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Asia Pacific Journal of Environmental Law, Vol. 24 No. 2, 2021, pp. 201–229

Climate loss and damage in Pacific Island States: International law implications of evolving climate science

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This article discusses the implications of recent developments in climate science for the efforts of Pacific Island States to avert, minimize and address loss and damage from climate change through international law. It discusses these implications in connection with three areas of international law pertaining to loss and damage: averting the threat of existential losses; minimizing loss and damage through adaptation and climate resilience; and addressing loss and damage through reparations for victims. As the article demonstrates, evolving climate science highlights the need for urgent action in each of these areas while providing fresh insight into the specific requirements for compliance with States' international obligations related to such action. It examines how these obligations can be met through the established mechanisms of the international climate regime, including the Warsaw International Mechanism on Loss and Damage associated with Climate Change Impacts. Further, it explores how, and to what extent, evolving climate science may bolster the evidentiary basis of climate cases seeking to hold States to account for failing to meet these obligations.

Keywords: *Pacific Islands, climate change, loss and damage, international law, climate financing, climate litigation, attribution science*

1 INTRODUCTION

On 6 August 2021, the Intergovernmental Panel on Climate Change (IPCC)'s Working Group I released its contribution to the Sixth Assessment Report, 'Climate Change 2021: The Physical Science Basis' (AR6 WGI).[1] Authored by 234 scientists from 66 States, the report featured 'the strongest statement yet from the IPCC' on global warming[2]

1. IPCC, *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2021) ('AR6 WGI').
2. Daisy Dunne and Louise Boyle, 'World's 1.5C Goal Slipping Beyond Reach Without Urgent Action, Warns Landmark IPCC Climate Report' *Independent* (9 August 2021) <www.independent.co.uk/climate-change/news/ipcc-report-2021-climate-un-b1899193.html> accessed 19 November 2021.

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The Lypiatts, 15 Lansdown Road, Cheltenham, Glos GL50 2JA, UK
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and, for the first time, 'truly connects the dots' between fossil fuel combustion, the warming of the planet and deadly extreme weather events.[3] Describing the impacts of climate change that are already occurring as 'widespread and rapid',[4] the report shows that even more severe impacts are now inevitable because of past emissions.[5] These findings were reinforced by the Working Group II report on 'Impacts, Adaptation and Vulnerability'(AR6 WGII), which highlights that the 'brief and rapidly closing window of opportunity to secure a liveable and sustainable future for all' will be missed without urgent scaled up action.[6] Further, the report finds that 'human-induced climate change, including more frequent and intense extreme events, has caused widespread adverse impacts and related losses and damages to nature and people, beyond natural climate variability, and across sectors and regions the most vulnerable people and systems are observed to be disproportionately affected'.[7] At the same time, however, the most recent Working Group III report, 'Climate Change 2022: Mitigation of Climate Change' (AR6 WGIII) shows that many catastrophic impacts projected to occur at more than 1.5°C of warming can still be prevented through deep reductions in carbon dioxide, methane and other greenhouse gas emissions.[8]

All these findings are of great significance to Pacific Island States, which are at the forefront of widespread and severe climate impacts and face existential losses at more than 1.5°C of warming. This article will focus on the contribution of AR6 WGI due to its deep implications for loss and damage in the Pacific. The AR6 WGI findings gain renewed significance in the aftermath of the 26th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in Glasgow (COP26), which Pacific representatives and negotiators described as a 'monumental failure' for its outcome that was seen as lacking in ambition and failing to deliver on loss and damage finance.[9]

While there is no agreed definition of 'loss and damage', it can be broadly understood as 'the actual and/or potential manifestation of impacts associated with climate change in developing States that negatively affect human and natural systems'.[10] Loss and damage is recognized institutionally under the UNFCCC through the Warsaw International

3. Michael E Mann, '"Widespread and Severe": The Climate Crisis is Here, But There's Still Time to Limit the Damage' *TIME* (9 August 2021) <https://time.com/6088531/ipcc-climate-report-hockey-stick-curve/> accessed 19 November 2021.
4. AR6 WGI (n 1) A.1.
5. Ibid, D.1.6, 9.6.3.5.
6. IPCC, *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2022) ('AR6 WGII').
7. Ibid, Summary for Policymakers, statement SPM.B.1.
8. IPCC, *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2022) ('AR6 WGIII').
9. Lagipoiva Cherelle Jackson, 'COP26: Pacific Delegates Condemn "Monumental Failure" That Leaves Islands in Peril' *The Guardian* (15 November 2021) <www.theguardian.com/world/2021/nov/15/cop26-pacific-delegates-condemn-monumental-failure-that-leaves-islands-in-peril>.
10. Subsidiary Body for Implementation, 'A Literature Review on the Topics in the Context of Thematic Area 2 of the Work Programme on Loss and Damage: A Range of Approaches to Address Loss and Damage Associated with the Adverse Effects of Climate Change, United Nations Framework Convention on Climate Change (UNFCCC), 37th session, 26 November to 1 December 2012, FCCC/SBI/2012/INF.14.

Mechanism on Loss and Damage associated with Climate Change Impacts (WIM), established in 2013 at the 19th Conference of the Parties (COP19).[11] At COP21 in 2015, the WIM was anchored in the Paris Agreement through Article 8.[12] Article 8 recognizes 'the importance of averting, minimising and addressing loss and damage associated with the adverse effects of climate change'[13] and provides a treaty basis for what has become the 'third pillar' of international climate law and policy, alongside mitigation and adaptation.[14] At the same time, however, the COP decision accompanying the Paris Agreement limited the scope of Article 8 by proclaiming that the provision 'does not involve or provide a basis for any liability or compensation'.[15] This limitation, and a lack of progress on climate action more generally, has triggered enhanced interest in alternative avenues for addressing questions of responsibility for averting, minimizing and addressing loss and damage, including litigation.[16] As of May 2021, 1,841 climate cases have commenced or concluded globally, spanning courts in 39 States and 13 international or regional courts or tribunals.[17] However, only a handful of these cases specifically address loss and damage suffered in the Pacific Island States or involve Pacific Island plaintiffs.[18] It is therefore timely to review relevant insights from AR6 WGI and other recent scientific publications and assess their implications for the development of international law and policy on loss and damage relevant to Pacific Island States.

We discuss the implications of AR6 WGI findings in connection with three areas of international law pertaining to loss and damage that are particularly relevant to Pacific Island States: averting the threat of existential losses; minimizing loss and damage through adaptation and climate resilience; and addressing loss and damage through reparations for victims. The first section following this introduction discusses what AR6 WGI tells us about the available pathways for preventing existential losses or reducing the risk thereof, and the legal and policy implications of these findings. The second section discusses AR6 WGI findings about the irreversibility of some

11. UNFCCC, 'Decision 2/CMA.2: Warsaw International Mechanism for Loss and Damage Associated with Climate Change Impacts and its 2019 Review', UN Doc FCCC/PA/CMA/2019/6/Add.1 (16 March 2020).
12. *Paris Agreement on Climate Change*, A/RES/61/295 (adopted 12 December 2015, entered into force 4 November 2016) art 8 ('Paris Agreement').
13. Ibid, art 8(1).
14. See generally, Morten Broberg and Meatriz Martinez Romera, *The Third Pillar of International Climate Change Policy: On 'Loss and Damage' After the Paris Agreement* (Routledge, 2021).
15. UNFCCC Secretariat, Decision 1/CP.21, 'Adoption of the Paris Agreement', UN Doc, FCCC/CP/2015/10/Add.1 (29 January 2016) para 52.
16. Emma Lees, 'Responsibility and Liability for Climate Loss and Damage After Paris' (2017) 17(1) *Climate Policy* 59.
17. Joanna Setzer and Catherine Higham, *Global Trends in Climate Change Litigation: 2021 Snapshot* (London: Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, London School of Economics and Political Science, 2021).
18. See, eg, *Armando Carvalho and Others v EU* (European General Court, T-330/18, complaint filed 24 May 2018) <https://peoplesclimatecase.caneurope.org/wp-content/uploads/2018/08/application-delivered-to- european-general-court.pdf> *Sacchi et al v Argentina et al* (Communications No. 104-108/2019 to the United Nations Committee on the Rights of the Child, complaint filed 23 September 2019) <https://climatecasechart.com/climate-change-litigation/non-us-case/sacchi-et-al-v-argentina-et-al/> accessed 19 November 2021.

climate impacts, even in low-emissions scenarios,[19] and the implications of these findings for adaptation and resilience building action in the Pacific, as well as international support for such action. The third section explores how advancements in attribution science, reflected in AR6 WGI, can inform action and support to address loss and damage through the WIM, as well as bolstering the evidentiary basis of climate cases seeking reparations for loss and damage.

As the article demonstrates, the best available climate science reflected in AR6 WGI highlights the need for urgent loss and damage action, while providing fresh insight into the specific requirements for compliance with States' international obligations related to such action. It may be expected that the enhanced clarity about States' obligations resulting from the evolving state of climate science will bolster Pacific Island States' position in international negotiations as well as in pending or potential legal cases seeking action to prevent, minimize or address loss and damage from climate change.

2 AVERTING THE THREAT OF EXISTENTIAL LOSSES

2.1 The risks to Pacific and low-lying island States

There is an extended history of Pacific and low-lying island States advocating for enhanced climate action to prevent existential losses – most notably the loss of all habitable territory for low-lying island States, which include the Marshall Islands, Kiribati, Tokelau and Tuvalu. In the context of climate change, 'existential losses' refer to existing and impending harm from climate change on vulnerable States, communities, cultures and ecosystems, resulting in irreversible loss.[20] Existential losses from climate change threaten more than loss of land and territory in the Pacific, to include loss of life, security, food, freshwater sources and culture, among others.[21] At COP21 in Paris, the Pacific Island States' advocacy for preventive action culminated in the inclusion of a long-term goal of keeping global temperature rise below 1.5°C in the Paris Agreement,[22] coupled with a request for a Special Report from the IPCC on 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,

19. The AR6 WGI report outlines five climate scenarios-referred to as shared socio-economic pathways (SSPs). SSP1-1.9 holds warming to approximately 1.5°C above 1850–1900 levels in 2100, following a slight overshoot. This scenario requires the highest levels of ambitions, including a rapid drawdown of fossil fuels, and implies net zero C02 emissions by around 2050. SSP1-2.6 holds warming to approximately 2°C, which implies net-zero emissions in the second half of the century. SSP2-4.5 was modelled on the combined pledges under the Paris Agreement, at the time the AR6 report was published, resulting in an estimated 2.7°C increase by the end of the century. SSP3-7 is a medium-to-high emissions scenario, with 1.5°C likely being exceeded by 2042, resulting in an estimated 3.6°C temperature increase by the end of the century. SSP5-8.5 is a high-to-very high emissions scenario, with 1.5°C exceeded by approximately 2038, resulting in an estimated 4.4°C of warming by the end of the century.

20. Emily Boyd et al, 'A Typology of Loss and Damage Perspectives' (2017) 7 *Nature Climate Change* 723, 725–26.

21. See, eg, Petra Tschakert et al, 'One Thousand Ways to Experience Loss: A Systematic Analysis of Climate-Related Intangible Harm from Around the World' (2019) 55 *Global Environmental Change* 58.

22. Margaretha Wewerinke-Singh and Curtis Doebbler, 'The Paris Agreement: Some Critical Reflections on Process and Substance' (2016) 39(4) *UNSW Law Journal* 1486.

sustainable development, and efforts to eradicate poverty (SR1.5°C Report).[23] The SR1.5°C Report underscored the existential impacts of more than 1.5°C warming, while at the same time confirming that keeping global temperature rise below this limit is still feasible if 'rapid, far-reaching and unprecedented changes' are made 'in all aspects of society'.[24]

AR6 WGI adds evidentiary weight and detail to both findings, and thus strengthens the legal and political argument in favour of ambitious climate action and enhanced international cooperation to limit temperature rise to 1.5°C. On the nature and severity of the threat, AR6 WGI indicates that a temperature rise of more than 1.5°C would result in more frequent, intense and widespread heat stress, rainfall and storm surges in the region.[25] Under a high emissions scenario, Pacific Islands are projected to experience more days with a heat index exceeding 41°C by the end of the century, which would have devastating health consequences.[26] Already, Pacific Island States face a range of adverse health impacts from climate change, including heat-related illnesses, trauma and injury from extreme weather events, food and water insecurity,[27] and increases in vector-borne diseases.[28] Increased extreme heat events will add to these impacts and exacerbate existing vulnerabilities, leading to increased loss of lives and damage to livelihoods and health for Pacific Island populations.[29] Extreme heat events will also have potentially negative impacts on marine ecosystems in the Pacific, and the communities that depend on them.[30] Currently, the equatorial Pacific experiences 30 days of marine heat wave events annually.[31] AR6 WGI predicts that this will increase to 100 days under a 1.5°C warming scenario, and an average of 200 days with 2°C of global temperature rise.[32] Marine heatwaves have detrimental effects for Pacific Island communities, due to associated biodiversity loss, coral bleaching events, and food insecurity.[33] While not as immediate as the impacts

23. IPCC, *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* (Cambridge University Press, 2018) ('SR1.5°yC Report'.)
24. IPCC, 'Summary for Policymakers of IPCC Special Report on Global Warming of 1.5°C approved by governments' *IPCC Newsroom* (8 October 2018) <www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/> accessed 19 November 2021.
25. AR6 WGI (n 1) 2.3.1.3.1; citing, Gabriel M Pontes et al, 'Drier Tropical and Subtropical Southern Hemisphere in the Mid-Pliocene Warm Period' (2020) 10(1) *Scientific Reports* 13458.
26. AR6 WGI (n 1) 12.4.7.1.
27. See, eg, Allison Lassiter, 'Rising Seas, Changing Salt Lines, and Drinking Water Salinization' (2021) *50 Current Opinion in Environmental Sustainability* 208, 209, 211.
28. Lachlan McIver et al, 'Health Impacts of Climate Change in Pacific Island Countries: A Regional Assessment of Vulnerabilities and Adaptation Priorities' (2016) 124(1) *Environmental Health Perspectives* 1707.
29. See, eg, Colin Tukuitonga and Paula Vivilli, 'Climate Change on Health in Small Islands Developing States' (2021) 5(2) *The Lancet Planetary Health* E69–E70.
30. Johanna E Johnson et al, 'Impacts of Climate Change on Marine Resources in the Pacific Island Region' in Lalit Kumar (ed), *Climate Change and Impacts in the Pacific* (Springer, 2020).
31. AR6 WGI (n 1) 12.4.7.4.
32. Ibid.
33. William WL Cheung and Thomas L Frölicher, 'Marine Heatwaves Exacerbate Climate Change Impacts for Fisheries in the Northeast Pacific' (2020) 10 *Scientific Reports* 6678, 6678.

from heat extremes or suddenonset events, these combined secondary impacts also pose existential threats to the lives, livelihoods, and ways of life of Pacific Island communities, and might contribute to certain Pacific Island States becoming uninhabitable.[34]

Warming of the oceans also drives other slow-onset events associated with existential losses, such as sea level rise. AR6 WGI provides a central estimate of 40 metres of shoreline retreat for Pacific Island States by 2050.[35] Irrespective of reductions to greenhouse gas emissions, sea levels are predicted to rise between 0.1–0.25 metres by 2050. As discussed below, such 'locked in' sea level rise means that Pacific Island States require substantially increased adaptation and resilience funding, as well as reparations for loss and damage. The need for adaptation and loss and damage financing will be exacerbated under higher emissions scenarios, if sufficient mitigation action is not undertaken. By 2100, it is likely that sea levels will rise between 0.28–0.55 metres under a very low-emission scenario.[36] This increases to 0.63–1.01 metres under a very high emissions scenario.[37] By 2150, sea levels are predicted to reach up to 1.9 metres under a very high emissions scenario.[38] To put this in perspective, the highest point above sea level in Tuvalu is approximately 4.6 metres, with the average height from sea level sitting at 1.2 metres.[39] Therefore, even under a low-emissions scenario, sea levels will encroach on Tuvalu's habitable land. Under a very high emissions scenario, much of Tuvalu will be underwater. If the low-likelihood, high impact scenario of 5.4 metres sea level rise by 2150 were to occur,[40] this would result in the complete inundation of Tuvalu, as well as a number of other existential-related loss and damage across other Pacific Island States.

Increased sea level rise will, in turn, increase the frequency and severity of extreme ocean and coastal impacts, such as storm surges, wave inundations and coastal floods.[41] AR6 WGI further predicts that rainfall rates will increase under all emissions scenarios, with a median projected increase of 14 percent at 2°C, which increases twofold under a 4°C scenario.[42] In addition, AR6 WGI predicts increased frequency of Category 4–5 storms in the Pacific under all emission scenarios, with average peak wind speeds of such storms increasing with further warming.[43] AR6 WGI also indicates that the influence of the el Niño-Southern Oscillation (ENSO) is projected to strengthen and shift eastward, resulting in an increase in rainfall variability from 2050 in the intermediate to very high emission scenarios.[44] Put simply, increased variability associated with ENSO is predicted to increase both flood risk and drought

34. See, eg, John Handmer and Johanna Nalau, 'Understanding Loss and Damage in Pacific Small Island Developing States' in Reinhard Mechler et al (eds), *Loss and Damage from Climate Change. Concepts, Methods and Policy Options* (Springer Open, 2019) 365–80.
35. AR6 WGI (n 1) 12.4.7.4.
36. Ibid, B.5.3.
37. Ibid.
38. Ibid.
39. Lalit Kumar, Tharani Gopalakrishnan and Sadeeka Jayasinghe, 'Population Distribution in the Pacific Islands, Proximity to Coastal Areas, and Risks' in Lalit Kumar (ed), *Climate Change and Impacts in the Pacific* (Springer, 2020) 319–20.
40. AR6 WGI (n 1) B.5.4.
41. Ibid, 12.4.7.3.
42. Ibid, figure SPM.6.
43. Ibid, 12.4.7.3.
44. Ibid, 8.4.2.9.1.

risk in the Pacific region.[45] And anthropogenic climate change not only increases the frequency and severity of slow- and sudden-onset events, but can also intensify the impacts of natural weather variability.[46]

When multiple climate drivers or risks are experienced together, and contribute to existing societal or environmental vulnerabilities, they are referred to as 'compound events'.[47] AR6 WGI notes that the probability of compound events increases in higher emissions scenarios.[48] Cities and settlements by the sea, including many Pacific Island communities, face particular risk of existential losses from compound coastal hazard risks, such as simultaneous sea level rise, storm surges, and more intense and frequent tropical cyclones.[49]

2.2 Tipping points

AR6 WGI also addresses uncertainties surrounding various 'tipping points' in the Earth system. For the purposes of AR6 WGI, a tipping point refers to a 'critical threshold, beyond which a system reorganises, often abruptly and/or irreversibly', while a 'tipping element' refers to a 'component of the Earth system that is susceptible to a tipping point'.[50] The tipping elements discussed in the report include global monsoons, tropical and boreal forest disturbance, declines in permafrost carbon, the loss of Arctic and Antarctic sea ice, ocean heating, acidification and deoxygenation, and global sea level-rise, among others.[51] In most scenarios, climatic changes to these elements reflects linear and gradual changes to global warming. While there is no current evidence of non-linear climate changes at the global scale, AR6 WGI expresses high confidence that future non-linear changes associated with these tipping points 'cannot be ruled out'.[52]

The global mean temperature at which tipping points are at risk of being crossed has lowered as climate science has continued to advance.[53] The SR1.5°C Report suggested that critical tipping points could be crossed even in a warming scenario between 1–2°C.[54] This risk increases under higher emissions scenarios. Activating

45. Ibid. Impacts differ geographically across the Pacific. Flood risks, cyclones/typhoons and storm surges increase in likelihood in the Central and eastern Pacific. In contrast, less rainfall and increased drought risks will impact the Western Pacific.
46. Rebecca Byrnes and Swenja Surminski, *Addressing the Impacts of Climate Change through an Effective Warsaw International Mechanism on loss and Damage: Submission to the Second Review of the Warsaw International Mechanism on Loss and Damage under the UNFCCC* (Grantham Research Institute on Climate Change and the Environment and Centre for Climate Change Economics and Policy, London School of Economics and Political Science, October 2019) 3.
47. AR6 WGI (n 1) Glossary ('Compound weather/climate events'); Jakob Zscheischler et al, 'Future Climate Risk from Compound Events' (2018) 8(6) *Nature Climate Change* 469–77.
48. AR6 WGI (n 1) C3.3.
49. Ibid, 12.4.10.2; See also, Reinhard Mechler and Teresa M Deubelli, 'Finance for Loss and Damage: A Comprehensive Risk Analytical Approach' *(2021) 50 Current Opinion in Environmental Sustainability* 185, 187; Rosanne Martyr-Koller et al, 'Loss and Damage Implications of Sea-level Rise on Small Island Developing States'(2021) 50 *Current Opinion in Environmental Sustainability* 245, 248.
50. AR6 WGI (n 1), Annex VII (definition of 'tipping point' and 'tipping element').
51. Ibid, Table 4.10.
52. Ibid, 4.8.
53. Zinta Zommers et al, 'Burning Embers: Towards More Transparent and Robust Climate-Change Risk Assessments' (2020) *1 Nature Reviews* 516, 521–22.
54. SR1.5°C Report (n 22) 3.5.5, Table 3.7.

one tipping element risks raising the temperature further, creating a reinforcing loop of climatic changes which mitigation and adaptation efforts would not be able to reverse, alter or slow.[55] If the Earth System were to cross such a 'planetary threshold' and enter a 'Hothouse Earth' pathway, as suggested by Steffen et al, the widespread disruptions to ecological, societal and economic systems would have existential impacts for Pacific Island States. For example, a Hothouse Earth pathway would result in the destruction of most coral reefs,[56] with impacts on communities in the Pacific that rely on coral reefs for fishing, subsistence and tourism.[57] Further, the loss of the polar ice sheets would lead to sea levels significantly higher than any time in the Holocene,[58] increasing risks of coastal flooding, water contamination and storm surges in the Pacific.[59]

While exceeding tipping points could result in a cascade of abrupt and irreversible climatic changes, there are certain climate impacts that may already be irreversible. By 2050, it is predicted that extreme sea level events, which were recently expected to occur once a century, will occur annually across 20–25 percent of the world, regardless of emissions levels.[60] However, current emissions do influence the extent of future sea-level rise. By 2100, AR6 WGI predicts a 60 percent annual increase of extreme sea level events under a low emissions scenario, compared to an increase of 80 percent annually under strong emissions.[61] As such, the stronger the global mitigation efforts to avert climate change, the less the Pacific will have to contest with existential loss and damage.

For a 50 percent chance of stabilizing global temperatures within 1.5°C, AR6 WGI indicates that the world has 500GtCO2 remaining in the global carbon budget.[62] If 2020 emission levels were to continue, this carbon budget would be exceeded within approximately 11.5 years.[63] The carbon budget decreases to 400GtCO2,[64] or approximately nine years of emissions at 2020 levels,[65] for a 66 percent chance of keeping temperatures below 1.5°C.[66] This time period could be shortened if emissions rebound following the easing of travel and trade-related restrictions during the COVID-19 recovery process.[67] In forward-looking terms, preventing or limiting overshoot of global average temperature increases to 1.5°C will require a reduction of global CO2

55. Will Steffen et al, 'Trajectories of the Earth System in the Anthropocene' (2018) 115(33) *PNAS: Commentary* 8252, 8254 –55.
56. Ibid, Annex Table S4.
57. Karen E McNamara, Ross Westoby and Alvin Chandra, 'Exploring Climate-Driven Non-Economic Loss and Damage in the Pacific Islands' (2021) 50 *Current Opinion in Environmental Sustainability* 1, 6.
58. Steffen et al (n 54) 8252.
59. Handmer and Nalau (n 33) 368–69, 373.
60. AR6 WGI (n 1) FAQ 9.2.
61. Ibid.
62. Ibid, Table SPM.2.
63. Carbon Brief Staff, 'In-Depth Q&A: The IPCC's Sixth Assessment Report on Climate Science' *CarbonBrief* (9 August 2021) <www.carbonbrief.org/in-depth-qa-the-ipccs-sixth-assessment-report-on-climate-science> accessed 19 November 2021.
64. AR6 WGI (n 1) Table SPM.2.
65. Carbon Brief Staff (n 62).
66. AR6 WGI (n 1) Table SPM.2.
67. AR6 WGI (n 1) D.2, Cross Chapter Box 6.1; Robert McSweeney and Ayesha Tandon, 'Global Carbon Project: Coronavirus Causes "Record Fall" in Fossil-Fuel Emissions in 2020' *CarbonBrief* (11 December 2020) <www.carbonbrief.org/global-carbon-project-coronavirus-causes-record-fall-in-fossil-fuel-emissions-in-2020> accessed 19 November 2021; World Meteorological Organisation, *The State of Greenhouse Gases in the Atmosphere*

emissions of 45 percent in 2030 and net zero emissions by around 2050, in addition to profound reductions in other anthropogenic emissions, such as methane and black carbon.[68] The 'Glasgow Climate Pact', adopted at COP26, reinforces these 2030 and 2050 emissions reduction targets, recognizing that limiting warming to 1.5°C requires 'rapid, deep and sustained' emissions cuts,[69] and 'resolves to pursue efforts to limit temperature increase to 1.5°C'.[70]

The legal and policy implications of these findings are significant and supported by a range of studies that assess the adequacy of mitigation pledges put forward to date. In brief, nearly all NDCs submitted to date would need to be revised and enhanced to reflect the dramatically higher level of ambition necessary to avert the threat of existential losses.[71] Current policies position the world on a trajectory towards approximately 2.7°C of warming by 2100.[72] If States fully implement their near-term 2030 NDC targets, taking into consideration the revised NDCs submitted at COP26,[73] global warming is projected to peak at 2.4°C.[74] This may decrease to 2.1°C under the full implementation of submitted and binding 2030 *and* 2050 NDC targets.[75] Finally, if all announced net-zero targets and long-term pledges are implemented, including those not yet formalized as NDCs, emissions could peak this decade at an estimated 1.8–1.9°C.[76] While this is a significant improvement from the 2.7°C estimate of the NDC Synthesis Report projection in September 2021,[77] there remains a 15–17 percent

Based on Global Observations through 2020 (WMO Greenhouse Gas Bulletin No 17, 25 October 2021) <https://library.wmo.int/doc_num.php?explnum_id=10870> accessed 19 November 2021.

68. AR6 WGI (n 1) Box 1.2.

69. UNFCCC, 'Glasgow Climate Pact', Decision 1/CP.26 (13 November 2021) para 22 <https://unfccc.int/sites/default/files/resource/cma3_auv_2_cover%20decision.pdf> accessed 19 November 2021.

70. Ibid, para 21 (emphasis in the original text).

71. Climate Action Tracker, *Climate Target Updates Slow as Science Ramps Up Need for Action* (Global Update Report, September 2021) 1 ('*Global Update Report 2021'*).

72. Climate Action Tracker, *Warming Projections Global Update* (November 2021) <https://climateactiontracker.org/documents/997/CAT_2021-11-09_Briefing_Global-UpdateGlasgow2030CredibilityGap.pdf> accessed 19 November 2021.

73. 11 new countries submitted revised NDCs at COP26, including major changes from two developing countries – China and India – both announcing net zero emissions targets by 2060 and 2070, respectively. Note, however, that at the time of publication India has 'pledged' updated climate commitments but is yet to formalise those commitments by submitting them as an NDC to the UNFCCC. See, Jonathon Watts et al, 'How Has COP26 Shifted the Dial on the Climate Crisis? A Visual Guide' *The Guardian* (12 November 2021) <www.theguardian.com/environment/ng-interactive/2021/nov/12/how-has-cop26-shifted-the-dial-on-the-climate-crisis-a-visual-guide> accessed 19 November 2021.

74. *Warming Projections Global Update* (n 71) i.

75. Ibid.

76. Climate Action Tracker indicates an 'optimistic scenario' may limit warming to 1.8°C. See, *Warming Projections Global Update* (n 69) i. The recent Climate Resource report suggests that, if all NDCs and pledges are implemented and achieved, there is a 50 percent chance of keeping warming below 2°C. Malte Meinshausen et al, *Briefing Paper: 1.9°C: New COP26 Pledges Bring Projected Warming to Below 2°C for the First Time in History* (Climate Resource, 3 November 2021) 1 <https://data.climateresource.com.au/ndc/20211103-ClimateResource-below2C.pdf> accessed 19 November 2021.

77. UNFCCC, *Nationally Determined Contributions under the Paris Agreement: Synthesis Report by the Secretariat*, FCCC/PA/CMA/2021/8 (17 September 2021) para 10(b)

gap between announced NDCs and implemented policies,[78] and still the full implementation of all global commitments would fail to keep warming levels below 1.5°C.[79] The Glasgow Climate Pact 'requests' States to raise their NDC ambitions again in 2022,[80] while also being the first COP decision to explicitly target action to reduce fossil fuels.[81] However, this request is non-binding and is likely to remain unanswered by some States.[82] Without increased NDC ambition levels, there is an estimated 90 percent probability that the 1.5°C target will be exceeded, which would result in near-certain existential losses for Pacific Island States.[83]

2.3 Pacific Island leadership

Although contributing only 0.23 percent of global greenhouse gases,[84] Pacific Island States have deployed a strategy of leading by example to inspire more ambitious global mitigation action. As the Chair of the Pacific Islands Forum and Prime Minister of Fiji, Honourable Joasai V Bainimarama, stated upon the release of AR6 WGI:

> Pacific Island Countries – the lowest-emitting nations on Earth – are committed to carbon-neutrality by 2050. We are not hiding behind the cowardly excuse that we are too small to make a meaningful difference. We are not shying away from our collective responsibility to head off this crisis. No nation should. We will not accept it. Our children and grandchildren -those who are poised to face the worst consequences of inaction – will not and should not forgive our continued inaction.[85]

<https://unfccc.int/sites/default/files/resource/cma2021_08_adv_1.pdf> United Nations Climate Press Release, 'Full NDC Synthesis Report: Some Progress, But Still a Big Concern' *UNFCCC News* (17 September 2021) <https://unfccc.int/news/full-ndc-synthesis-report-some-progress-but-still-a-big-concern> accessed 19 November 2021.

78. *Warming Projections Global Update* (n 69) ii.
79. Meinshausen et al (n 75) 2.
80. 'Glasgow Climate Pact' (n 68) para 5.
81. Ibid, para 36.
82. For example, Australia's continued expansion of its coal mining industry, lack of policies, weak 2030 NDC targets, and high per capita greenhouse gas emissions. See, eg, Maite Fernández Simon, 'Australian Prime Minister Scott Morrison Doubles Down on Coal After COP26' *The Washington Post* (15 November 2021) <www.washingtonpost.com/world/2021/11/15/australia-coal-scott-morrison-cop26/> accessed 19 November 2021; Graham Readfearn, 'Australia Ranked Last of 60 Countries for Policy Response to Climate Crisis' *The Guardian* (10 November 2021) <www.theguardian.com/environment/2021/nov/09/australia-ranked-last-of-60-countries-for-policy-response-to-climate-crisis> accessed 19 November 2021.
83. Meinshausen et al (n 75) 2.
84. This figure consists of the contributions of the 14 Pacific Island countries that have signed and ratified the UNFCCC: Cook Islands, Fiji, Kiribati, Marshall Islands, Federated States of Micronesia, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. See, Greenpeace, *Te Mana O Te Moana: The State of the Climate in the Pacific 2021* (9 August 2021) 16.
85. Statement by Hon Joasai V Bainimarama, Chair of the Pacific Islands Forum, Prime Minister of Fiji, On the IPCC Working Group 1 Report on the Physical Science Basis of the Sixth Assessment Report, 'Come with Commitments to COP26: Forum Chair Statement on IPCC Report' *Pacific Islands Forum* (Suva: Fiji, 12 August 2021) <www.forumsec.org/2021/08/20/come-with-commitments-to-cop26-forum-chair-statement-on-ipcc-report/> accessed 19 November 2021.

Fiji itself is a case in point, having matched its calls for global climate action with robust national commitments. In December of 2020, Fiji submitted its updated NDC, reaffirming its commitment to emissions reductions by 30 percent by 2030, while also committing to achieve net-zero emissions by 2050.[86] Fiji's Climate Change Act, passed in September 2021, anchors its emission reduction targets into domestic law.[87] However, climate leadership by the Pacific can contribute only a fraction of the emission reductions needed to avert existential climate losses. To avert such losses, developed and developing States alike must commit to stronger NDCs falling within the mitigation pathways assessed by the AR6 WGI, as compatible with the 1.5°C limit.[88]

Against this backdrop, developed States' obligations to provide financial assistance for climate action in developing States have a critical role to play in filling the 'emissions gap'.[89] Indeed, rapidly scaling up the provision of climate finance is necessary to enable developing States to reduce their domestic emissions without compromising on sustainable development and poverty eradication objectives.[90] Most developing States, including Pacific Island States, have made the full implementation of their NDCs[91] conditional on the receipt of various forms of international support, including finance, technology transfer and capacity-building.[92] This approach demonstrates how the principle of common but differentiated responsibilities and respective capabilities (CBDRRC) – according to which States with the greatest historical responsibility for causing climate change and the greatest capacity to respond to it carry a heavier burden of responsibility for climate action – can be put into practice to enhance global mitigation ambition.[93]

86. Government of the Republic of Fiji, *Fiji's Updated Nationally Determined Contribution* (31 December 2020) <www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Fiji%20First/Republic%20of%20Fiji%27s%20Updated%20NDC%2020201.pdf> accessed 19 November 2021.
87. Government of the Republic of Fiji, *Climate Change Bill 2021* (Bill No 31 of 2021).
88. Lavanya Rajamani et al, 'National "Fair Shares" in Reducing Greenhouse Gas Emissions within the Principles Framework of International Environmental Law' (2021) 21(8) *Climate Policy* 983, 999.
89. *United Nations Framework Convention on Climate Change*, opened for signature 4 June 1992, 1771 UNTS 107, 31 ILM 849 (1992), (entered into force 21 March 1994) art 4(3) ('UNFCCC'); Paris Agreement (n 11) art 9.
90. Mariya Aleksandrova and Cecilia Costella, 'Reaching the Poorest and Most Vulnerable: Addressing Loss and Damage through Social Protection' (2021) 50 *Current Opinion in Environmental Sustainability* 121.
91. Across the 136 countries that make their NDCs conditional upon at least one type of support, capacity building is the most frequently requested type of support (113 NDCs), followed by mitigation finance (110), technology transfer (109) and adaptation finance (79). WP Pauw et al, 'Conditional Nationally Determined Contributions in the Paris Agreement: Foothold for Equity or Achilles Heel?' (2020) 20(4) *Climate Policy* 468, 473–74.
92. See, eg, Pieter Pauw, Kennedy Mbeva and Harro van Asselt, 'Subtle Differentiation of Countries' Responsibilities under the Paris Agreement' (2019) 5(86) *Palgrave Communications* 1; Linda Flora Vaike, Diana Hinge Salili and Morgan Wairiu, 'An Overview of the Information Presented in Nationally Determined Contributions (NDCs) for Fiji, Papau New Guinea, Solomon Islands and Vanuatu' in Walter Leal Filho (ed), *Managing Climate Change Adaptation in the Pacific Region* (Springer, 2020) 85.
93. For further information on the CBDR-RC principle, see Christina Voigt and Felipe Ferreira, '"Dynamic Differentiation": The Principles of CBDR-RC, Progression and Highest Possible Ambition in the Paris Agreement' (2016) 5(2) *Transnational Environmental Law* 285.

As confirmed by several recent court cases, ensuring that climate policies are aligned with the 1.5°C limit and the CBDRRC principle may be understood as a legal obligation of all States under international law.[94] The evidence contained in AR6 WGI further strengthens the argument that this obligation is not subject to a 'margin of appreciation', due to the existential scale of the losses and damages posed by scenarios of global warming exceeding 1.5°C.[95] Pacific Island States could highlight this obligation in international fora and bilateral engagements, including to advocate for enhanced mitigation ambition and scaled-up climate finance to enable more rapid and far-reaching mitigation action in developing States.

Critically, the financial support necessary to fulfil all conditional commitments far exceeds the amount of US$100-billion per annum, which developed States had committed to provide by 2020.[96] The Glasgow Climate Pact expresses 'deep regret' that this commitment has not been fulfilled, and urged developed States to 'fully deliver' on this commitment 'urgently and through to 2025'.[97] The Pact also calls upon Parties to accelerate the adoption of policies to transition towards low-emission energy systems, including by 'accelerating efforts towards the phasedown of unabated coal power and phase-out of inefficient subsidies'.[98] In connection with climate finance, it is important to note that global fossil fuel subsidies amounted to $5.9 trillion in 2020 alone,[99] which in turn contributes to significant loss and damage, both economic and non-economic, globally.[100]

In sum, the evidentiary basis for finding States and private actors accountable for failing to prevent existential climate losses in the Pacific is stronger than ever. The science reflected in AR6 WGI could inform new initiatives to accomplish more ambitious and more equitable climate action to prevent existential losses for Pacific Island States, including through legal cases before international courts and tribunals.[101] Whether in negotiations or in courtrooms, those advocating for such preventive action could take advantage of the evolving scientific evidence as reflected in AR6 WGI and elsewhere to bolster their claims.

94. See, eg, *Urgenda Foundation* v *Netherlands* (24 June 2015) ECLI:NL:RBDHA:2015:7196 ('*Urgenda*'). Lucy Maxwell, Sarah Mead and Dennis van Berkel, 'Standards for Adjudicating the Next Generation of Urgenda-Style Climate Cases' (2022) 13(1) *Journal of Human Rights and the Environment* 35–63.
95. Ibid, para 3(aa).
96. Pauw, Mbeva and van Asselt (n 91) 476.
97. 'Glasgow ClimatePact' (n 68) para 44.
98. Ibid, para 36.
99. Ian Parry, Simon Black and Nate Vernon, *Still Not Getting Energy Prices Right: A Global and Country Update of Fossil Fuel Subsidies* (International Monetary Fund Working Paper No 2021/236, 24 September 2021).
100. See, eg, Carmen C Gonzalez, 'The Sacrifice Zones of Carbon Capitalism: Race, Expendability, and Loss and Damage' in Meinhard Doelle and Sara Seck (eds), *Research Handbook on Climate Change Law and Loss and Damage* (Edward Elgar, 2021).
101. The role of science in climate litigation is explored further in Section 4. For further reading, see Margaretha Wewerinke-Singh, Julian Aguon and Julie Hunter, 'Bringing Climate Change before the International Court of Justice: Prospects for Contentious Cases and Advisory Opinions' in Ivano Alogna, Christine Bakker and Jean-Pierre Gauci (eds), *Climate Change Litigation: Global Perspectives* (Brill Nijhoff 2021) 393–414; Philippe Sands, 'Climate Change and the Rule of Law: Adjudicating the Future in International Law' (2016) 28 *Journal of Environmental Law 19*.

3 MINIMIZING LOSS AND DAMAGE THROUGH ENHANCED ADAPTATION AND CLIMATE RESILIENCE

3.1 The state of loss and damage in Pacific Islands

As noted above, AR6 WGI shows that several changes to the climate are already irreversible, even in low-emissions scenarios. The report indicates that disturbances to tropical and boreal forests could be irreversible for multiple decades.[102] Climate change is also changing the chemistry of the world's oceans. AR6 WGI demonstrates that ocean acidification and deoxygenation are likely reversible at the surface, but irreversible at depth for millennia.[103] Ocean acidification is virtually certain to continue with increasing CO2 levels, while there is medium confidence that ocean deoxygenation and hypoxia rates will continue to increase.[104] Ocean acidification has been associated with marine ecosystem degradation, including loss of marine biodiversity, changes to biogeochemical processes and disruptions to the flow of goods and ecosystem services from the marine environment.[105] These impacts are of great concern to Pacific and small island communities, who often rely on the ecosystem services provided by and related to the marine environment for their lives and livelihoods.[106] Socioecological impacts to subsistence and oceanic fisheries, tourism activities, coastal protection and regional income are likely to further limit the resources available for Pacific Island States to allocate for adaptation and climate resilience.[107]

AR6 WGI also conveys high confidence that the melting of the Greenland Ice Sheet is irreversible for millennia, with virtual certain mass loss under all scenarios.[108] Further, while there remains uncertainty about the extent of Antarctic sea ice loss, the report indicates high confidence that mass loss of the West Antarctic Ice Sheet and Shelves is irreversible for decades to millennia, with likely mass loss under all scenarios.[109] Adding to this, AR6 WGI finds that high impact scenarios, such as the breakdown of Antarctic ice sheets, which could generate much higher sea level rise, 'cannot be ruled out'.[110] Specifically, AR6 WGI states that sea levels could rise by as much as 2 metres by 2100, and 5.4 metres by 2150.[111] Due to the irreversible impacts of deep ocean heat uptake and ice sheet loss, sea levels are predicted to continue to rise for centuries to millennia beyond 2150, and will remain at elevated levels for thousands of years.[112] In its regional analysis, AR6 WGI specifically notes that '[i]t is *very likely* that sea levels will continue to rise in all Small Island

102. AR6 WGI (n 1) Table 4.10.
103. Ibid.
104. Ibid.
105. See, Scott C Doney et al, 'The Impacts of Ocean Acidification on Marine Ecosystems and Reliant Human Communities' (2020) 45 *Annual Review of Environment and Resources* 83.
106. Joanna Johnson, Johann Bell, and Alex Sen Gupta, *Pacific Islands Ocean Acidification Vulnerability Assessment* (Secretariat of the Pacific Regional Environment Programme, 30 October 2015) 20–25.
107. See, eg, Quentin Hanich et al., 'Small-scale Fisheries under Climate Change in the Pacific Islands Region' (2018) 88 *Marine Policy* 279, 281.
108. AR6 WGI (n 1) Table 4.10.
109. Ibid.
110. Ibid, B5.2, 4.7.
111. Ibid, 9.6.3.3.
112. Ibid, B.5.4.

regions and this will result in increased coastal flooding with the potential to increase salt-water intrusion into aquifers in Small Islands'.[113]

These findings highlight the importance of enhancing adaptive capacity and climate resilience in the Pacific Island States and other climate vulnerable States. Climate vulnerability, in this context, is used to refer to States' susceptibility to loss and damage.[114] This susceptibility is often exacerbated when adaptation is defined by structurally privileged States, to the exclusion of traditional knowledges and existing adaptative capacities in the Pacific.[115]

Throughout time and space, Pacific Island counties have harnessed traditional knowledges – referring to Indigenous, local and place-based knowledges 'rooted in the culture and traditions of a particular community'[116] – to understand and adapt to climate change.[117] For example, traditional knowledge informs Pacific States' approaches to planting techniques and resource preservation to promote resilience when faced with extreme weather events.[118] Equally, slow-onset processes such as rising sea levels and droughts can be better managed through resource use and management, leadership and social connections centred around traditional knowledges in the Pacific.[119] For example, community members of Tamil – a municipality on the island of Yap in the Federated States of Micronesia – have harnessed traditional composting techniques when planting food crops and plants to revegetate coastal areas vulnerable to erosion.[120] The same community also implemented their first Watershed Protected Area in 2017, under the protection of traditional council members, which provides the community with water security, drought resilience and protection from wildfires.[121] More broadly, many Pacific Islands have established coastal zones where marine stocks are protected.[122] These areas are known as *Tabu* in States such as Kiribati and Fiji, *ra'ui* in the Cook Islands, or *tapu* in Tonga.

Further, the value of traditional customary law is recognized in the domestic law of many Pacific Island States. For example, the Constitution of Palau stipulates that 'Statutes and traditional law shall be equally authoritative. In the case of conflict between a statute and a traditional law, the statute shall prevail only to the extent it is not in conflict with the underlying principles of the traditional law'.[123] A similar

113. Ibid, Cross Chapter BoxAtlas2 (emphasis in original).
114. Carol Farbotko and Heather Lazrus, 'The First Climate Refugees? Contesting Global Narratives of Climate Change in Tuvalu' (2012) 22(2) *Global Environmental Change* 382.
115. Nicole Teng, 'From Vulnerable to Resilient: Amplifying the Voice of Small Island Developing States towards Virtuous Climate Change Action' (2019) 30(2) *King's Law Journal* 254.
116. Ainka A Granderson, 'The Role of Traditional Knowledge in Building Adaptive Capacity for Climate Change: Perspectives from Vanuatu' (2017) 9(3) *Weather, Climate, and Society* 545.
117. See, eg, Penehuro Fatu Lefale, *'Ua 'afa le Aso* Stormy Weather Today: Traditional Ecological Knowledge of Weather and Climate. The Samoa Experience' (2010) 100 *Climatic Change* 317.
118. McNamara, Westoby and Chandra (n 56) 6; Karen E McNamara and Shirleen Shomila-Prasad,'Coping with Extreme Weather: Communities in Fiji and Vanuatu Share their Experiences and Knowledge'(2014) 123 *Climatic Change* 121.
119. Granderson (n 115).
120. Elizabeth McLoad, et al, 'Lessons from the Pacific Islands: Adapting to Climate Change by Supporting Social and Ecological Resilience' (2019) 6(289) *Frontiers in Marine Science* 1, 3.
121. Ibid.
122. Kirsten Davies, 'Traditional Customary Law Responding to Climate Change' in Margaretha Wewerinke-Singh and Evan Hamman (eds), *Environmental Law and Governance in the Pacific: Climate Change, Biodiversity and Communities* (Routledge, 2020).
123. Constitution of the Republic of Palau 1979, Article V, section 2.

approach can be seen in the Constitutions of Vanuatu, Samoa and Papua New Guinea, among others. The recognition of, and respect for, traditional ecological knowledge and customary law in the Pacific provides for a form of legal pluralism that is not mirrored on an international scale, and which reflects the complex interaction of socio-ecological systems in the region.[124]

Traditional and place-based perspectives should also inform the narrative framing of adaptive mechanisms.[125] Climate-related displacement and resettlement may, in some contexts, result in significant loss and damage for Pacific communities, due to a disruption of connection to land and sea, culture, ways of life and community connections, among many others.[126] However, mobility was and continues to be central to the identity of many small island States,[127] framed as 'tidalectics' by Barbadian poet Kamau Brathwaite.[128] The Pacific's oceanic worldview therefore has a critical role to play in ensuring equitable and effective policies to frame climate adaptation and loss and damage in the Pacific.[129]

3.2 The need for increased global support

With the scale and rate of climate change accelerating and intensifying, increased global support is necessary to equip Pacific Island States with the resources to maintain and scale their inherent adaptive capacities. As UN Secretary-General António Guterres has repeatedly pointed out, promoting equitable climate adaptation requires dramatically scaled-up financial assistance.[130] Providing such assistance constitutes a legal obligation for developed States under Article 4(4) of the UNFCCC and Article 9 of the Paris Agreement,[131] with the latter provision stipulating that climate finance should represent a progression beyond previous efforts and aim to achieve a balance between adaptation and mitigation.[132] Without adequate adaptation funding, Pacific Island States will face intolerable risks that exceed local adaptive capacities.[133] Where climate impacts exceed adaptation efforts and limits, Pacific Island States will face increased economic and non-economic loss and damage.[134]

124. Davies (n 121).
125. Sarah Louise Nash, *Negotiating Migration in the Context of Climate Change: International Policy and Discourse* (Policy Press, 2019) 111–36.
126. See, eg, Emma Allen, 'Climate Change and Disappearing Island States: Pursuing Remedial Territory' (2018) *Brill Open Law 1*.
127. Jon Barnett and Elissa Waters, 'Rethinking the Vulnerability of Small Island States: Climate Change and Development in the Pacific Islands' in Jean Grugel and Daniel Hammett (eds), *The Palgrave Handbook of International Development* (Springer, 2016) 731.
128. Kamau Brathwaite, *Caribbean Culture: Soundings on Kamau Brathwaite* (University of West Indies Press, 2007); see also, Stefanie Hessler (ed), *Tidalectics: Imagining an Oceanic Worldview through Art and Science* (MIT Press, 2018).
129. Farbotko and Lazrus (n 113).
130. United Nations Secretary-General, 'Secretary-General's statement on the IPCC Working Group 1 Report on the Physical Science Basis of the Sixth Assessment' (9 August 2021) <www.un.org/sg/en/content/secretary-generals-statement-the-ipcc-working-group-1-report-the-physical-science-basis-of-the-sixth-assessment> accessed 19 November 2021.
131. UNFCCC (n 88) art 4(4); Paris Agreement (n 11) art 9(1).
132. Paris Agreement (n 11) art 9(3).
133. Handmer and Nalau (n 33) 369.
134. Moleen Monita Nand and Douglas K Bardsley, 'Climate Change Loss and Damage Policy Implications for Pacific Island Countries' (2020) 25(9) *Local Environment* 725.

There are several challenges in estimating flows of adaptation finance provided to climate vulnerable States, particularly so for the Pacific. A lack of precise accounting mechanisms and data collection, obscurity surrounding the definition of 'adaptation finance', and gaps in reporting on non-grant instruments, can lead to different climate finance estimates. Nonetheless, all estimates highlight that only a fraction of the finance necessary for adequate adaptation is being provided. As of 2021, the Climate Policy Initiative estimated total climate finance flows, including domestic and international, and public and private funds, amounted to US$632 billion in 2019/2020, which is only a 10 percent increase from 2017/2018.[135] In comparison, annual climate finance between 2013/2014 and 2017/2018 grew more than 24 percent each period. This indicates that total climate finance is beginning to plateau.[136] Yet, to stay within warming levels of 1.5°C, it is estimated that 2030 annual climate finance must increase to around US$4.5–5 trillion annually.[137]

Of the US$632 billion currently allocated to climate finance, only US$46 billion is allocated to adaptation, with an additional US$15 billion to projects cutting across mitigation and adaptation themes.[138] The discrepancy between mitigation and adaptation initiatives was also demonstrated by the Climate Bonds Initiative report in March 2019, which revealed that only 10 percent of sovereign green bonds and 3 percent of emerging market green bonds are allocated to adaptation initiatives and resilience building.[139] In an analysis of climate finance provided by Annex I States, Climate Action Tracker rated major actors such as the USA, Australia, Japan and Russia as 'critically insufficient', with the remaining States deemed 'highly insufficient' or 'insufficient'. No States were rated as committing to 'almost sufficient' or 'good' levels of climate finance.[140]

While adaptation finance remains insufficient, there has been a slow increase in adaptation finance and adaptation project implementation. From 2006 to 2020, 397 adaptation projects were implemented by the Adaptation Fund, Green Climate Fund and Global Environment Facility, 51 percent of which (203 projects) have been implemented since 2015.[141] Of those projects implemented since 2015, 14 percent have been in small island developing States.[142] As of 2020, 36 additional projects have been approved and are awaiting implementation, while 80 adaptation project proposals are awaiting approval.[143] Further, at COP26, States established the Glasgow-Sharm el-Sheikh Work Programme on the Global Goal on Adaptation, a mechanism dedicated to channelling resources towards adaptation, and agreed 'at

135. Climate Policy Initiative, *Global Landscape of Climate Finance* (2021) 5 <www.climatepolicyinitiative.org/wp-content/uploads/2021/10/Global-Landscape-of-Climate-Finance-2021.pdf> accessed 19 November 2021.
136. Ibid, 2.
137. Ibid.
138. Ibid, 5.
139. Climate Bonds Initiative, *Why Making Infrastructure Climate-Adapted and Resilient Will Help Meet the SDGs* (Climate Bonds Initiative, 2018) <www.climatebonds.net/files/reports/cbi_briefing-climate_adaptated_investment_helps_achieve_sdgs_final.pdf> accessed 19 November 2021.
140. *Global Update Report 2021* (n 70) Annex 3.
141. United Nations Environment Programme, *Adaptation Gap Report 2021: The Gathering Storm – Adapting to Climate Change in a Post-pandemic World* (UNEP, 2021) 41.
142. United Nations Environment Programme, *Adaptation Gap Report 2020* (UNEP Report, 2020) 36.
143. Ibid, 37.

least to double' adaptation finance between 2019 and 2025,[144] which would mobilize an estimated US$40 billion in adaptation financing.[145] These figures demonstrate a trajectory of gradual increases in adaptation financing and action. However, adaptation finance commitments remain outpaced by accumulating adaptation costs.

Predicted adaptation costs vary widely across studies, which can be attributed, in part, to different future mitigation and climate impact scenarios being used as reference points; higher emissions scenarios lead to higher adaptation costs, while lower emissions scenarios lower predicted costs.[146] Estimates of adaptation costs are made more complex by different interpretations of the scope of 'adaptation' and the extent of residual loss and damage deemed acceptable and equitable.[147] While recognizing the ethical and technical issues in predicting adaptation costs, a number of leading international bodies have provided tentative estimates. In 2010, the World Bank Group estimated that developing States would require an average of US$70-100-billion a year between 2010 and 2050 under a 2°C emissions scenario.[148] In 2016, UNEP outlined amplified adaptation financing requirements, predicting that developing States would require US$140–300 billion annually by 2030, rising to US$280–500 billion annually by 2050.[149] Therefore, while some progress is being made in the provision of adaptation finance, the gap between adaptation financing and adaptation needs is still growing.

While estimated on a global scale, adaptation costs vary across regions. Relative to Gross Domestic Product (GDP), the world's poorest regions will disproportionately face adaptation costs, despite contributing least to the drivers of climate change. The Pacific is one such region, required to spend a large proportion of their already limited financial resources on adaptation efforts. Adaptation costs can be reduced by dramatically increased global mitigation action. Recent research by Chapagain et al. indicates that high levels of global mitigation with a high discount rate (roughly equivalent to the 'low' emissions pathway in AR6) could reduce adaptation costs by 75 percent compared to a high emissions scenario with low discount rate (roughly equivalent to AR6's 'very high' emissions scenario).[150] However, even in a low emissions scenario, residual climate impacts will remain. Where climate impacts are avoidable, strengthened adaptation financing pathways are critical to minimizing loss and damage in the Pacific and elsewhere. Significantly, the benefits of investing in adaptation pathways often offset or exceed the costs.[151] This was highlighted by the

144. 'Glasgow Climate Pact' (n 68) para 17.
145. United Nations Environment Programme, 'What does COP26 mean for adaptation?' (17 November 2021) <www.unep.org/news-and-stories/story/what-does-cop26-mean-adaptation> accessed 19 November 2021.
146. *Adaptation Gap Report 2020* (n 141) 26.
147. Stephane Hallgate et al, *The Economics of (and Obstacles to) Aligning Development and Climate Change Adaptation* (World Bank Group Discussion Paper, Global Commission on Adaptation, 2018) 7 <https://gca.org/wp-content/uploads/2018/10/18_WP_GCA_Economics_1001_final.pdf>.
148. World Bank Group, *Economics of Adaptation to Climate Change: Synthesis Report* (World Bank Group Report, 2010) 89 <https://documents1.worldbank.org/curated/en/646291468171244256/pdf/702670ESW0P10800EACCSynthesisReport.pdf> accessed 19 November 2021.
149. United Nations Environment Programme, *Adaptation Gap Report 2016* (UNEP Report, 2016) 40.
150. Dipesh Chapagain et al, 'Climate Change Adaptation Costs in Developing Countries: Insights from Existing Estimates' (2020) 12(1) *Climate and Development* 934, 939.
151. *Adaptation Gap Report 2020* (n 141).

Global Commission for Adaptation, in its estimate that an investment of US$1.8 trillion in adaptation interventions – such as early warning systems, climate-resilient infrastructure and resilient food and water resources – could generate US$7.1 trillion in benefits.[152]

3.3 Adaptation financing and resilience

Increased adaptation financing is not synonymous with increased climate resilience. There are several barriers to the effective and just use of available climate adaptation funds. Concerns have been raised that communities directly facing climate impacts and engaging in climate adaptation will not be the primary beneficiaries of climate adaptation investment.[153] Indigenous Peoples, women, children and other marginalized groups have been identified as particularly vulnerable to climate impacts in the Pacific,[154] yet these groups often do not receive equivalent funds for adaptation.[155] In a study of community-based adaptation initiatives in Pacific Islands, McNamara et al. found that projects perform better when locally owned and led, with ecosystem-based adaptation initiatives supported by climate awareness-raising initiatives performing best.[156] Thus, as investments in climate finance initiatives increase, at international, national and sub-national levels, it is critical that climate finance is 'owned by the country undertaking the change' and allocated in a way that is responsive to community needs and fosters agency and equality.[157] In financing adaptation initiatives in the Pacific region, contextual factors should be considered, including the States' geography, land, customs, governance structures and social norms.

AR6 WGI's increased certainty in future climate impacts can support pre-emptive action, as well as post-disaster recovery and reparations. For example, knowledge about the probable long-term and irreversible climate impacts may assist policy-makers in deciding how risks should be managed, what can be done to avert, minimize and address loss and damage, and which forms of reparation could best support communities to recover from loss and damage scenarios. These findings were supplemented by the AR6 WGII report, which states with high confidence that small islands 'present the most urgent need for investment in capacity building and adaptation strategies'.[158] To close these 'adaptation gaps', critical investments

152. Global Commission for Adaptation, *Adapt Now: A Global Call for Leadership on Climate Resilience* (13 September 2019) 12–13 <https://gca.org/wp-content/uploads/2019/09/Global Commission_Report_FINAL.pdf> accessed 19 November 2021.
153. Mizan Khan et al, 'Twenty-five Years of Adaptation Finance Through a Climate Justice Lens' (2020) 161 *Climatic Change* 251, 261.
154. McNamara, Westoby and Chandra (n 56) 6.
155. See, eg, Jale Samuwai, Eliala Fihaki, and Yvonne Te Ruki Rangi o Tangaroa Underhill-Sem, 'Demystifying Climate Finance Impacts in Small Island Developing States: Pacific Women's Perspectives from Funafuti and Weno' (2020) 3(2) *Small States & Territories* 283.
156. See, eg, Karen E McNamara et al, 'An Assessment of Community-Based Adaptation Initiatives in the Pacific Islands' (2020) 10 *Nature Climate Change* 628, 636–37; see also, Daniel Lund, 'Navigating Slow-Onset Risks Through Foresight and Flexibility in Fiji: Emerging Recommendations for the Planned Relocation of Climate-Vulnerable Communities' (2021) 50 *Current Opinion in Environmental Sustainability* 12, 16.
157. Harald Winkler and Navroz K Dubash, 'Who Determines Transformational Change in Development and Climate Finance?' (2016) 16(6) *Climate Policy* 783, 788.
158. AR6 WGII (n 6) Chapter 15, Executive summary.

in technology and climate finance are necessary. The AR6 WGI report once again confirms, however, that current and projected climate impacts are of such magnitude that the promise of US$100-billion annually will urgently need to be revised upwards, while at the same time correcting the imbalance between mitigation and adaptation finance. While arguments along these lines have so far not been advanced in litigation, AR6 WGI strengthens the evidentiary base for litigation seeking to address the shortfalls in finance for enhancing adaptation and climate resilience in the Pacific.

4 ADDRESSING LOSS AND DAMAGE THROUGH REPARATIONS FOR VICTIMS

4.1 Extreme weather events

One of the most significant policy questions concerning climate impacts in the Pacific relates to reparations for climatic impacts that cannot, or have not, been mitigated or adapted to, including both extreme weather events and slow-onset harms.[159] AR6 WGI contributes important insights that could help to advance international negotiations and litigation on this question, as it reflects significant advances in attribution science. Attribution science refers to 'the process of evaluating the relative contributions of multiple causal factors to a change or event with an assignment of statistical confidence'.[160] AR6 WGI provides evidence of how human activities affect the global climate system (climate change attribution) and how climate change alters the frequency, magnitude and other characteristics of extreme events (extreme events attribution).[161] At the policy level, such evidence is important for understanding which impacts fall within the scope of the loss and damage regime, and to advance discussions on responsibility for addressing such loss and damage.

On climate change attribution, AR6 WGI states that 'it is *unequivocal* that human influence has warmed the atmosphere, ocean, and land'[162] – a term that was used in AR5 in the context of observed warming. Therefore, while AR5 presented the

159. See, Alliance of Small Island States 'Proposal to the AWG-LCA: Multi-Window Mechanism to Address Loss and Damage from Climate Change Impacts' (2008) <http://unfccc.int/files/kyoto_protocol/application/pdf/aosisinsurance061208.pdf> accessed 19 November 2021; UNFCCC, 'Bali Action Plan', Decision 1/ CP.13 (December 2007); UNFCCC, 'Decision 7/ CP.17: Work Programme on Loss and Damage', FCCC/CP/2011/9/Add.2 (15 March 2012); UNFCCC, 'Decision 3/CP.18: Approaches to Address Loss and Damage Associated with Climate Change Impacts in Developing Countries that are Particularly Vulnerable to the Adverse Effects of Climate Change to Enhance Adaptive Capacity', FCCC/CP/2012/8/Add.1 (8 December 2012); UNFCCC, 'Decision 2/CP.19: Warsaw International Mechanism for Loss and Damage Associated with Climate Change Impacts', FCCC/CP/2013/10/Add.1 (31 January 2014); UNFCCC, 'Decision 3/CP.22: Warsaw International Mechanism for Loss and Damage Associated with Climate Change Impacts', FCCC/CP/2016/10/Add.1 (2017); Adelle Thomas and Lisa Benjamin, 'Management of Loss and Damage in Small Island Developing States: Implications for a 1.5°C or Warmer World' (2019) 18 *Regional Environmental Change* 2369.
160. IPCC, *Climate Change 2013:The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2013) 872.
161. Rachel A James et al, 'Attribution: How Is It Relevant for Loss and Damage Policy and Practice?' in Reinhard Mechler et al (eds), *Loss and Damage from Climate Change* (Springer Open, 2019) 113–54.
162. AR6 WGI (n 1) A.1 (italics added).

existence of climate change as a fact, AR6 WGI finds that the causal influence of humans in climate change is also indisputable. AR6 WGI adds that 'humans are responsible for approximately 100% of global warming',[163] and states that it is 'virtually certain' that anthropogenic greenhouse gases emitted over nearly 200 years are the primary driver of those climatic changes.[164] In other words, the evidence that humanity, through actions or inaction, has warmed the planet is stronger than ever.

Further, AR6 WGI reflects a significant breakthrough in the attribution of extreme weather events and other adverse impacts to anthropogenic climate change. This is particularly relevant to the Pacific, where loss and damage from both sudden-onset events and slow-onset disasters is already a lived reality. For example, some communities have already faced relocation in response to rising sea levels, such as the villages of Vunidogoloa and Denimanu in Fiji,[165] and the villages of Mararo and Nuatambu in the Solomon Islands.[166] In 2014, Kiribati spent US$8.77 million to acquire land on Vanua Levu – Fiji's second largest island – to provide food security and land for potential relocation in the face of coastal erosion, sea-level rise and soil salinization.[167] In 2015, Cyclone Pam cost Vanuatu US$450 million in economic damages, equating to 64 percent of Vanuatu's GDP[168] – a figure that does not account for non-economic losses such as loss of life, health and livelihoods and damage to ecosystems suffered as a result of the cyclone.[169] In 2016, Tropical Cyclone Winston struck Fiji as a Category 5 Cyclone, resulting in the loss of 43 lives, devastating 18,000 households and large areas of agricultural land, and otherwise affecting the lives of 350,000 people.[170] In 2017, approximately 4.3 million people in Viet Nam and the Philippines were affected by Typhoon Damrey/Ramil, with 300,000 houses damaged or destroyed and 400,000 people requiring humanitarian assistance.[171] In 2018, Tropical Cyclone Dita had impacts on more than 80 percent of the population in Tonga; that same year, Papua New Guinea experienced a 7.5-magnitude

163. Ibid, Figure SPM.2.
164. Ibid, Cross-Chapter Box 3.2.
165. Annah E Piggot-McKellar, 'Moving People in a Changing Climate: Lessons from Two Case Studies in Fiji' (2019) 8(5) *Social Sciences* 133; Dhrishna Charan, Manpreet Kaur and Priyatma Singh, 'Customary Land and Climate Change Induced Relocation: A Case Study of Vunidogoloa Village, Vanua Levu, Fiji' in Walter Leal Filho (ed), *Climate Change Adaptation in Pacific Countries: Climate Change Management* (Springer, 2017) 19–33.
166. Simon Albert et al, 'Interactions Between Sea-Level Rise and Wave Exposure on Reef Island Dynamics in The Solomon Islands' (2016) 11(054011) *Environmental Research Letters* 1, 7.
167. Laurence Caramel, 'Besieged by the Rising Tides of Climate Change, Kiribati Buys Land in Fiji' *The Guardian* (1 July 2014) <www.theguardian.com/environment/2014/jul/01/kiribati-climate-change-fiji-vanua-levu> accessed 15 November 2020.
168. Global Facility for Disaster Reduction and Recovery (GFDRR), 'Infographic Cyclone Pam', <www.gfdrr.org/sites/default/files/publication/infographic-cyclone-pam.pdf> accessed 15 November 2020. See also Global Facility for Disaster Reduction and Recovery (GFDRR), 'Vanuatu', <www.gfdrr.org/en/vanuatu> accessed 15 November 2020.
169. Sarah Mead and Margaretha Wewerinke-Singh, 'Recent Developments in International Climate Change Law' (2021) 23 *International Community Law Review* 294, 302–03.
170. European Commission: Humanitarian Aid and Civil Protection, 'The Pacific Region' (ECHO Factsheet, September 2016).
171. Ly Phat Viet Linh, 'CERF releases US$ 4 million to help people affected by Typhoon Damrey in Viet Nam', *United Nations Central Emergency Response Fund* (5 December 2017) <https://cerf.un.org/news/story/cerf-releases-us-4-million-help-people-affected-typhoon-damrey-viet-nam> accessed 4 October 2021.

earthquake, and Vanuatu faced heavy volcanic ash falls and gas cloud emissions due to increased seismic activity of the Ambae volcano.[172] In 2019, the Asia-Pacific Disaster Report found that the annual economic costs of both slow- and sudden-onset disaster losses in the Asia-Pacific amounted to US$675 billion.[173] In 2020, two category 5 cyclones were recorded in the South-West Pacific. The first was Tropical Cyclone Harold, affecting approximately 65 percent of Vanuatu's population and damaging or destroying over 17,000 homes.[174] The second was Fiji's second strongest cyclone on record – Tropical Cyclone Yasa – which affected approximately 139,000 people and displaced tens of thousands, exacerbated food insecurities, and resulted in infrastructure losses of an estimated US$250 million.[175] These disasters provide only a brief snapshot of the wide array of climate-related losses, damages and risks currently faced by Pacific Island States.

AR6 WGI corroborates these lived experiences by providing a scientific outline of current climatic changes, including both sudden- and slow-onset events, and linking these to anthropogenic climate change. For example, it states that, across the Pacific region over the past 40 years, tropical cyclones have decreased in frequency but increased in severity.[176] In relation to sea level rise, it finds that in the Western Pacific, sea levels rose faster than any other region between 1993–2015.[177] The Central Pacific experienced 1–2 metres of coastal erosion annually between 1984–2016.[178] While AR6 WGI does not scope down to country or local-level impacts, its findings about the connection between anthropogenic climate change on the one hand, and observed impacts and trends on the other, can be extrapolated to more specific impacts and events. As Saleemul Huq puts it, 'it is probably correct to say that from now on, every record-breaking extreme weather event can be reasonably attributed to having been exacerbated by human-induced climate change'.[179]

In addition, it is also increasingly possible to establish causal connections between anthropogenic climate change and particular extreme weather events through event attribution studies. AR6 WGI draws on longer observational datasets, improved climate models and advanced detection-attribution tools, to quantify the role of anthropogenic climate change in altering the probability and magnitude of some regional weather patterns and climate-related events.[180]

172. European Civil Protection and Humanitarian Aid Operations, 'Pacific Region' (European Commission Factsheet, October 2019).
173. United Nations Economic and Social Commission for Asia and the Pacific, *Asia-Pacific Disaster Report 2019: The Disaster Riskscape Across Asia-Pacific: Pathways for Resilience, Inclusion and Empowerment* (UN ESCAP Report, 2019).
174. World Meteorological Organization, *State of the Global Climate 2020* (WMO, 2021) <https://asvis.it/public/asvis2/files/1264_Statement_2020_en.pdf> accessed 4 November 2021.
175. Jacqueline Kessler, 'Tropical Cyclone Yasa: Fiji's Second Category 5 Cyclone in a Year' *Refugees International* (17 March 2021) <www.refugeesinternational.org/reports/2021/3/15/tropical-cyclone-yasa-fijis-second-category-5-cyclone-in-a-year> accessed 28 October 2021.
176. AR6 WGI (n 1) A.3.4.
177. Ibid, 9.2.4, 9.6.1.
178. Ibid, 12.4.7.4.
179. Saleemul Huq, 'Latest IPCC Climate Report Shows Time is Running out to Save the Planet' *The Daily Star* (11 August 2021) <www.thedailystar.net/opinion/politics-climate-change/news/latest-ipcc-climate-report-shows-time-running-out-save-the-planet-2149406> accessed 5 October 2021.
180. AR6 WGI (n 1) TS.10.

4.2 The issue of reparations

The advances in attribution science reflected in AR6 WGI can inform the evolution of the loss and damage regime under the UNFCCC on perhaps the most critical issue for the Pacific, which is finance for loss and damage. Loss and damage finance is needed to enable Pacific Island States and other developing States to assess risks of loss and damage, conduct comprehensive risk management and implement disaster risk management strategies, collect data on climate impacts, empower vulnerable communities, and facilitate data and technology sharing.[181] Despite mounting loss and damage costs, loss and damage financing is not currently tracked as a distinct category under the international climate regime. As mentioned above, Article 9 of the Paris Agreement requires developed States to provide financial resources to assist developing States with respect to both mitigation and adaptation. However, there is no framework provided for the financing of climate loss and damage. To fill this gap, WIM was developed with the purpose of enhancing relevant action and support in response to climate loss and damage, including finance.[182] To date, the WIM has focused its efforts on risk transfer schemes, such as insurance mechanisms, while avoiding discussions of responsibility, accountability, and reparations.[183] Evidence suggests that insurance schemes address approximately 3 percent of loss and damage from extreme weather events in developing States.[184] Insurance schemes require a cost and the payment of insurance premiums, which may prevent those already facing socio-economic hardship from accessing the financial support required in the context of severe climate-related events.[185]

At COP26, loss and damage received unprecedented attention but unfortunately with no concrete results. The Glasgow Climate Pact reiterated the urgency of scaling up finance to avert, minimize and address loss and damage,[186] but failed to incorporate a proposal from developing States to develop a 'Glasgow Loss and Damage Facility'.[187] A step forward was taken by Scotland, which pledged Euro 1 million, and later doubled that pledge to 2 million, to address loss and damage.[188] While this pledge carries

181. UNFCCC, 'Decision 3/CP.18' (n 158) para 6.
182. UNFCCC, 'Decision 2/CP.19' (n 158) para 5(c).
183. Sam Adelman, 'Climate Justice, Loss and Damage and Compensation for Small Island Developing States' (2016) 7(1) *Journal of Human Rights and the Environment* 32, 38–40.
184. Ibid, 49.
185. JoAnne Linnerooth-Bayer et al, 'Insurance as a Response to Loss and Damage?' in Reinhard Mechler et al (eds), *Loss and Damage from Climate Change: Climate Risk Management, Policy and Governance* (Springer, 2019) 483–512.
186. 'Glasgow Climate Pact' (n 68) para 63.
187. UNFCCC, 'High Level Event – Forging a CVF – COP26 Climate Emergency Pact' *UN Climate Change Conference UK 2021* (3 November 2021) <https://unfccc-cop26.streamworld.de/webcast/high-level-event-forging-a-cvf-cop-26-climate-emer> accessed 19 November 2021. A group of philanthropic organisations pledged £3million to AOSIS' proposal for a dedicated loss and damage finance facility and encouraged developed countries to support the initiative. See, Children's Investment Fund Foundation, 'Philanthropies Offer Kick-Start Funds for Prospective Glasgow Loss and Damage Facility to Support Vulnerable Countries Suffering from Climate Change' (12 November 2021) <https://ciff.org/news/philanthropies-offer-kick-start-funds-for-prospective-glasgow-loss-damage-facility-to-support-vulnerable-countries-suffering-from-climate-change/> accessed 17 November 2021.
188. Scottish Government, 'Scotland to Boost Climate Funding' (11 November 2021) <www.gov.scot/news/scotland-to-boost-climate-funding/> accessed 19 November 2021.

symbolic significance, as the first money pledged specifically to loss and damage,[189] the amount is just a fraction of the finance that vulnerable States, such as those in the Pacific, need for addressing current and ongoing losses and damages.[190]

Markandya and González-Eguino predict that, by 2030, climate financing for loss and damage in developing States will require US$30 billion, in a low emissions scenario, with a drastic inflation to US$410 billion under a high emissions scenario. These figures are estimated to increase to US$1.1 trillion to US$1.7 trillion by 2050.[191] In the IPCC's Special Report on Global Warming of 1.5°C, it was projected that 1.5°C of warming in 2100 will cost US$54-trillion annually, while a 2°C scenario would cost U$69 trillion annually, relative to 1961–90.[192] Sanderson and O'Neill estimate that the global delay in climate mitigation between 1980–2020 likely translates to a 15 percent increase in financial damages by 2100.[193] Costs continue to climb rapidly – an estimated US$500 billion with each additional year that transformative climate action is delayed.[194] Significantly, these estimations do not account for the non-economic losses and damages that cannot be recovered. It is difficult, if not impossible, to understand these losses in quantitative terms, as they are mediated by the values, cultures, beliefs, ways of life, socio-economic positions and worldviews of the impacted communities.[195] Nonetheless, it is reasonable to assume that, like economic loss and damage, non-economic loss and damage will be more severe under high emissions scenarios, and the costs of addressing it will increase accordingly.

By attributing slow- and sudden-onset events to anthropogenic climate change, AR6 bolsters developing States' position that these events fall within the scope of the loss and damage regime and must be addressed through enhanced action and support, including finance. As Pacific Island States and other developing States have repeatedly highlighted, such finance 'should be in addition to adaptation finance' rather than at the expense of it.[196] In order to ensure loss and damage finance is both comprehensive and equitable, funds should go beyond risk-transfer mechanisms, to include capacity building, technological advancements and data collection, comprehensive risk

189. Climate Home News, 'Scotland Breaks Loss and Damage "Taboo", Raising Hopes Others Will Follow' (3 November 2021) <www.climatechangenews.com/2021/11/03/scotland-breaks-loss-damage-taboo-raising-hopes-others-will-follow/> accessed 19 November 2021.
190. Carbon Brief, 'COP26: Key Outcomes Agreed at the UN Climate Talks in Glasgow' (15 November 2021) <http://www.carbonbrief.org/cop26-key-outcomes-agreed-at-the-un-climate-talks-in-glasgow > accessed 18 November 2021.
191. Anil Markandya and Mikel González-Eguino, 'Integrated Assessment for Identifying Climate Finance Needs for Loss and Damage: A Critical Review' in Reinhard Mechler et al (eds), *Loss and Damage from Climate Change: Concepts, Methods and Policy Options* (Springer Open, 2019) 343–62.
192. SR1.5°C Report (n 22) 264–65.
193. Benjamin J Sanderson and Brian C O'Neill, 'Assessing the Costs of Historical Inaction on Climate Change' (2020) 10(9173) *Nature: Scientific Reports*.
194. Ibid.
195. Emily Boyd et al, 'Loss and Damage from Climate Change: A New Climate Justice Agenda' (2021) 4 *One Earth* 1365, 1366.
196. Co-chairs' Summary of the Presidencies' Consultations with Heads of Delegations on Loss and Damage (3–4 August 2021) <https://unfccc.int/process-and-meetings/bodies/supreme-bodies/conference-of-the-parties-cop/presidency-consultations-and-other-presidency-meetings/informal-consultations-by-the-cop-25-presidency-and-the-cop-26-incoming-presidency#eq-32> accessed 4 October 2021.

management, and the development of equitable insurance mechanisms.[197] These capacity building and technical assistance needs may be addressed by the Santiago Network for Loss and Damage, an initiative that was formally established at COP25 in 2019 as part of the WIM.[198] The Santiago Network was further operationalized at COP26, with Parties agreeing on its core functions, including the facilitation of finance to avert, minimize and address loss and damage.[199]

Reparations for loss and damage must also address non-economic losses, included losses related to climate displacement.[200] Already, climate impacts are resulting in the displacement of Pacific Island communities and individuals. Attempts to quantify the movement of people in the context of climate change are confronted with the multicausality of forced migration and displacement in the context of climate change.[201] However, broadly, weather-related disasters now account for the largest number of newly displaced people each year, compared to conflict and violence.[202] Pacific Island States are among the most vulnerable to both internal and cross-border displacement as climate change exacerbates the intensity and frequency of both slow- and sudden-onset disasters, as well as existing structural injustices.[203]

As AR6 WGI provides further knowledge about the drivers of climate change, their interactions, and their sources, it can inform both preparations and reparations for impending climate losses and damages.[204] Loss and damage reparations may involve mechanisms and support to prevent climate displacement, as well as policies and programmes to facilitate voluntary relocation. Further, it may involve establishing international and transnational agreements on the rights and status of persons displaced due to climate change,[205] and mainstreaming climate resilience across all investments and policy decisions,[206] among many other forms of reparation.

4.3 Climate litigation

Advances in attribution science, brought together in AR6, are also highly relevant for the rapidly evolving field of climate litigation. Of course, attribution science

197. UNFCCC, 'Decision 2/CMA.2' (n 10) paras 31–2.
198. Ibid, para 43.
199. UNFCCC, 'Decision 7/CMA. 3: Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts' (13 November 2021).
200. See, eg, Jonathan Boston, Architesh Panda and Swenja Surminski, 'Designing a Funding Framework for the Impacts of Slow-Onset Climate Change: Insights from Recent Experiences with Planned Relocation' (2021) 50 *Current Opinion in Environmental Sustainability* 159, 163–65.
201. Jane McAdam, *Climate Change, Forced Migration, and International Law* (Oxford University Press, 2012) 24–5.
202. Internal Displacement Monitoring Centre, *Global Report on Internal Displacement 2021* (IDMC, 2021) Figure 1.
203. Tammy Tabe, 'Climate Change Migration and Displacement: Learning from Past Relocations in the Pacific' (2019) 8(7) *Social Sciences;* McNamara, Westoby and Chandra (n 56) 2–5.
204. See, eg, James et al (n 160).
205. See, eg, Jakob Schou Kupferberg, 'Migration and Dignity: Relocation and Adaptation in the Face of Climate Change Displacement in the Pacific: A Human Rights Perspective' (2021) *The International Journal of Human Rights* 1, 5; See also, *Sendai Framework for Disaster Risk Reduction 2015–2030*, adopted by the Third United Nations World Conference on Disaster Risk Reduction, and endorsed by the UN General Assembly in Res. 69/283 (3 June 2015) para 19(a).
206. See, eg, Stacy-Ann Robinson, 'Mainstreaming Climate Change Adaptation in Small Island Developing States' (2019) 11(1) *Climate and Development* 47–59.

does not directly establish responsibility or liability for loss and damage, but rather serves to identify and link the drivers and impacts of climate change. Questions of responsibility and liability are legal and political questions that involve their own complexities, as discussed elsewhere.[207] It is also important to highlight that attribution science is necessarily probabilistic.[208] The capacity for such scientific evidence to satisfy legal attribution tests in court largely depends on the causation test being used, which differ across jurisdictions and cases. Stuart-Smith et al. suggest that existing methods of attribution science may already be sufficient to address evidentiary gaps in climate litigation for causation tests requiring that the defendant's actions materially contributed to the harm, or the risk of harm.[209] However, in the case of stricter causation tests, such as those requiring the claimant to demonstrate that harm would not have occurred 'but for' the defendant's actions, liability may be more difficult to establish. Particularly in such cases, overcoming evidentiary barriers requires not only advancements in attribution science, but also innovative legal imaginaries.[210]

Already, Pacific Island States are seeking new avenues of responsibility for inequitable climate impacts through litigation pathways. For example, Vanuatu has recently announced its campaign to seek an Advisory Opinion before the International Court of Justice (ICJ) on the topic of climate change, human rights and intergenerational equity.[211] While such an opinion would not be binding *per se*, it could provide greater clarity about the obligations of States related to climate change, which in turn could help advance discussions on loss and damage.[212] Further, at the start of COP26, Antigua and Barbuda and Tuvalu established the Commission of Small Island States on Climate Change and International Law.[213] The Commission is expressly mandated to seek an Advisory Opinion from the International Tribunal on the Law of the Sea, which could potentially address the legal responsibility of States in connection

207. James et al (n 160) 138.
208. Rupert Stuart-Smith et al, *Attribution Science and Litigation: Facilitating Effective Legal Arguments and Strategies to Manage Climate Change Damages* (Oxford Sustainable Law Programme, Environmental Change Institute, & Smith School of Enterprise and the Environment, 2021) 4.
209. Ibid, 2; Rupert Stuart-Smith et al, 'Filling the Evidentiary Gap in Climate Litigation' (2021) 11 *Nature Climate Change* 651, 654.
210. See also Jacqueline Peel, 'Issues in Climate Litigation' (2011) 5(1) *Carbon & Climate Law Review* 15, 17.
211. See, eg, Michael B Gerrard, 'Taking Climate Change to the International Court of Justice: Legal and Procedural Issues' *Climate Law Blog* (Sabin Center for Climate Change Law, Columbia Law School, 29 September 2021) <http://blogs.law.columbia.edu/climatechange/2021/09/29/taking-climate-change-to-the-international-court-of-justice-legal-and-procedural-issues> accessed 19 November 2021.
212. This initiative was highlighted in AR6 WGIII (n 7), Chapter 14. See further Margaretha Wewerinke-Singh, Julian Aguon and Julie Hunter, 'Bringing Climate Change before the International Court of Justice: Prospects for Contentious Cases and Advisory Opinions' in Christine Bakker, Ivano Alogna and Jean-Pierre Gauci, *Climate Change Litigation: Comparative and International Law Perspectives* (Brill Publishers, 2021).
213. The Commission was launched on the first day of COP26. See the announcement: United Nations Climate Change Conference UK 2021, 'Press Conference: Antigua and Barbuda, Tuvalu' (1 November 2021) <https://unfccc-cop26.streamworld.de/webcast/antigua-barbuda-tuvalu> accessed 19 November 2021. See also AR6 WGIII (n 7), Chapter 14.

with the protection and preservation of the marine environment in the context of climate change.[214]

The ICJ's decision in the *Certain Activities (Calculation of Damages)* case illustrates both the potential of bringing climate loss and damage before international courts and tribunal and the challenges Pacific Island States may face in obtaining adequate redress for harm suffered.[215] On the one hand, the Court held that 'damage to the environment, and the consequent impairment or loss of the ability of the environment to provide goods and services, is compensable under international law'.[216] Significantly, the majority judgment also stated that a lack of certainty about the extent of damage did not preclude an award of compensation for environmental damage.[217] On the other hand, however, the Court failed to explicitly outline its method for assessing damages, with the 'incrementalist' approach it used resulting in an award of only 5 percent of Costa Rica's claim.[218] Further, as noted in the Separate Opinions of Justices Trindade and Bhandari, the majority judgment failed to recognize the intrinsic value of the natural environment or the precautionary principle, among other considerations.[219] With a mounting number of climate litigation cases, and an increasing focus on loss and damage-related litigation, these issues are likely to be expanded in subsequent claims.[220]

214. Marlise Simons, 'Small Island Nations Try to Take Major Polluters to Court' *NY Times* (1 November 2021) <www.nytimes.com/live/2021/11/01/world/cop26-climate-change-summit/small-island-nations-try-to-take-major-polluters-to-court> accessed 19 November 2021.
215. *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua), Compensation*, International Court of Justice, Judgment of 2 February 2018, <www.icj-cij.org/public/files/case-related/150/150-20180202-JUD-01-00-EN.pdf> accessed 22 February 2022.
216. Ibid, para 42.
217. Ibid, paras 35 and 86.
218. See, eg, Diane Desierto, 'Environmental Damages, Environmental Reparations, and the Right to a Healthy Environment: The ICJ Compensation Judgment in Costa Rica v. Nicaragua and the IACtHR Advisory Opinion on Marine Protection for the Greater Caribbean' *EJIL:Talk!* (14 February 2018) <www.ejiltalk.org/environmental-damages-environmental-reparations-and-the-right-to-a-healthy-environment-the-icj-compensation-judgment-in-costa-rica-v-nicaragua-and-the-iacthr-advisory-opinion-on-marine-protection/> accessed 21 February 2022.Similar concerns arose in the ICJ's more recent Reparations Judgment in *Armed Activities on the Territory of the Congo (Democratic Republic of the Congo v Uganda)* [citation]. See alsoDiane Desierto, 'The International Court of Justice's 2022 Reparations Judgment in DRC v. Uganda: "Global Sums" as the New Device for Human Rights-Based Inter-State Disputes', *EJIL:Talk!* (14 February 2022) <www.ejiltalk.org/the-international-court-of-justices-2022-reparations-judgment-in-drc-v-uganda-a-new-methodology-for-human-rights-in-inter-state-disputes/?utm_source=mailpoet&utm_medium=email&utm_campaign=ejil-talk-newsletter-post-title_2>.
219. On the intrinsic value of the natural environment, see, Separate Opinion of Judge Cançado Trindade in *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v Nicaragua), Compensation*, para 68 <www.icj-cij. org/public/files/case-related/150/150-20180202-JUD-01-01-EN.pdf> accessed 21 February 2022. On the precautionary principle, see, Separate Opinion of Judge Bhandari in *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v Nicaragua)*, paras 13–15 <www.icj-cij.org/public/files/case-related/150/150-20180202- JUD-01-03-EN.pdf> accessed 21 February 2022. See generally also Jason Ruddall [book on compensation for environmental harm].
220. Patrick Toussaint, 'Loss and Damage and Climate Litigation: The Case for Greater Interlinkage' (2020) *Review of European, Comparative & International Environmental Law*.

The significance of climate litigation in driving substantive action to address loss and damage should not be overlooked. In fact, the recent AR6 WGIII report highlighted that 'climate litigation is growing and can affect the outcome and ambition of climate governance'.[221] The capacity for attribution science to inform tests of causation and foreseeability in climate litigation will be a crucial factor in loss and damage claims before any court or tribunal. We may expect this capacity to improve further in line with data quantity and quality, and further understanding of the regional climate drivers and impacts. In the Pacific and other developing States, however, the lack of mechanisms for monitoring, collecting and reporting on climate-related data inhibits the capacity for attribution science to inform loss and damage policies.[222] In AR5, climate-related loss and damage experienced by high-income regions was discussed more than those States most vulnerable to climate change, such as those in the Pacific region.[223] This may, at least in part, be attributed to the gap in knowledge surrounding loss in damage in small island States and least developed States. This evidentiary gap continued in AR6 WGI, with 'observational issues, incomplete understanding of some modes of variability and their representation by climate models and the lack of availability of large ensembles of regional climate model simulations and limited studies to decouple internal variability and anthropogenic influences'.[224] Similarly, AR6 WGII explicitly noted the ambiguity surrounding the scope of the term 'loss and damage', the lack of systemic risk assessments to inform loss and damage analyses, and gaps in understanding surrounding non-economic losses and damages.[225]

The collection, sharing, management and relevant use of data and information falls within the scope of the WIM's mandate. In order to equitably operationalize the WIM's mandate, further funding and technology transfer should be directed to the Pacific and other developing States for the purposes of improving data collection, policies and mechanisms for the monitoring, measurement, recording and assessment of climate driver and impact data.[226] Further research with Pacific communities is required to determine whose responsibility it should be to record loss and damage data in the Pacific, what mechanisms and technologies are required to fill the data gap, and how to ensure different perceptions and experiences of loss and damage are captured in the data.[227] These questions are particularly relevant to inform the upcoming Global Stocktake in 2023,[228] and gain increased importance in light of alternative pathways that are being explored to address loss and damage.

A final point to consider is that addressing loss and damage through policy or litigation can provide a stimulus for governments to implement more robust mitigation and adaptation efforts. AR6 WGI demonstrated an almost linear relationship between accumulated carbon dioxide emissions (historical emissions) and global temperature change.[229] Accordingly, there is a direct relationship between the extent of mitigation and

221. AR6 WGIII (n 7) Chapter 13, Executive summary.
222. Handmer and Nalau (n 33) 371.
223. Kees van der Geest and Koko Warner, 'Loss and Damage in the IPCC Fifth Assessment Report (Working Group II): A Text-mining Analysis' (2020) 20(6) *Climate Policy* 729–42.
224. AR6 WGI (n 1) 108.
225. AR6 WGII (n 6) Cross-Chapter Box LOSS in Chapter 17; Box 15.2.
226. Thomas and Benjamin (n 158) 2376.
227. Boyd et al, 'Loss and Damage from Climate Change' (n 194) 1369.
228. Adelle Thomas, Olivia Serdecsny and Patrick Pringle, 'Loss and Damage Research for the Global Stocktake' (2020) 10 *Nature Correspondence* 700.
229. AR6 WGI (n 1) D.1.1, Figure SPM.10.

adaptation action, and residual loss and damage. Byrnes and Surminski suggest that loss and damage may therefore operate as a reference point from which to analyze the success of climate mitigation and adaptation efforts.[230] In this way, loss and damage should not be the last point of call when mitigation and adaptation action are no longer viable. Instead, addressing loss and damage through holistic financing mechanisms or litigation could incentivize States to avert and minimize losses and damages in the future.

5 CONCLUDING REMARKS

The 'Glasgow Climate Pact', adopted at COP26, includes 12 references to loss and damage,[231] firmly placing the issue on the global climate agenda. Nevertheless, no substantive steps were made to mobilize finance for loss and damage, with action on mitigation and adaption also falling short of what is needed to avert the threat of existential losses and minimize loss and damage through adaptation and climate resilience. As our article has demonstrated, evolving climate science reflected in AR6 provides a robust evidentiary basis upon which to increase consensus on cooperative action across these areas, as well as for potential litigation.

First, AR6 provides evidence of existing and emerging climate-related harm, which poses existential threats for Pacific Island States. In supplement of this, AR6 provides a robust evidentiary basis for steps to be taken to mitigate existential losses – namely, for States to commit to transformative 2030 carbon budgets, in addition to net zero commitments by 2050. Multiple studies also underscore the need for increased financial and technical support, so that developing States are able to fulfil their conditional NDCs, in accordance with the principle of common but differentiated responsibilities and respective capabilities.

Second, AR6 outlines a range of climate impacts that will continue far into the future, including irreversible impacts. In this context, it is necessary to develop robust adaptation and resilience building mechanisms that complement and strengthen traditional knowledges and existing adaptative capacities, so as to minimize loss and damage from such impacts. For Pacific Island States and other developing nations, who have benefited least from the industrial activities that have caused climate change but are impacted most by its adverse effects, this will require dramatic increases in adaptation financing.

Third, AR6 highlights advancements in attribution science, which has the capacity to bolster *ex post* measures to address loss and damage. In addition to financial compensation, reparations for loss and damage may include establishing international and transnational agreements on the rights and status of persons displaced due to climate change – leading to the development of migration facilities, displacement support and homeland resettlement – and mainstreaming climate resilience across all investments and policy decisions, among many others. For attribution science to be effectively harnessed by Pacific Island States to address loss and damage, there is a need for further analyses of regional and place-based hazards and risks.[232]

While this article has focused on the implications of AR6 WGI for the Pacific, the subsequent WGII and WGIII reports are also critically important to inform future

230. Byrnes and Surminski (n 45) 4.
231. 'Glasgow Climate Pact' (n 68).
232. For a country level analysis of climate impacts in the Pacific more generally, see Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Secretariat of the Pacific

actions to avert, minimize and address loss and damage in the region. The intersections between socioeconomic conditions and regional loss and damage were further explored in the AR6 WGII report, and the need for States and transnational actors to rapidly and dramatically decarbonize was emphasized once again in the WGIII report. As a consequence, the Sixth Assessment Cycle of the IPCC report has the potential to strengthen the evidentiary base for both policy-making and litigation to address questions of responsibility for averting, minimizing and addressing loss and damage.

For Pacific Island States, addressing loss and damage is an existential question of how to preserve ecosystems, livelihoods, human rights and their connections to land and sea. As Fiji's Prime Minister, Hon. Joasai V. Bainimarama, put it: '[w]hen the ocean is lapping at your door, fires approaching your home, or flood waters are sweeping through your community, the 1.5-degree target is not a preference – it is vital'.[233] This lived experience of climate loss and damage has been long expressed by Pacific Island communities. With advancements in climate science reaffirming the calls to action from Pacific Island States on the frontline of both climate impacts and climate action, it is overdue for international climate policies to follow suit.

Regional Environment Programme (SPREP), 'Climate Change Update for the Pacific' *Regional Climate Consortium for Asia and the Pacific* (2021) <www.rccap.org/climate-change-update-for-the-pacific/> accessed 19 November 2021.
233. Bainimarama (n 84).