] – have recognised that climate change is a threat to fundamental human rights. These rights are varied, protected within the Inter-American system, and include the right to life,[179] health,[180] food,[181] water,[182] housing,[183] private and family life,[184] development,[185] culture[186] and the right to a clean and healthy environment.[187][188] The Court will be familiar with these developments, and as such this section will primarily focus on identifying certain State obligations that have particular relevance for methane mitigation and adaptation. Nonetheless, it is helpful to set out a short overview of relevant obligations drawn from different sources of international law.

96. As set out above, there is ample scientific evidence that climate change affects human rights and is a threat that is both actual and imminent – that is, it is already severely affecting the enjoyment of rights, and will continue to affect rights in the future.[189] These impacts are asymmetrical, in that they disproportionately affect vulnerable communities such as Indigenous Peoples in Brazil and Guatemala, Afro-descendant communities, and peasant farmers.[190]

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[178] Inter-American Court of Human Rights Advisory Opinion OC-23/17 (15 November 2017; Inter-American Commission of Human Rights (IACHR), Resolution 3/2021, Climate Emergency: Scope of Inter-American Human Rights Obligations (2021).
[179] American Convention on Human Rights, Article 4.
[180] Additional Protocol to the American Convention on Human Rights in the area of Economic, Social and Cultural Rights, Article 10 ("**Protocol of San Salvador**").
[181] Protocol of San Salvador, Article 12.
[182] The Human Right to Safe Drinking Water and Sanitation, AG/RES. 2760 (XLII-O/12).
[183] Charter of the Organisation of American States ("**OAS Charter**"), Article 34(k).
[184] American Convention on Human Rights, Article 11; Protocol of San Salvador, Article 15.
[185] American Convention on Human Rights, Article 26; Protocol of San Salvador, Article 14.
[186] Ibid.
[187] Protocol of San Salvador, Article 11.
[188] See generally: UN Human Rights Council, Res. A/HRC/RES/50/9 (July 14, 2022); UN General Assembly, The Human Right to a Clean, Healthy and Sustainable Environment, A/RES/76/300 (July 28, 2022); UN Human Rights Committee, *Billy et al. v. Australia*, Communication No. 3624/2019, Doc. No. CCPR/C/135/D/3624/2019 (Sept. 22, 2022); *Leghari v. Pakistan* (2015) W.P. No. 25501/201; *Urgenda Foundation v. The State of The Netherlands* [2019] ECLI:NL:HR:2019:2006; *Neubauer, et al. v. Germany, Bundesverfassungsgericht* [BVerfG] [Federal Constitutional Court], Mar. 24, 2021, Case No. BvR 2656/18/1, BvR 78/20/1, BvR 96/20/1, BvR 288/20; UN Committee on the Rights of the Child, *Sacchi v. Argentina*, Communication No. 107/2019, Doc. No. CRC/C/88/D/104/2019 (Oct. 8, 2021); Brussels Court of First Instance, *VZW Klimaatzaak v. Kingdom of Belgium & Others* (17 November 2021); Federal Supreme Court of Brazil, *PSB et al. v. Brazil (on Climate Fund*), ADPF 708, 1 July 2022.
[189] See generally: IPCC, *Global Warming of 1.5C: An IPCC Special Report on the Impacts of Global Warming of 1.5C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways 5* (2018) Accessed at: https://www.ipcc.ch/sr15/
[190] Request for Advisory Opinion on Climate Emergency and Human Rights to the Inter-American Court of Human Rights from the Republic of Colombia and the Republic of Chile (January 9, 2023), s IV(E)(3).

97. The potential sources of injury are varied, and include more frequent and severe extreme weather events, endangering lives, livelihoods, health, infrastructure, cultural practices and property; food and water security threats; inundation of coastal areas and small island states; disruption of ecosystems; and displacement and climate migration due to sea level rise and extreme weather events. These climate impacts directly threaten human rights. To choose a limited number of examples: a higher number of more severe extreme weather events threatens the right to life and health; changes in ecosystems and destruction of natural habitats erodes the right to a healthy environment; and complete inundation of small islands undermines nearly all the rights mentioned herein, including, in particular, rights to culture and self-determination.[191] The severity of these impacts is reflected in the Inter-American Commission on Human Rights recognising that climate change is "*one of the greatest threats to the full enjoyment and exercise of human rights of present and future generations*.".[192]

98. Accordingly, Courts have recognised that States have obligations both to mitigate and adapt to climate change. The Request sought explicit clarification on the mitigation obligations of States, in order to protect the rights to life, and ensure a clean environment in the context of climate change:[193]In a number of jurisdictions courts have held that States have an enforceable obligation to reduce greenhouse gas emissions in line with the Paris Agreement, in order to protect human rights.[194] These obligations have been based in human rights law, constitutional law, international law, and by reference to the provisions of the UNFCCC. States have held that greenhouse gas mitigation policies should reflect a State's fair share of mitigation required, consistent with the principle of common but differentiated responsibilities, which is addressed further below in the context of methane emissions.[195]

99. The Request also raises a number of climate justice-focused questions exploring the extent of State adaptation obligations.[196] These questions relate to the protection of

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[191] See *Daniel Billy et al. v Australia* [2022] CCPR/C/135/D/3624/2019.
[192] Inter-American Commission of Human Rights, Resolution 3/2021, *Climate Emergency: Scope of Inter-American Human Rights Obligations* {2021] at [8].
[193] Request for Advisory Opinion on Climate Emergency and Human Rights to the Inter-American Court of Human Rights from the Republic of Colombia and the Republic of Chile (January 9, 2023), s IV(A)-(B).
[194] See *Urgenda Foundation v. The State of The Netherlands* [2019] ECLI:NL:HR:2019:2006; *PSB et al. v. Brazil (on Climate Fund*), ADPF 708, 1 July 2022.; *Neubauer, et al. v. Germany, Bundesverfassungsgericht* [BVerfG] [Federal Constitutional Court], Mar. 24, 2021, Case No. BvR 2656/18/1, BvR 78/20/1, BvR 96/20/1, BvR 288/20, and further see note [182] above.
[195] Ibid. See also *Future Generations v. Ministry of the Environment and Others, Corte Suprema de Justicia [C.S.J.]* abril 5, 2018, M.P: L. Villabona, Expediente : 11001-22-03-000-2018-00319-01.
[196] See Request for Advisory Opinion on Climate Emergency and Human Rights to the Inter-American Court of Human Rights from the Republic of Colombia and the Republic of Chile (January 9, 2023), s IV(A)(2); IV(B)(1)(ii)-(iii); (IV)(C)(1).

vulnerable groups and communities, such as children and Indigenous communities, from the impacts of climate change. It is established in international human rights law that States must take reasonable measures to protect human rights in the face of foreseeable environmental risks and natural hazards.[197]As such, States must anticipate and respond to the impacts of climate change, particularly those which threaten human rights. Accurate climate science is critical to this process and should include adequate information relating to the climate impacts of methane emissions.

100. While there is relatively limited judicial engagement with adaptation obligations compared with mitigation obligations, Courts have generally been favourable to finding that governments have an obligation to assume adaptation measures in order to protect fundamental rights.[198] The UNHRC decision in *Billy et al. v Australia* is the strongest articulation yet setting out State adaptation obligations under human rights law, concluding that Australia had failed to "*discharge its positive obligation to implement adequate adaptation measures*". As a result, the Committee concluded that there were State adaptation obligations to "*provide adequate compensation, to the authors for the harm they have suffered*", and to "*take steps to prevent similar violations in the future*".[199] As the pace of climate change increases, more cases in this vein will be filed, and as such it is important that the Court adopts an authoritative position recognising that States have obligations to implement adaptation measures.

101. Underpinning these mitigation and adaptation obligations are a range of principles of international law which collectively form the basis for all State obligations in the context of climate change. States parties to the UNFCCC have agreed to preserve the climate system "*for the benefit of present and future generations*", and to "*prevent dangerous anthropogenic interference with the climate system*" by limiting warming to well below 2°C or 1.5°C above pre-industrial levels.[200] States therefore have committed to mitigation, adaptation, information collection and disclosure, and international cooperation. The latter commitment is consistent with the duty to cooperate when implementing international agreements and addressing international problems.[201] This duty applies

[197] IACtHR Advisory Opinion OC-23/17; see also the jurisprudence from the ECtHR: *Öneryildiz v. Turkey, ECtHR* (2004) at [1] – a case which related to a methane explosion at a landfill site; *Budayeva and Others v. Russia, App. Nos. 15339/02, 21155/02, 20058/02, 11673/02 and 1543/02,* ECtHR (March 20, 2008); *Kolyadenko and Others v. Russia,* ECtHR (Judgment, February 28, 2012).
[198] See *Leghari v. Pakistan* (2015) W.P. No. 25501/201; *Future Generations v. Ministry of the Environment and Others, Corte Suprema de Justicia [C.S.J.]* abril 5, 2018, M.P: L. Villabona, Expediente : 11001-22-03-000-2018-00319-01.
[199] *Future Generations v. Ministry of the Environment and Others* at [11].
[200] UN Framework Convention on Climate Change, Article 2.
[201] Rio Declaration, Principle 5; IACtHR Advisory Opinion OC-23/17 at [B.3]; Paris Agreement, Article 6.

both to treaties and non-treaty agreements such as the Global Methane Pledge, which has a high number of signatories from States within the jurisdiction of the Court. It is also connected to the principle of common but differentiated capabilities ("**CBDR**"), explored below, and the related concept that States should take responsibility for their "fair share" of emissions reduction and climate finance.[202]

102. States also have obligations under the duty to prevent transboundary harm and the "no harm rule." These principles hold that States must undertake due diligence to ensure that activities carried out within their jurisdiction do not harm the environment or the territory of other states – including by way of greenhouse gas emissions.[203] The precautionary principle is considered below, and holds that States should adopt a precautionary approach when there is scientific uncertainty, which is particularly relevant in the context of methane emissions.[204] The principle of equity under international law holds that decisionmakers should account for considerations of justice and fairness on the operation of the rule of law, which is closely connected to CBDR.[205] A final relevant principle is the principle of intergenerational equity and the rights of future generations, which holds that there should be equity between generations in shouldering the burden for climate change.[206] Closer consideration of selected principles that are particularly relevant to methane mitigation is briefly provided below.

Precautionary principle

103. The precautionary principle is a cornerstone of international environmental law and is directly relevant to assessing State obligations in the context of climate change. The Rio Declaration sets out that:

> *In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*[207]

104. The United Nations Framework Convention on Climate Change incorporates the precautionary principle in Article 3(3), requiring States to "*take precautionary measures to*

[202]UN Framework Convention on Climate Change, Article 3(1); Paris Agreement, Article 4; Stockholm Declaration of the UN Conference on the Human Environment (1972); Rio Declaration, Principle 15.
[203] Rio Declaration Principles 12 and 19; IACtHR Advisory Opinion OC-23/17 at s [C].
[204] UN Framework Convention on Climate Change, Article 3; Rio Declaration, Principle 15; IACtHR Advisory Opinion OC-23/17 at s [B.2].
[205] Paris Agreement, Article 2(2).
[206] IACtHR Advisory Opinion OC-23/17 at [59]; Paris Agreement, preamble; Stockholm Declaration Principle 1; Rio Declaration Principle 3.
[207] Rio Declaration on Environment and Development, United Nations Conference on Environment and Development, Rio de Janeiro, June 3 to 14 1992, UN Doc. A/CONF.151/26/Rev.1 (Vol. 1), Principle 15.

anticipate, prevent or minimise the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postposing such measures…" The principle has been recognised by this Court in the Advisory Opinion OC-23/17 on the environment and human rights, with the Court noting that:

> *States must act in keeping with the precautionary principle in order to protect the rights to life and to personal integrity in cases where there are plausible indications that an activity could result in severe and irreversible damage to the environment, even in the absence of scientific certainty … they must take "effective" measures to prevent severe or irreversible damage.*[208]

105. It is clear that States are required to adopt a precautionary approach in the context of scientific uncertainty. In addressing the challenge of climate change, this requires States to take actions to reduce greenhouse gas emissions to prevent or minimise prospective harms from climate change, even in the face of uncertainty around the scope, nature and timing of that harm.

106. As set out above in Section II, there is a significant risk that near-term warming will lead to self-reinforcing feedbacks, which will accelerate rising temperatures and trigger a cascade of irreversible tipping points. It is well established that the consequences of crossing these tipping points would be catastrophic, and certainly entail "*severe and irreversible damage to the environment*"[209] and climate.

107. While there is significant scientific uncertainty relating to when and how we may cross climate tipping points, recent scientific work has suggested that the rate, as opposed to the level, of warming controls the likelihood of extreme weather events (see Section II above). As we set out above, this means that the probability of extreme weather events occurring increases with the speed of global warming.[210] Consequently, the speed at which methane mitigation is implemented is vitally important.[211] As such, the Court is respectfully invited to advise that a precautionary approach requires States to rapidly abate methane emissions as an important measure to prevent and reduce the likelihood

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[208] Inter-American Court of Human Rights Advisory Opinion OC-23/17 (15 November 2017) at para [180].
[209] Inter-American Court of Human Rights Advisory Opinion OC-23/17 (15 November 2017) at para [180].
[210] E. M. Fischer, S. Sippel, R. Knutti, Increasing probability of record-shattering climate extremes. Nat. Clim. Chang.11, 689–695 (2021). *See also*: S. B. Power, F. P. D. Delage, Setting and smashing extreme temperature records over the coming century. Nat. Clim. Chang.9, 529–534 (2019).
[211] See e.g., from Ocko et al. 2021 https://iopscience.iop.org/article/10.1088/1748-9326/abf9c8. How fast we implement methane mitigation matters: "*On the other hand, slow implementation of these measures may result in an additional tenth of a degree of global-mean warming by midcentury and 5% faster warming rate (relative to fast action), and waiting to pursue these measures until midcentury may result in an additional two tenths of a degree centigrade by midcentury and 15% faster warming rate (relative to fast action)*".

of extreme weather events, as well as the likelihood that tipping points are reached and feedbacks occur.

108. Nuestro Futuro further notes that the principle of intergenerational equity supports this understanding of the precautionary principle in the context of methane abatement. In circumstances where future risks are uncertain, but potentially devastating, the principle of intergenerational equity similarly requires heightened efforts to abate methane and prevent such possible consequences.[212] As noted above at paragraph 27, the seesaw characteristic that plays out in the interaction between near-term emissions reductions and the timing of net zero GHG emissions means that rapid methane abatement is not only required by the precautionary principle but also necessary to ensure intergenerational equity.

Common but differentiated responsibility and fair shares

109. Consideration of the principle of common but differentiated responsibilities ("**CBDR**") is important for assessing the mitigation obligations of States in relation to climate change in general, and methane emissions in particular. The principle, as set out in the Rio Declaration, requires that State obligations in relation to climate change should be construed by reference to a State's specific contribution to climate change, as well as a States' capacity to respond to the problem: "*In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities.*"[213] In practice, this requires countries that have contributed more to climate change to take the lead in combating climate change and its impacts.

110. Importantly, CBDR forms the basis of the concept that States should pursue emissions reductions which reflect their "fair share" of responsibility.[214] This is generally assessed by reference to a State's cumulative emissions, calculated on a territorial or per capita

[212] Nuestro Futuro points the court to the following sources which are amongst those that recognise the principle of intergenerational equity: the Inter-American Commission on Human Rights (IACHR)'s reference to the principle of intergenerational equity in Resolution 3/2021 "Climate Emergency: Scope and Inter-American Human Rights Obligations;" Principle 3 of the Rio Declaration on Environment and Development; Article 3 of the United Nations Framework Convention on Climate Change; Article 3 of the Escazú Agreement, the Paris Agreement itself, and, at the domestic level in Mexico, *Controversia Constitucional* 212/20218 of the First Chamber of the Supreme Court, pp. 103-104.

[213] Rio Declaration on Environment and Development, United Nations Conference on Environment and Development, Rio de Janeiro, June 3 to 14 1992, UN Doc. A/CONF.151/26/Rev.1 (Vol. 1), Principle 7. See also United Nations Framework Convention on Climate Change, Article 3(1), which adds the wording "respective capabilities" to the principle; Paris Agreement to the United Nations Convention on Climate Change, A/RES/48/189, Article 4.

[214] See Lavanya Rajamani et al., "National 'fair shares' in reducing greenhouse gas emissions within the principled framework of international environmental law" (2021) 21(8) *Climate Policy* 983; Jason Hickel, "Quantifying National Responsibility for Climate Breakdown: An Equality-Based Attribution Approach for Carbon Dioxide Emissions in Excess of the Planetary Boundary" (2020) 4(9) *Lancet Planetary Health* E399.

basis.[215] However, while cumulative emissions provide an important basis for determining State responsibility, they are not the only reference point. Fair share obligations, drawing on notions of equity and climate justice, may also consider whether a State has greater responsibility in relation to recent and future emissions due to factors such as: i) the foreseeability of harm from newer emissions; ii) the ability of States to control current and future emissions, and iii) the fact that more recent emissions may cause greater damage as they are less likely to be absorbed by ocean and terrestrial systems,[216] rapidly increasing the risk of crossing critical thresholds and tipping points.

111. In this sense, the significantly elevated warming potential of methane, detailed above in Section II, increases responsibility for those States who continue to emit the gas unbated. Under a fair share analysis, there is clearly foreseeable harm as a result of newer emissions in the form of increased risk of crossing thresholds and tipping points. Similarly, the absorption capacity of methane is limited compared with CO_2, as methane does not dissolve as readily in water and is not taken up by biological systems in the same way.[217] States also largely have the capacity to control anthropogenic methane emissions. As such, given the established scientific understanding surrounding the climate impacts of methane emissions, we invite the Court to recognise that the States that continue to emit methane unabated should have greater fair share obligations.[218]

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[215] While the methodologies for establishing cumulative emissions are well established, new methods which take into account the history of colonialism in calculating cumulative emissions have recently been developed. Unsurprisingly, these show that former colonial powers in Western Europe have a larger share of cumulative emissions, and therefore a greater responsibility to address climate change. See Carbon Brief, "Revealed: How colonial rule radically shifts historical responsibility for climate change" (2023) access at: https://www.carbonbrief.org/revealed-how-colonial-rule-radically-shifts-historical-responsibility-for-climate-change/

[216] "Sink saturation" occurs in both terrestrial and ocean systems, and refers to the decreasing ability to absorb greenhouse gases. In the ocean context, as the concentration of CO2 in the atmosphere increases, the ability of the ocean to take up CO2 decreases as the ocean reaches buffer capacity. Similarly, land use changes such as deforestation reduce the sequestration capacity of terrestrial systems. This leaves more CO2 in the atmosphere, further exacerbating climate change: Müller, J. D., Gruber, N., Carter, B., Feely, R., Ishii, M., Lange, N., et al. "Decadal trends in the oceanic storage of anthropogenic carbon from 1994 to 2014" (2023) *AGU Advances* 4. Accessed at: https://doi.org/10.1029/2023AV000875.

[217] Methane is a hydrophobic molecule, and therefore has a naturally lower solubility in water than CO2. This means that methane cannot be absorbed into aquatic systems and used by aquatic organisms in the same way, and is not involved in the chemical and biological processes that facilitate the sequestration of CO2: Kathleen A. Mar, Charlotte Unger, Ludmila Walderdorff, Tim Butler (2022) "Beyond CO2 equivalence: the impacts of methane on climate, ecosystems, and health" 134 Environmental Science & Policy, pp 127-136.

[218] This appears to be accepted in some policy arenas – for instance, the European Scientific Advisory Board on Climate Change advised, in June 2023, that the determination of a fair share target for the EU must include rapid reductions in methane emissions, given the EU's ability to implement such measures and limited ability to remove carbon: "*The EU's main non-CO2 emissions come from methane and nitrous oxide, which in 2019 accounted for 11% and 6.2% of EU emissions, respectively. In the filtered scenarios, non-CO2 emissions represent between 41% and 90% of residual gross emissions in 2050, and hence require to be compensated by carbon removals, in particular from the land sector, in order to reach net zero emissions (Rogelj, J., et al., 2021). However, the capacity of the EU to remove carbon is limited, and hence a*

Rights of indigenous peoples

112. The Request for an Advisory Opinion submitted by Chile and Colombia asks the Court to consider what "*specific considerations should be taken into account to guarantee the right to defend a healthy environment and the territory based on intersectional factors and differentiated impacts, inter alia, of indigenous peoples…*"[219] The first vitally important consideration is the disproportionate suffering experienced by Indigenous Peoples as a result of States' inaction in the face of the climate crisis. This reality has been recognised regionally and under international law.

113. This Court in its Advisory Opinion OC-23/17 recognised that Indigenous Peoples are "*especially vulnerable to environmental damage*".[220] The UN General Assembly has made similar observations, noting that "*the adverse effects of climate change are felt most acutely by those segments of the population that are already in vulnerable situations owing to factors such as geography, poverty, gender, age, indigenous or minority status, national or social origin, birth or other status and disability.*"[221] The UN Special Rapporteur on the Rights of Indigenous Peoples regards Indigenous Peoples as being "*among those who have contributed least to the problem of climate change, yet they are the ones suffering from its worst impacts.*"[222] This acute vulnerability to climate change stems from Indigenous Peoples depending on ecosystems that are particularly sensitive to the effects of climate change.

114. The Special Rapporteur notes that this condition is exacerbated by the fact that Indigenous Peoples "*are heavily dependent on lands and natural resources for their basic needs and livelihoods, such as food, medicine, shelter and fuel, and they are among the poorest and most marginalized people in the world.*"[223] Globally, indigenous communities are facing the risk of forced displacement due to sea level rise, food and water insecurity, and other climate impacts. This adversely affects Indigenous Peoples' rights to culture, self-determination, and territorial integrity protected under the American Declaration on the Rights of

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rapid reduction of nonCO2 emissions, in particular from the agriculture sector, is critical to limit the reliance on carbon capture technologies (Soergel et al., 2021)."
Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050, June 2023, accessible here: https://climate-advisory-board.europa.eu/reports-and-publications/scientific-advice-for-the-determination-of-an-eu-wide-2040/scientific-advice-for-the-determination-of-an-eu-wide-2040-climate-target-and-a-greenhouse-gas-budget-for-2030-2050.pdf/@@display-file/file

[219] Request for Advisory Opinion on Climate Emergency and Human Rights to the Inter-American Court of Human Rights from the Republic of Colombia and the Republic of Chile (January 9, 2023), s IV(E)(3).

[220] IACtHR Advisory Opinion OC023/17, 15 November 2017, at [67].

[221] UN General Assembly Resolution 41/21, Human Rights and Climate Change, 23 July 2019, A/HRC/RES/41/21, p. 2.

[222] Human Rights Council, "Report of the Special Rapporteur on the rights of Indigenous Peoples", 1 November 2017, A/HRC/36/46, at [6].

[223] Human Rights Council, "Report of the Special Rapporteur on the rights of Indigenous Peoples", 1 November 2017, A/HRC/36/46, at [7].

Indigenous Peoples ("**ADRIP"**), under other international treaties, prime amongst them the Indigenous and Tribal Peoples Convention 1989 ('**ILO 169**'), as well as the rights to life and health held by all people.[224]

115. In order to address the profound issues faced by Indigenous communities in Guatemala, Brazil and across Latin America, as a result of increased climate impacts, a comprehensive range of measures is required, with the primary intervention being the recognition of land rights.

116. International human rights law recognises that Indigenous communities have rights to natural resources, land, and communal property. These rights fundamentally stem from the right to self-determination recognised in Article 3 of UNDRIP, the exercise of which is "*indispensable for indigenous peoples' enjoyment of all their other rights, including, importantly, land rights … and political participation*."[225] These land rights are also set out in applicable regional legal instruments, such as Article 21 of the American Convention on Human Rights, which recognises the right to private property, and Articles VI, XIX, XXV, XXVI(2), XXIX(4), XXX(4) and (5) of ADRIP, as well as Part II of ILO 169. These provisions recognise and seek to protect the close relationship between Indigenous Peoples and their lands. Indeed, "*for indigenous communities, relations to the land are not merely a matter of possession and production but a material and spiritual element which they must fully enjoy, even to preserve their cultural legacy and transmit it to future generations*".[226]

117. Because of the unique relationship that Indigenous Peoples maintain with their land, this Court and the Inter-American Commission on Human Rights ("**IACHR"**) have interpreted Article 21 of the ACHR in conjunction with the right of Indigenous Peoples to have their ancestral territories protected as part of Indigenous Peoples' cultural identity, the protection of which is a human right recognised in several international human rights instruments. This Court in *Comunidad Mayagna (Sumo) Awas Tingni v Nicaragua* set out that "*Indigenous groups, by the fact of their very existence, have the right to live freely in their own territory; the close ties of indigenous people with the land must be recognized and understood as the fundamental basis of their cultures, their spiritual life, their integrity, and their economic survival*."[227]

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[224] See American Declaration on the Rights of Indigenous Peoples (2016), Articles III, IV, VI, and XIII.
[225] Human Rights Committee, "Efforts to implement the United Nations Declaration on the Rights of Indigenous Peoples", 4 August 2021, A/HRC/48/75, at [14].
[226] *Mayagna Awas Tingni Community v Nicaragua*, Judgment, 31 August 2001, at [p149]
[227] Ibid.

118. More recently, the Human Rights Committee in the Torres Strait Islands case recognised "*the inalienable right of Indigenous Peoples to enjoy the territories and natural resources that they have traditionally used for their subsistence and cultural identity*."[228] In noting that the health of their land and the surrounding seas are closely linked to the cultural identity of the Torres Islanders, the Human Rights Committee found that Australia's failure to take measures to fight the adverse impact of the climate crisis on the Torres Islanders breached Article 27 of the ICCPR because the climate crisis eroded the traditional lands and natural resources that Torres Islanders used for traditional fishing and farming, as well as for cultural ceremonies that can only be performed on the islands.[229]

Access to information and public participation

119. The issues of access to information, public participation, and the related matters of access to justice and government procedure are raised in the Request in questions IV(A)(2.A) and IV(B)(1)(iv). The questions relating to government procedure include reference to state obligations related to regulation, monitoring, social and environmental impact assessment and contingency planning. These issues are of fundamental importance for ensuring accountability and public participation in environmental and climate change-related decision making. Organisations such as CEMDA rely on State adherence to existing obligations, such as those under the Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean ("**Escazú Agreement"**).

120. The Escazú Agreement requires that signatories "*shall ensure the public's right of access to environmental information in its possession … in accordance with the principle of maximum disclosure*."[230] This is accompanied by a particular obligation to "*facilitate access to environmental information for persons or groups in vulnerable situations,*" which is particularly relevant to climate vulnerable and historically marginalised communities such as Indigenous Peoples. Article 6 of the Agreement requires States to ensure that relevant authorities "*generate, collect, publicise, and disseminate environmental information relevant to their functions in a systematic, proactive, timely, regular, accessible and comprehensible manner.*" As set out above in Section III (Mexico case study), this is a matter of particular importance to environmental and climate organisations, and the Court is respectfully encouraged to issue strong guidance on these principles.

[228] Human Rights Committee, 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, at [8.13].
[229] Ibid, at [8.14].
[230] Escazú Agreement, Article 5.

121. In all of these areas, fair opportunity for public comment and feedback should be encouraged as a key part of ensuring effective decision-making and environmental and climate policy design. This Court has previously recognised the importance of public participation in the context of environmental matters, noting that it is a process which serves to integrate public concerns into decision-making, but also public knowledge – such as citizen science, or Indigenous knowledge.[231] More pragmatically, it also allows States to "*respond promptly to public concerns and demands, build consensus, and secure increased acceptance of and compliance with environmental decisions.*"[232]

122. In the connected domain of access to justice, this Court has previously recognised that "*States have the obligation to guarantee access to justice in relation to State environmental protection obligations.*"[233] This involves having the ability to contest any provision, decision, act or omission of public authorities that violates or could violate obligations under environmental law.[234] This functionally requires that communities and other plaintiffs have the capacity to use public law judicial mechanisms to challenge decisions relating to environmental and climate policy. The public should have both formal and substantive access to appropriate procedures of statutory and judicial review, particularly in circumstances where a State fails to comply with its international commitments and domestic laws, regulations and judgments relating to methane abatement. Systematic failures to adhere to relevant domestic and international laws should provide a ready and cost-effective ground for the judiciary to review the State's compliance with the rights enshrined within the American Convention and associated jurisprudence. This ultimately ensures greater access to justice and allows States to discharge their obligations under human rights law.

[231] IACtHR Advisory Opinion OC023/17, 15 November 2017, at [228].
[232] Ibid.
[233] IACtHR Advisory Opinion OC023/17, 15 November 2017, at [237].
[234] Ibid.

V. Conclusion and Recommendations

123. This section builds on the sections above and draws out a set of simple, distinct recommendations that the signatories to this *amicus curiae* ask the Court make its own as part of its recommendations to state parties, as measures that States could adopt to comply with the obligations discussed in Section IV. Reliance is placed on the Mexico and Brazil case studies to draw out recommendations focused on the mitigation of methane emissions. Reliance is placed on the Guatemala case study to draw out recommendations focusing on mitigation of methane emissions *and* adaptation to the consequence of near-term warming largely caused by methane emissions.

124. All recommendations made are non-exhaustive examples of measures that the Court may wish to urge states to adopt to ensure that they comply with their legal obligations under the American Convention, which are discussed above in Section IV.

125. First, in relation to mitigation of methane emissions, and in line with the precautionary principle and CBDR, states with methane emissions in the fossil fuel sector should regulate the oil and gas sector effectively, such that oil and gas operators are required to take action to reduce CH_4 emissions as a precondition to operating in the energy sector (supporting such actions, where necessary, via the provision of public funds, incentives and expertise).[235] Doing so is necessary to protect communities neighbouring oil and gas facilities from the immediate health impacts associated to methane emissions, as well as to protect against the likelihood of systemic violations of the public's right to a healthy environment caused by the accelerated pace of and increase in near-term warming. States must ensure that legal and regulatory measures geared towards methane abatement in the energy sector are implemented and enforced.

126. Further, CEMDA suggests, on the basis of its joint study with Carto Crítica, cited above at paragraph 34, that states should review environmental and health regulations for the oil and gas sector from a human rights perspective. Any such review should ensure that

[235] Example measures are provided by the signatories of this amicus via their work with OBMEM. These include:
- Installation of compression equipment at oil and gas platforms and associated pipelines.
- Installation of nitrogen removal units at oil and gas fields.
- Recovery of associated gas at onshore and offshore facilities.
- Detection and repair of methane leaks at onshore and offshore facilities.
- Changing wet seals for dry seals in compressors in complex gas processors, offshore platforms and in compression stations.
- Conversion of pneumatic devices from gas to air in complex gas processors, offshore platforms and in onshore installations.
- Installation of vapor recovery units in storage tanks.

See: https://www.obmem.mx/mx-ch4.

entities operating within the oil and gas sector are bound to take sufficient preventative actions to mitigate the health and human rights impacts of methane and associated emissions.

127. Second, states should ensure that proper access to information, and proper access to statutory and judicial review mechanisms are readily available to the public. As noted above, enforcement of laws and regulations geared towards methane abatement is necessary to ensure their effectiveness. Access to information and to justice ensures that civil society can play its role in guaranteeing such enforcement and, consequently, in ensuring state compliance with other fundamental rights engaged by the climate crisis.

128. States should adopt and comply with the Escazú Agreement.[236] CEMDA further submits that, in the context of a climate emergency, environmental information should be treated as an asset that must be protected at the highest possible level and suggests that:

128.1. It is *not* appropriate that organisations like CEMDA are required, as discussed above at paragraph 65 to undertake lengthy and expensive litigation before the courts in order to access information that should have been available to them via quick and low-cost administrative processes. In the Mexican context (but potentially more widely), CEMDA considers that access to environmental public information must be guaranteed under the same heightened standards as access to information which concerns human rights violations and corruption.

128.2. Environmental information to which public access should be guaranteed as urged by CEMDA should cover a wide range of information, in order to allow proper public participation and civic involvement in decision-making around planning and development that is carbon-intensive.[237] States should ensure access to accurate information about methane emissions is provided for.

[236] Escazú Agreement, https://www.cepal.org/en/escazuagreement/text, accessed 17 December 2023.

[237] For instance, this range of information should include, at a minimum,

- greenhouse gas emissions inventories, accounting for all territorial emissions on the basis of observational methods (as noted above, shifting to observational methods for emissions data gathering and disclosure is necessary to ensure against underestimation);
- disclosure of emissions as part of environmental impact assessment processes (in the context of fossil fuel production, disclosure should account for Scope 1, 2 and 3 emissions);
- detailed information relating to States' mitigation measures and progress towards agreed targets. This would ideally be linked with reporting under the UNFCCC framework;
- in relation to adaptation, States should develop assessments of their vulnerability and exposure to climate impacts. These assessments should involve and empower affected communities, in order to facilitate participation in developing adaptation plans which best reflect their interests and address issues connected to loss and damage. Similarly, States should monitor and report on their progress in adaptation planning, and publicly report all information collected in an accessible way.

128.3. The public should have access to appropriate procedures of statutory and judicial review in circumstances where a state fails to comply with its international commitments and domestic laws, regulations and court judgments relating to methane abatement. Systematic failures to comply with such domestic and international laws should provide a ready ground for the judiciary to review the state's compliance with the rights enshrined within the American Convention and associated jurisprudence, prime amongst them the right to a healthy environment.

129. Third, states must guarantee and protect Indigenous rights, and enhance the capacity of Indigenous and vulnerable communities to self-govern their lands. These measures are necessary to ensure maximum mitigation of land-use-related methame emissions and to ensure indigenous peoples are able to adapt to the likely significant increases in near-term warming, destabilising climate impacts and changing weather patterns should methane emissions remain unabated in coming decades. This is particularly crucial for highly climate-vulnerable countries like Brazil and Guatemala.

130. In the Brazilian context, the Court is invited to consider the following recommendations to address the infringement of Indigenous rights in Indigenous Territories, recognising that addressing such infringements is one amongst the most effective measures to abate agricultural methane emissions:

130.1. Increase support to *Fundação Nacional do Índio* (Brazil's National Indian Foundation), the federal agency responsible for protecting indigenous rights. This can include the creation of new Indigenous Territories, increased funding to hire new staff, and ensuring the involvement of indigenous communities in decision-making processes and supporting their efforts to protect their lands.[238]

130.2. Recommend that the Brazilian federal government repeal laws and policies that have facilitated environmental degradation. This would reverse the weakening of local governance and reduce further deforestation led by cattle ranching, land grabbing and illegal mining.[239]

130.3. Strengthen enforcement institutions, such as IBAMA, that operate in Indigenous Territories, with a particular focus on territories that have seen increases in deforestation rates.[240]

[238] Celso Silva-Junior et al., "Brazilian Amazon indigenous territories under deforestation pressure" (2023) *Science Reporter* 13(5851) p 1, accessed at: https://www.nature.com/articles/s41598-023-32746-7#citeas, p 5.
[239] Ibid.
[240] Ibid.

130.4. Require a buffer zone of 10km between Indigenous Territories and extractive activities, such as mining exploration areas or environmentally harmful development projects.[241]

130.5. Encourage the Brazilian government to support initiatives that promote legal agriculture, forestry, and other sustainable land-use practices, including ecosystem restoration projects, to reduce the pressure of deforestation on Indigenous Territories.[242]

130.6. Enhance remote sensing monitoring and increase investments in developing new systems with improvements in frequency and scale of activities. Forest degradation and non-forest native vegetation should also be monitored.

131. In the Guatemalan context, the Court is respectfully asked to endorse and adopt as its own the IDIL's recommendations to the Guatemalan state, as a recognition that recognising indigenous rights to land is a fundamental precondition to mitigating methane emissions and to ensuring that indigenous peoples can adapt to the consequences of near-term warming induced by methane emissions. These recommendations include (but are not limited to)[243] recommendations that the Guatemalan state:

131.1. Recognise the intimate link between Indigenous peoples and their ancestral lands, territories and resources, and the need to enshrine their communal land rights, so that they can effectively exercise their collective rights to land ownership and tenure.

131.2. Cease the use of criminal law to stifle peaceful Indigenous resistance. Create an agrarian conflict-resolution mechanism to be prioritised over the use of the criminal justice system to resolve land disputes, which: acts to prevent, negotiate and resolve conflicts and ensure access to intercultural justice; involves all relevant state institutions, and provides legal aid for Indigenous peoples to access that mechanism with the assistance of their own lawyers and experts.

131.3. Develop remedial mechanisms for Indigenous peoples whose ancestral land rights have been violated; who have been forcibly displaced, or whose land has

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[241] Fellows, M., Alencar, A., Bandeira, M., Castro, I. & Guyot, C. *Amazônia em Chamas - desmatamento e fogo em terras indígenas: nota técnica nº 6*. (2021).

[242] Celso Silva-Junior et al., "Brazilian Amazon indigenous territories under deforestation pressure" (2023) *Science Reporter* 13(5851) p 1, accessed at: https://www.nature.com/articles/s41598-023-32746-7#citeas, p 5.

[243] The recommendations are set out fully at Independent Delegation of International Lawyers (2023), *op cit*. para 158.

been damaged by development projects, including restitution of their lands, compensation and other forms of comprehensive reparation.

131.4. Provide resources to FONTIERRAS[244] so that vacant land is returned to Indigenous communities at no cost, and to increase the amount of arable farmland that is available for Indigenous communities to buy.

131.5. Monitor and punish fraudulent land transactions and curb land grabbing.

131.6. Cease to issue licenses for activities that affect Indigenous peoples without their consultation and consent.

131.7. Cease forced evictions until it can be ensured that all evictions are in line with international human rights standards.

131.8. Strengthen protection mechanisms and assistance programmes for Indigenous human rights defenders who are at risk, adapted to their specific needs and ways of life.

131.9. Create special protocols for the care of women and children who are victims of agrarian conflict and/or human rights violations by agricultural and extractive industries.

131.10. Draw up and implement environmental legislation that will respect the rights of Indigenous peoples over their lands, territories and natural resources, including as regards action against climate change.

131.11. Ensure that the private sector, as part of its due diligence and contractual obligations, fully respects the rights of Indigenous peoples, in accordance with international norms, conventions and standards. Importantly, the IDIL also recommended "that the UK and European Union ensure that their own supply chain laws are strong enough and require sufficient transparency to counter the possibility of MNCs profiting from human rights abuses."[245]

132. Overall, and on the issue of indigenous rights more generally, any state within whose territory live indigenous communities should dedicate sufficient resources to ensuring that indigenous rights are protected such that communities are empowered to manage land in a climate-responsible manner, as well as to adapt to the increasingly intensifying impacts of climate change. Recognising, respecting and protecting indigenous land rights is the first step in ensuring that indigenous communities are resilient to the impacts of climate change.

[244] The Land Fund (Fondo de Tierras, "FONTIERRAS" by its Spanish acronym): https://www.fontierras.gob.gt/.
[245] Independent Delegation of International Lawyers (2023), *op cit*. para 159.

133. The profound insecurity that indigenous communities often face in practice as regards land tenure and the lawfulness of their use and occupation of ancestral lands, compounded by endemic structural discrimination at the national level, means that they are left without the ability to plan their mitigation of, and resilience to, climate change, on their lands, in the long-term. Issues affecting indigenous communities disproportionately, such as poverty, agrarian conflict, criminalisation and displacement, similarly leave communities without the means required to resist increased methane emissions emanating from their lands as a result of exploitation and extractivism, and to adapt to the extreme impacts of methane emissions. States should prioritise addressing issues that disproportionately affect indigenous peoples to ensure compliance with their human rights obligations in the face of climate change.[246]

Margherita Cornaglia

Doughty Street Chambers

18 December 2023

[246] States have a plethora of measures to choose from; the following are non-exhaustive examples of actions which states may take to increase the adaptive capacity of Indigenous groups. For instance, these can include:

- Equipping indigenous groups with forest protection technology;
- Increasing direct finance to frontline organizations;
- Fostering stronger international relationships.
- Increasing agricultural resilience to climate change, tackling rural poverty, and improving internal migration options

See S. Pellietier Aug 23 2021 paper: "The UN's IPCC Report: to avoid the worst of the climate catastrophe, indigenous people's rights must be protected".
Rural Poverty, Climate Change, and Family Migration from Guatemala, Sarah Bermeo, David Lebland, and Gabriela Nagle Alverio

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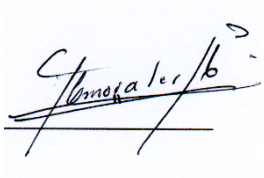

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