

# The 2025 small island developing states report of the Lancet Countdown on health and climate change: building resilience in the face of rising heat



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## Executive summary

Small island developing states (SIDS) are particularly vulnerable to climate change, and people living in SIDS continue to bear the brunt of its manifestations, including sea-level rise, droughts, floods, and extreme weather events. The vulnerability of SIDS stems from their size, remoteness, geographical locations, and small economies. Collectively, SIDS produce less than 1% of the global greenhouse gas emissions, yet climate change presents an existential threat to them. In this report, we shed light on the disproportionate impact of climate change on SIDS and progress towards achieving the goals of the Paris Agreement by presenting the findings of specific indicators at the climate change–health nexus in SIDS.

In this second iteration of the SIDS report, we present the findings of 28 indicators from five thematic areas: health hazards, exposures, and impacts; adaptation, planning, and resilience for health; mitigation actions and health co-benefits; economics and finance; and public and political engagement in health and climate change. The report is compiled by 30 authors from 25 institutions. General statements about SIDS were only made for indicators with data coverage of at least 70%, with the number of SIDS with available indicator data explicitly stated when this threshold was not met. The 2025 report includes a dedicated chapter on financing with a deep dive into international climate financing for SIDS.

## Health hazards, exposures, and impacts

Extreme heat remains a major concern for SIDS. There is overwhelming evidence of the danger extreme heat poses to sustaining health, lives, and livelihoods, with negative effects along numerous clinical pathways. During the 2015–24 period, infants ( $\leq 1$ -year old) were exposed to seven times the number of heatwave days than during the 2000–09 baseline period. During this period, their exposure increased from an average of 2.4 days per year per infant to 15.8. For the same comparison period, adults aged 65 years and older (older adults) faced five times more exposure than the baseline (average of 3.0 days per person per year to 15.9). Infants and older adults are clinically vulnerable to extreme heat; this substantial increase highlights the need for increased attention to the ramifications of exposure to

extreme heat and investment in nature-based cooling systems.

SIDS have some of the highest rates of premature mortality due to non-communicable diseases, with more than 30% of all deaths occurring due to them. Consequently, Ministries of Health have advocated for the adoption of a healthy lifestyle built on the pillars of healthy diets and physical activity. The increase in ambient temperature since 2010 has made performing even light outdoor exercise difficult. Compared with the 1990–99 period, in 2024, SIDS were exposed to a record average of 41% more hours per year during which ambient heat posed moderate risk of heat stress when undertaking light outdoor exercise.

An estimated 4.4 billion potential work hours were lost due to heat in 2024, which was another record high. The potential loss in labour capacity in 2024 was twice as much as the annual average hours potentially lost over the 1991–2000 period. The associated loss in potential earnings has implications for the lives and livelihoods of outdoor workers and their families, and for the productivity of SIDS. The loss in earnings from heat-related reduction in labour capacity in 2024 was estimated at 1.27% of SIDS' gross domestic product; this estimate was higher than the global gross domestic product estimate of 0.99%.

On average, more than 40 million people in SIDS were exposed to daily concentrations of particulate matter with a diameter of less than  $10\ \mu\text{m}$  ( $\text{PM}_{10}$ ) higher than the WHO guideline (2019–23). The exposure was driven by sand and dust storms, such as the Saharan dust events over the Caribbean. Poor air quality is associated with a cascade of health conditions, including asthma, chronic obstructive pulmonary disease, stroke, and cardiovascular disease. Dust warning systems are in place in the Caribbean; however, further research is required to assess the effectiveness of these early warning systems in evoking appropriate responses.

Climate suitability for the transmission of dengue fever carried by the *Aedes aegypti* mosquito increased by 9% and that for chikungunya carried by the same vector increased by 17% during the 2015–24 period, compared with that in the 1951–60 period. Of note, the number of months suitable for malaria transmission by the *Anopheles* spp mosquito has decreased by 5% in countries with low elevation.

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Coastline suitability for *Vibrio* transmission increased by 4% in the 2015–24 period, when compared with that in the 1982–90 baseline period.

The changing weather patterns have resulted in 80% of the land area of 15 SIDS facing at least 1 month of extreme drought in 2024. Extreme drought affects planting and harvesting cycles and could ultimately affect local food availability. The increased frequency of heatwave days and droughts was associated with 2·7 million additional people facing moderate to severe food insecurity across 26 SIDS. Concurrently, marine food security is threatened by a 0·61°C increase in sea surface temperature (SST) from 1981–2010 to 2022–24.

## Adaptation, planning, and resilience for health

By 2024, national plans to guide the implementation of adaptation and mitigation interventions were completed in 13 (22·4%) of 58 SIDS; however, few SIDS reported that these assessments strongly informed policy development. As of 2024, ten (17%) of the 58 SIDS had developed national health and climate-change adaptation plans.

The integration of climate monitoring, analysis, and diagnostic services with health, disaster, and disease surveillance is important for the development of climate change-resilient and responsive health systems. More effort is needed to integrate climate or weather and health surveillance, as less than half of the SIDS (25 [43%] of 58) have health systems that receive climate or weather data for decision making.

The importance of trees and greenspaces for carbon capture and sequestration, cooling the surroundings, and improving mental wellbeing cannot be overstated. Sadly, there has been a minimal increase in urban greenspace in 2024 (0·2% increase from the 2015–20 baseline period). Compounding the problem is the reduction in tree cover, which was double the hectares lost (2014–23), as compared with that in the previous decade of 2004–13. Sustainable development that incorporates nature-based solutions is essential.

The lethality of extreme weather events in SIDS decreased by 4% in the last decade (2015–24) compared with that in the 2000–09 period, possibly indicating better preparedness and early warning systems for extreme weather events, such as tropical cyclones. However, the number of people affected nearly tripled, possibly due to the increase in the intensity of such extreme weather events.

## Mitigation actions and health co-benefits

Solar photovoltaic electricity capacity increased 2·3 times from 2020 to 2024 and is trending in the right direction. The installation of battery systems will augur well for maintaining supply and grid stability. The gap between investments in renewables and fossil fuels has remained constant at US\$300 million per year since 2020, favouring clean energy investment. However, more public and private investment is needed for SIDS to achieve their energy mix targets by 2030–50.

## Economics and finance

Regarding multilateral funding, the Green Climate Fund has supported 24 SIDS in the development of national adaptation plans, totalling more than \$50 million in financing since 2017. The deep dive into climate financing for SIDS unearthed systemic challenges in the fragmented request processes for technical and non-technical assistance through the UN Framework Convention on Climate Change. The international finance landscape has created increasingly burdensome requirements for SIDS, which has caused strain on the scarce personnel and infrastructural resources available to apply for such funds. Given the potential for duplication and other inefficiencies, there is a need to streamline the process for sharing the requisite transparency and technical assessment reports necessary for accessing climate funding. Much scope exists in assisting SIDS to create the conditions to promote transparency and inform evidence-based allocation. The evolution of climate finance needs to be paired with the development of climate law and justice.

## Public and political engagement in health and climate change

On an inspirational note, July 23, 2025, was historic, as the day the International Court of Justice (ICJ) unanimously upheld the obligations of the UN member states with respect to climate change. ICJ expounded many determinations, three major ones being that the Paris Agreement's global warming target of 1·5°C is legally binding; the production of fossil fuels could constitute an international wrongful act attributable to that state; and there is a duty to make reparations as a legal consequence arising from such wrongful acts, provided that causation has been established.

The Pacific Islands Students Fighting Climate Change, who initiated this request, was unrelenting in its campaign to seek an advisory opinion of the ICJ and was instrumental in mobilising public and political support for the International Court of Justice Advisory Opinion on Climate Change (#ICJAO campaign). Young Vanuatuan students, the Pacific youth advocates, the Government of Vanuatu, and the Melanesian Spearhead Group were highly instrumental in bringing the case before the ICJ. This example of engagement serves as an impetus for further climate action in SIDS.

## Introduction

2024 was a transformative year for global climate-change discourse and for small island developing states (SIDS), which are directly affected by the decisions made. As the hottest year recorded in 175 years—the latest in a trend of record-breaking temperatures—health and development agencies in the Caribbean and the Pacific are increasingly concerned about the millions of children endangered by extreme heat exposure.<sup>1–4</sup> This development, along with severe impacts from tropical cyclones, has marked regions with SIDS (panel 1) among the WHO regions with the

### Panel 1: What are the SIDS?

Small island developing states (SIDS) are some of the world's smallest and most remote countries. The three geographical subregions in SIDS are the Atlantic, Indian Ocean, and South China Sea (AIS); the Caribbean; and the Pacific. The population of SIDS (70 million) is slightly less than 1% of the global population. Although located in different geographical areas, they share similar challenges and vulnerabilities, such as high exposure to extreme weather events and natural disasters, climate change, and global economic shocks.<sup>5,6</sup> This fact, coupled with the low revenue and borrowing opportunities, hinders investments within SIDS on resilience development, with negative effects on economic growth. The natural resources of SIDS are crucially important, with tourism and fisheries making up more than half of the gross domestic product of several states. These vulnerabilities make SIDS especially sensitive to shocks when these resources are affected.

The SIDS designation was first recognised at the 1992 UN Conference on Environment and Development and is supported by several UN Programmes of Action, such as the Barbados Programme of Action (1994), the Mauritius Strategy (2005), the SIDS Accelerated Modalities of Action Pathway (SAMOA Pathway) (2014), and the Antigua and Barbuda Agenda for SIDS (2024). These programmes recognise the impacts of climate change and sea-level rise in SIDS and their efforts to achieve economic development, food security, disaster risk reduction, and ocean management.<sup>5</sup> This report presents data from 58 SIDS across the regions.

#### List of SIDS per subregion

##### The AIS

Cabo Verde, Comoros, Guinea-Bissau, Maldives, Mauritius, São Tomé and Príncipe, Seychelles, Singapore

##### The Caribbean

Anguilla, Antigua and Barbuda, Aruba, the Bahamas, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Cuba, Curaçao, Dominica, Dominican Republic, Grenada, Guadeloupe, Guyana, Haiti, Jamaica, Martinique, Montserrat, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Martin, Saint Vincent and the Grenadines, Sint Maarten, Suriname, Trinidad and Tobago, Turks and Caicos Islands, Virgin Islands

##### The Pacific

American Samoa, Northern Marianas Islands, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, Vanuatu

Of note, 18 of the official SIDS are associate member states and are territories of the US, the UK, or the Netherlands. As such, independent data from the following territories are not always available but are incorporated wherever they exist for indicators: American Samoa, Anguilla, Aruba, Bermuda, British Virgin Islands, Cayman Islands, Northern Marianas Islands, Curaçao, French Polynesia, Guadeloupe, Guam, Martinique, Montserrat, Sint Maarten\*, New Caledonia, Puerto Rico, Turks and Caicos Islands, Virgin Islands

\*The landmass occupied by Sint Maarten (an associate member) is shared with Saint Martin (not an associated member). For indicators using gridded data, given the small size of the island (88.06 km<sup>2</sup>), Saint Martin was added for practicality in reporting.

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highest relative proportion of children displaced by weather-related events.<sup>3,4</sup> Drought events in Timor-Leste and Saint Kitts and Nevis have severely compromised crop yields and produce availability, exposing the fragility of agrifood systems to climate change.<sup>7,8</sup> Rising concerns about impending food crises, malnutrition, marine food insecurity, non-communicable diseases, and high dependence on imports in the Pacific Island Countries and Territories (PICTs) have prompted regional collaboration on innovating solutions to reduce vulnerability to climate change and economic shocks.<sup>7,9</sup> With an increasing health focus of regional climate convenings, SIDS are strengthening and intensifying protective public health measures while closely monitoring the international assistance mechanisms that remain crucial to achieving climate resilience.

Following up on the inaugural SIDS report, this report presents evidence for 58 SIDS using 28 indicators that track essential health aspects of climate change and the

economic, developmental, and political elements that support sustainable health adaptation (panel 2). This collaborative effort was made possible thanks to more than 30 authors worldwide, led by the *Lancet* Countdown Regional Centre for Small Island Developing States. This publication was also supported by the valuable contributions of more than 100 collaborators of the global *Lancet* Countdown on health and climate change. In accordance with the previous report, general statements about SIDS were only made for indicators with data coverage of at least 70%, as data from publicly available, consistent, and valid sources are not always present for SIDS. In instances wherein data coverage for an indicator was less than 70%, the number of SIDS with available data was explicitly stated. The last chapter explores the latest decisions on international climate financing and their implications for vulnerable economies and future development of SIDS.

## Section 1: Health hazards, exposures, and impacts

Unprecedented flood events, crippling droughts, and frequent intense storms affect health in SIDS constantly rather than seasonally. This section discusses the exposure of populations in SIDS to climate hazards that affect human health. The primary focus, at the centre of public health concerns, is on year-round heat exposure, infectious disease transmission, respiratory health, and malnutrition.

### 1.1: Health and heat

Rising temperatures and increasing humidity have been shown to worsen cardiovascular health; hinder childhood development; and cause heatstroke, kidney injury, and even death.<sup>10–12</sup> The physiological responses to extended, year-round heat exposure are not well understood. Children, outdoor workers, older adults, and the general population across SIDS have faced record-breaking, health-threatening heat since 2015.<sup>13</sup> With unabated fossil fuel use, heat has become a health crisis regionally and globally.

#### *Indicator 1.1.1: exposure of clinically vulnerable populations to heatwaves*

Heatwaves can negatively affect physical and mental health.<sup>14</sup> Risk factors increase vulnerability to adverse health effects from heatwaves, especially in infants (aged  $\leq 1$  year) and older adults (aged  $\geq 65$  years). This indicator tracks the total annual exposure of these two particularly clinically vulnerable age groups to heatwave days from 2000 to 2024 in SIDS subregions. Exposure to heatwaves in these groups is increasing in all three SIDS subregions, with record-high exposures in 2024 in the Pacific (both age groups) and the Atlantic, Indian Ocean, and South China Sea (AIS) (infants). Although heatwave exposure for infants and older adults in the Caribbean decreased slightly in 2024, compared with the extreme record highs in 2023, the exposure remained at levels far greater than those faced over the 2000–18 period. Average exposures increased from the 2000–09 period to the 2015–24 period, reaching 6.69 times higher in infants (from an average 2.4 days per year to an average 15.8) and 5.28 times higher in older adults (from 3.0 days per year to 15.9) across all SIDS.

#### *Indicator 1.1.2: heat and physical activity*

SIDS dominate the list of countries with the highest premature non-communicable disease mortality risk ( $>30\%$ ).<sup>15</sup> Frequent engagement in exercise benefits physical and mental health and can lower the prevalence of non-communicable diseases.<sup>12,13</sup> However, heat discourages outdoor activity and increases health risks.<sup>16,17</sup> This indicator estimates how often light outdoor physical activity, such as walking, poses an elevated risk of heat stress. In 2024, a record average of 3000 h for each person would have posed at least moderate risk of heat stress when undertaking light outdoor exercise, 41% more than the average for the 1990–99 period. The AIS had the highest hours of exposure to at

least moderate heat stress risk (3600 h per person; 27%). The Caribbean had the largest absolute and relative increase between the 1990–99 and 2015–24 periods, at 560 h per person (27%), followed by the AIS (550 h per person; 19%) and then the Pacific (190 h per person; 12%). Extreme heat diminishes opportunities for physical activity such as outdoor walking, hindering modifiable protective factors against non-communicable diseases and potentially worsening overall health.

#### *Indicator 1.1.3: change in labour capacity due to heat*

Rising temperatures have implications for productivity and pose hazardous occupational risks, with outdoor workers emerging as a clinically vulnerable group.<sup>18,19</sup> This indicator tracks the potential work hours lost from heat in outdoor sectors on the basis of metabolic heat stress. Alarming, the 4.4 billion potential work hours lost across SIDS in 2024 represent the highest single-year potential loss since tracking began in 1990 (figure 1). The potential heat-related reduction in labour capacity in 2024 was twice as high as the annual loss in outdoor sectors from 1991 to 2000 (2.2 billion h on average per year from 1991 to 2000, compared with 4.4 billion h potentially lost in 2024). Workers in agriculture potentially lost more than 1.3 billion work hours, accounting for 70% of the total potential work hours lost in 2024. The share of potential losses faced by the service sector in 2024 was almost four times higher (an additional 500 million h) than the average in that sector for the 1991–2000 period. The proportion of potential hours lost in services was higher than that in the other outdoor sectors in the Caribbean (450 million potential hours) and the AIS (120 million; 332% more hours). In the PICTs, potential hours lost in construction showed the highest increase (a 195% increase or an additional 60 million potential hours) of the four sectors. In 2024, similar to that in every year since 1990, potential work hours lost were the highest in the agriculture sector, wherein the Caribbean had potential losses of 2 billion h; the Pacific, 900 million h; and the AIS, 250 million h, highlighting the extreme burden that extended occupational heat hazard puts on agricultural workers.

#### *Indicator 1.1.4: heat-related mortality*

Urbanisation, increasing chronic non-communicable disease incidence rates, and ageing populations exacerbate vulnerabilities to heat. This indicator monitors heat-related mortality using a new model based on mortality data from 120 countries. The indicator combines advanced temperature–mortality modelling with Global Burden of Disease estimates to provide the most comprehensive global assessment to date.<sup>20</sup> Using data derived from two non-contiguous 10-year periods, this indicator provides point estimates for the number of deaths attributable to extreme heat.

Across all SIDS subregions, there were comparable relative increases in heat-related mortality estimates.

During the 2012–21 period, heat-related mortality for the Caribbean SIDS reached 25 500 deaths, up from 15 800 for the 1990–99 baseline period, an increase of 61·4%. Similarly, for the AIS SIDS, 8800 deaths were estimated during the 2012–21 period, up from 5500 (60·0%) for the 1990–99 period. In the Pacific SIDS, more than 2000 deaths occurred during the 2012–21 period, compared with roughly 1100 during the 1990–99 baseline period, an increase of 81·6%.

These findings indicate growing mortality risks associated with increases in extreme heat within SIDS, which could be further elevated among more clinically vulnerable subpopulations, such as older adults.

## 1.2: Health and extreme weather events

Extreme weather events overwhelm social systems and infrastructure that were not designed to withstand such occurrences. This section presents the frequency of severe drought, which has implications for food and water security and quality. Exposure to harmful concentrations of particulate matter through sand and dust storms is also presented herein.

### Indicator 1.2.1: drought

A paucity of natural water resources perpetuates water insecurity in small islands, namely manifesting through low rainwater catchment usage, pollution of potable water sources, high rates of treated water loss through distribution networks, and underexplored nature-based solutions for increasing resource collection and storage capacity.<sup>21</sup> This indicator tracks yearly changes in land area facing extreme drought, measured by gridded standard precipitation indices with a resolution of  $0.5^\circ \times 0.5^\circ$ , to study the spatial patterns for each grid. Of the 15 SIDS for which data were available, an average of 61% of land area faced extreme drought for at least 1 month per year in the 2015–24 period, up from the 23% annual average for the 1961–70 period. The total land area facing 3 months of extreme drought per year was nearly five times higher on average for the 2015–24 period (43%) than for the 1961–70 period (9%). A more drastic increase (ten times higher) in the land area facing 6 months of drought per year was noted for the 2015–24 period (19%), as compared with the yearly average (2%) for the 1961–70 baseline period. 2024 was a standout year, with 80% of the land area for SIDS facing at least 1 month of drought, and 70% of the land facing at least 3 months of extreme drought.

### Indicator 1.2.2: sand and dust storms

The frequency and intensity of dust events from natural and anthropogenic sources can be worsened by aridity, deforestation, and poor environmental practices. This indicator measures population exposure to particulate matter with a diameter of  $10\text{ }\mu\text{m}$  or less ( $\text{PM}_{10}$ ) exceeding the WHO daily and annual recommendations, mainly from dust events originating in arid and semi-arid regions. Over the 2019–23 period, almost 41 million individuals across SIDS

## Panel 2: Indicators of the 2025 SIDS report of the Lancet Countdown

### Health hazards, exposures, and impacts

#### 1.1: Health and heat

- 1.1.1: Exposure of vulnerable populations to heatwaves
- 1.1.2: Heat and physical activity
- 1.1.3: Change in labour capacity
- 1.1.4: Heat-related mortality

#### 1.2: Health and extreme weather events

- 1.2.1: Drought
- 1.2.2: Sand and dust storms

#### 1.3: Climate suitability for infectious disease transmission

#### 1.4: Food security and undernutrition

- 1.4.1: Food Insecurity
- 1.4.2: Marine food insecurity

### Adaptation, planning, and resilience for health

#### 2.1: Assessment and planning of health adaptation

- 2.1.1: National assessments of climate-change impacts, vulnerability, and adaptation for health
- 2.1.2: National adaptation plans for health

#### 2.2: Enabling conditions, adaptation delivery, and implementation

- 2.2.1: Climate information for health
- 2.2.2: Urban greenspace
- 2.2.3: Detection, preparedness, and response to health emergencies

#### 2.3: Vulnerabilities, health risks, and resilience to climate change

- 2.3.1: Lethality of extreme weather events
- 2.3.2: Rising sea levels, migration, and displacement

### Mitigation actions and health co-benefits

#### 3.1: Energy use, energy generation, and health

- 3.1.1: Energy use and generation
- 3.1.2: Per-capita energy use

#### 3.2: Mortality from ambient air pollution

#### 3.3: Diet and health co-benefits

#### 3.4: Tree cover loss

### Economics and finance

#### 4.1: Economic impact of climate change and its mitigation

- 4.1.1: Economic losses due to weather-related extreme events
- 4.1.2: Costs of heat-related mortality
- 4.1.3: Loss of earnings from heat-related reduction in labour capacity

#### 4.2: Financial transitions for a healthy future

- 4.2.1: Clean energy investment
- 4.2.2: Global multilateral funding for health adaptation

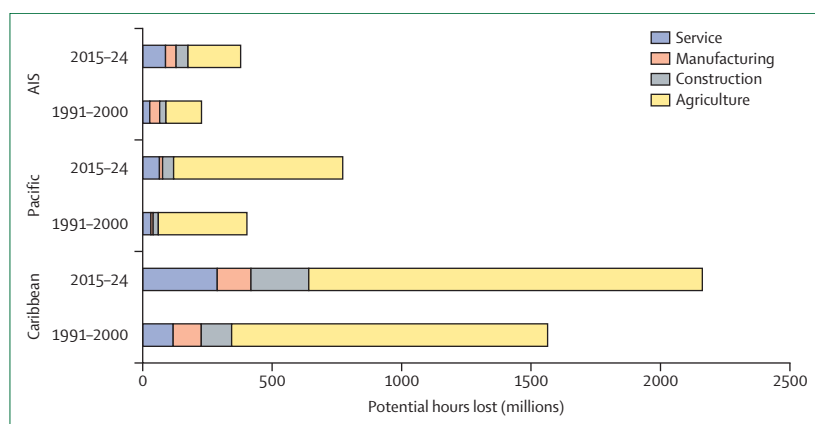
### Public and political engagement in health and climate change

#### 5.1: Scientific engagement on the health impacts of climate change

#### 5.2: Government engagement in health and climate change

SIDS=small island developing states.

(63% of the combined population) were exposed to daily  $\text{PM}_{10}$  concentrations higher than  $45\text{ }\mu\text{g}/\text{m}^3$  at least once in any given year, and almost 12 million (18% of the SIDS population) were annually exposed to levels exceeding



**Figure 1: Potential work hours lost due to heat in SIDS**  
AIS=Atlantic, Indian Ocean, and South China Sea. SIDS=small island developing states.

15  $\mu\text{g}/\text{m}^3$  at least once each year. Over the same period, the Caribbean had the highest absolute and relative population exposure to  $\text{PM}_{10}$  exceeding the WHO daily recommendation (38.6 million people; 90% of the population) and annual recommendation (9.1 million people; 21% of the population). The exposed population in the AIS accounted for 24% of the overall population (equivalent to around 2.3 million) over the period for daily exposure exceeding 45  $\mu\text{g}/\text{m}^3$  and 27% of that (equivalent to around 2.7 million) for annual exposure exceeding 15  $\mu\text{g}/\text{m}^3$ . Of note, AIS was the only subregion in which the number of people exposed annually to abnormal concentrations was higher than those exposed daily. Due to the location of PICTs, exposure to  $\text{PM}_{10}$  from dust events originating in semi-arid and arid areas was minimal for the 2019–23 period.

On an average, each person in SIDS was exposed to 19 days of  $\text{PM}_{10}$  concentrations exceeding 45  $\mu\text{g}/\text{m}^3$ , up 20% (three additional days) from the average days of exposure over the 2003–12 period. In the 2003–22 period, there were peaks in days of exposure in SIDS in 2015 (28 days), 2020 (23 days), and 2021 (24 days), coinciding with the trans-Atlantic African dust event of 2015 and the Godzilla trans-Atlantic dust event of 2020.<sup>22</sup> The high exposure rates reflect that SIDS, especially the Caribbean SIDS in the atmospheric pathway of trans-Atlantic events, are confronted by increasing environmental challenges that amplify the burden of respiratory diseases.

### 1.3: Climate suitability for infectious diseases

The transmission suitability of dengue by *Aedes aegypti* across SIDS increased by 3.65 basic reproduction number ( $R_0$ ; 12.8%) in the 2015–24 period, compared with 28.56  $R_0$  in the 1951–60 baseline period, whereas that by *Aedes albopictus* mosquitoes increased by 2.31  $R_0$  (27.4%) from 8.44  $R_0$ , with the AIS and Pacific regions showing disproportionately higher increases than the Caribbean (AIS: *A. aegypti* 13.4% and *A. albopictus* 17.8%; Caribbean:

*A. aegypti* 7.3% and *A. albopictus* 9.7%; Pacific: *A. aegypti* 17.7% and *A. albopictus* 45.4%). As compared with that in the 1951–60 baseline period, overall transmission suitability of chikungunya increased by 17.2% in the 2015–24 period, whereas that of Zika increased by 9.3%, with region-specific increases of 17.2% (chikungunya) and 13.4% (Zika) in AIS, 13.1% (chikungunya) and 3.0% (Zika) in the Caribbean, and 47.0% (chikungunya) and 20.4% (Zika) in the Pacific (figure 2). The magnitude of these increases justifies strengthening intervention activities for *Aedes*-related diseases, both on a global level and, in particular, for SIDS.<sup>23</sup>

*Plasmodium falciparum* and *Plasmodium vivax* are *Plasmodium* species carried by the Anopheles mosquito, which transmit malaria to humans.<sup>24</sup> In countries with only areas of low elevation (<1500 m), the number of months suitable for transmission of *P. falciparum* malaria decreased by 0.25 months (5.0%) (from 5.05 months) and that for *P. vivax* malaria decreased by 0.26 months (5.1%) (from 5.06 months) in the 2015–24 period, as compared with that in the 1951–60 period. Only two countries in the SIDS region possess land masses higher than 1500 m. In these high-elevation areas, the number of months suitable for transmission decreased by 0.15 months (3.2%) from 4.67 months for both *P. falciparum* and *P. vivax* in Dominican Republic and increased by 1 month (15.7%) from 6.4 months for *P. falciparum* and by 0.29 months (3.5%) from 8.21 months for *P. vivax* in Papua New Guinea.

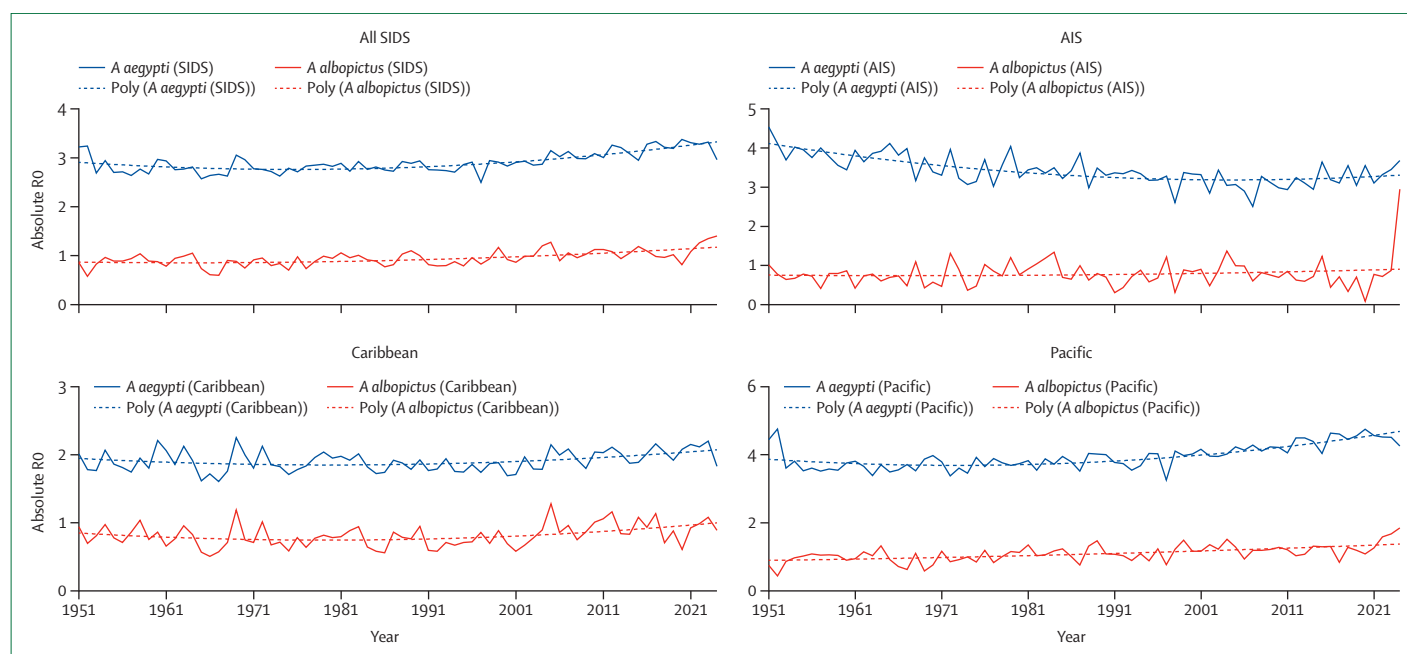
Only six countries had available data on the length of coastline suitable for *Vibrio* transmission. There was a 4.2% increase in the length of coastline suitable for *Vibrio* transmission in the 2015–24 period, as compared with that in the 1982–90 baseline period. However, this aggregate hides regional trends, as there was a 24.7% increase in the four Caribbean countries (Belize, Guyana, Suriname, Trinidad and Tobago) and a 53.0% decrease in the two Pacific countries (Papua New Guinea and Solomon Islands). In addition, overall, both the size of the population at risk and the number of vibriosis cases increased across SIDS regions by more than 40% in the 2015–24 period, as compared with those in the 1982–90 baseline period.

### 1.4: Food security and undernutrition

Food availability is a challenge for sea-locked small islands with scarce land area and growing populations. SIDS also contend with low food quality and increased consumption of highly processed food, exacerbated by climate and weather shocks. The following indicators measure the moderately to severely food-insecure population attributable to heat and droughts, in addition to the impact of ocean temperatures on marine food sources.

#### Indicator 1.4.1: food insecurity

SIDS tend to be highly dependent on food imports, which makes them vulnerable to climate and international



**Figure 2: Absolute R0 for *A. aegypti* and *A. albopictus* for SIDS regions (1951–2024)**

AIS=Atlantic, Indian Ocean, and South China Sea. Poly=polynomial trendline. R0=basic reproduction number. SIDS=small island developing states.

shocks, affecting local food production and supply chains.<sup>25–27</sup> In 2023, 11.7 million people in SIDS countries were malnourished;<sup>5</sup> 35.6% of those responding to the Food and Agriculture Organization Food Insecurity Experience Scale surveys reported being worried that they would not have enough food to eat,<sup>28</sup> 32.2% reported that they would be unable to eat healthy and nutritious food, and 30.3% reported eating less than they thought they should. This year's indicator combines data from the Food Insecurity Experience Scale with annual heatwave day anomalies of the 1981–2010 period and drought month (Standardized Precipitation Evapotranspiration Index at a 12-month timescale [SPEI-12]) anomalies, using a time-varying panel regression to explore the effects of climate change on food insecurity, controlling explicitly for the share of food that is imported.<sup>27,29–31</sup>

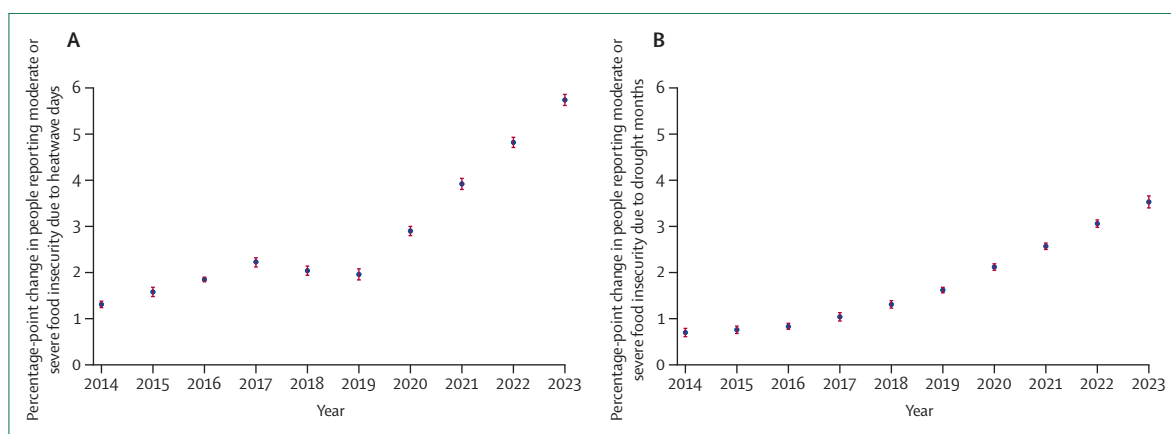
In 2023, an additional 2.7 million people (4.9% of the total population in the 26 countries considered) were estimated to have faced moderate or severe food insecurity due to a higher frequency of heatwaves and droughts, as compared with that in the 1981–2010 baseline period. A higher number of heatwave days was associated with 5.74 percentage-points higher moderate or severe food insecurity in 2023; increasing frequency of droughts was associated with 3.53 percentage-points higher food insecurity (figure 3) than that in 2022. Of note, low-income respondents have a **substantial** higher risk of facing food insecurity than medium-income respondents. In addition, extreme weather events damage infrastructure and disrupt import trade, such that countries that are more dependent on food

imports are at a higher risk of food insecurity than those less dependent. As such, climate shocks have a higher impact on more food import-dependent countries than other countries that are less dependent on the same.

#### Indicator 1.4.2: marine food security

Capture fisheries continue to serve as a cornerstone of economic and nutritional security for SIDS, especially in the Pacific. In some countries, capture fisheries account for as much as 10–35% of the national gross domestic product (GDP), while also supplying between 50% and 90% of the animal protein consumed by coastal populations.<sup>25,32</sup> Disruptions in fishery resources leave these populations vulnerable to fluctuations in income generation, food access, and employment. Rising SSTs along coastal regions pose a substantial threat to marine primary productivity, triggering a cascade of ecological disruptions and adverse impacts across the marine food web.<sup>33</sup>

This indicator captures variations in SSTs across coastal areas of 57 SIDS from 1958 to 2024. The indicator is further complemented by data on fish production (covering both aquaculture and capture fisheries) sourced from the Food and Agriculture Organization.<sup>34,35</sup> Coastal regions of SIDS recorded a substantial rise in SSTs, with the 3-year average (reflective of the El Niño–Southern Oscillation) for the 2022–24 period showing an increase of 0.61°C, compared with the average in the 1981–2010 baseline period. Despite rising SSTs, the per-capita capture-based fish production in SIDS remains more than the global average. However, this trend might not be sustainable in the coming years, given



**Figure 3:** Change in the share of the population (percentage-point change) reporting moderate or severe food insecurity due to (A) heatwave days and (B) drought months

the extensive ecological disruptions associated with increasing SSTs.

### Conclusion

As the evidence shows, extreme heat is affecting human health in small islands via several pathways. Clinically vulnerable populations faced seven times (infants) and five times (older adults) more days of exposure to damaging heat in the 2015–24 period than in the 2000–09 period. The number of hours per year within which overwhelming outdoor heat would have posed a health risk when performing outdoor activity increased by 41% (2015–24) compared with that in the period 1990–99. The record-breaking rise in SSTs was a testament to 2024 marking what the World Meteorological Organization (WMO) is calling the beginning of irreversible ocean warming.<sup>1</sup> Increasing temperatures have contributed to increased food insecurity, suitability for disease vectors and pathogens such as *Aedes* mosquitoes and *Vibrio*, and drought-affected land areas. These findings also emphasise the urgency of global action to implement adaptation actions to cope with those impacts and to substantially reduce high-carbon emitting activities to curb the intensification of climate change. In the meantime, SIDS are already faced with an overwhelming reality of extended, unbearable heat and other climate-change manifestations, such as divergence in the intensities of flooding, cyclones, and droughts.

## Section 2: Adaptation, planning, and resilience for health

The people living in SIDS are being forced to quickly adapt to an increasingly challenging present and a potentially unsustainable future. Robust health-care systems protect health amid growing threats and emergencies. Unprecedented changes in vector suitability, food and water access, and prevalence of disability have compromised the ability of health systems to identify and respond to potential health risks in SIDS. This section tracks protective measures to improve the climate resilience of health systems, boost the

capacity to monitor and respond to emerging climate-sensitive health threats, and provide support systems of sustainable health care.

### 2.1: Assessment and planning of health adaptation

In SIDS, strategic resource allocation is essential for safeguarding populations from negative health outcomes, including those that are climate sensitive. Planning for health emergencies identifies gaps for targeted interventions. The following indicators monitor the regional capacity for health adaptation through this perspective.

#### *Indicator 2.1.1: national assessments of climate-change impacts, vulnerability, and adaptation for health*

Conducting assessments to understand the health impacts of climate change is a key step for taking positive action. As of August, 2024, of the 28 participating WHO member states that are SIDS, 13 have completed Climate Change and Health Vulnerability and Adaptation Assessments, including four (20%) of the 20 SIDS from the Pacific, three (38%) of the eight SIDS from the AIS, and six (20%) of 30 SIDS from the Caribbean. This figure is up from nine SIDS in 2021, marking incremental improvements in conducting these crucial assessments. In the 2021 WHO Climate Change and Health Survey, only four participants reported that these assessments strongly informed policy development.<sup>36</sup> All completed assessments benefited from climate financing, which underscores the crucial role of international support in health adaptation in SIDS.

#### *Indicator 2.1.2: national adaptation plans for health*

The inclusion of health in national adaptation plans is a barometer of a country's active recognition that climate change impedes health developments. According to the 2021 WHO Climate Change and Health Survey and the Alliance for action on climate change and health, 10 (37%) of the 27 participating countries reported having a health national adaptation plan, with two in the Caribbean, three in the AIS, and five in the Pacific.<sup>36</sup> Health national

adaptation plans require strong leadership, well-grounded partnerships, and extensive collaboration, which assure that interventions are planned in response to health risks and provide justification for funding for such interventions.

## 2.2: Enabling conditions, adaptation delivery, and implementation

Adaptive support systems are key for anticipating and managing climate risks, providing decision makers with timely, relevant, and accurate climate information. Furthermore, minimising exposure to risk factors and aggravators can reduce disease incidence, alleviating the burden of climate-sensitive diseases on health services. This section delves into the services available to support evidence-based decisions for health adaptation.

### *Indicator 2.2.1: climate information for health*

The formulation of medium-term to long-term strategies for public health presents a key challenge to SIDS with smaller economies due to a scarcity of data infrastructure and lower financial capacity to invest in climate adaptation. International support is often crucial to bridging these gaps in SIDS. This indicator examines the reported integration of climate information into health surveillance and early warning systems. Of the 36 WMO member states in SIDS that provide climate information to their health sectors through partnership (overall 36 WMO member states of the 58 SIDS), 34 indicated that the information is mainly shared as data services. The health sectors in 25 SIDS are engaged in climate monitoring, which is a major component enabling surveillance of climate-sensitive health outcomes. Climate services in the form of climate analysis and diagnostics were provided by 22 SIDS, which can boost the early warning and response capacity of public health management. 26 SIDS reported providing climate predictions to their health sectors, whereas only 15 provided climate-change projections, highlighting gaps in preparing for future health system resilience.<sup>37</sup>

### *Indicator 2.2.2: urban greenspace*

Adequate greening of urban spaces can contribute to lowering temperatures by up to 5°C per km<sup>2</sup>.<sup>38</sup> Greenspaces also improve local air quality and mental health outcomes and promote outdoor physical activity, yet they continue to be an underutilised protective intervention in SIDS.<sup>39–42</sup> This indicator tracks the vegetation coverage within urban cities using remote sensing to estimate the normalised difference vegetation index. The data cover 22 SIDS.

In 2024, average greenspace increased slightly (0.2%) compared with that in the 2015–20 baseline period, and individual city changes in greenspace ranged from 34% loss to 69% gain. On an average, cities with high and very high human development indices (HDIs) had slight increases in the normalised difference vegetation index in 2024, whereas those with medium and low HDIs had slight decreases. For instance, in 2024, the classification of

Cabo Verde moved from moderate (2023) to high (appendix p 70). Furthermore, the 4% increase in the urban population from 2015 to 2020, which is projected to increase further, underscores the importance of greenspace in city planning.

See Online for appendix

### *Indicator 2.2.3: detection, preparedness, and response to health emergencies*

International Health Regulations core capacity 7 comprises indicators C.7.1 (planning for health emergencies), C.7.2 (management of health emergency response), and C.7.3 (emergency logistics and supply chain management). In 2024, there was improved reporting; 39 (67%) of 58 countries provided data versus 32 (55%) of 58 countries in 2023, due to new reporting from seven Pacific countries, five of which achieved high or very high implementation scores (appendix p 73). Overall, 31 (53%) of 58 SIDS reported high or very high implementation scores, which is an improvement from the 2023 findings (n=24 [41%] of 58). AIS had the lowest scores among all SIDS for C.7.1. Overall, indicator C.7.1 is a concern, accounting for four of the seven lowest scores recorded.

Strengthening planning capacity is a SIDS priority, but gaps in the capacity to detect, prepare, and respond to climate-driven health emergencies remain a concern. Lessons from the COVID-19 pandemic also underscore the need to address inequities in the health emergency response.<sup>43</sup> The WHO Health Emergency Preparedness, Response, and Resilience framework can provide key guidance in developing sustainable approaches.<sup>44</sup>

## 2.3: Vulnerabilities, health risks, and resilience to climate change

Understanding the added risks climate-change impacts pose to SIDS and how countries are withstanding the effects is crucial. Increased droughts, floods, and storms can disrupt essential services and lead to displacement, casualties, and death-posing risks to people worldwide. Uniquely, sea-level rise could cause forced migration of the entire PICTs and destabilise coastal communities in many SIDS. These two indicators track the human harm caused by extreme weather events, threats to settlements within the range of rising sea levels, and planned responses to these risks.

### *Indicator 2.3.1: lethality of extreme weather events*

Although the number of extreme weather events decreased by 4% from 137 in the 2000–09 period to 131 in the 2015–24 period, there was a 195% increase in the number of affected people in the 2015–24 period (more than 38 million) compared with that in the 2000–19 period (more than 13 million). Despite this increase, the number of related deaths fell from 8100 in the 2000–09 period to 1800 in the 2015–24 period, a 78% decrease. The death rate also decreased from 2.15% in the 2000–09 period to 0.43% in the 2015–24 period. This reduction in deaths could be due to the strengthening of resilience mechanisms,

including improved surveillance and early warning systems, and disaster preparedness measures.

Of note, the devastating 2024 Hurricane Beryl was the earliest recorded Category 5 hurricane to ever hit the Caribbean,<sup>45</sup> a key marker for changing emergency response in the region. These findings highlight the importance of ongoing resilience building to prepare for and respond to the impacts of extreme weather events.

#### *Indicator 2.3.2: migration, displacement, and rising sea levels*

Adaptation to slow-onset sea-level rise will reduce the impact of inundation and coastal erosion. In most SIDS, tourism and fishing make the coastal regions the state's economic drivers, and continued loss and damage due to sea-level rise will affect the region's GDP.<sup>46</sup> Among SIDS, Papua New Guinea had the highest annual flooded area of 1124 (SD 568-4485) km<sup>2</sup> in 2020.<sup>6</sup> This indicator uses land elevation and population data. An estimated 1·12 million people in SIDS were living less than 1 m above sea level in 2024. Adaptation measures are important to reduce the growing impact of sea-level rise, including on populations and economies.

The second part of this indicator monitors national policies related to climate change, health, and migration. As of 2024, 23 policies mention migration related to climate change. Most of these policies (16) are from the Pacific subregion and are concrete or have guidelines related to climate change, health, and migration. The remaining provide frameworks, plans, and commitments to guide policy development.

Fiji, Vanuatu, and Solomon Islands have policies that include planned relocation due to the impact of climate change-related events. The Falepili Union treaty (2023), not included in the 23 policies due to the shared jurisdiction between Australia (not a SIDS) and Tuvalu, allows up to 280 Tuvaluans per year to be issued with an Australian permanent residency visa. This is among the first bilateral agreements to acknowledge the threat of climate change, such as sea-level rise.<sup>47</sup>

#### **Conclusion**

Demonstrably effective adaptation interventions have been underutilised across SIDS. In particular, too few SIDS cities have adequate urban greenspace, one of the few nature-based protective features against heat. There have been improvements in integrating climate data into health services through collaborations with WMO members, and more countries have completed Climate Change and Health Vulnerability and Adaptation Assessments. However, there is little proof that the body of evidence provided by these added resources strongly informed policy planning or resource allocation, which could aid in the management of public health threats. Nevertheless, improvements in emergency preparedness and response are likely to have contributed to the decrease in the lethality of storms and floods. Finally, PICTs continue to lead the way with policy planning for sea-level rise-related

migration. SIDS in other locations could benefit from studying these national plans and international agreements, recognising their unique vulnerability, and taking action to protect the health of residents of SIDS.

### **Section 3: Mitigation actions and health co-benefits**

Accelerating and upscaling mitigation action ensures long-term stability in vulnerable SIDS. In addition to ensuring energy independence, reducing the use of polluting fuels improves human health. The following section explores the influence of energy usage, diet, and deforestation on health outcomes.

#### **3.1: Energy use, energy generation, and health**

The heavy reliance of SIDS on fossil fuels compromises air quality, imposes a significant economic burden, and restricts access to healthy food. The following indicators track energy use and its impact on health.

##### *Indicator 3.1.1: energy systems*

Sustainable Development Goal (SDG) 7 calls for “reliable, sustainable and modern energy for all by 2030”. In 2024, on an average, 16·6% of the total energy consumption in SIDS came from renewable energy sources, 1·3% lower than the global average (17·9%).<sup>48,49</sup> This indicator tracks the share of fossil fuels and renewables in electricity capacity across 56 SIDS from 2000 to 2022, using data from the International Renewable Energy Agency (appendix p 81). From 2000 to 2024, the total installed electricity capacity grew from 26·8 GW to 49·4 GW. In 2024, oil (20·8 GW) and natural gas (16·8 GW) were the largest sources of installed non-renewable electricity capacity. Solar photovoltaic and hydropower were the largest sources of installed renewable energy in 2022, but at much lower capacities of 5·2 GW (solar photovoltaic) and 1·8 GW (hydropower). There was a five percentage-point increase in the renewable energy mix supplied in 2024 (14·6%) versus that supplied in 2020 (9%). Across SIDS, 18% of on-grid and 21% of off-grid electricity capacity came from renewable sources, up from 9% for on-grid and 13% for off-grid in 2000.<sup>48</sup>

There has been a steady increase in solar photovoltaic power stations, both on-grid and off-grid, marked by a 2·3-fold increase from 2020 to 2024 (table 1). Smaller increases in installed electricity capacity for onshore wind and renewable hydropower technologies could indicate that SIDS do not find these a suitable alternative or could be related to investments for their installation.<sup>50,51</sup> The Caribbean leads in installed electricity from all main renewable energy technologies, whereas only the Pacific exploits renewable municipal waste (table 1).

From 2020 to 2022, Puerto Rico was the highest consumer of coal, accounting for greater than 9000 MW/GWh, and New Caledonia was the highest consumer of peat, accounting for greater than 4000 MW/GWh. Singapore relied heavily on natural gas, while Puerto Rico (over 45 000 MW/GWh) and Cuba (50 000 MW/GWh) were the

highest oil consumers (accounting for 45 000 of the near 160 000 MW/GWh oil consumed). Polluting fuels in the energy systems of SIDS can be reduced through the increased rollout of renewables and battery energy storage system investment. This fact highlights that renewables protect health and curb climate change and provide crucial frequency regulation and grid stabilisation.<sup>52</sup>

### Indicator 3.1.2: per-capita energy use

Energy consumption figures reveal the state of economic development, access to amenities, and energy efficiency. However, since fossil fuels remain the primary source of energy in SIDS, high energy use drives greenhouse gas emissions. This indicator uses electric energy consumption per capita for nine SIDS to estimate the potential CO<sub>2</sub> equivalents (CO<sub>2</sub>e, a unit in measuring greenhouse gas emissions including, but not restricted, to CO<sub>2</sub>).

From 2000 to 2022, average electric power consumption in six of nine SIDS (ranging from low to high HDIs) was lower than the global average of 3000 kWh per capita. The remaining three SIDS all had high to very high HDIs and exceeded the global average. Singapore had the highest per-capita consumption of the nine SIDS, with an annual average of more than 9600 kWh per capita over the 2018–22 period, marking a 23% increase from the 2000–04 (baseline) period average (close to 8000 kWh per capita). This consumption produced an estimated CO<sub>2</sub>e of 8000 pounds per person between 2018 and 2022. Trinidad and Tobago and Curaçao were the top electric energy consumers, with averages near 6500 kWh per capita (5300 pounds CO<sub>2</sub>e; Trinidad and Tobago) and 5000 kWh per capita (4000 pounds CO<sub>2</sub>e, Curaçao) from 2018 to 2022. Curaçao was one of the only two SIDS—the other being Jamaica—with decreased electric energy consumption (33% less than that in the 2000–04 period). Factors such as population decline and changing energy profiles can cause reductions in energy consumption. Of the nine SIDS, Haiti remained the country with the lowest electric energy consumption over the 2000–22 period; however, Haiti was also the country with the highest percentage change (a 143% increase) for the 2018–22 period (80 kWh per capita), as compared with that in the 2000–04 period (30 kWh per capita).

### 3.2: Mortality from ambient air pollution

Air pollution is one of the many challenges faced by SIDS (panel 3). Ambient fine particulate matter with a diameter of 2.5 µm or less (PM<sub>2.5</sub>) and other air pollution measures are undermonitored in SIDS.<sup>87,88</sup>

In 2021, 26 000 deaths were attributable to PM<sub>2.5</sub>, a 5.7% increase compared with the 24 000 deaths in 2016. The Pacific SIDS had an 18% increase in deaths over the same period, from 2200 to 2600, whereas the Caribbean SIDS had more than 20 000 deaths in 2021, a 4.4% increase.

Fuels containing sulphur are burned in the production of coal, metal mining and smelting, and heavy diesel equipment transportation. The combustion of sulphur-

|                     | Other renewables | Onshore wind | Hydropower | Solar photovoltaic | Total |
|---------------------|------------------|--------------|------------|--------------------|-------|
| AIS (2020–24)       | 0.04             | 0.55         | 1.58       | 1.07               | 3.19  |
| Caribbean (2020–24) | 0.56             | 8.16         | 26.47      | 16.29              | 51.48 |
| Pacific (2020–24)   | 4.66             | 1.11         | 12.21      | 7.66               | 25.63 |
| SIDS 2020–24 total  | 5.25             | 9.76         | 40.27      | 25.02              | 80.30 |
| SIDS 2020           | 0.22             | 0.82         | 1.77       | 2.20               | 5.01  |
| SIDS 2024           | 0.28             | 0.97         | 1.84       | 5.14               | 8.23  |

Data are indicated as GW. AIS=Atlantic, Indian Ocean, and South China Sea. SIDS=small island developing states.

Table 1: Renewable energy distribution by SIDS subregion (2020–22)

containing fossil fuels releases SO<sub>2</sub> into the atmosphere. Volatile organic molecules and nitrogen oxides, both of which are produced as a result of the combustion of fossil fuels, react to form ozone in the atmosphere. The concern with these more commonly noted phenomena is that interactions between ground-level ozone, nitrogen, and methane—which are produced in industrial zones, agricultural areas, and dirty fuel-dependent transport systems—can combine to worsen air quality (specifically PM<sub>2.5</sub>).<sup>89</sup> This occurrence contributes to worsening respiratory issues, triggers asthma attacks, and increases the propensity to respiratory infections in clinically vulnerable populations.<sup>90</sup> These facts support the need for air quality modelling and early warning.<sup>90,91</sup>

### 3.3: Diet and health co-benefits

Low intake of high-quality, plant-based foods and excessive intake of red and processed meat are major contributors to greenhouse gas emissions and human health risks. This indicator monitors the health burden (captured in mortality estimates) associated with unhealthy food consumption (appendix p 87).

Comparable patterns in diet-related mortality were observed for the Caribbean and the AIS. Between 2021 and 2022, alongside a population increase of 1%, the diet-related mortality estimates for the Caribbean increased from 65 000 to 66 000 attributable deaths (1%). Notably, the largest proportional increase in attributable deaths (91 200) was associated with underconsumption of fruits. In the AIS, the burden of total diet-related mortality increased from 6600 in 2021 to 6700 attributable deaths in 2022, against a 9% population increase between 2021 and 2022. In the Pacific SIDS, the burden of diet-related mortality increased from 31 000 to 32 000 attributable deaths, as compared with a population increase of 2%. Together, carbon-intensive diets including meats, milk, and sugar were linked to an increase of more than 17 000 (303%) attributable deaths in the Pacific subregion between 2021 and 2022.<sup>92</sup> Across all SIDS, attributable death estimates indicate that the burden of diet-related mortality increased by almost 1500 deaths (1%).

### 3.4: Tree cover loss

SIDS continue to lose millions of hectares of tree cover on an annual basis, which has implications for climate-change

### Panel 3: Health impacts of air pollution associated with climate change

Air pollution is a major public health problem. Air pollution has been well researched and documented in many regions of the world, and its role in a wide range of health outcomes has been proven.<sup>53</sup> Problems related to air pollution and climate can have serious impacts on economies and the social fabric of communities.<sup>54</sup> People in urban areas are particularly vulnerable to health risks due to changing patterns and frequency of ground-level atmospheric ozone concentration or smog, dust, aeroallergens, and other aerosols, which can trigger asthmatic responses and can cause cancer.<sup>55</sup> Small island developing states are particularly vulnerable to extreme weather events, including large-scale outbreaks of Saharan dust and urban smog.

Globally, the largest dust sources are in the northern hemisphere, with major contributions from the Sahara and Sahel regions in north Africa. Dust research in the Caribbean (eg, Barbados, Puerto Rico, Guadeloupe, Martinique, and Cayenne) has provided a broad understanding of long-range atmospheric transport of African dust<sup>56,57</sup> and has shed light on particle characterisation.<sup>58–64</sup> These dust particles affect climate, weather, and ecosystems, including coral reefs, forests, and human populations.<sup>65–72</sup> Seasonal asthma rates are high in many Caribbean island nations.<sup>73–75</sup> The population of Puerto Rico has the highest prevalence of asthma and respiratory diseases related to aerosols in the USA.<sup>76,77</sup> African dust outbreaks are also known to increase the risk of asthma-related emergency room visits and hospital admissions for children in Trinidad and Tobago, Guadeloupe, and Grenada.<sup>73,78,79</sup> In addition, human exposure to dust is associated with allergies, fungal infections, and premature death.<sup>80</sup> Dust is also a major safety hazard to road transportation, aviation, and marine navigation.<sup>80</sup>

The key anthropogenic sources of primary particulate matter in small island developing states are fossil-fuel-based power plants, cement production, mining, stone crushing, burning of agricultural fields, and vehicle traffic.<sup>79,81</sup> Polycyclic aromatic hydrocarbons are usually found in emissions from diesel vehicles and the production of crude oil and pose a major health threat when they bind, forming small particles in the air known as black carbon.<sup>81–84</sup> Long-term contact with black carbon is linked to major health issues, including respiratory diseases, cancer, and birth defects.<sup>85</sup> Nitrogen oxides are also released in fumes from traffic congestion, causing respiratory issues such as sore throat, runny nose, and coughing, and are linked to respiratory conditions such as bronchitis, asthma, and pneumonia.<sup>86</sup>

and health-related impacts. Using satellite imagery analysis, this indicator measures vegetation in hectares of tree cover of at least 30% tree canopy density. Between 2014 and 2023, SIDS had an additional loss of 2.6 million hectares of tree cover over the previous decade, 2001–10. From 2014 to 2023, tree cover loss among SIDS almost doubled. This reduction between 2014 and 2023 reflects a 113% change in tree cover loss, compared with that in the baseline period.

On a subregional basis, the majority of this loss occurred in the Pacific (53%) and the Caribbean (42%), in contrast to minimal tree cover loss (6%) in the AIS. Shifting agriculture, involving the slashing and burning of tree cover as part of the land-preparation process, and commodity-driven deforestation, especially for timber production, are the main drivers of deforestation in SIDS, which have all increased exponentially since 2002 (appendix p 105). Urbanisation, including informal settlements, also continues to reduce tree cover, which

contributes to urban heat stress as tropical trees provide shade and play a key role in ameliorating higher temperatures.<sup>93</sup> Tree cover loss is accelerating surface runoff following intense rainfall, leading to flooding in many urban areas, especially in capital cities, where outdated drainage systems are inefficient in coping with flash floods.<sup>94,95</sup> Deforestation is linked to a paucity of carbon sequestration, increased carbon emissions, and lower air quality, which affects urban population health substantially.<sup>93</sup>

### Conclusion

Reliance on fossil fuels remains high in SIDS, with oil providing 20.8 GW of installed electricity for SIDS in 2022 compared with the 5.1 GW provided by solar photovoltaic power. With the exception of solar photovoltaic power, there was little increase in renewable technologies in the installed electricity capacity. The 2.3-fold increase in solar photovoltaic energy between 2020 and 2022 is a positive trend. Given the great potential to exploit renewable energy and reduced capital cost of installing solar photovoltaic technologies, SIDS are well poised to take advantage of this opportunity and move towards achieving energy independence.

The 5% increase in deaths attributable to ambient fine PM<sub>2.5</sub> over the 2016–21 period should not be ignored. Increasing internal migration to urban spaces in SIDS requires the implementation of urban planning codes designed to reduce urban sprawl and improve air quality and urban greenness. The occurrence of deforestation in SIDS at such a rapid pace and on such a large scale is concerning. Given the high climate vulnerability, small size of SIDS, and unprecedented heat, building nature-based strategies into sustainable development planning could be cost effective.

Further research is needed to identify the underlying reasons for the increasing consumption of unhealthy foods in SIDS. The underconsumption of fruits and vegetables is particularly concerning and could be due to a growing dependence on imported food. Evidence exists that revitalising local food landscapes reduces the high cost burden associated with food importation, which can range up to 60–90% in the Caribbean and the PICTs, and provides direct health benefits through the provision of more nutrient-dense food.<sup>96,97</sup>

### Section 4: Economics and finance

The economic burden of frequent extreme weather events, high debt, heavy reliance on external funds, and the growing cost of maintaining healthy societies are challenges to achieving long-term climate resilience and stable socio-economic development in SIDS. This section explores the financial impacts of climate change. This section also monitors the green climate investment and adaptation financing available to SIDS.

#### 4.1: Economic impact of climate change and its mitigation

These indicators explicate the economic costs to SIDS due to climate change, accruing from total damage and loss, heat-related mortality, and potential loss in wages due to heat-related reduction in labour capacity—a key socioeconomic determinant of health.<sup>98</sup>

##### *Indicator 4.1.1: economic losses due to climate-related extreme weather events*

According to data from the Emergency Events Database (EM-DAT), total losses due to climate-related hazards from 2014 to 2024 for all SIDS exceeded \$127 billion, representing a 300% increase over the \$31.3 billion lost between 2000 and 2010. Most of the damage occurred in 2017 and was caused by several Category 5 tropical cyclones in the Caribbean.

Country-by-country losses as a proportion of GDP were in the range of 0.04% to 304% from 2014 to 2024. Eight events caused within-country damage of more than 25% of the GDP.<sup>99</sup> Although countries with smaller economies tended to see higher percentage losses, countries with larger economies also faced substantial losses from tropical cyclones, with the Bahamas (32% of GDP), Haiti (17%), and Puerto Rico (83%) facing losses during the period.

##### *Indicator 4.1.2: costs of heat-related mortality*

SIDS recorded an increase in economic costs of heat-related mortality in older adults during the 2000–04 to 2020–24 periods (appendix p 105). The global average increase was 206%, whereas average annual monetised costs of heat-related mortality in SIDS increased by 432%, from \$924.24 million (2000–04) to \$4.92 billion (2020–24). This value is equivalent to the income of 315 680 individuals during 2020–24. Increases in monetised costs (506%) and personal income equivalents (327%) for the Caribbean SIDS were more than twice the increase in monetised costs (235%) and personal income equivalents (136%) for the Pacific SIDS, and almost twice as much as the increase in monetised costs (275%) and personal income equivalents (167%) of the AIS SIDS. On an average, between 2000 and 2024, monetised costs of heat-related mortality increased annually by \$32.39 million in the Caribbean, \$4.73 million in PICTs, and \$1.14 million in the AIS. Heat-related mortality in older adults was associated with the income of an additional 1900 people in the Caribbean, 250 in the Pacific, and 63 in the AIS.

##### *Indicator 4.1.3: loss of earnings from heat-related reduction in labour capacity*

In 2024, SIDS continued to see potential loss of earnings from heat-related reduction in labour capacity. Losses from the economic sectors of construction (31.8%) and agriculture (31%) accounted for nearly two-thirds of the total losses, and services contributed almost a quarter (24.4%).

Across all SIDS, potential lost wages in 2024 reached a record high of \$14.7 billion, increasing by 11.4% from

2023. Although this increase is lower than the average global increase of 17%, the implications remain dire in the fragile SIDS economic context. When considered as a proportion of GDP, SIDS had higher impacts of lost wages. Potential losses are equivalent to 1.27% of GDP in SIDS, which is 1.3-times the global level of 0.99%. Important subregional differences were noted in the drivers and estimated potential lost wages as a proportion of GDP. The economic impact was the highest in the Pacific (2.14% of GDP), largely due to agricultural losses, which constituted 65% of the total losses. The economic impact in the Caribbean represented 1.58% of the GDP, with agriculture (38.8%) and construction (31.6%) having the greatest influence. The AIS had the lowest economic impact (0.86% of the GDP), driven by the construction (35.9%) and service (33.3%) sectors.

Between 1990 and 2024, the total loss of potential earnings for SIDS was \$309 billion, with \$103.9 billion (33.6%) in the construction sector and \$97.6 billion (31.6%) in the agricultural sector. These findings are in contrast with the global pattern of higher losses in agriculture (47.6%) than in construction (25.6%).

SIDS are highly reliant on outdoor, recreational, and service industries, which put workers at risk of heat exposure, such as tourism (which contributes to 30% of the GDP [twice the global average])<sup>100</sup> and construction.<sup>98</sup> Thus, continued reliance on these industries as drivers of economic growth will put workers at further risk and exacerbate the loss of earnings from heat-related reduction in labour capacity in SIDS.

#### 4.2: Financial transitions for a healthy future

Financing that supports the shift from high-carbon activities and practices to low-carbon and sustainable alternatives is imperative to navigate the challenges of climate change, sustainable development, and economic vulnerability. The following indicators track two key aspects needed to accomplish this financial transition in SIDS: investment in sustainable forms of energy and access to international funding for health adaptation.

##### *Indicator 4.2.1: clean energy investment*

The issue of developing viable renewable energy resources is a priority for SIDS, which are often rich in natural resources such as sun and wind. In accordance with SDG7, which aims to ensure universal access to affordable and clean energy, several countries have set targets towards increasing the renewable energy mix of their energy systems. Some countries have taken the bold step of setting a target of 100% renewable energy by 2030. These countries include Fiji, Vanuatu, the Solomon Islands, and Antigua and Barbuda.<sup>101</sup>

Between 2000 and 2022, \$4 billion of public funds were invested in renewable energy in SIDS. Of this amount, the investment in the Caribbean represented 46.8%, that in the Pacific 32.6%, and that in the AIS 20.6%. The increase in public investment in renewables and fossil fuels has

remained at approximately \$300 million per year since 2020, indicating that SIDS continue to maintain their renewable energy investment edge. In 2021, the cumulative capacity of SIDS renewables was 5.2 GW; however, the cumulative targeted capacity set by SIDS is 13 GW by 2030. Using the current trajectory, SIDS will need to double their cumulative capacity to achieve their target.

#### *Indicator 4.2.2: global multilateral funding for health-adaptation programmes*

For SIDS, international financial support and capacity building are key for health adaptation. Commitments from high-emitting countries and partnerships with multilateral development agencies have been crucial in the success of climate resilience projects with direct and indirect health benefits to SIDS, particularly in water resource and agriculture management in the Caribbean, Samoa, and Vanuatu.<sup>102</sup> This indicator tracks the global pool of funding for health adaptation, monitored by the Climate Funds Update and the Green Climate Fund (GCF). In 2024, \$152 million was approved for adaptation projects that included at least one SIDS. Of this amount, \$137 million was available through the GCF, and the remaining financing was through the Least Developed Countries Fund and the Adaptation Fund. Although the projects approved in 2024 are likely to have health co-benefits, none of the adaptation projects with SIDS explicitly targeted health adaptation.

In 2024, the GCF approved \$6.2 million for the development of national adaptation plans for three SIDS (Seychelles, Vanuatu, and Saint Lucia). Overall, since 2017, national adaptation plan development in 24 SIDS has been supported via the GCF, which shows that global financial assistance in capacity building is a key pillar accelerating national readiness for sustainable health adaptation.

#### **Conclusion**

The available SIDS data highlight the increasing burden of health and the socioeconomic costs of climate change. That no one-size-fits-all approach will work is apparent, as there are important emerging differences between SIDS subregions, resulting in the need to tailor climate-resilient interventions. The Caribbean SIDS faced the greatest losses and damages from climate-related extreme events, possibly due to having more HDI countries with high-value infrastructure and economic assets, and also showed increased vulnerability to heat-related mortality than other subregions. In contrast, the Pacific had the greatest impact from loss of potential earnings due to heat-related reduction in labour capacity among the subregions. As SIDS continue to make progress towards targets to ensure a healthy future, addressing the disconnect between priority setting and achieving adequate funding for clean energy investment and sustainable health adaptation requires focused and sustainable global political commitment. Findings presented in this section did not have country-level data for all SIDS countries; thus, future work should focus on improving data collection and sharing.

## **Section 5: Public and political engagement in health and climate change**

There can be no meaningful change without engagement of the key actors at the intersection of climate change and health. Individual, scientific, and government engagement is crucial for the discovery and measurement of the impact of climate change on health and for introducing innovations and taking action for adaptation. Not to be overlooked are the roles of engagement through public and private participation in the development and enforcement of norms and legislation on climate and health, especially to protect the most vulnerable; international and national negotiations and development of long-term policies on climate and health, ideally based on evidence; public funding of prioritised actions on climate and health; and development of public education campaigns and formal public education on climate and health.<sup>103–105</sup> Governments and private-sector organisations working hand-in-hand are valuable for lobbying for mitigation efforts. SIDS have been vocal in the international space through government engagement, as the impacts on the population's health and the environment continue to worsen.

The world's leaders came together when signing the Paris Agreement, deciding upon global goals for limiting global warming. Despite this global agreement, which also offers an opportunity to streamline efforts to address climate change, there have been delays in achieving these goals. Although government engagement is measurable in terms of several of the aforementioned key roles, in this report (particularly due to inconsistent sources of information), we delve into government engagement through the lens of engagement of civil society, academia, international organisations, and governments and their roles in combating the impact of climate change on human health.

### **5.1: Scientific engagement on the impacts of climate change on health**

Within the climate change–health nexus, one of the key roles of the scientific community is bridging the gap between evidence and actionable strategies. This bridging will involve translating science into real-world principles that can be used by policy makers and facilitate actual change. The work of academic communities through studies conducted on small islands is one way to measure how effectively engaged researchers are with health and climate change and whether sufficient evidence is being provided for informed decision making.

This indicator tracks the number of scientific publications at the climate change–health nexus for the 1990–2024 period. The indicator also counts the number of studies that focus on impacts and mention an attributable link between human-induced climate change and impacts in a given location (table 2).

There was a 216.7% increase in the number of scientific publications for SIDS from 2015 to 2024, largely driven by publications from Puerto Rico and Singapore. However, a closer examination of the trend in publications over the past

|                  | Year |      |      |
|------------------|------|------|------|
|                  | 2024 | 2023 | 2020 |
| SIDS             | 91   | 100  | 101  |
| Oceania          | 91   | 107  | 108  |
| Latin America    | 162  | 184  | 186  |
| Africa           | 387  | 367  | 264  |
| Europe           | 503  | 560  | 444  |
| Northern America | 539  | 618  | 557  |
| Asia             | 1125 | 1382 | 1138 |

SIDS=small island developing states. \*The *Lancet* Countdown regions are defined on the basis of the network of *Lancet* Countdown Regional Centres. Although some align with WHO regional divisions, the countries involved are generally reported under the six established regional centres (Asia, Africa, Europe, Oceania, SIDS, and Latin America) and North America.

**Table 2: Number of studies on health with attributable climate trends by *Lancet* Countdown region\***

5 years (2020–24) showed quite stable numbers, with an average of 93 publications per year. The number of scientific publications for SIDS was 91 in 2024, resulting in a publication rate of 1.6 per country. This figure represents a 9.0% decline from 2023 (100 publications, 1.8 per country). Compared with those of other world regions, the scientific engagement rates of SIDS and Oceania (defined as *Lancet* Countdown regions) are the lowest.

SIDS are highly vulnerable but the least studied, leaving them underprepared for evidence-based decision making.<sup>20,31</sup> Given the vulnerability of SIDS to climate change, this shortfall in scientific engagement to address climate change and health is alarming. There is an urgent need for a comprehensive review of the barriers to conducting research on the health–climate change nexus in SIDS. Additional support could then be targeted for SIDS, to improve capacity for scientific engagement. The fourth International Conference on Financing for Development (2025) supported the need for increased funding for science and to ensure that scientific data and publications are accessible to countries in need.<sup>106</sup>

## 5.2: Government engagement

The annual UN General Debate provides governments of SIDS with a global forum to discuss priority issues regarding climate change as a public health issue. As the representatives of their people and by extension of the collective interest of the most vulnerable communities in nations, governments are key enablers for initiating action to tackle the health implications of climate change. Attendance of governments of SIDS in regional and international conventions presents opportunities for amplifying purposive and participatory approaches to solving shared challenges. This indicator focuses on the inclusion of climate change and health in statements at the UN General Assembly and in submissions for nationally determined contributions (NDCs).

In the 2024 UN General Assembly statements, governments of SIDS, including Antigua and Barbuda, Barbados,

Vanuatu, Tuvalu, Tonga, Saint Kitts and Nevis, the Bahamas, and Papua New Guinea, all repeated the warning that urgent actions are needed to address a crisis not created by small islanders.<sup>107</sup> Despite the increased representation of health in climate-change governance structures nationally,<sup>108,109</sup> the proportion of SIDS referencing health and climate change at the debates declined from 19 (51%) of 37 SIDS in 2023 to 17 (46%) in 2024. This trend represents a continuous annual decline from the peak of 81% in 2020. The Pacific subregion continues to lead in terms of the proportion of governments referencing health and climate change, with 10 (77%) of 13 countries mentioning the intersection. Although mentions of the intersection of health and climate change are declining, the governments of SIDS still recognise the overall issue, with 36 (97%) of 37 mentioning climate change and its impact on their countries. Sea-level rise, coastal erosion, and extreme weather events, along with the paucity of recovery funds, were prominent themes in the speeches of the governments.

The second part of this indicator tracks the engagement with health and climate change in NDCs. The NDCs are requirements agreed upon under the Paris Agreement and are updated every 5 years.<sup>110</sup> The third submission was due in 2025. Only four SIDS submitted their third NDCs as of the initial February, 2025 deadline; this number increased to 21 (36%) of 58 SIDS by mid-November, 2025.<sup>111</sup> The second round of submission saw 32 (97%) of the 33 submitting SIDS mentioning health keywords, an increase from the first round, where 32 (82%) of the 39 submitting SIDS mentioned health keywords.

## Conclusion

Political engagement in health and climate change has continually decreased since 2020. To combat this downward trend and keep health at the centre of climate discussions, there is a need to further embed health arguments and professionals in climate spaces, including in climate-change governance. Members of the public and private sectors, along with individuals, can guarantee increased participation of health-sector representatives in climate-change governance structures and clearly state health-promoting actions in climate-planning processes and funding programmes, develop health impact assessments and health-economic assessments for all actions listed in a country's NDCs, and use this information in the prioritisation of interventions and policies that can maximise health gains or avoid health-related costs. NDCs present a massive opportunity to advance health and climate action together, and assessments of actions listed in NDCs could be a great way to prioritise actions.

Despite declines, leaders of SIDS continue to be vocal on the health–climate change nexus, with 97% of the submitting countries highlighting the crisis in their second round of NDCs. Political engagement needs to continue for improvement in mitigation and adaptation efforts for SIDS.

For more information, see  
<https://lancetcountdown.org/our-regionals-centres/>

#### Panel 4: Youth advocacy and the ICJ: Pacific students challenge climate injustice

In 2019, a group of 27 law students from the University of the South Pacific in Fiji launched the #ICJAO (International Court of Justice Advisory Opinion) campaign to beseech the governments of Pacific Island Countries and Territories to seek an advisory opinion from the ICJ on the obligations of States with regard to climate change and human rights. The group, Pacific Islands Students Fighting Climate Change (PISFCC), contended that climate change was an infringement on the human rights of small island states and that “for too long those most responsible for the climate crisis have ignored their obligations while our homes, cultures, identity and entire futures disappear”.<sup>112</sup>

In August, 2022, at the 51<sup>st</sup> Pacific Islands Forum, Vanuatu’s request for a formal endorsement of the members to seek an advisory opinion from the ICJ was unanimously supported. The Government of Vanuatu formed a coalition and presented a resolution to the UN General Assembly. In March, 2023, the UN General Assembly unanimously adopted the resolution and requested the ICJ to issue an advisory opinion on two main questions:<sup>113</sup> what are the obligations of States under international law to ensure the protection of climate systems and other parts of the environment from anthropogenic emissions of greenhouse gases for States and for present and future generations? What are the legal consequences under these obligations for States wherein they, by their acts and omissions, have caused substantial harm to the climate system and other parts of the environment?

In December, 2024, the ICJ heard from 94 nations and 12 intergovernmental organisations, including representatives from the PISFCC, led by Vanuatu and the Melanesian Spearhead Group.<sup>114,115</sup> Of note, although the ICJ opinions are non-binding, they carry legal, political, and moral weight.

On July 23, 2025, the ICJ delivered its historic advisory opinion on the obligation of States with respect to climate change.<sup>116</sup> The ICJ’s opinion was a huge win for SIDS as it upheld the obligations of the States with respect to climate change. The Court expounded many determinations, three major ones being that the Paris Agreement’s global warming target of 1.5°C is legally binding, the production of fossil fuels could constitute an international wrongful act attributable to the State responsible for fossil fuel production and there is a duty to make reparations as a legal consequence arising from such wrongful acts as long as causation has been established.

The PISFCC was unrelenting in their campaign and instrumental in mobilising public and political support for the #ICJAO case. Having a unanimous decision at the UN General Assembly in favour of the request for an advisory opinion is also certainly worth celebrating.

“It’s the relationships we’ve built along the way that have carried us. This victory belongs to all of us.”<sup>117</sup>

Cynthia Houniui  
President, PISFCC

ICJ=International Court of Justice.

Scientific engagement in health and climate change has been insufficient in SIDS, which continues to be a concern, as evidence of the impacts of climate change on health is essential to inform policy makers and to plan interventions. The scientific community in SIDS should collaborate in their efforts with low funding to achieve higher quality research for evidence as the policy makers continue to elevate the health–climate nexus, especially as the third NDCs are due.

Finally, focus was given to the important role of the Pacific youth in campaigning for climate action (panel 4).

With the decision of the ICJ on the case brought forward on the “obligation of States with respect to climate change”, there is tremendous hope for the future of climate justice. This case highlights that although the government and policy makers play a crucial role in enacting change, individuals can make a difference at the highest level. The next few years should see the tracking of climate justice being increased with this decision, especially for SIDS.

#### Special chapter—deep dive

##### International climate financing: are SIDS at risk of being overlooked?

As noted in the previous report, heat, scientific engagement, and research gaps in mental health, water safety, chronic non-communicable diseases, and impacts on marginalised groups emerged as regionally relevant areas in need of urgent climate intervention for SIDS.<sup>31,118</sup> SIDS still face data challenges that, at their core, require more investment in data infrastructure and sharing frameworks.<sup>119</sup> Continuing advocacy from SIDS and other low-income and middle-income country (LMIC) parties at Conference of the Parties (COP) has raised the minimum recommended annual climate financing from \$100 billion (COP15 in 2009) to \$300 billion by 2035 (COP29 in 2024). Yet concerns remain that COP29 failed to secure the realistic financial obligations SIDS and other LMICs require to hasten climate resilience and advance the Paris Agreement.<sup>120</sup> Some success has been noted at COP30, with more developed countries agreeing in 2025 to triple their contributions towards climate adaptation by 2035.<sup>121</sup> However, a lukewarm precedent of slow action, not enough bilateral and private partnerships, and over-reliance on singular sources of climate support have been set in the past that should be carefully navigated moving forward.<sup>121,122</sup> Although the COP15 target was met in 2022, most of the \$115.9 billion was disbursed as loans, mainly to middle-income countries, as opposed to primary assistance to the lowest-income countries.<sup>123</sup> Further, the second report on the needs of LMIC parties (Needs Determination Report) to the parties of the Paris Agreement at COP29 identified that the non-costed needs, among which health is included, are potentially higher than the costed needs related to adaptation, mitigation, and averting loss and damage from climate change. Explicitly, given the complexity of quantifying the non-cost component, there is a shortfall in the costed portion, especially as the costed portion relates to minimising loss and damage for adaptation.

Of the almost 1500 documents from NDCs, national adaptation plans, and other national and global sources outlining the climate financing needs for SIDS, just less than 50% (668) of the reported needs were costed, equating to \$90 billion by 2030.<sup>124</sup> Additionally, 40–41% of the costs for SIDS were required for adaptation interventions (\$36–41 billion), 6% for minimising loss and damage (\$5 billion), and the remainder (52%) were towards mitigation programmes.<sup>124,125</sup> A commentary from the London

School of Economics highlighted that a key driver of these shortfalls is the misconception that smaller states require less finance than larger LMICs.<sup>126</sup> However, SIDS urgently require higher adaptation finance (accounting for 3·4% of their collective GDP annually vs 1·4% GDP for other LMICs).<sup>126</sup>

### Missed opportunity to address the health priorities of SIDS

The adaptation finance gap is more pronounced for the health sector than for other sectors. Although 64% of SIDS NDCs highlight health as an urgent priority area, projects explicitly addressing health benefits are among the least funded through multilateral mechanisms.<sup>30</sup> Assuming that, based on the second Needs Determination Report,<sup>123</sup> the proportion of costed health-sector needs for all LMICs approximates the proportions for the SIDS subset, roughly 8–17% of the costed needs for SIDS should be allocated for health adaptation (ie, up to \$6·1 billion of \$36 billion) and \$600 million for minimising health sector-related loss and damage from climate impacts. Moreover, general adaptation finance flows to SIDS each year (\$1·4 billion) cover less than a third of the annual adaptation costs modelled for SIDS (\$5·1 billion).<sup>126</sup> The situation becomes more dire as data gaps across SIDS indicate a high possibility that non-costed needs far exceed even the costed annual expected adaptation needs. Another consensus towards the right direction was an outcome of COP30: the Belém Health Action Plan was the first international agreement on climate adaptation, specifically for health.

### Systemic challenges of fragmentation, duplication, and poor governance

The less-than-ideal climate finance landscape extends to the onerous bureaucratic channels through which funding for varied or abstractly explained climate action needs to be routed.<sup>127</sup> Of note, at each COP since 2018, there has been consensus on improving and increasing the avenues for international financial and non-financial interventions. However, the resulting fiduciary obligations, borne by SIDS, have threatened to perpetuate the same burden on capacity development and social actualisation that financial relief mechanisms have sought to avoid. This effect has manifested due to, at the very least, the following two notable outcomes from international convenings.

#### *Fragmented request processes for technical and non-technical assistance through the UN Framework Convention on Climate Change (UNFCCC)*

The international climate financing landscape is characterised by siloed and increasingly complex request procedures. Although the avenues through which international climate aid can be provided to SIDS have expanded from the Initial Technology Framework priorities, so have the operational procedures required for making formal requests (Decision 14/CMA.1 COP24/2018).<sup>128</sup> For instance, requests addressing youth involvement and gap

reductions can be funnelled through the Glasgow work programme on Action for Climate Empowerment, which builds on the existing Doha Work Programme (Decision 19/CMA.3 COP26/2021).<sup>129</sup> These requests are separate from adaptation-related requests through the Glasgow–Sharm el-Sheik work programme on the global goal on adaptation (Decision 19/CMA.3 COP26/2021),<sup>129</sup> which was succeeded by the UAE Framework for Global Climate Resilience in 2023 (Decision 2/CMA.5 COP28/2023).<sup>130</sup> For matters related to minimising loss and damage from climate change, the functions of the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts have been expanded upon through the Santiago Network, whose efficiency at connecting requests for technical assistance (from vulnerable nations to expertise in developed countries) is guided by a monitoring, evaluation, accountability, and learning framework specific to the Santiago Network Secretariat (Decision 11/CMA.4 COP122 (p27/2022)).<sup>131</sup>

Finally, the latest outcome of advocacy has actualised the New Collective Quantified Goal on Climate Finance (Decisions 14/CMA.1 COP 24/2018 and 5/CMA.5 COP28/2023),<sup>128,130</sup> which seeks to ratify a new work programme governing how financing, particularly focused on minimising loss and damage, will be disseminated. Setting up new plans, thematic areas, and finance access for each mechanism requires establishing new committees, technical reports, transparency reviews, evaluations, and new points of contacts in low-income and middle-income nations dedicated to making use of climate finance and technical assistance (Decisions 14/CMA.1 COP24/2018, 19/CMA.3 COP26/2021, 22/CMA.4 COP27/2022, and 5/CMA.5 COP28/2023).<sup>128–131</sup> This process can take years. Although appearing to acquiesce to the needs of the most disadvantaged countries, there is concern that the insufficient procedural clarity might facilitate loopholes that bad actors could exploit.

#### *Inadequate stipulations on the form of climate finance flows could compromise the socioeconomic development of vulnerable countries*

Although UNFCCC agencies and actors recommend that concessional approaches should dominate climate financing, there is no obligatory language stipulating that developed countries make concessional contributions. Consequently, almost 40% of adaptation finance to SIDS from 2018 to 2022 occurred as loans, 14% of which were non-concessional.<sup>126</sup> A high share of low-to-non-concessional financing for adaptation incurs a higher debt burden on society and the individual, either through increased taxation or through repayment for amenities, services, or goods related to adaptation projects.<sup>124</sup> The emergence of this new category of climate debt compounds the existing debt crises that are occurring in even high-income SIDS with low access to debt relief, such as Mauritius, Palau, and Nauru.<sup>132–134</sup> Consensus by UNFCCC member parties in specifying the precise share of annual

climate finance flows to SIDS and other vulnerable nations would ensure that private profit-driven entities cannot capitalise on the unintended incentive structure as SIDS advance towards climate resilience and energy transitioning.

### Is this the best we can do?

That the evolution of climate finance goes hand-in-hand with the development of climate law and justice is imperative.<sup>126</sup> Recent calls for the re-imagining of global financing highlight the need for joint, purposive mechanisms that promote achievement of the SDGs while addressing the burgeoning and inequitable debt-related and climate-related challenges in emerging and developing economies.<sup>135</sup> Specific recommendations include embedding climate infrastructure (resilience) as a key element of debt management, prioritising grant-based financing over concessional loan financing, and developing strategies to increase access to and foster autonomy of developing states in managing loss and damage funding.<sup>126,136</sup>

## Conclusions

The evidence from climate indicators points overwhelmingly to the devastating threat of heat to older adults, children, and outdoor workers in SIDS. Furthermore, rising heat is reducing the liveability of small islands, whose climates are primarily tropical with year-round high temperatures. Rising temperatures have also contributed to higher transmissibility of dengue and *Vibrio*. Extreme drought has affected more land, further compounding the unreliability of agrifood systems in SIDS. Simultaneously, ocean temperature reached a tipping point in 2024, and SIDS await the effects of an upward trend in SSTs over the past decade, including impacts on the marine food systems. Poor commercial fishing practices need to be discontinued before coastal and deep-sea ecosystems become unrecognisable.

In revisiting key research gaps, the evidence from the previous report (up to 2023 indicator data) showed that heat, scientific engagement, and research gaps relating to climate and health emerged as regionally relevant areas in need of urgent climate intervention for SIDS. Among the research gaps were linkages between climate change and mental health, water safety, chronic non-communicable diseases, and impacts on marginalised groups in the SIDS population. The research community serving small islands would benefit from participation in regionally appropriate health attribution and disease modelling focused on improving the techniques and robustness of indicators for SIDS.

However, SIDS have not been complacent. Adaptive solutions, such as urban greening, have improved integration of climate data services with health systems (and health emergency preparedness) and have brought about observable health and socioeconomic co-benefits, namely reduced lethality of extreme weather events. Although the

pace of a net-zero transition appeared slower than what was needed to meet mid-century goals, public investments in clean energy have already paid off with decreased energy costs across SIDS. Continued and accelerated investment in renewables at a national level will enable energy self-sufficiency, which can ultimately untether the wellbeing of people in SIDS from some of the more negative commercial determinants of health.

The economic context within SIDS remains unsuitable for adequate climate adaptation. Moreover, climate change has presented added aggravators for small island economies. Deadly heat carried a high economic cost, and the potential loss of earnings from outdoor work due to heat exposure and associated lowered labour capacity were in billions of US dollars. At the same time, funding for health adaptation, although an invaluable source that facilitated positive outcomes, remained short of what was needed. Additionally, and resoundingly, change cannot occur without engagement. In 2024, a remarkable example of engagement came from young Vanuatuan students and other Pacific youth advocates. Their governing bodies need to refrain from losing momentum in spreading awareness on climate-related health issues specific to SIDS. Furthermore, more scientific collaborations and research will provide policy makers with the appropriate evidence to initiate action.

Climate change has posed measurable and immeasurable threats to life for people in SIDS; however, hope remains, and successes should be celebrated. Those entrusted with the future have already made their mark with the monumental ICJ legal case and have propelled climate accountability. Now, we are charged with strengthening the pillars of climate resilience.

### Contributors

This submission is the culmination of the collaborative efforts of 30 authors contributing their expertise to five working groups. All authors contributed to the drafting, review, and interpretation of their relevant indicator and section. RNS, PJB, KGM, NGG-D, EJZR, SD, MT, FO, MM-L, MRa, KSM, SYP, and NSG contributed to working group 1; GMG-S, HCH, MAM, DFB, KSO, KAP, KFP, and SYP contributed to working group 2; PM-L, HK, SBM, KSM, KGM, MM, and KFP contributed to working group 3; HCH, DCS, and AOA contributed to working group 4; and DCS, TR, GMG-S, KFP, and SRM contributed to working group 5. MRo (Executive Director of *The Lancet Global*), GMG-S (Executive Director of the *Lancet* SIDS Regional Centre), SYP, KFP, and MW contributed to editorial support, coordination, and strategic direction. All authors had full access to all the data in the study and had final responsibility for the decision to submit for publication. The authors alone are responsible for the views expressed in this paper, and the findings do not necessarily represent the views, decisions, or policies of the institutions with which they are affiliated.

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