



## ★ KEY HIGHLIGHTS

Papua New Guinea (PNG) is exposed to a wide range of natural hazards including earthquakes, tsunami, volcanic eruptions, landslides, floods, drought, frost, heatwaves, and tropical cyclones (as seen in the following figures). Like many countries in the Indo-Pacific region, its seismic and volcanic risk is high due to its location within the Pacific Ring of Fire.

PNG is the most populous, diverse and resource rich pacific island nation, however, it is faced with a complex set of challenges which compounds the risk from natural hazards, including an overburdened health system, election and communal violence, the country's overall development status, and frequent natural disasters.<sup>1</sup>

- The climate is monsoonal with high temperatures and humidity throughout the year. Rainfall peaks between December and April followed by a drier period during July - August<sup>23</sup>
- Exposure to hazards is significant and likely to increase, with populations living in flood and landslide prone areas, and coastal communities and infrastructure exposed to coastal flooding. A World Bank study suggests that flash floods, landslides, and coastal flooding are likely to intensify.<sup>4</sup> Another study estimates PNG has an 81% chance of suffering a significant disaster related to natural hazards each year<sup>5</sup>

### Vulnerability Factors

- Around 85% live in rural areas with limited transportation infrastructure. This provides obstacles to emergency response efforts and health care access.<sup>6</sup> The road network is very limited with only 3% of roads paved; most travel between provinces is by air or boat<sup>7</sup>
- Communities rely on a few staple crops, making food sources vulnerable from natural disasters.<sup>89</sup> Historically, houses and infrastructure in PNG have not been built to withstand natural hazards.<sup>10</sup> High poverty (40% of the population)<sup>11</sup> and low coping capacity levels add to overall vulnerability

### Impact on Communities

- Natural hazards have affected agriculture, infrastructure and livelihoods. Any impacts from natural hazards can significantly affect food security, due to a reliance of foods that are mostly produced in country. At least 70% of households in PNG are dependent on subsistence agriculture and fishing, and natural hazards can disrupt food supplies<sup>12</sup>
- The most vulnerable are those in remote locations with limited cash, access to urban markets and relief distributions. During drought and frost events people from affected areas were forced to leave their homes and migrate to areas with more food availability<sup>13</sup>

## FAST FACTS



**Geography:** PNG is located in the southwestern Pacific Ocean and is comprised of four large islands and over 600 smaller islands, with a total land area of 462,840 km<sup>2</sup>.<sup>14</sup> Its main land area comprises the eastern half of the island of New Guinea, the world's second largest island. Areas above 1,200 meters are referred to as the highlands. PNG is additionally comprised of the Bismarck Archipelago; Bougainville and Buka; and small offshore islands and atolls<sup>15, 16</sup>



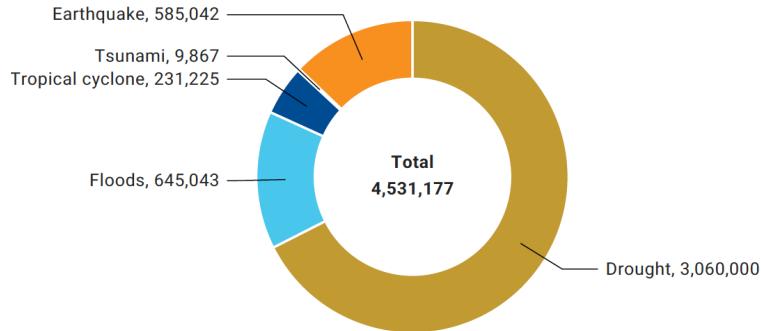
**Population:** 10,046,233 (2024)<sup>17</sup>

**Population of Port Moresby (Capital):** 410,000 (2023)<sup>18</sup>



**Administration:** PNG is comprised of 20 provinces, 1 autonomous region, and 1 district<sup>19</sup>

### Number of affected All hazards, in number of people



Source: UNESCAP. Risk and Resilience Portal: Papua New Guinea. Number of Affected: All hazards, in number of people (1970 – 2021). <https://rrp.unescap.org/country-profile/png>



## OVERVIEW OF NATURAL HAZARDS



### Earthquakes

PNG is located on one of the world's tectonically active areas, located between the Australian and the Pacific plate.<sup>20</sup> PNG experiences small earthquakes daily, large earthquakes frequently, and a severely damaging earthquake every few years.<sup>21</sup> From 2014 – 2018, at least 10 earthquakes were recorded with a magnitude (M) above 7.0.<sup>22</sup> In March 2024, a M 6.9 earthquake struck in a remote northern region, killing five people and destroying more than a thousand homes across dozens of villages already affected by severe flooding along the Sepik River.<sup>23</sup>

### Major earthquakes include:

- 2022: In September the M 7.6 Markham Valley earthquake affected Morobe, Madang, and the Eastern Highlands, leaving 21 dead and affecting 3,211 people<sup>24</sup>
- 2018: In February, a M 7.5 earthquake in Hela Province, caused 160 deaths and US\$140 million in damages. Tribal violence complicated relief efforts<sup>25, 26</sup>



## ⚠ NATURAL HAZARDS (CONT.)



### Tsunami

Because of PNG's high exposure to earthquakes, tsunamis remain a major hazard risk for the country, although only three major tsunamis have occurred in relatively recent history with the last to occur in 1998. Prior to that, the last major tsunami likely occurred in 1931.<sup>27</sup> On 17 July 1998, a strong M 7.0 earthquake off the northwest coast of PNG, triggered three large tsunami waves, with a maximum height of 15 meters, that wiped out villages on the north coast of PNG, leaving at least 1,600 dead, at least 700 seriously injured and displacing more than 10,000 people.<sup>28</sup> While most tsunamis are triggered by earthquakes, scientists determined that a submarine landslide generated by the earthquake triggered the tsunami.<sup>29</sup>



### Volcanoes

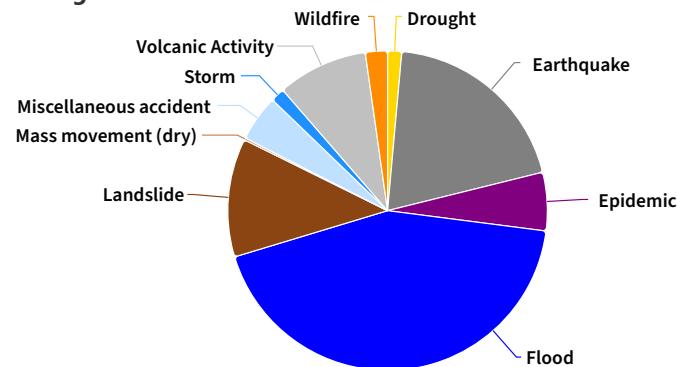
PNG is home to the most active volcanoes in the southwest Pacific. There are 14 active volcanoes that put an estimated 250,000 people at risk. Several volcanoes, including Manam volcano on Manam Island, are at risk of an eruption or flank collapse that could possibly produce a tsunami.<sup>30</sup> The original capital, Rabaul town, was destroyed following the eruption of Tavurvur volcano in September 1994 that caused 80% of the town's buildings to collapse from ashfall. The eruption resulted in several deaths, over 50,000 evacuees, and an 18km ash plume.<sup>31, 32</sup>

Recent major eruptions highlight the risk to the community. In November 2023, Mt. Ulawon began a series of eruptions that left five dead, affected over 24,000 people and displaced over 16,000 in West New Britain and East New Britain. Ash plumes rose at least 15,000 meters from the volcano, with lava and ashfall affecting nearby areas.<sup>33</sup> In July 2023, Mount Bagana, located on Bougainville Island in the Autonomous Region of Bougainville (ARB), began erupting. Bagana spewed an ash column that reached 16-18 kilometers high, causing significant ashfall. The eruption affected more than 12,000 people and displaced nearly 4,000.<sup>34</sup>

#### Major volcanic eruptions include:

- 2014: In August, thousands of people were evacuated from Matupit Island following the eruption of Mt. Tavurvur which heavily damaged the island<sup>35</sup>
- 2004: An eruption at Manam volcano forced the evacuation of most of Manam Island's 9,000 residents<sup>36</sup>

#### Average Annual Natural Hazard Occurrence for 1980-2020



Source: World Bank Group. Papua New Guinea: Natural Hazard Statistics. <https://climateknowledgeportal.worldbank.org/country/papua-new-guinea/vulnerability>



### Floods

River flooding, king tides, sea level rise, coastal flooding, and rainfall events pose flooding risks to PNG. The southwest pacific, including PNG, experienced a "triple-dip" La Nina event in 2020, 2021 and 2022. During a La Nina event, PNG generally sees higher than normal rainfall. However, due to its geography, some parts of PNG experienced drought conditions, such as in the northeast.<sup>37</sup>

Inland flooding affects over 22,000 people yearly, displacing over 6,000 and typically resulting in a few deaths, while causing damages of over US\$8 million. By 2030, economic damages and the population affected by river flooding are expected to double.<sup>38</sup>

Many areas are highly vulnerable to sea level rise, with activities and development located in coastal areas or in areas along rivers. The Carteret Islands were among the first Pacific islands from which populations relocated due to rising sea levels.<sup>39</sup> PNG is sometimes affected by king tides such as in December 2021, when communities in Bougainville, East Sepik, and New Ireland experienced tides that displaced 53,000 people and washed away houses.<sup>40</sup>

#### Major floods include:

- 2020: In early April nearly 500 homes were damaged or destroyed by flooding from the Zokozoi River in Eastern Highlands Province<sup>41</sup>
- 2012: In September, heavy rains in Southern Highlands province triggered flooding and landslides that affected as many as 200,000 and left at least three dead<sup>42</sup>



### Landslides

Landslides are a common occurrence in PNG and are often triggered by other natural hazards such as earthquakes, rain, volcanic eruptions and flash flooding. In May 2024, a massive landslide in Enga province in the central highlands buried six villages, leaving at least 173 people dead. Around 7,849 were affected, while 1,650 were displaced.<sup>43</sup>

#### Major landslides include:

- 2020: A landslide in Western Highlands province in March resulted in 10 deaths, and at least 1,000 affected<sup>44</sup>
- 2012: Landslide in Hela province resulted in dozens of deaths<sup>45</sup>
- 2002: In early April, a large landslide in Morobe province left at least 36 people dead. The landslide was likely triggered by rains although a M 5.3M quake may have contributed<sup>46</sup>
- 1988 the Kaiapit Landslide in the Markham area destroyed 3 villages killing 74<sup>47</sup>



## NATURAL HAZARDS (CONT.)



### Drought

Droughts are common in PNG, often coinciding with El Niño effects of dry spells and heat. PNG is affected by two types of droughts – meteorological (a precipitation deficit) and hydrological (deficit in surface and subsurface water flow).<sup>48</sup> Despite receiving large amounts of rainfall, little water is collected and stored.<sup>49</sup>

El Niño and La Niña events affect precipitation levels in the country. Some 3.09 million people are exposed to the effects of El Niño, including 1.24 million vulnerable. The effects of La Niña, while generally associated with wetter than normal conditions, results in dry spells in some areas. La Niña brought dry spells to South Bougainville, East New Britain, and parts of New Ireland provinces experienced critical drought conditions in early 2024.<sup>50</sup> Droughts have led to reductions in crop yields and wildfires.<sup>51</sup> The resumption of rainfall after drought can lead to floods, crop pest attacks, and disease outbreaks such as the case in 1998,<sup>52</sup> following the worst drought in PNG history.<sup>53</sup>

#### Historical droughts:

- 2022: PNG relies on hydroelectric power for 40% of its power supply. In September, water levels at three of the country's six dams dropped to critical levels from drought, affecting power to around 1 million residents<sup>54</sup>
- 2015 – 2016: El Niño related drought affected around 40 percent of the population and about half a million were affected by food shortages<sup>55</sup>
- 1997 - 1998: El Niño event led to over 1 million people facing food shortages<sup>56</sup>



### Frost

Frost can severely damage crops, leading to food shortages and economic hardships. Like drought, frost is affected by El Niño events. In 2015 an El Niño event triggered a prolonged drought and frost in the Highlands region, affecting some 2 million people.<sup>57</sup> Altitudes above 1,700m are particularly at risk of crop destruction from frost. The main staple, sweet potatoes, are mainly grown in the Highlands. In the Highlands, reduced humidity and lack of cloud cover at night cause temperatures to drop below zero. However, frost can also affect the lowlands and island areas.<sup>58</sup>

Consecutive and repeated frost events can stop production of root crops for 6 months. Surviving crops are often weakened and more susceptible to pests and disease.<sup>59</sup> Severe frost events have led to populations migrating to lower areas.

#### Major frost events include:

- 2015 – 2016: Enga and Southern Highlands provinces declared a state of emergency and thousands reportedly migrated to lower altitudes<sup>60</sup>
- 1997: El Niño event led to drought and frost in the Eastern Highlands, Simbu and Western Highlands provinces. Populations from the Highlands to lower altitudes were displaced and over 300,000 were affected by food insecurity<sup>61</sup>



### Tropical Cyclones (TC)

PNG is at risk of TCs, although they are not a frequent hazard for the country, due to the location of northern areas close to the equator. However, even passing cyclones can bring wind and flooding damage to low-lying areas. The ARB has the highest exposure to cyclones.<sup>62</sup>

#### Historical cyclones:

- 2015: TC Pam affected more than 10,750 people in March<sup>63</sup>
- 2014: TC Ita hit Milne Bay in April affecting 54,000 people and destroying 1,134 houses<sup>64</sup>
- 2007: TC Guba struck 12-16 November, bringing torrential rains, high tides, and claiming more than 70 lives and affecting 145,000 people<sup>65</sup>



### Extreme Weather Events

PNG is at risk of extreme weather events and is ranked 16 out of 191 countries in the 2024 Risk Inform Index.

Additionally, the country ranks 10 out of 191 countries in terms of lack of coping capacity,<sup>66</sup> making PNG highly vulnerable. Much of the population is at risk, due to dependence on subsistence agriculture, natural resources and limited adaptation capacity. Over 500,000 live in coastal areas exposed to sea level rise, coastal degradation and storm surges.<sup>67</sup> Exposure to hazards is also likely to increase. With projected increases in intensity and frequency, communities may face significant natural hazards and disaster risk that will disproportionately affect the poorest.<sup>68</sup>

## DISASTER MANAGEMENT STRUCTURE

- National Disaster Centre (NDC) is the lead agency for disaster management and response. The NDC is responsible for coordination, training, legislation, plans and policy, and manages the National Operations Centre. It falls under the Ministry of Defense and operates with the National Executive Council (NEC) and the National Disaster Committee
- NDC has two divisions: Risk Management, which researches, analyzes and provides training and the Community Government Liaison (CGL) for response and operations
- NEC oversees policy decisions. It is comprised of members of the National Parliament and guided by the National Disaster Committee, made up of heads of agencies and responsible for supervising and reporting on preparedness, supporting planning and awareness
- Provincial, district and local-level disaster committees are responsible for developing and coordinating preparedness and maintaining emergency plans at each level
- Climate Change and Development Authority (CCDA) is the governing body at the national level, with Provincial Climate Change Committees at the provincial level
- PNG Defence Force (PNGDF) provides assistance for civil disasters<sup>69, 70</sup>



## MAJOR ACTORS IN A DISASTER RESPONSE

### National:

- NDC is responsible for advising the NEC on declarations of emergency and requirements for international aid
- Emergency Controller leads a disaster response pursuant to the emergency powers provisions of the Constitution
- NEC may require the PNGDF to assist as Emergency Controller during a national emergency. PNGDF also provides security support for humanitarian responders
- PNG Red Cross
- UN Country Team for Papua New Guinea (UNCT PNG)
- Disaster Management Team (DMT): UN Resident Coordinator and the NDC Director co-chair the DMT. The DMT is responsible for coordinating international relief and includes representatives from the UN, NGOs, and the PNG Red Cross<sup>71</sup>

### International:

- UN Agencies: UN Office for the Coordination of Humanitarian Affairs (OCHA), International Organization for Migration (IOM), UN Children's Fund (UNICEF), World Food Program (WFP), World Health Organization (WHO)
- International Federation of Red Cross and Red Crescent Societies (IFRC)
- International NGOs
- FRANZ Arrangement partners: Australia, France, New Zealand
- Bilateral donors: USA, UK, EU, India, Japan

## USINDOPACOM DISASTER RESPONSE

USINDOPACOM aided the Government of PNG in July 2023, after the Autonomous Bougainville Government requested help from Port Moresby following the eruption of Mt. Bagana. Due to the logistical challenges of delivering relief supplies in Bougainville, the unique capabilities of the DOD to transport emergency relief was requested. U.S. Marines from the 31st Marine Expeditionary Unit (31st MEU) embarked aboard the USS America helped respond with deliveries of relief to remote areas.<sup>72</sup>



Displaced Bougainville villagers alongside U.S. Marines with the 31st MEU and other NGOs offload aid supplies during an HADR operation on Bougainville Island, Aug. 12, 2023. Source: DVIDS. Photo by Gunnery Sgt. J. R. Heins. <https://www.dvidshub.net/image/7969131/31st-meu-supports-humanitarian-efforts-papa-new-guinea>

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