

Disaster Monitor



The Format:

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Photo: C. Eckrom

■ **The Series:** Looking at countries in the context of natural catastrophes positions World Vision to better predict, prevent or prepare for the onslaught of disasters. The rationale is simple: disasters can wipe out years of development in mere minutes. Reducing disaster risks is not an optional extra – but an extra obligation. It is at the heart of sustainable development.

Papua New Guinea

World Vision 

I. The Facts

With more than 700 native tongues, Papua New Guinea (PNG) is the world's most linguistically diverse nation. However, many tribal groups have little or no contact with each other – let alone the outside world. More than 80% live in rural areas with few or no facilities. Situated on the Pacific Ring of Fire, at the point of collision of several tectonic plates, PNG is prey to volcanic activity, earthquakes and tidal waves. The fast facts follow:

The Independent State of Papua New Guinea	Population: 6.1 million ⁽¹⁾
Share of income or consumption, poorest 10% in percent [richest 10%]	1.7% [40.5%] ⁽²⁾
Share of income or consumption, poorest 20% in percent [richest 20%]	4.5% [56.5%] ⁽²⁾
Life expectancy at birth, annual estimates (2005)	56.9 years ⁽¹⁾
Adult illiteracy rate (15 and older, 1995-2005)	42.7% ⁽³⁾
Children underweight for age (under age 5, 1996-2005)	35% ⁽⁴⁾
Population not using an improved water source, in percent (2004) [real figures]	61% [3.7 million] ⁽⁵⁾
Physicians (per 100,000 people, 2000-04)	5 [equals one doctor per 20,000 people] ⁽⁶⁾
Human Development Index (HDI) value [rank]	0.530 [rank: 145 of 177] ^(7,8)
Natural Disaster Index (NDI) value [risk; rank]	1.9 [risk: "extreme"; rank: 23 of 204] ^(9,10,12)

2. The Forces

“People who live in the Pacific Islands or Papua New Guinea are among the most vulnerable to disasters anywhere on earth. The threat of tidal surges, earthquakes, volcanoes and storms is ever present. Now they face a new challenge, climate change and rising sea levels.” (Laurence Gray, World Vision Advocacy Director Asia Pacific Regional Office) ⁽¹¹⁾

Disaster Environment: The severity of any disaster depends on two factors: the country context within which the disaster occurs, and the nature and force of the onslaught itself. Given a country context like that of Papua New Guinea with poor infrastructure and only one doctor for every 20,000 people, catastrophes can be cataclysmic.

PNG's disaster environment is defined in large by its geographical location on the Pacific Ring of Fire, an area of frequent earthquakes and volcanic eruptions encircling the basin of the Pacific Ocean. Its vast land area, diverse and rugged geography, populous highlands, dense rainforests and highly exposed coastal regions make the monitoring and mitigation of disasters extremely difficult. The challenges are compounded by the fact that many tribes live within non-monetarised isolated economies.

Disaster Definition: The Center for Research on the Epidemiology of Disasters (CRED) defines a disaster as a "situation or event, which overwhelms local capacity, necessitating a request to national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering." For a disaster to be entered into the EM-DAT ⁽¹²⁾ database, at least one of the following criteria must be fulfilled:

- 10 or more people reported killed
- 100 people reported affected
- Declaration of a state of emergency
- Call for international assistance

Past Years: Using this definition, the years 1990-2007 have seen PNG impacted by 40 natural disasters. The majority of these disasters have featured little in international news but amount to great developmental destruction when added together (figure 1). The pie charts show the prevalence of natural catastrophes by disaster types (figure 2) and the number of people affected by them (figure 3).

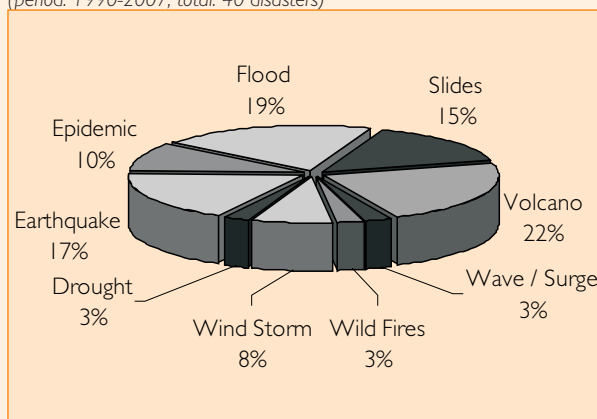
Volcanoes are the most prevalent (22%) natural disaster activity, tsunamis the most deadly (2,182 people killed) and droughts exert the most far-reaching effect on the population (more than 500,000 people affected).

Past Century: Mega-disasters – sometimes called "disasters of the century" – occur less frequently, but their destructive force can overpower a vulnerable nation. Figures 4 and 5 show two perspectives of the top three natural disasters in Papua New Guinea since record-keeping began in 1930. [Data based on ⁽¹²⁾.]

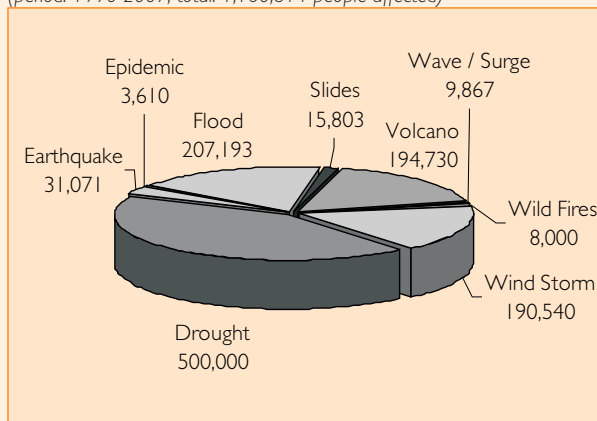
■ Figure 1: Impact from 40 natural disasters (summary for 1990-2007)

Human Impact	Cumulative Total	Annual Average
1. People killed	3,084	171
2. People affected	1,160,814	64,490
3. Damage caused	US\$ 162.2 million	US\$ 9 million

■ Figure 2: Prevalence of natural disasters by types (period: 1990-2007; total: 40 disasters)



■ Figure 3: Number of people affected by natural disaster types (period: 1990-2007; total: 1,160,814 people affected)



■ Figure 4: Worst disasters (by people killed; period: 1930-2007)

Top Three Disasters (Date)	People killed
1. Volcano (15 January 1951)	3,000
2. Wave / Surge (17 July 1998)	2,182
3. Volcano (29 May 1937)	506

■ Figure 5: Worst disasters (by people affected; period: 1930-2007)

Top Three Disasters (Date)	People affected
1. Drought (September 1997)	500,000
2. Volcano (19 September 1994)	152,002
3. Wind Storm (12 November 2007)	143,000

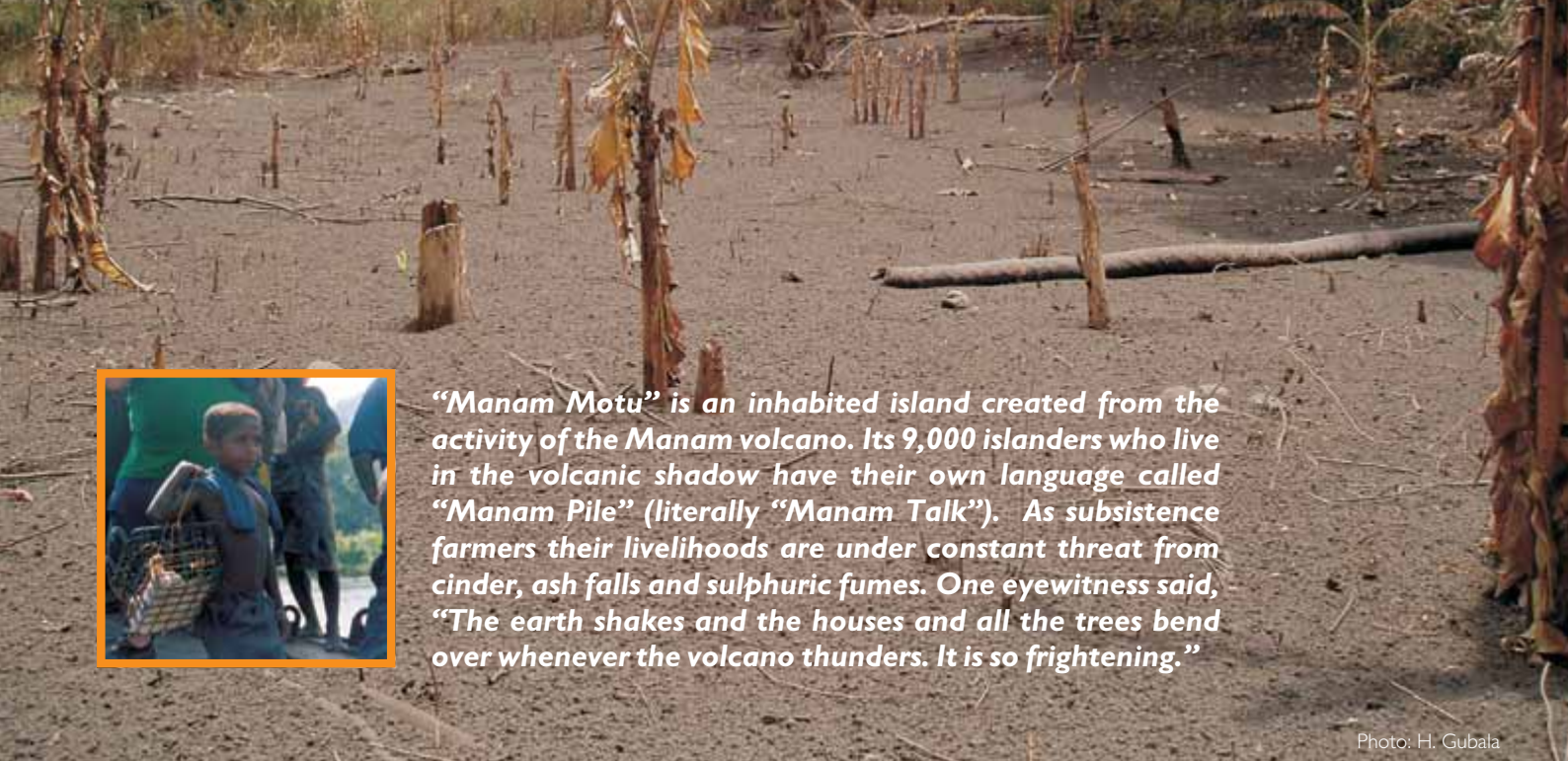


Photo: H. Gubala



“Manam Motu” is an inhabited island created from the activity of the Manam volcano. Its 9,000 islanders who live in the volcanic shadow have their own language called “Manam Pile” (literally “Manam Talk”). As subsistence farmers their livelihoods are under constant threat from cinder, ash falls and sulphuric fumes. One eyewitness said, “The earth shakes and the houses and all the trees bend over whenever the volcano thunders. It is so frightening.”

3. The Faces

Manam is one of six high-risk volcanoes in Papua New Guinea. It is 1807 metres high (3000 metres from the ocean floor) and erupts frequently. The earliest documented eruption occurred in 1616 and the most recent in 2007 (ongoing).⁽¹⁵⁾ In 2004 it was the site of the largest eruption in the world. There were no fatalities. However, thousands of islanders were evacuated after suffering weeks of sustained scoria and ash pollution (photo).

The volcano first erupted on 24 October 2004 and remained active throughout November, completely burying the villages of Bokure, Kolang and Warise under hot lava. However, villagers trained by World Vision in disaster preparedness in 2003 mitigated the effects so that islanders responded quickly and managed to flee before the lava hit. Prior to being evacuated to Bogia, all 18 villages on Manam (total population 9,467) were in desperate need of food, water, shelter and medicine as a result of ash fall pollution. Islanders called the eruption “the worst” in their lifetime.

The arrivals looked sick and tired, carrying with them all their belongings. Small children were among the group, carrying their own domestic animals such as cats, dogs and chickens. People also brought canoes, special seedlings and other items with them. According to World Vision Relief Manager Harry Gubala who was on site and assisted in the evacuation, the most vulnerable people were taken to Bogia Health Centre as soon as they arrived at the wharf. Many children looked malnourished after surviving on ash-affected food crops and water for over a month. ■

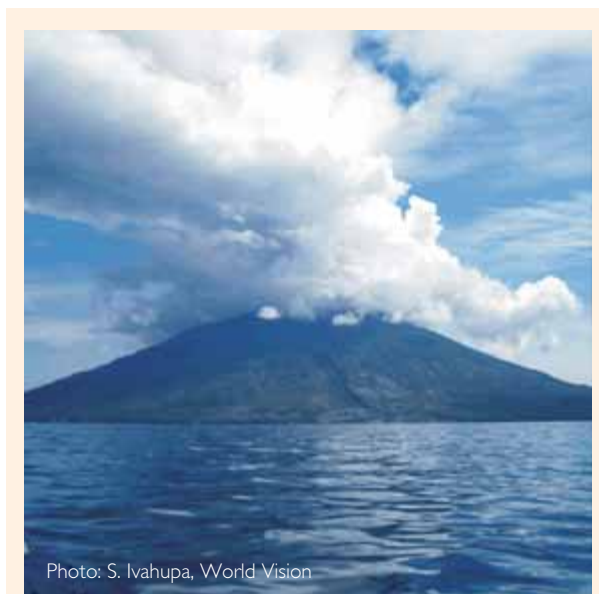
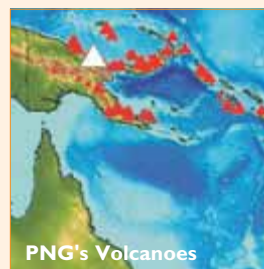


Photo: S. Ivahupa, World Vision

Manam volcano eruption: Smoke seen from sea on 26 October 2004, two days after first major eruption. Preparedness training carried out in 2003 mitigated disaster effects and averted loss of life.



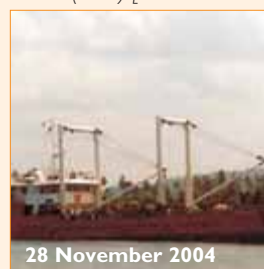
PNG's Volcanoes

Volcanic eruptions (red), Manam volcano (white). [Smithsonian Inst.]



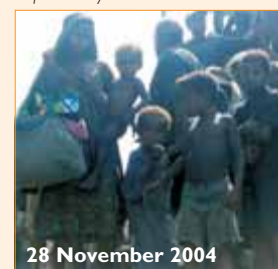
15 November 2004

Ash plume from Manam volcano captured by NASA's Terra Satellite.



28 November 2004

Ship transporting evacuees from Manam Island to Bogia wharf.



28 November 2004

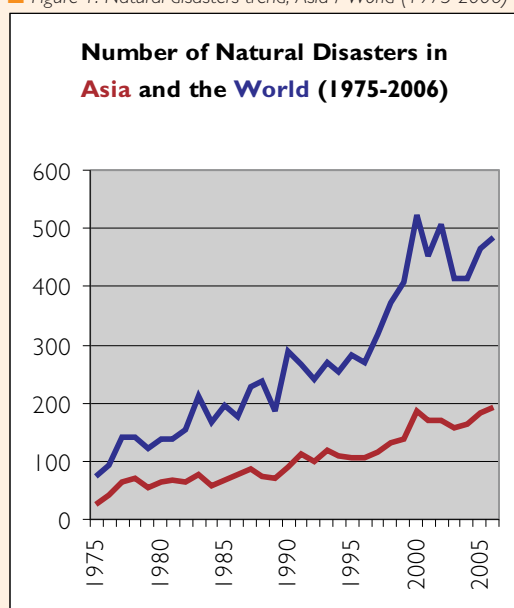
Evacuated Manam islanders. Photos left and right: H. Gubala

4. The Forecasts

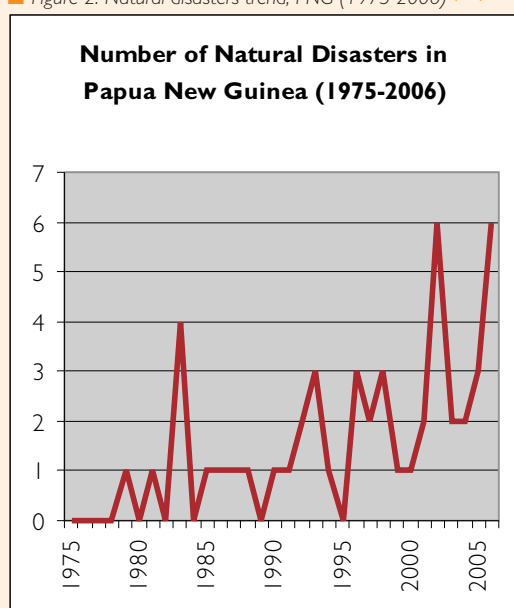
“The countries most vulnerable are least able to protect themselves.” (Kofi Annan) ⁽¹⁶⁾ “There are times for hoping for the best and for not wanting to sound ‘alarmist.’ But the forecasts are alarming. There comes a time for recognising that we have overstepped the mark and have no right to be taking the reckless risks we are taking; and for issuing an urgent clarion call for action. That time is now.” (Brett Parris) ⁽¹⁷⁾

The Trends: Over recent decades, the number of natural disasters has steadily risen, both globally, regionally (figure 1) and nationally (figure 2). Past progressions (below) and future forecasts (right) speak the same language.

■ Figure 1: Natural disasters trend, Asia / World (1975-2006) ⁽¹²⁾



■ Figure 2: Natural disasters trend, PNG (1975-2006) ⁽¹²⁾



Climate change has the potential to undo the last 50 years of development work. The poorest will be hit first and worst. Policy makers and NGOs must help Papua New Guinea prepare itself.

Global Forecasts: Recent assessment reports by the UN Intergovernmental Panel on Climate Change (IPCC), the recognised global authority on climate change honoured with the Nobel Peace Prize 2007, have released substantive scientific forecasts about global climate change: ⁽¹⁸⁾

- Probable temperature rise by 2100: 1.8-4.0° C
- Probable sea level rise: 18-59 cm

Rising sea levels mean more and more severe floods. The trend is not only expected to continue but to accelerate. During the last century, global sea levels rose 10-25 cm which – given the predictions – amounts to a two- to five-fold acceleration. ⁽¹⁴⁾ The effects are undeniable. In 2006 the world was impacted by a record 226 floods (up from an average 162 over previous years). ⁽¹⁹⁾ About 1.5 billion people were affected by floods in the last decade of the 20th century. ⁽²¹⁾ IPCC forecasts for "small island states" are made with "high" to "very high" confidence: "Sea-level rise is expected to exacerbate inundation, storm surge, erosion and other coastal hazards, thus threatening vital infrastructure, settlements and facilities that support the livelihood of island communities." ⁽¹³⁾

National Forecasts: Papua New Guinea is one of the most heterogeneous yet least explored nations on earth. This makes cross-cutting national forecasts difficult. However, prognoses can be inferred from current impacts such as shifting tectonic plates which seem to make sea level rises more pronounced in Oceania than global averages and IPCC forecasts (above) suggest. Indications are that Papua New Guinea may be at the forefront of future changes that could impact Oceania as a whole.

Diseases such as malaria already pose serious challenges to communities in the Pacific, a trend expected to worsen with climate change. ⁽²⁵⁾ For low-lying islands, sea level rises and extreme weather events pose significant risks and could displace entire populations. The world's first climate change-related evacuation of low-lying islands is now underway in Papua New Guinea's Carteret Islands, ⁽²⁰⁾ and Tuvalu has already secured New Zealand's agreement to accept an annual quota of its citizens as "environmental refugees." ⁽¹⁴⁾ Coral atolls are particularly vulnerable to water shortages as seeping ocean water salinates scarce groundwater supplies. In the Carteret Atoll percolating saltwater progressively contaminated wells and destroyed food gardens locals used to grow taro, breadfruit and bananas. The Carterets are among the hardest hit islands in the Pacific and may be completely submerged by as early as 2015. ⁽²²⁾ Communities across Oceania face a similar fate. The age of climate change migration has begun. ■

Paradise Lost?

Photo: T. Peluso

“According to one of the world’s most prominent [NASA] climate scientists, ice sheet disintegration ... could yield sea level rises in the order of 5 metres this century. ... The IPCC sets out what can be thought of as a lowest common denominator consensus... Headline risk numbers may err on the side of understatement.”
—UN Human Development Report 2007/2008 ⁽²⁸⁾

5. The Focus

“Just as you do not tell a person staring at their blazing house that it is not burning because science has not yet agreed on the cause of the fire, so you cannot tell Pacific island countries that they should ignore the changes they are now experiencing.” (Tamari’i Tutangata, former Director of the South Pacific Regional Environment Programme, SPREP) ⁽²⁵⁾

Climate Change Refugees: Climate change migration has become a reality in Papua New Guinea. It is reported that the village of Labutali on the Huon Gulf peninsula is preparing to relocate its 1,500 residents two kilometres inland "because of rising sea levels." After much convincing the village had reached the decision to "relocate Labutali for the safety of the residents." The new village site is called Pohamo. ⁽²³⁾

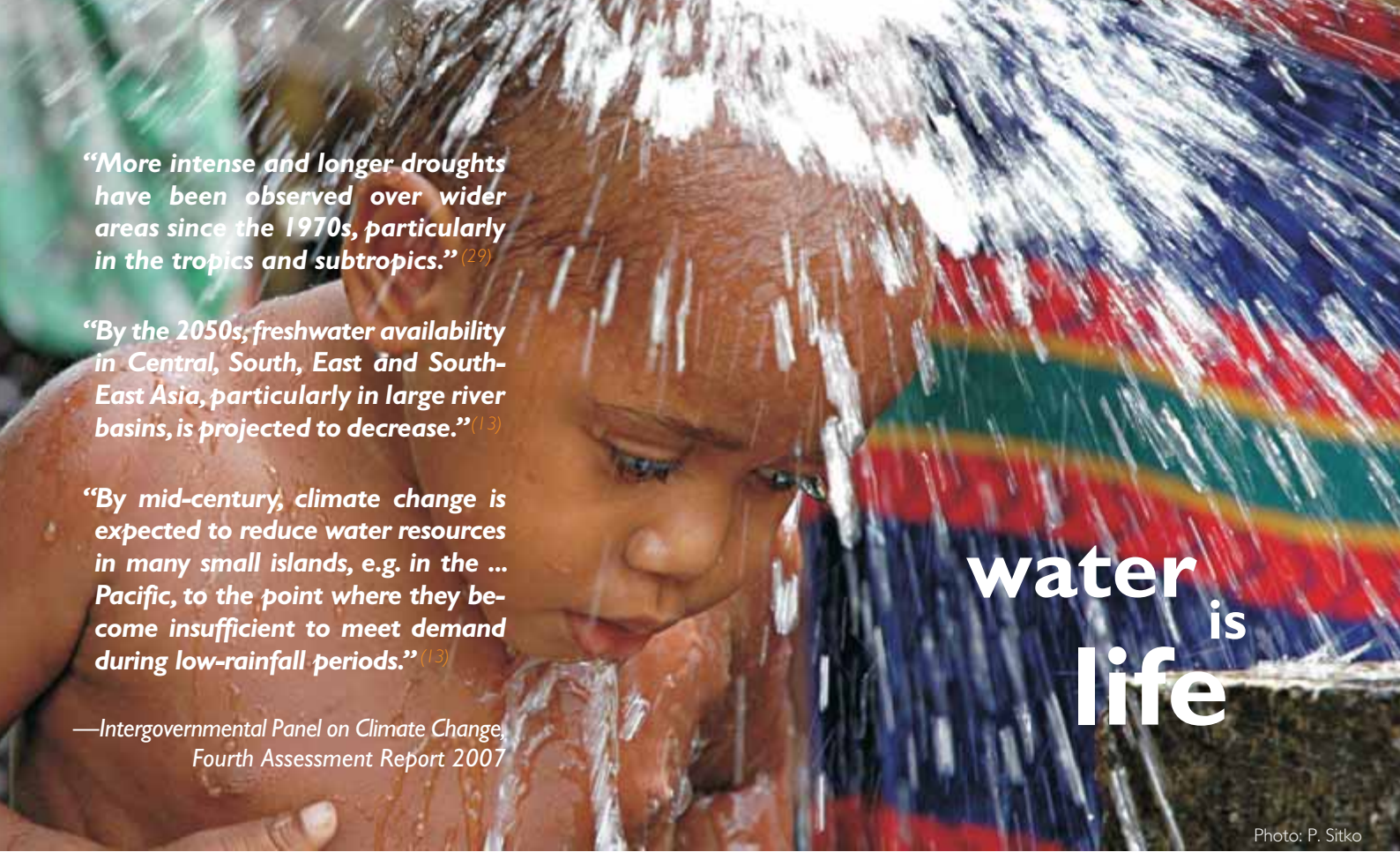
That Sinking Feeling: Islands in PNG (photo) and Oceania are in growing danger of disappearing under the sea. In 2005, a political decision was reached to evacuate the Carteret Islands and resettle its tiny population of 2,600 islanders on larger Bougainville Island, a four-hour boat ride to the southwest. Ten families at a time are being moved under the resettlement programme until the whole island population is fully evacuated. There has been a reluctance to leave, especially among older islanders, but after fighting a losing battle against the ocean for more than 20 years (building sea walls and planting mangroves), it appears the islanders have finally given up hope, resigned to be among the world’s first climate change refugees. ⁽³²⁾

Exit Strategy: Recently, Papua New Guinea's Prime Minister Sir Michael Somare approved K4.1 million (US\$1.3 million) to resettle PNG villagers affected by global warming (with nearly half allocated for the Carteret islanders). The debate about what is causing the island atoll to sink includes multiple factors ranging from regional tectonic plate movements to global warming and accompanying sea level rises. ⁽²⁴⁾ Causes probably act in concert.

Low-Lying Atolls: The Carterets are a portent of catastrophe to come for other low-lying atolls of the South Pacific. The highest point of the Carterets lies no more than 1.7 metres above sea level, a vulnerability shared across Oceania where the majority of Pacific islands lie only 1-2 metres above sea level ⁽²⁵⁾ and are on the brink of being swallowed by the sea. Low-lying islands elsewhere face the same threat. "For the Maldives, where 80 percent of the land area is less than 1 metre above sea level, even the most benign climate change scenarios point to deep vulnerabilities." ⁽²⁶⁾

Pacific Atlantis: At least two *motu* or islets have disappeared in 1999 – Tebua Tarawa and Abanuea – the latter ironically known locally as "long-lasting beach." Until recently, local fishermen in Kiribati used Tebua Tarawa as a resting place to beach their boats and harvest coconuts to slake their thirst. Then the coconuts disappeared, then the sand banks – now the fishing boats skim over it as it lies beneath the waves. In Tuvalu, the oceans have similarly begun to reclaim the *motu* of Tepuka Savilivili. ⁽²⁵⁾

The Next Wave: Sea-level monitoring has shown significant variability, including rises in sea level of up to 25 millimetres a year, well above IPCC estimates. ⁽²⁵⁾ Whether differences mark decadal variations or the beginning of an impending end, Pacific islanders have long begun to exhort each other to believe not the statistical data but to "believe with their eyes." ⁽²⁷⁾ As tidal surges are becoming stronger and more frequent, committed global action is needed to prepare islanders who are losing their land to the sea. ■



“More intense and longer droughts have been observed over wider areas since the 1970s, particularly in the tropics and subtropics.”⁽²⁹⁾

“By the 2050s, freshwater availability in Central, South, East and South-East Asia, particularly in large river basins, is projected to decrease.”⁽¹³⁾

“By mid-century, climate change is expected to reduce water resources in many small islands, e.g. in the ... Pacific, to the point where they become insufficient to meet demand during low-rainfall periods.”⁽¹³⁾

—Intergovernmental Panel on Climate Change,
Fourth Assessment Report 2007

water
is
life

Photo: P. Sitko

6. The Future

“The poor are currently suffering and will continue to suffer the most from climate change. They are least able to protect themselves. Climate change will exacerbate poverty and the solutions proposed to respond to climate change will affect the trajectory of every country’s future development. Climate change is fundamentally a development problem, not simply an environmental problem.” (Brett Parris)⁽¹⁷⁾

Water: If coasts are suffering from saltwater intrusion, coastal communities are suffering from freshwater scarcity.⁽¹³⁾ The 2007/2008 UN Human Development Report highlights that in Papua New Guinea 61 percent of the population cannot access an “improved water source,” making it the “second least developed nation” in the world in terms of “population using an improved water source.”⁽³¹⁾ While most countries have made developmental gains in this area, PNG had the same water security score in 1990 and 2004.

Drought: The problem of continuing water scarcity is especially disquieting in light of a growing preponderance of dry spells in the region. The 1997 drought afflicted 500,000 people across PNG and drove many people in the highlands and low-lying islands close to starvation.⁽¹²⁾ But the drought’s regional ripple effect also created “major problems for water supplies and food production in the Pacific,” affecting Micronesia, Fiji, the Marshall Islands, Samoa and Tonga. In Fiji, sugar cane production “fell by two-thirds,” Tonga’s squash crop was “more than halved,” and in Micronesia, “almost 40 atolls ran out of water.”⁽²⁵⁾

Investment: Recent years have seen a shift from disaster response to disaster readiness and mitigation. Increasing resilience means promoting *preparedness*. This is proving to be one of the most critical challenges.

Preparedness: By positioning to reduce the impact of disasters *before* they occur, unnecessary harm can be averted and decades of developmental achievements protected. Reducing risks is at the heart of sustainable human development – predict, prevent, prepare, protect! One study found that for every dollar invested in pre-disaster risk reduction activities in developing countries seven dollars in losses can be prevented.⁽²⁸⁾ However, most donor funding comes in response to appeals *after* major disasters, making the shift from post-disaster recovery to pre-disaster preparedness a compelling priority.

The Future: Raising resilience is a multi-tiered approach. Pacific nations must implement development policies that make sense for a range of climate change scenarios. These include introducing salt-tolerant crops, increasing the availability of clean water, investing in coastal protection through mangrove protection and reforestation, and enforcing a blanket ban on dynamite fishing. Educating children about natural disasters and how to prepare for and survive them is also essential in the Pacific region where 22 countries are strung out across 29 million square kilometres of ocean. Finally, the fact that 98 percent of people affected by climate disasters live in developing countries highlights the link between levels of development and natural disaster risk.⁽³⁰⁾ PNG also needs the international community to invest in the region’s development. ■

World Vision Capacity

- **One full-time Humanitarian & Emergency Affairs** manager coordinates emergency responses across Papua New Guinea
- **7-8 Pacific Rapid Response Team** relief practitioners are being trained and will be stationed in 3 Pacific offices, leading emergency responses both in PNG and across the Asia-Pacific region
- **Early Warning System:** Plans are being developed to implement an Early Warning System which will warn World Vision in PNG and the Solomon and Vanuatu islands about threats and emergencies and enhance communication with communities in disaster-prone areas
- **A two-year capacity-building programme** is being implemented which will establish in-country disaster response and preparedness systems, structures and training to comply with international standards (SPHERE, LEAP, Red Cross Code of Conduct, etc.)
- **Prepositioning:** Assessments are being made to preposition key emergency relief items in storage sites across PNG and Oceania [AusAID is investing in a prepositioning warehouse in Brisbane which will store and dispatch World Vision relief items to support emergencies in the Asia Pacific region]
- **Internal Partnerships:** World Vision PNG maintains support relationships with relief staff in other WV offices (Australia and New Zealand) to enhance rapid assistance in emergency response operations
- **External Coordination:** World Vision PNG coordinates with the National Disaster Management Office, the United Nations Office for the Coordination of Humanitarian Affairs, and the Inter-Agency Standing Committee to strengthen networking relationships and interagency coordination in times of emergencies

7. The Footnotes

- 1 United Nations Development Programme (UNDP). Human Development Report 2007/2008. Papua New Guinea. {Source: UN (United Nations). 2007e. World Population Prospects 1950-2050: The 2006 Revision. Database. Department of Economic and Social Affairs, Population Division. New York. Accessed July 2007.}
- 2 UNDP. Human Development Report 2007/2008. Papua New Guinea. {Source: World Bank. 2007b. World Development Indicators 2007. CD-ROM. Wash., D.C.}
- 3 UNDP. Human Development Report 2007/2008. Papua New Guinea. {Source: calculated on the basis of data on adult literacy rates from UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics. 2007a. Adult and youth literacy rates.}
- 4 UNDP. Human Development Report 2007/2008. Papua New Guinea. {Source: UNICEF (United Nations Children's Fund). 2006. State of the World's Children 2007. New York. Data refers to most recent year available during period specified.}
- 5 UNDP. Human Development Report 2007/2008. Papua New Guinea. {Source: UN (United Nations). 2006a. Millennium Development Goals Indicators Database. Department of Economic and Social Affairs, Statistics Division. New York. [http://mdgs.un.org]. Accessed May 2007, based on a joint effort by UNICEF and WHO.}}
- 6 UNDP. Human Development Report 2007/2008. Papua New Guinea. {Source: WHO (World Health Organization). 2007a. Core Health Indicators 2007 Database. Geneva. [http://www.who.int/whosis/database/]. Accessed July 2007. Data refers to the most recent year available.}
- 7 UNDP. Human Development Report 2007/2008. Fighting climate change: Human solidarity in a divided world. Published 2007. New York. USA.
- 8 The Human Development Index (HDI) is a composite index that measures the average achievements in a country in three basic dimensions of human development: a long and healthy life (measured by life expectancy at birth); knowledge (measured by adult literacy rate and enrollment ratio for primary, secondary and tertiary schools); and a decent standard of living (measured by GDP per capita in purchasing power parity (PPP) US dollars). While the concept of human development is much broader than any single composite index can measure, the HDI offers a powerful alternative to income as a summary calculation measure of human well-being and development. It is used to distinguish whether a country is a developed, developing, or under-developed country. The index was developed in 1990 by Pakistani economist Mahbub ul Haq and has been used since 1993 by the United Nations Development Programme in its annual Human Development Report.
- 9 The Natural Disaster Index (NDI) is a composite index developed by Maplecroft. The NDI measures the relative risk to human health from natural disasters. The NDI incorporates the following types of natural disasters: hydro-meteorological disasters (droughts, extreme temperatures, floods, slides, wildfires, and wind storms); geological disasters (earthquakes, tsunamis, and volcano eruptions); biological disasters (epidemics and insect infestations). To calculate the risk to human health from natural disasters, the NDI analyses the following indicators: number of deaths; number of people injured; number of people made homeless; number of people otherwise affected. By using the indicators above, rather than the number of deaths alone, the NDI renders a holistic perspective of the risks posed by natural disasters.
- 10 Data for the NDI has been obtained from two sources. First, *natural disaster data* has been obtained from the EM-DAT International Disaster Database (2005). Second, *population and economic data* comes from the World Development Indicators (2005), compiled by the World Bank Group. A disaster must fulfill at least one of the following criteria: 10 or more people reported killed (incl. 'persons confirmed dead and persons missing/presumed dead'); 100 people reported affected ('requiring immediate assistance'); declaration of a state of emergency; call for international assistance.
- 11 Laurence Gray. World Vision Regional Advocacy Director for the Asia-Pacific region. Laurence_Gray@wvi.org
- 12 The EM-DAT International Disaster Database, Université Catholique de Louvain, Brussels, Belgium [www.em-dat.net] is a joint project of the Centre for Research on the Epidemiology of Disasters (CRED) and USAID's Office of Foreign Disaster Assistance (OFDA). According to EM-DAT classification, natural disasters comprise droughts, earthquakes, epidemics, extreme temperatures, floods, insect infestations, slides, volcanos, waves / surges, wild fires, and wind storms.
- 13 Intergovernmental Panel on Climate Change (IPCC). Fourth Assessment Report. Climate Change 2007: Synthesis Report. Summary for Policymakers. Pages 10-12. [Note: "Very high confidence" represents "at least a 9 out of 10 chance of being correct." / "High confidence" represents "about a 8 out of 10 chance."]
- 14 Maplecroft Map Issue Report. Climate Change. Feb. 2007. Page 14.
- 15 Manam. <http://www.mineral.gov.pg/volcObs/manam.htm>
- 16 Cited on page 72 in (7)
- 17 Brett Parris (PhD). Senior Economic Advisor, World Vision Australia. Abridged from World Vision Australia's Policy Position on Climate Change. 2nd Edition. 3 Dec. 2007. Page 8.
- 18 Intergovernmental Panel on Climate Change (IPCC). Feb. 2007. Climate Change 2007. The Physical Science Basis Summary for Policymakers. Fourth Assessment Report.
- 19 United Nations International Strategy for Disaster Reduction (ISDR). Press Release dated January 29, 2007. www.unisdr.org
- 20 World Vision Policy Brief: Climate Change and Poverty. Nov. 2007.
- 21 World Meteorological Organization (WMO). Natural hazards. http://www.wmo.ch/pages/themes/hazards/index_en.html
- 22 Pacific Islands drowning due to climate change. Greenpeace. 16 Aug. 2007.
- 23 Labutali village to be relocated inland. Bonnie Abola. The National Newspaper. 30 Jan. 2008. <http://www.thenational.com.pg/>
- 24 Carteret Islands sinking fast. The National/ Pacnews. 17 Oct. 2007.
- 25 Vanishing Islands. Tamari'i Tutangata describes how rising seas are already beginning to overwhelm Pacific island nations. http://www.unep.org/ourplanet/imgversn/103/06_van.htm
- 26 Cited on page 100 in (7)
- 27 A Sinking Feeling. Samir S. Patel. Nature. Vol. 440. 6 Apr. 2006.
- 28 Cited on page 37 in (7)
- 29 Intergovernmental Panel on Climate Change (IPCC). A report of Working Group I of the IPCC. Summary for Policymakers. Page 8.
- 30 Cited on pages 30 and 77 in (7)
- 31 Cited on pages 253 and 371 in (7)
Population using an improved water source (definition): "The share of the population with reasonable access to any of the following types of water supply for drinking: household connections, public standpipes, boreholes, protected dug wells, protected springs and rain-water collection. Reasonable access is defined as the availability of at least 20 litres a person per day from a source within one kilometre of the user's dwelling. Unimproved sources include vendors, bottled water, tanker trucks and unprotected wells and springs."
- 32 The last tide could come at any time. Then these islands at the end of the Earth will simply vanish. Times Online. Richard L. Parry. 21 Dec. 2006.

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exploring new horizons:

highlighting
vulnerabilities, risks and
opportunities for improved
pre-disaster preparedness!

“Prevention is not only more humane than cure; it is also much cheaper. Above all let us not forget that disaster prevention is a moral imperative...”

—Kofi Annan

Issues highlighted in this fact sheet are discussed in more depth in the World Vision annual disaster reports.

Photo: T. Peluso

■ **World Vision** is a Christian humanitarian organisation dedicated to working with children, families and communities to overcome poverty and injustice. Motivated by our Christian faith, World Vision is dedicated to working with the world's most vulnerable people. World Vision serves all people regardless of religion, race, ethnicity or gender.

■ **Fact Sheets:** The Asia-Pacific fact sheet series is a joint initiative by regional World Vision players. Partnering together, Advocacy, Communications and Humanitarian and Emergency Affairs (HEA) are aiming to position for heightened disaster preparedness in the Asia-Pacific region.

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