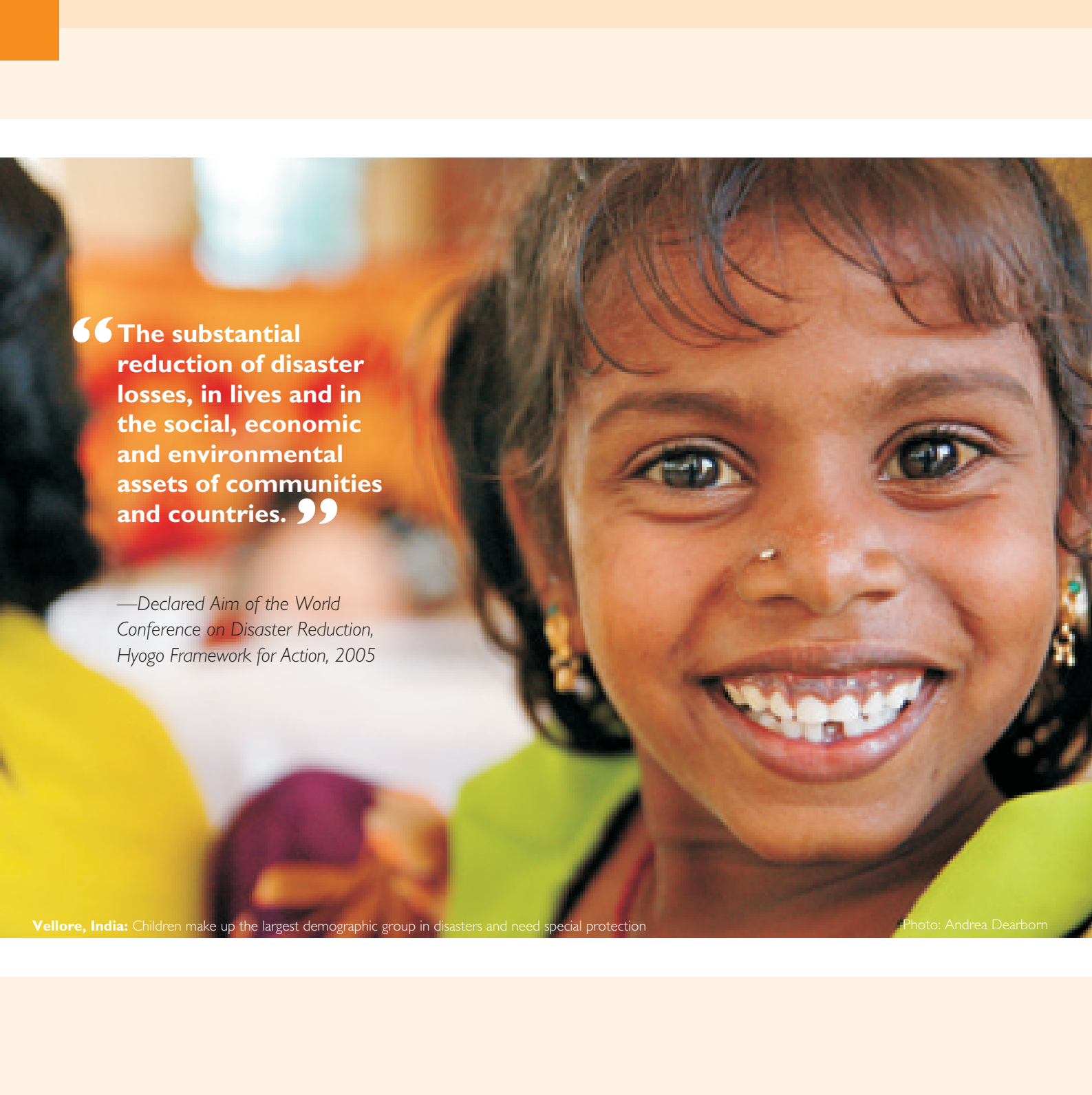




□ PLANET PREPARE

PREPARING
COASTAL COMMUNITIES
IN ASIA FOR **FUTURE**
CATASTROPHES

ASIAPACIFIC
DISASTER**REPORT**



“The substantial reduction of disaster losses, in lives and in the social, economic and environmental assets of communities and countries. ”

—Declared Aim of the World Conference on Disaster Reduction, Hyogo Framework for Action, 2005

Vellore, India: Children make up the largest demographic group in disasters and need special protection

Photo: Andrea Dearborn

DISASTER PREPAREDNESS

The word "disaster" is derived from the Greek pejorative prefix "dis-" (bad) and "aster" (star). According to the Oxford Dictionary, the word's root in astrology literally denotes an "ill-starred" event. ⁽¹⁾ For many centuries people believed that a catastrophic event resulted under a "bad star" – a *dis-aster*. But while natural disasters have occurred throughout history, today we know that they occur not as a result of a bad alignment of the stars, but when hazards and vulnerabilities combine. Recent decades have seen a steep increase in natural disasters across the world. While these events are largely unavoidable – and are projected to increase as a result of climate change – their impacts can be lessened through disaster "preparedness." Incidentally, the verb "prepare" is derived from the Latin "prae" (before) and "parāre" (make ready). According to Chambers Dictionary of Etymology, to "prepare" literally means to "make ready beforehand." ⁽²⁾ The world needs to prepare for disasters *before* they occur, reducing risk, raising resilience and promoting *preparedness*. The future of our planet lies not in the stars. The future of our planet lies in our hands.

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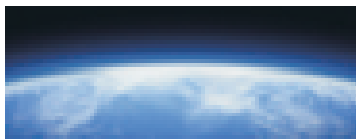
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Planet Prepare is the product of a collaborative effort by regional World Vision players. Partnering together, Advocacy, Communications, Humanitarian and Emergency Affairs (HEA), and World Vision Singapore are aiming to position the organisation for heightened disaster preparedness.



“ For tomorrow belongs
to the people who
PREPARE for it today. ”

—African Proverb

*This publication is dedicated
to the world's climate change refugees. (a)*

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PLANET PREPARE

“Climate change is expected to cause more severe and more frequent natural hazards. As our cities and coasts grow more vulnerable, these hazards can lead to disasters that are far worse than those we have seen to date. We have a moral, social and economic obligation to build resilience by 2015. Implementing the Hyogo Framework for Action will also help us reach the Millennium Development Goals.” ⁽³⁾

—Ban Ki-moon, Secretary-General of the United Nations, 2007

Sundarbans, Bangladesh: The world's largest mangrove forest is threatened by climate change and rising sea levels

Photo: Philip Gain

Executive Summary

“There is a window of opportunity for avoiding the most damaging climate change impacts, but that window is closing: the world has less than a decade to change course. Actions taken – or not taken – ... will have a profound bearing on the future ... The world lacks neither the financial resources nor the technological capabilities ... What is missing is a sense of urgency, human solidarity and collective interest.” (2007/2008 Human Development Report) ⁽⁴⁾

Planet Prepare: The negative effects of climate change are becoming more and more evident not least for those poor communities living in coastal areas across the Asia Pacific Region. Poor communities are regularly forced to live in the most inhospitable and marginalised locations which are frequently in areas most vulnerable to natural disasters. People in coastal zones in countries like Bangladesh are increasingly experiencing the double impact of rising sea levels compounded by more severe and frequent wind storms and storm surges. The two recent devastating Cyclones Nargis in Myanmar and Sidr in Bangladesh highlight the stark reality of this growing trend and the impact on vulnerable coastal populations. The causes and symptoms of climate change are well documented and rapidly gaining international prominence in macro policy dialogue. However, the immediate and imminent implications for communities World Vision works with in Asia Pacific are only

just starting to be realised. Even if greenhouse gases were reduced to zero tomorrow, an unstoppable pattern of environmental degradation and negative climatic change has been set in motion that is already severely eroding the security and livelihoods of millions of poor people across the Asia Pacific Region. This pattern of change is rapidly undoing years of development gains. Given the inertia of the Earth's climate system, the coming decades will see the climate crisis exacerbate to the detriment of poor communities. Unless there is an immediate political sea change towards decarbonising the global economy, future generations will be impacted by climate change on an order of magnitude not hereunto experienced by humanity. If decades of development gains are not to be lost to future climate disasters, development agencies and donor governments need to urgently shift the emphasis of development practice from disaster response to disaster preparedness,

including vulnerability analysis, risk reduction and the build-up of capacity and resilience at grassroots community level. More flexible organisational systems and practices that enable rapid adaptation are urgently needed, as are adaptive approaches to partnering with other organisations as co-implementers. Moreover, comprehensive disaster early warning mechanisms and long-term macro policy instruments for controlled migratory adjustments need to be innovated. Additionally, aid budgets must be refocussed towards risk reduction initiatives. The present global preparedness engagement of 4 percent (of an estimated US\$10 billion in annual humanitarian assistance) falls far short of future adaptation and "climate proofing" requirements.

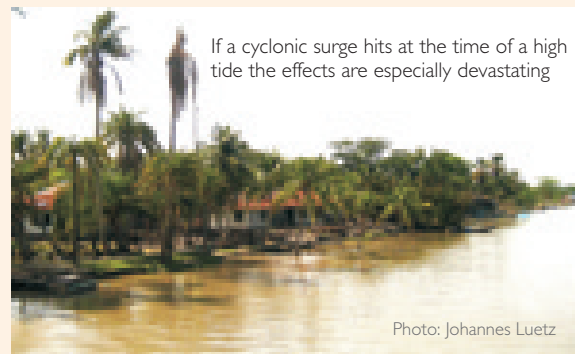
Fast Facts: Climate change is fast converging on an unequal world. In the time it takes to read this publication – estimated at one hour – more than...

- 3.6 million barrels of oil will be consumed by the world – the majority will be burned and absorbed by the Earth's thin atmosphere ⁽⁵⁾
- US\$ 400 million in revenue will be generated from the sale of this quantity of oil ⁽⁶⁾
- 3.6 million metric tonnes of Carbon Dioxide (CO₂) will be emitted into the atmosphere ⁽⁷⁾
- 44 million cubic metres of meltwater will flow into the oceans from the melting of ice sheets in Greenland and Antarctica ⁽⁸⁾
- 8 square kilometres of forest will be cut down, slashed or burned ⁽⁹⁾
- 11 people in Bangladesh will lose their homes due to the effects of intensifying river erosion from the glacial meltdown in the Himalayas ⁽¹⁰⁾
- 28,200 people will be affected by natural disasters ⁽¹¹⁾

Preparedness: As a joint publication by regional World Vision stakeholders, *Planet Prepare* explores and highlights opportunities to better protect development gains, research priorities, empower communities, partner and network together, advocate for justice, reinforce disaster defences, and educate children to be better prepared for an uncertain future. Acknowledging that as one of the leading development agencies World Vision will likely be needed more than ever before, Advocacy, Communications, Humanitarian and Emergency Affairs (HEA), and World Vision Singapore are aiming to preposition the humanitarian organisation of more than 31,000 employees in 98 nations ⁽¹²⁾ for heightened global disaster preparedness.



Sundarbans, Bangladesh: Regular low tide (top) and high tide (bottom)



If a cyclonic surge hits at the time of a high tide the effects are especially devastating

Photo: Johannes Luetz



“ Climate change is fundamentally a development problem, not simply an environmental problem. The poor are currently suffering and will continue to suffer the most from climate change. They are least able to protect themselves from its effects and they are least able to recover from climatic disasters. They tend to live in the most vulnerable areas, such as low-lying land prone to flooding, or marginal agricultural land prone to drought. They are the most likely to have to leave their homes in search of water or to escape flooding. ”

—Excerpt World Vision Australia
Policy Position on Climate Change

Torotsian, Papua New Guinea:

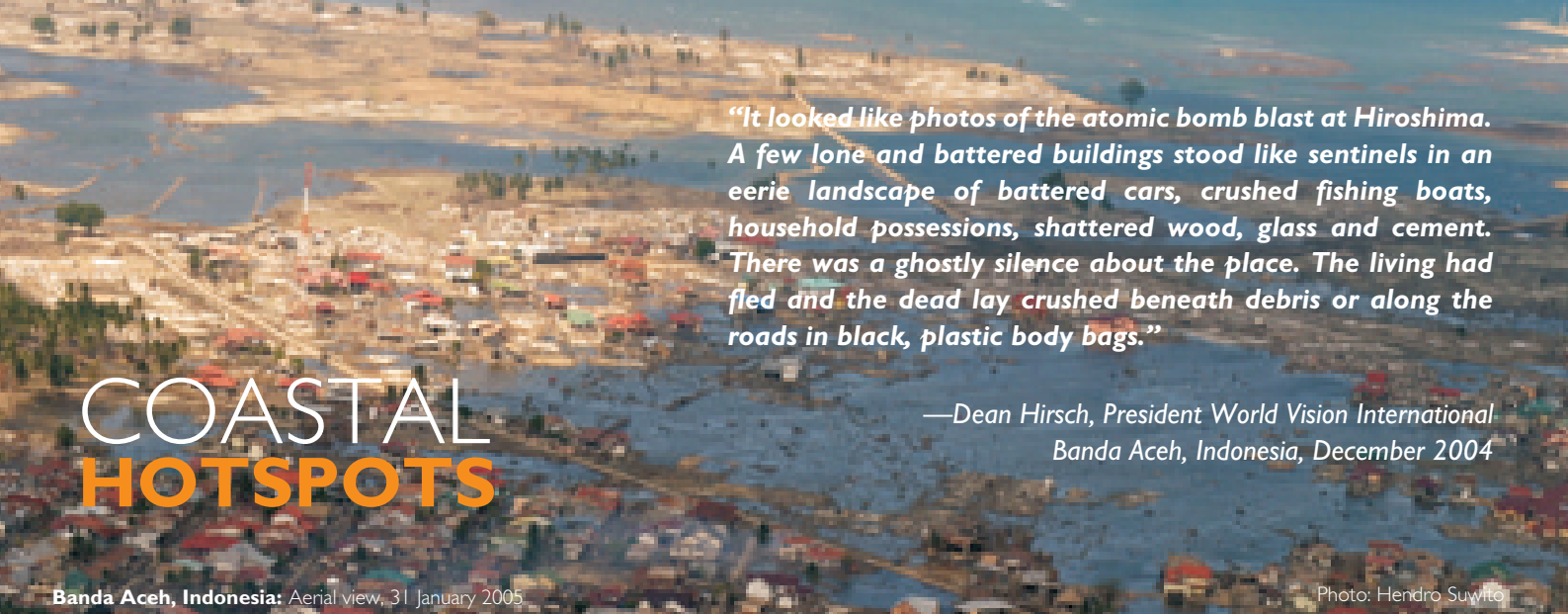
Chief Joash Kela has watched the sea swallow land over the years

Photo: Johannes Luetz

INTRODUCTION

COASTAL COMMUNITIES

Ten percent of people worldwide live less than ten metres above sea level and near the coast, a high-risk zone for floods and storms – about 75 percent of them live in Asia. Many of those nations with the greatest proportion of their people *in* the zone, are small island states. ⁽¹³⁾ People living on low-lying land in coastal proximity or densely populated flood plains are among the most vulnerable communities on Earth. Recent years have seen a dramatic rise in the frequency and severity of natural catastrophes and the trend is toward larger losses. In 2007, the UN Intergovernmental Panel on Climate Change (IPCC), a consortium of 2,500+ climate scientists from 130 countries, predicted that the 21st century would see an "increase in intense tropical cyclone activity" as well as "increased incidence of extreme high sea level." ⁽¹⁴⁾ Rapid population growth and often uncontrolled development exacerbate the vulnerabilities by degrading the very ecosystems that once protected these areas. The net effect is simple: more and more people are congregating in a high-risk zone for floods and storms, but are less and less protected from them. Coastal communities need urgent help to *prepare* in areas of adaptation, mitigation, and migration.



“It looked like photos of the atomic bomb blast at Hiroshima. A few lone and battered buildings stood like sentinels in an eerie landscape of battered cars, crushed fishing boats, household possessions, shattered wood, glass and cement. There was a ghostly silence about the place. The living had fled and the dead lay crushed beneath debris or along the roads in black, plastic body bags.”

—Dean Hirsch, President World Vision International
Banda Aceh, Indonesia, December 2004

COASTAL HOTSPOTS

Banda Aceh, Indonesia: Aerial view, 31 January 2005

Photo: Hendro Suwito

INTRODUCTION

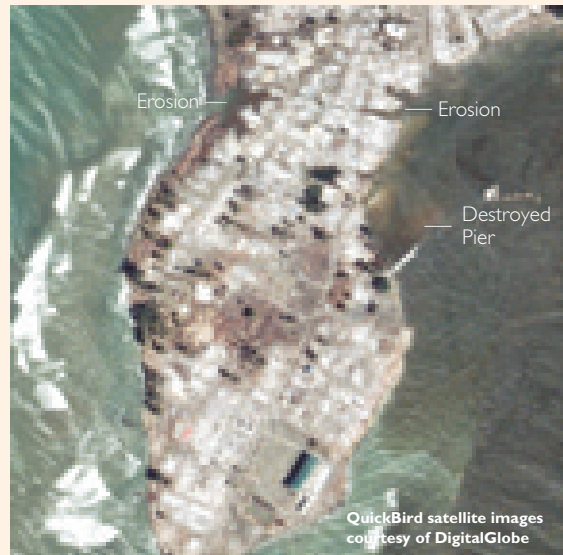
“The past year has reminded people everywhere that no place in the world is immune from natural disaster... The lesson we must draw is encapsulated in the theme of this year's International Day for Disaster Reduction: ‘Invest to prevent disaster.’ We cannot stop natural calamities, but we can and must better equip individuals and communities to withstand them.” (Kofi Annan, United Nations, 2005) ⁽¹⁵⁾

Drowning in Disaster: On 26 December 2004, a massive earthquake off the coast of Northern Sumatra produced a shock wave along 1,200 kilometres of ocean floor, triggering a series of giant tsunamis the world will never forget. Within hours of the tsunami waves hitting 14 countries around the Indian Ocean, more than 227,000 people in coastal communities were dead and 1.7 million displaced. The economic losses were estimated at US\$ 9.9 billion, although the true extent of human suffering can never be measured. Entire coastal regions were devastated, and in some cases the giant tsunami waves of up to 12 metres caused destruction up to 3 kilometres inland. ⁽¹⁶⁾ It was a highly visible tragedy which awakened the world to the conspicuous vulnerabilities of coastal communities. Within days of the Tsunami, one of the worst natural disasters in recent human history gave rise to the world's greatest international relief effort, showing what can be achieved

through global solidarity when the international community commits itself to a great endeavour. As one of the world's leading humanitarian organisations, World Vision was actively involved in rebuilding people's lives in Indonesia, India, Sri Lanka, Thailand and Myanmar. Yet despite having been involved in what has become “the most rapidly and generously funded disaster response in history” with a record US\$ 13.5 billion raised in international aid, ⁽¹⁷⁾ it is the sore conclusion of the Tsunami Evaluation Coalition (TEC) which is most notable: *disaster preparedness could have saved many lives.* The report notes that “... disaster risk reduction (DRR) and preparedness, though demonstrably cost-efficient and effective if correctly undertaken, receive only a small portion of international aid.” ⁽¹⁸⁾ The world must be far more assertive in exploring and exploiting the largely untapped potential inherent in proactive and preemptive *disaster preparedness.*

Tsunamis: One of the most lethal threats to coastal communities is the ever-present danger posed by "tsunamis." According to the Oxford Dictionary, the word "tsunami" is derived from Japanese "tsu" (harbour) and "nami" (wave). (19) Together these two characters denote a "great wave in harbour" – a fitting term, as these giant waves have frequently brought death and destruction to Japanese harbours and coastal villages." (20) Although tsunamis are popularly called "tidal waves," this term is inaccurate because tsunamis are unrelated to tides. (It is worth noting that the term "tsunami" is also inaccurate in that tsunamis are not limited to harbours; scientists frequently prefer the term "seismic sea waves.") (21) In the very simplest terms, "a tsunami is a series of waves most commonly caused by violent movement of the sea floor. In some ways a tsunami resembles the ripples that radiate outward from the spot where a stone has been thrown into the water." (22) Big tsunamis can create enormous surges of water piling dozens of metres high. (23)

Origins: Tsunamis are created by violent geologic activity (earthquakes, landslides and volcanic eruptions) along the great ocean trenches, where the tectonic plates collide. "Frequent earthquakes and volcanic eruptions make the rim of the Pacific basin the most geologically active region in the world ... The Indo-Australian plate, the Asian plate, and the Pacific plate all converge and thrust against one another, producing some of the largest and most frequent earthquakes on earth ... Most tsunamis occur in the Pacific Ocean." (24) [See Figure 10 on page 40.] The commonly used scale for measuring the magnitude of earthquakes is the *Richter Scale*. "The scale is not linear but logarithmic, so each unit represents a 10-fold increase in ground movement and a 32-fold increase in energy. For example, an earthquake of Richter magnitude 7 would have 10 times the earth shaking strength and release 32 times as much energy as an earthquake of magnitude 6." (25) With a Richter magnitude of 9.3 the 2004 *Indian Ocean earthquake* (which triggered the *Boxing Day Tsunami*) ranks as the second most powerful seismic event on record. (26)



■ **Meulaboh, Indonesia:** (150 kilometres from epicentre) The images show a small peninsula *before* (18 May 2004) and *after* (7 January 2005) the tsunami destroyed many houses



STORM SURGES

“An estimated 2.4 million people were severely affected by Cyclone Nargis, equivalent to more than one third of the population of 7.3 million in the affected townships. Nearly 140,000 died or are missing, among which an estimated 55% were female.”⁽²⁸⁾

—United Nations Office for the Coordination of Humanitarian Affairs (OCHA)

Irrawaddy Delta, Myanmar: About 20 minutes flight from the heavily-affected coastal village of Paung Doe

Photo: Ashley Clements

Cyclone Nargis

“Impacts will require adaptive responses such as investments in storm protection and water supply infrastructure, as well as community health services. ... The global community needs to coordinate a far more proactive effort towards implementing adaptation measures in the most vulnerable communities and systems in the world.” (R. K. Pachauri, Chairman of the Intergovernmental Panel on Climate Change, Nobel Lecture)⁽²⁷⁾

Catastrophic Cyclones: Certain meteorological conditions can generate so-called “storm surges” which can temporarily raise ocean water levels by several metres and cause enormous coastal flooding. Although storm surges can have the appearance of tsunamis – driving millions of tonnes of saltwater many kilometres inland – they are not generated by geological but meteorological conditions. Such a storm surge inundated vast swathes of land in Myanmar during the night of 2-3 May 2008. With nearly 140,000 people dead or missing,⁽²⁸⁾ the Category 4 Very Severe Cyclonic Storm Nargis (or “Cyclone Nargis”) is considered the worst natural disaster in the recorded history of Myanmar and the second deadliest named cyclone of all time. (Including unnamed storms like the 1970 Bhola cyclone, Cyclone Nargis ranks as the eighth deadliest cyclone of all time.) World Vision’s relief and recovery efforts are expected to continue for several years.

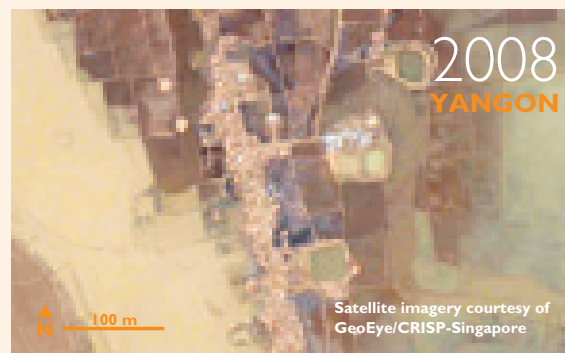
Coastal Flooding: A recent World Bank report states that a storm surge typically diminishes “0.2 to 0.4 m per km inland,”⁽²⁹⁾ underscoring the vast destructive potential of wind storm-induced coastal flooding. According to the Food and Agriculture Organization (FAO), “about 200,000 hectares, or 16 percent, of the delta’s total 1.3 million hectares of agricultural land were severely damaged in the cyclone and would ‘not be available for planting this season.’ Some of the fields have suffered severe salinity damage – due to the ... surge that swept salt water up to 35km inland – and will require environmental remediation.”⁽³⁰⁾ By examining Terra and Aqua satellite observations, researchers have estimated that Cyclone Nargis flooded about 14,402 square kilometres of land – an area equal to one third of Switzerland.⁽³¹⁾ The lethal combination of winds and water makes cyclones a serious hazard for coastal communities in tropical and subtropical areas of the world.

Coastal Living: A total 634 million people in the world live in coastal areas that lie at or below ten metres above sea level. Although these so-called Low Elevation Coastal Zones (LECZ) constitute only 2 percent of the Earth's land mass, they contain 10 percent of its population and have a higher rate of urbanisation than the rest of the world. ⁽³²⁾ The economic boom of many countries in Asia is largely driven by policies that promote coastal development and encourage coastward migration. But rapid urbanisation in coastal zones holds multiple risks. It exposes people to seaward hazards such as floods, cyclones and storm surges, while progressively degrading the very ecosystems that once protected these coastlines.

Coastal Degradation: Mangrove forests which have served as natural barriers against rising sea levels by breaking big waves and halting salt water intrusion have been significantly weakened. In the Philippines, where 62 percent of the population live in the coastal zone, ⁽³³⁾ mangrove swamps have declined from 450,000 hectares in 1918 to 120,000 hectares in 1995. ⁽³⁴⁾ And in Bangladesh, about 25-40 percent of the Sundarbans – the world's largest mangrove forest – is now destroyed. This UNESCO world heritage site has long been instrumental in protecting thousands from death when cyclonic surges strike. ⁽³⁵⁾ The net effect of coastal degradation is that more and more people are flooding into a high-risk zone for floods and storms but are less and less protected from them.

Coastal Development: Rapid population growth and uncontrolled development further exacerbate the problems by proliferating substandard housing with poor waste management and sewerage systems. As more and more people flock from rural to urban zones along the coasts, the risks begin the moment poor migrants arrive. In claustrophobic urban environments any available land is often found only in hazardous areas – cliff sides, flood plains, industrial zones, garbage dumps – the very reason why these lands are still "available" and why people can "settle" there. Since many such settlements evolve beyond the influence

and reach of official urban planning and are often considered "illegal," such areas are not usually included in national mitigation or disaster preparedness schemes. Urban slums in coastal areas are among the most vulnerable communities on Earth. Unlike middle-class urban populations in developed areas, the urban poor and slum dwellers have very little capacity to adapt, mitigate, or migrate. With little political voice and leverage, many poor coastal communities depend on outside assistance to prepare for projected climate change-related sea level rises. ⁽³⁶⁾



Low Elevation Coastal Zones: These Ikonos Satellite images show a tiny village 27 kilometres south of Yangon before (3 May 2002) and after (7 May 2008) Cyclone Nargis devastated it. Low-lying land is particularly prone to flooding.

POLAR MELTDOWN

There could be no more serious threat than for the world's most rapid warming – 0.5 degrees Celsius per decade ⁽³⁷⁾ – to occur in the region with the world's largest ice mass – Antarctica. ⁽³⁸⁾ “Antarctica and Greenland [hold] 98-99 percent of the world's freshwater ice.” Severe signs of melting are being observed in both places, and the UNEP has warned of “severe consequences.” ⁽³⁹⁾

—United Nations Environment Programme, World Environment Day 2007

Antarctica: A total 11 percent of the fifth largest continent are floating ice shelves ⁽⁴⁷⁾

Photo: Erlend Kvalsvik

Climate Change

“A total meltdown of the Greenland ice sheet would trigger an estimated seven metre rise in sea levels. Even just a 20 percent melting of Greenland and a five percent melting of Antarctica would result in a four to five metre sea level rise.” (United Nations Environment Programme, 2005) ⁽⁴⁰⁾ “The Maps of the world will have to be redrawn.” (Sir David King, U.K. Science Advisor for the British Government, 2004) ⁽⁴¹⁾

Climate Change Changes Everything: It is impossible to comprehend the mounting level of threat facing coastal communities without first understanding climate change-related processes now underway – particularly near the poles of the Earth. Climate change is beginning to introduce hazards for which there is no preexisting experience. Therefore climate change considerations cannot be uncoupled from disaster risk reduction frameworks, even though many effects are difficult or impossible to predict with any level of certainty. The aim must be not only to keep *up* with the changes – but to stay *ahead* of them. “Imagining the unimaginable” is as important as factoring “climate and disaster wild cards” into disaster planning. This is especially crucial given that the most dire effects of climate change fall disproportionately upon the poor – the very ones who are least responsible for it. Though these communities have emitted only modest amounts of green-

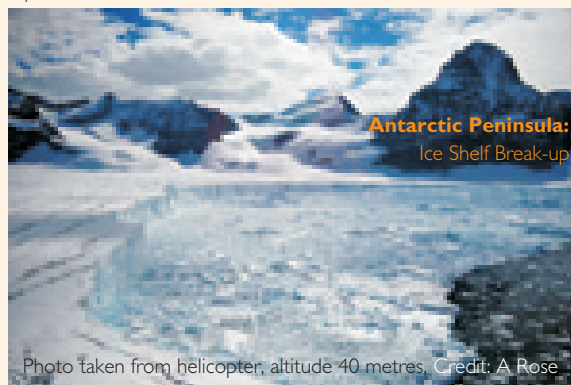
house gas pollutants into the Earth's atmosphere and have had little or no effect on the world's overall climate, they are most at risk from being sucked into the eye of future climatic storms. In short, climate change will exacerbate poverty. The solutions proposed to help mitigate its effects and adapt to its corollary consequences will affect the trajectory of every country's future development. As such climate change will affect nearly every facet of World Vision's work with the poor in the years ahead and must be proactively incorporated into all disaster preparedness planning and prognoses. World Vision and its colleague agencies promoting development at the community level must utilise the present time window to progressively position for heightened disaster preparedness across the world. On a global level, the prolonged period of planetary warming is a civilisation-scale challenge which will require strategic, holistic and multidisciplinary approaches.

Melting Ice: A Hot Topic! Recent assessment reports by the UN Intergovernmental Panel on Climate Change (IPCC), the 2007 Nobel Peace Prize-winning global authority on climate change, have released substantive scientific forecasts about global climate change. They project a rise in global sea levels of 18-59 centimetres this century, ⁽⁴²⁾ but acknowledge that "larger values cannot be excluded." ⁽⁴³⁾ Many climate scientists view these predictions as unrealistically optimistic and assert that sea level rise will accelerate far more *rapidly* than has been predicted on account of dynamic "feedback" processes (see page 54) which are not reflected in IPCC climate models. ⁽⁴⁴⁾ When land-based ice melts, it raises sea levels. One major contributor to rising ocean levels is the melting of ice sheets in Greenland and Antarctica. Studies show they are melting faster than expected, discharging massive amounts of meltwater into the sea. Recent satellite measurements reveal that the Greenland Ice Sheet is disappearing at the rate of 240 cubic kilometres per year, with melting accelerating since 2004, ⁽⁴⁵⁾ and that Antarctica is losing 152 cubic kilometres annually. ⁽⁴⁶⁾ [The city of Los Angeles uses one cubic mile of fresh water annually.] ⁽⁴⁷⁾

Breaking News: Breaking Shelves! Until recently it was thought that major ice sheets such as those in Greenland and Antarctica were relatively stable, melting slowly and predictably over centuries or millennia. Recently this understanding has been challenged by glaciologists. However, their growing concern is not adequately reflected even in the latest climate models considered by the IPCC. ⁽⁴⁸⁾ Reputable scientists have observed that IPCC projections "specifically exclude the contribution that could arise from rapidly changing flow in ice sheets, especially in Greenland and West Antarctica." ⁽⁴⁹⁾ This carries important implications because 98 percent of Antarctica – which is twice as large as Australia – are covered with an average ice thickness of 2 kilometres. ⁽⁵⁰⁾ The 2007/2008 UN Human Development Report highlights the possibility of "nasty surprises" and "catastrophic risks" posed by the "known unknowns" of rapid ice shelf disintegration, warning that "the

demise of the Greenland and West Antarctic ice sheets are perhaps the greatest of all the threats linked to climate change." ⁽⁵¹⁾ In 2002, the gigantic Larsen B ice shelf on the east coast of the Antarctic Peninsula completely collapsed in only 35 days. Starting on 31 January 2002, the 220-metre-thick plate of 720 billion tonnes of solid ice mass measuring 3,250 square kilometres – more than four times the size of Singapore – completely broke up, most of it disintegrating over the course of just two days. ⁽⁵²⁾ More recently, the National Snow and Ice Data Center (NSIDC) drew attention to the impending break-up of the yet bigger Wilkins ice shelf. The report emphasises satellite measurements from 2008. They show that the 13,680 square kilometre ice shelf has begun to collapse "because of rapid climate change," stressing that "the western Antarctic Peninsula has experienced the biggest temperature increase on earth, rising by 0.5 degrees Celsius ... per decade." British Antarctic Survey (BAS) glaciologist David Vaughan says: "Wilkins is the largest ice shelf on West Antarctica yet to be threatened. This shelf is hanging by a thread." ⁽⁵³⁾

John Mercer, scientist, 1978: "One of the warning signs that a dangerous warming trend is underway in Antarctica will be the break-up of ice shelves on both coasts of the Antarctic Peninsula." ⁽⁵⁴⁾



Armin Rose, scientist, 2007: "Steep ice edge shows giant glacier mounting into the sea where until 2002 the Larsen B ice shelf used to extend 60-70 kilometres to the right – now open water." ⁽⁵⁵⁾

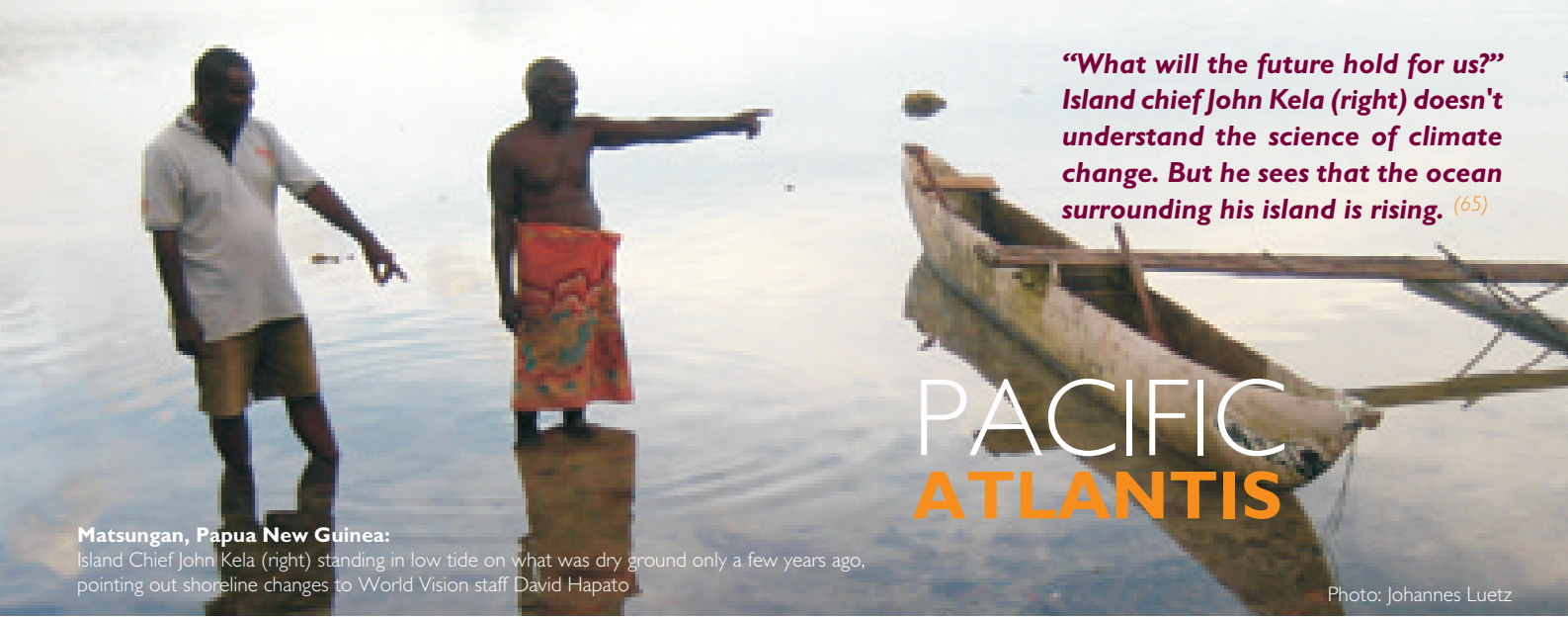
Gigantic Glaciers: Scientists track ice shelf collapses carefully because several of them hold back enormous glaciers, which if unleashed, will significantly accelerate their surge to the sea, discharging massive amounts of ice mass into the ocean. Satellite measurements have shown that three huge glaciers in West Antarctica have been speeding up for more than a decade, with the biggest glacier – the Pine Island Glacier – causing most concern. BAS researcher Stott warns: "This is a very important glacier; it's putting more ice into the sea than any other glacier in Antarctica. It's a couple of kilometres thick, it's 30 km wide, and it's moving at 3.5 km per year, so it's putting a lot of ice into the ocean. ... The measurements from last season show an incredible acceleration, a rate of up to 7% [over 1% in the 1990s]. Stated simply, the glacier is flowing more and more rapidly towards the sea, "sending more and more glacial ice into the ocean." (56)



■ **Melting with Fear:** "There must be a thunderstorm approaching, I can hear the distant thunder – but it was the sound of glaciers melting and crashing into the sea." (Armin Rose) Glaciers on King George Island, 120 kilometres off the coast of Antarctica, have dramatically retreated in the last years. (57) "West Antarctic glaciers are melting at 20 times their former rate," (58) and "85 percent of the glaciers [in East Antarctica] appear to be accelerating their flow toward the sea." (59)

Global Threat – Cold As Ice: The 2007/2008 UN Human Development Report warns that the intense melting in the Antarctic region is a source of awesome concern: "One of the reasons for uncertainty about the future is that ice sheet disintegration, unlike ice sheet formation, can happen *very rapidly*." The report notes further: "According to one of the world's most prominent climate scientists working at the North American Space Agency (NASA), a business-as-usual scenario for ice sheet disintegration in the 21st Century could yield sea level rises in the order of 5 metres this century. Note that this does not take into account accelerated melting of the Greenland ice sheet, the complete elimination of which would add around 7 metres to sea levels." (60) Another paper warns that "a threshold triggering many metres of sea-level rise could be crossed well before the end of the century, particularly given that high levels of anthropogenic soot [carbon dioxide concentrations are at their highest level in 650,000 years] (61) may hasten future ice-sheet melting." (62)

Summary: Several of the most recent studies not only confirm the IPCC's bleak outlook, but suggest it may be overly optimistic in its assessment. (63) The IPCC sets out what can be thought of as a lowest common denominator consensus, and headline risk numbers may err on the side of understatement. Its assessment reports offer reasonable insights into the *minimum probable* climatic effects, not the *maximum possible* effects – but conservatism is perhaps to be expected from a committee involving 2,500+ scientists seeking to accommodate the views of 130 participating nations. Climate scientists cannot predict precisely what will happen tomorrow, but the coming century promises climatic upheavals the likes of which human beings have not seen since the last ice age. Coastal communities will be hugely affected by impending sea level rises which the IPCC observes show signs of acceleration. (64) Every effort must be made by the international community to help brace these communities for coming catastrophes. Climate change changes *everything*, and the 21st century is likely to see large-scale movements of people.



“What will the future hold for us?” Island chief John Kela (right) doesn't understand the science of climate change. But he sees that the ocean surrounding his island is rising. ⁽⁶⁵⁾

Matsungan, Papua New Guinea:

Island Chief John Kela (right) standing in low tide on what was dry ground only a few years ago, pointing out shoreline changes to World Vision staff David Hapato.

Photo: Johannes Luetz

PACIFIC ATLANTIS

Sinking Feeling

Island chief John Kela doesn't know his age – when he was born there were no birth certificates. He can only guess at it from the childhood memory of playing on the island of Matsungan as a young boy sometime during World War II. But while Chief Kela can never know his date of birth, what he has seen over his lifetime is that the island on which he grew up is undergoing a “strange transformation” – the sea is creeping up. ⁽⁶⁵⁾

Island of Matsungan: There are no roads on Matsungan, no cars, no telephones, no electricity, no running water. If islanders want to traverse their island they cross it on foot, a journey that only takes 10 minutes. The footpath is mostly moist or muddy and leads between tin huts, water tanks, coconut trees and vegetable gardens, where islanders grow sweet potato, cassava, taro, breadfruit, banana and sugar cane, through increasingly dense brush forest – until the sudden appearance of vast oceanic horizon on the other side.

Matsungan abounds with paradisiac peace and tranquility – and a throng of lively, giggling children who are happy to walk visiting strangers all over their island home. But their peaceful and isolated life is now under threat. Everywhere on Matsungan there are signs of severe erosion. Waves can be seen lapping at the roots of giant callophylum trees

which – as John Kela points out – stood at a safe distance from the shore only a few years ago. In a matter of months they will be uprooted and washed out to sea. He says ocean currents and storm surges have become much stronger than in the past and big waves routinely spill over the sea walls that the islanders have built, driving saltwater deep into the huts of the small village.

John Kela doesn't understand the causes driving the decay of his island, but the effects have become impossible to miss: The oceanic water is rising, and the shoreline is progressively inching upward, little by little. His island is going down – slowly, but perceptibly. Although Island Chief Kela never formulates the words, his face cannot hide a worrying question: What will the future hold for our children and grandchildren? – What will happen to our little community of islanders?

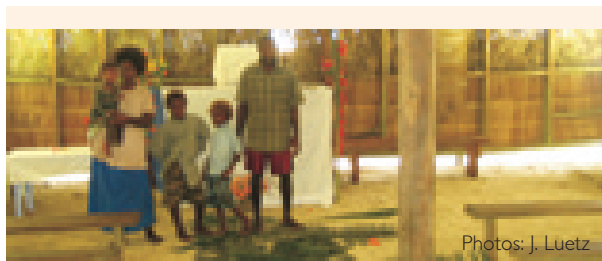
PRAYING FOR PETATS

Petats, Papua New Guinea: Sea of smiling children

Photo: Pamela Sitko

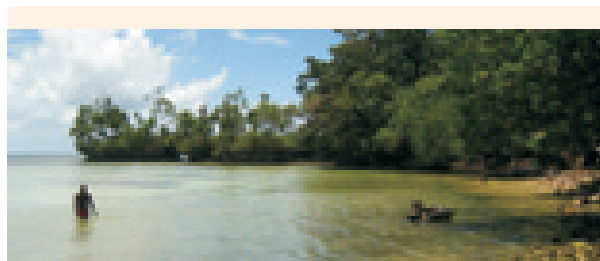
■ **Island of Petats:** On Petats, Pastor Sialis Tonge (36) shepherds a congregation of 96 members. The vibrant singing of Tanei United Church can be heard long before the church hut can be seen. After the Palm Sunday service the proud pastor is happy to talk about his island. He first became aware of the rising water in the 1980s when the older people began to tell stories of "observable changes" and then began to build sea walls. Luke Rutsie (36) who works as a carpenter in Buka elaborates: "People are afraid and have begun to move away from the sea to higher ground. But they can't go far – the island is small and the highest point lies barely three metres above sea level."

Pastor Sialis points to a dead tree stub sticking out of the water. "This land area used to be green and arable – now it is covered with water." Ezekiel Somi, Chairman of the Water and Sanitation Committee of Tanei village, remembers that the tree used to be strong and robust – now it is but a dead sentinel, warning the islanders to take heed of an impending threat they feel defenceless to face. During high tides the whole area in and around the church building floods. Luke Rutsie glances down at the waves lapping at his sea wall, only feet away from his cooking hut. He points out that during high tides the well water tastes very salty – islanders now use it only for cooking and bathing. ⁽⁶⁶⁾



Photos: J. Luetz

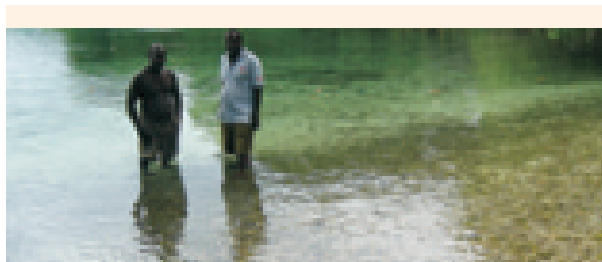
■ **Palm Sunday:** Pastor Sialis Tonge inside Tanei United church with his wife Joycelyne, baby daughter Emerol, and his two sons Seth and Elias.



■ **Island of Petats:** Pastor Sialis walks along the "old" island perimeter, the dead tree stub a reminder of arable land lost to the encroaching ocean.

■ **Island of Torotsian:** Torotsian is one of several inhabited islands on the chain of Saposa where things are similar. Island Chief Joash Kela was born on Torotsian and never lived anywhere else. He doesn't know the exact number of islanders living with him on the island but puts the figure somewhere at "threehundred plus." [The National Statistical Office estimates the figure at 672, although that number is based not on a recent census but on data from the year 2000, "enhanced" with a mathematical formula.] Nobody can be sure how many people chief Joash Kela *really* shares his island home with. But what chief Kela does know beyond doubt is that his island is shrinking. Storms have increased in intensity, and tides have been creeping higher and higher, dragging more and more fertile soil out to sea. He says, land which used to be "straight" is "caving" in. Storm surges recurrently drive saltwater into huts that until recently stood "safe."

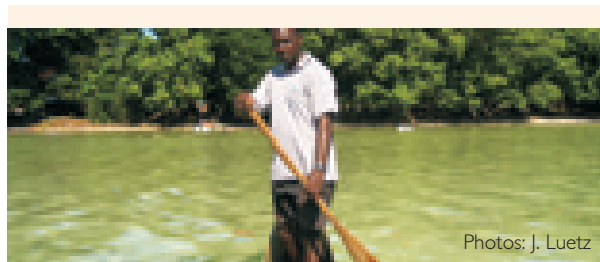
In the 58 years since he was born, Chief Joash Kela witnessed ample change. He saw the population of his island "double", he became the father of five, the grand-father of seven, and recently the chief of "threehundred plus". But in the autumn of his life, Chief Kela is beginning to deal with a kind of change he doesn't understand well. Land is disappearing. The islands of Saposa are getting smaller. The shorelines are moving up. More and more people are crowding together, sharing less and less land. (67)



■ **Island of Torotsian:** Chief Kela (left) standing on what was dry ground only a few years ago, explaining changes to World Vision staff member David Hapato.

■ **Island of Pororan:** On Pororan, retired police officer Francis Giran (59) explains that the encroaching sea is affecting agricultural processes, making cassava trees "smaller and smaller." A walk around the island perimeter leads past a towering terminalia tree (photo on page 22). During high tide, its root system is totally submerged. The massive trunk of this slow-growing tree reveals that for many years its location was safe. Francis Giran remarks that it could be gone in a matter of months, just like the other trees that once lined the area where now the ocean has taken over. He says that in his childhood days the island was much bigger, extending dozens of metres out to sea. Today there is less land and less freshwater. The well water has become salty and unfit for consumption – the World Vision pump is brown with rust. (Refer to figures 1 and 2 on page 23.)

Lawrence Belleh (45) is a political leader for the Peit Constituency in the House of Representatives of the Autonomous Bougainville Government. He represents 15,000 constituency members. For many years he raised awareness about sea level rises, advocating for sea wall construction and mangrove afforestation. He knows only too well how severe the progressive peril is – the area where he used to live in a hut as a young boy has been swallowed by the sea. Today he lives 100 metres inland. He doesn't know how much time remains, but worries that he and his fellow villagers could be forced to move again soon. (68)



Photos: J. Luetz

■ **Island of Pororan:** "This area used to be dotted with trees and huts!" Political leader Lawrence Belleh is paddling across an area he says was the site of his childhood family hut.



PACIFIC PORTENT

“Storm surges regularly overtop our islands – then the sea and low-lying land become ‘level.’ My home island – the Island of Huene – was sliced in two. The time for adaptation and mitigation has run out. The time for migration and relocation has come. Resettlement is underway. It is so sad to leave.” ⁽⁶⁹⁾

—Ursula Rakova, Carteret Islander and Director of Tulele Peisa NGO

Carteret Atoll, Papua New Guinea: “After Huene was sliced in two, my family settled on Huene One (right). There are three houses there. On Huene Two (left) there are only gardens. The ‘channel’ keeps widening.” (Ursula Rakova)

Photo: Tulele Peisa, courtesy P. Starr

Climate Change Migration

“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.” (Tamarī'i Tutangata, former Director of the South Pacific Regional Environment Programme, SPREP) ⁽⁷⁰⁾

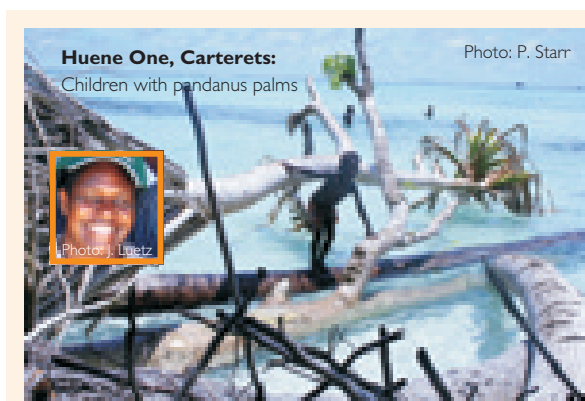
Carteret Islands: On the remote Carterets, a tiny and flat Pacific atoll, things are dire. Surrounded by nothing but open ocean, its six inhabited islands are extremely vulnerable to the rising sea – the highest point of the Carterets lies no more than 1.2 metres above sea level. In 2005, a political decision was reached to evacuate the Carteret Islands and resettle its tiny population (the official figure stands at 2,502) on larger Bougainville island, a four-hour boat ride to the southwest. Over the course of seven to ten years, ten families at a time are being moved under the resettlement scheme, until the whole island population is fully evacuated. There has been 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 given up hope, resigned to be among the world's first “climate change refugees.” ^(a) Ursula Rakova, founding direc-

tor of the locally registered NGO Tulele Peisa (“Sailing the Waves On Our Own”), says that during storm surges the sea and land become “level.” Her island – Huene – was sliced in two by the sea. In places the ocean water is now seeping up through the ground, creating swampy breeding grounds for malaria-carrying mosquitoes. ⁽⁶⁹⁾ Paul Tobasi (58), Executive Manager of the Atolls District in Buka, has managed the affairs of the four atolls under his jurisdiction for 13 years. As an islander from the largest atoll island – the Island of Han – he knows that everywhere on the Carterets the story is the same – strong currents and powerful sea surges carry mangrove and other seedlings away while causing severe saltwater contamination. The results are rotting roots, degraded arable land and tiny taros. Even as the last veneers of organic matter are pushed out to the ocean, Tobasi prays daily for his island. He knows that life on the atoll is coming to an end. ⁽⁷¹⁾

The Next Wave: The Carterets could be submerged by as early as 2015 and are a portent of catastrophe to come for other low-lying atolls of the South Pacific. Most island communities in Oceania lie 1-2 metres above sea level, share the basic vulnerabilities and are on the brink of being swallowed by the sea. The UN Human Development Report notes that Small Island States 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." (72) At least two motu or islets 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. (73)

The "Known Unknowns": The textbook *Climate Change and Sea Level – Physical Science*, published under the South Pacific Sea Level and Climate Monitoring Project, opens with a tongue-in-cheek acknowledgment that the science of sea level rise can be extremely hard to grasp: "One of the great problems of the world today is undoubtedly this problem of not being able to talk to scientists, because we don't understand science; they can't talk to us because they don't understand anything else, poor dears!" (74) Professor of Environmental Science at the University of Papua New Guinea, Chalapan Kaluwin, sums up the complexities: "The causes of sea level rises are manifold, intertwined and acting in concert. Research requires a prolonged, multidisciplinary investigation with scientific contributions from different fields of study – glaciologists, oceanographers, geodesists, geologists, meteorologists, and climate scientists." (75) Scientists say they need more time because "sea level records of less than 25 years are thought to be too short for obtaining reliable sea level estimates." (76) – Time, however, is fast running out..

Alarming Acceleration: According to the IPCC, sea levels have been stable for 2,000-3,000 years and "did not change significantly ... until the late 19th century. ... Estimates for the 20th century show that global average sea level rose at a rate of 1.7 mm per year. Satellite observations available since the early 1990s provide more accurate [global] sea level data [which show] that since 1993, sea level has been rising at a rate of around 3 mm per year, significantly higher than the average during the previous half century." (77) Satellite altimetry also provides "unambiguous evidence of non-uniform sea level change in open oceans, with some regions exhibiting rates of sea level change about five times the global mean." (78) Research in Papua New Guinea has shown sea level rises in the order of 6.2-8.1 mm per year, (79) and monitoring in the Pacific has shown enormous variability, including rises in sea level of up to 25 mm a year, far above IPCC estimates. (80) Whether differences mark decadal variations like El Niño/ Southern Oscillation (ENSO) or the beginning of an impending end, Pacific islanders have long begun to exhort each other to believe not the statistically smoothed data of global means and averages but to "believe with their eyes." (81)



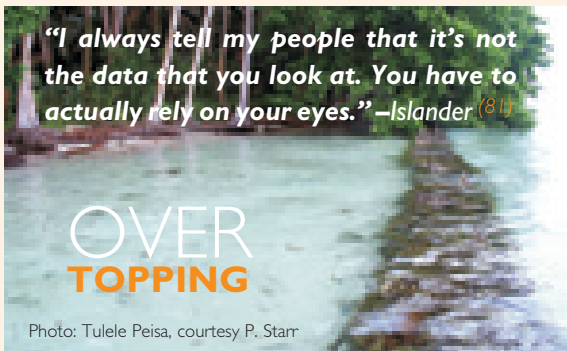
Huene One, Carterets:

Children with pandanus palms

Photo: P. Starr

Photo: J. Uetz

■ **Ursula Rakova:** "Rising sea levels produce a higher base for storm surges, increasing wave energy, felling pandanus palms, and leading to island erosion and land loss."



Islands Are Under Rising Pressure From The Sea: King tides crash through a sea wall in Kiribati (top). In Papua New Guinea, rising ocean levels overtop the Carteret Atoll (middle) and creep up on a terminalia tree on the Island of Pororan (bottom)

Water is Life: The most obvious consequences of rising sea levels are signs of coastal erosion and flooding of low-lying land. When elevated tides start to flow over the surface of islands or "overtop" them, habitation obviously becomes impossible. However, rising sea levels make islands uninhabitable long before the island itself is submerged. Decreased island size means less surface area for rain catchment and storage. As seawater pushes upward, diminishing the freshwater lens, saltwater seeps into freshwater sources, making groundwater saline and "unfit for household and agricultural use." ⁽⁸²⁾

"Wait-And-See?" The United Nations Environment Programme recently summed up the scientific position: We "need ... greater certainty with regards to the fate of ice sheets. There are signs that these are breaking up, not just slowly melting [but] to date we do not fully understand the processes behind this. We can state with confidence that sea level rise is increasing, but we lack the ability to predict how much the ice sheets will in the end contribute to this over the next 10 years, let alone the next 50 years – all we can say is that their potential to dramatically increase sea levels is enormous and far above the current UN Intergovernmental Panel on Climate Change predictions." ⁽⁸³⁾ Will policy makers wait for science to yield more definitive answers – answers that could be decades away – before stepping up efforts to curb greenhouse gas emissions? Indications are that the planet could be pushed past an environmental tipping point from which there would be no winners. Spread over centuries or millennia, planetary warming and related sea level rises could perhaps be managed. Compressed within the space of a single century, rapid temperature increases and rising sea levels present awesome challenges to human adaptation and biological ecosystems which typically evolve over millions of years. ⁽⁸⁴⁾ Today there could be no more dangerous and self-destructing policy position than the "wait-and-see" stance. As storm surges are becoming fiercer and more frequent, global action is needed to prepare islanders and coastal communities who are losing their land to the sea.

“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.” (85)

—Intergovernmental Panel on Climate Change,
Fourth Assessment Report 2007

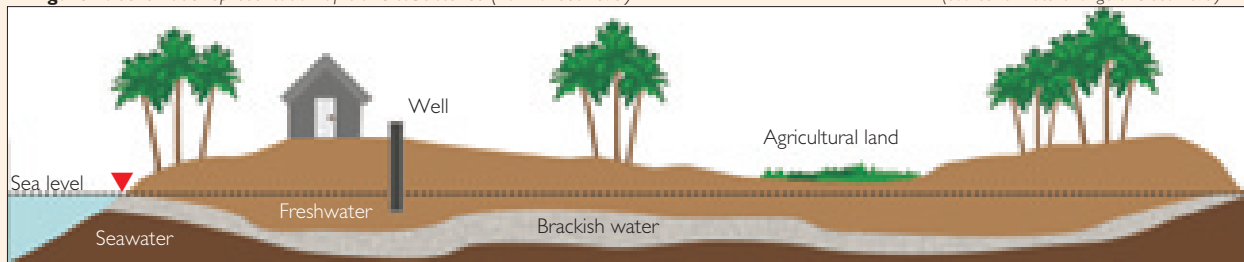
WATER WORLD

Island of Buka, Papua New Guinea: World Vision water and sanitation projects address water stress on islands in Papua New Guinea

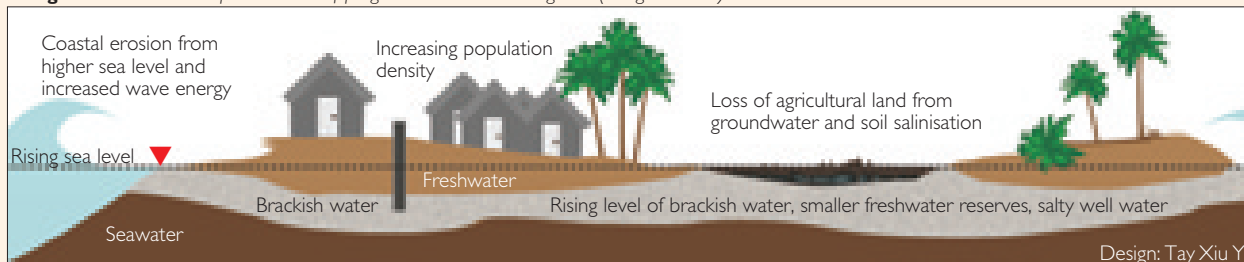
Photo: Pamela Sitko

■ **Figure 1:** Schematic representation of island subsistence (normal sea level)

(Source: Climate Change and Sea Level) (86)



■ **Figure 2:** Schematic representation of progressive island submergence (rising sea level)



■ **Island Erosion:** Islands have large coastal areas compared to their total land area. Storm surges and island "over-topping" cause erosion and freshwater lens contamination.

Population growth and decreasing land area exacerbate water stress, making rain catchment and freshwater storage systems increasingly indispensable.

CLIMATE REFUGEES

"The bush is better than the beach." ⁽⁹⁷⁾

—Jerry Yacku (47), Labutali environmental refugee



Mondo Sigar

Jerry Yacku

Albert Nai

Puwamo/Labutali, Papua New Guinea: First group of "climate change refugees" who abandoned their coastal village "because of rising sea levels." Photo: J. Luetz

Resettling Coastal Communities

"Climate shifts, manifested in rising sea levels and more intense droughts and storms, could stimulate large scale movements of people within, and across, international borders. Individually or collectively, such developments could destabilise nations internally, aggravate tensions between states and endanger human security." (Dr. Alan Du Pont and Dr. Graeme Pearman, Lowy Institute for International Policy) ⁽⁸⁷⁾

Climate Refugees: The era of climate change migration is beginning to dawn on the world. The world's first evacuation of low-lying islands due to climate change is presently underway in the Carteret Islands. ⁽⁸⁸⁾ Tuvalu – the fourth-smallest country in the world and most commonly known for its internet domain .tv – could be next: "The sea level is rising so much ... that [Tuvalu's] water has become too salty to drink and to grow vegetables." ⁽⁸⁹⁾ As the rising waters are progressively creeping up the scrawny neck of the nine tiny Tuvaluan islands – "slowly but effectively killing them off" ⁽⁹⁰⁾ – island communities across the Pacific are watching with trepidation, bracing themselves at the prospect of being forced to abandon their island homes and relocate to foreign lands as "climate change refugees." ^(a) The Cold War may be over, but the Warm War has barely begun. Thousands of coastal communities around the world stand to be affected.

Creeping Crisis: Climate change-related people movements are certain to dominate the international political landscape of the 21st century. The trend which has barely begun with a trickle could soon turn into a torrent. Islands and mainland coastal communities alike are at threat as even diminutive rises in sea level vertically can lead to enormous erosion horizontally. Reports by the IPCC have stated that a rise in sea level of one centimetre can result in beach erosion of one metre horizontally. ⁽⁹¹⁾ This puts extreme pressure on developed beaches and densely populated coastal areas across the world, including sealed nations in Asia like the Philippines. As an archipelagic state with a complex coastline roughly equivalent to the earth's circumference, the Philippines is extremely vulnerable to climate change-induced sea level rises. According to a recent Greenpeace study, a one-metre rise in sea level is projected to affect 64 out of 81 of its provinces and unin-

date 700 million square metres of land area. ⁽⁹²⁾ And what of scenarios based on a rise in sea level of *multiple* metres? Daring to "think the unthinkable" is the kind of proactive preparedness planning which a growing body of reputable researchers are propagating. A recent World Bank study of 84 developing countries concluded: "... global warming could well promote SLR [sea level rises] of 1m-3m in this century, and unexpectedly rapid breakup of the Greenland and West Antarctic ice sheets might produce a 5m SLR. ... Our results reveal that hundreds of millions of people in the developing world are likely to be displaced by SLR within this century; and accompanying economic and ecological damage will be severe ... To date, there is little evidence that the international community has seriously considered the implications of SLR for population location and infrastructure planning in developing countries." ⁽⁹³⁾ Dr. Sudhir Chella Rajan, climate expert and Professor of Humanities and Social Sciences at the Indian Institute of Technology (IIT) Madras, recently said: "This isn't going to happen gradually. What we are going to see is a series of coastal surges – inundation, saltwater intrusion – which will cause lots of harm and devastate a lot of these infrastructures." ⁽⁹⁴⁾ Such climate change catastrophes could create waves of environment-driven migration within and across international borders and – in the absence of political forethought – become a formula for protracted, bloody conflicts and human misery. ⁽⁹⁵⁾

Relocating Labutali: Climate change migration has become a reality for Labutali, a village of 2,500 residents on the Huon Gulf peninsula in Papua New Guinea which was forced to relocate two kilometres inland "because of rising sea levels." ⁽⁹⁶⁾ For decades the village had been forced to retreat, progressively inching inland each year. But when the village backed up against a backbeach swamp, villagers could move no further. Sandwiched on a thin strip of beach between the advancing seawater in front and the brackish water behind, decades of Labutali life were fast coming to an end. Assisted by Thomas Warr (40) of the Village Development Trust, a local environmental and de-

velopment NGO that coached the villagers throughout lengthy decision-making deliberations, in 2005 the village finally reached a collective decision to move inland "for the safety of its residents" ⁽⁹⁷⁾ after severe King Tides rocked the village for weeks. Jerry Yacku (47), father of five, remembers: "I was very afraid and unable to sleep at night – the pounding waves were destroying our house, dumping sand at the doorstep." He was among the first to move to the newly-cleared site in the bush – now called Puwamo. He smiles. "I don't miss the coast at all. The bush is better than the beach!" Polina (50) says: "The winds and waves are much more violent today than in the past when I was a girl." Albert Nai (63) is another villager who was eager to move – on the day of our visit he moved up his "last cargo" from the beach. ⁽⁹⁷⁾

Beginnings: The fate of Labutali is no isolated incidence. Elsewhere in Papua New Guinea people are contemplating relocation. ⁽⁹⁸⁾ Thousands of villages in the Asia Pacific and the wider world face the same threat from the encroaching sea. The United Nations University warns that "in Alaska, 213 communities are threatened by tides that creep roughly 3 metres further inland each year." ⁽⁹⁹⁾



Photo: J. Luetz

■ **Labutali, Papua New Guinea:** On the day of our visit, Albert Nai (seen here with two grandchildren) moved his "last cargo" from the beach to his new home in the bush

DOUBLE EROSION

“Bhola – Bangladesh’s biggest island – is eroding at a phenomenal rate. From a size of 6,400 square kilometres in the 1960s, Bhola is now only half its original size.” (113)

—Mohammad Shamsuddoha, General Secretary Equity and Justice Working Group

Bhola, Bangladesh: Community leader Abdul Mannan (centre) points out erosion in Dalalkandi, Tajumuddin

Photo: Johannes Luetz

Losing Land

“Climate change is the biggest environmental threat faced by South Asia and may well be the biggest ... challenge that the developing world will have to face in the coming decades. While the world has woken up to the threat of climate change, the true enormity of what this implies is still sinking in... About 125 million migrants ... from Bangladesh and ... India could be rendered homeless by the end of this century.” (Dr. Sudhir C. Rajan) (100)

Perfect Storm: Bangladesh has the highest population density in the world (not counting city states). With more than 1,000 people squeezed on each square kilometre of available land, more people live in Bangladesh than in all of Russia. Bangladesh is also one of the poorest and most low-lying coastal countries on earth. Of its population of 153.3 million people, (101) 84 percent (128.8 million) live on less than two dollars a day, 41.3 percent (63.3 million) on less than one dollar a day, (102) – 46 percent (70 million) live within ten metres above sea level (103) and 33 percent (50 million) below five metres above sea level. (104) The Bay of Bengal is also the greatest river delta in the world – one of the most flood-prone regions worldwide. One third of Bangladesh floods annually during the monsoon season, but extreme floods cover up to two thirds. (105) Factor in climate change – sea level rises, fiercer and more frequent floods and cyclones – and the result is a “perfect storm.”

Mega-Migration: Bangladesh's woes – demography, geography and topography – have already made it the world's number one hotspot for disaster homelessness. According to the World Bank, from 1980 to 2000 more than 37 million Bangladeshis were made homeless by disasters. (106) Dr. Sudhir Chella Rajan estimates that climate change could see 125 million people from India and Bangladesh uprooted by the end of this century: “Most of these people will be forced to leave their homes because of the sea level rise and drought associated with shrinking water supplies and monsoon variability. The bulk of them will come from Bangladesh as most of the parts of that country will be inundated.” (107) The warning should be taken seriously. With average ground levels in coastal areas as low-lying as 1.5 to 2 metres above sea level – and storm surges reaching heights of up to 6 metres (108) – powerful erosion has long begun to eat away at Bangladesh's very existence.

Thorough Thawing: Criss-crossed by 230 rivers, Bangladesh's problem of river erosion is perennial. However, recent years have seen the issue exacerbated by the growing pressure from glacial meltdown in the Himalayas as well as from rising sea levels along the coastal belt. The worsening problems are noted in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC): "Widespread mass losses from glaciers and reductions in snow cover over recent decades are projected to accelerate throughout the 21st century, ... [eventually] changing seasonality of flows in regions supplied by meltwater from major mountain ranges (e.g. Hindu-Kush, Himalaya, Andes), where more than one-sixth of the world population currently lives." (109) "Coastal areas, especially heavily populated megadelta regions in South, East and South-East Asia, will be at greatest risk due to increased flooding from the sea and, in some megadeltas, flooding from the rivers." (110) South Asia is particularly susceptible to glacial meltwater run-off, given that three of the region's major rivers – the Ganga, Yamuna and Brahmaputra – originate in the Himalayas, also known as the "water tower of Asia." According to Dr. J. T. Gergan of the Wadia Institute of Himalayan Geology, the roughly 5,000 Indian Himalayan glaciers contribute 50 to 70 percent of their annual meltwater discharge into Himalayan river systems. Dr. Gergan says that in less than 50 years, smaller glaciers measuring between 1 and 5 kilometres in length will be reduced to "small patches of ice." (111) The IPCC synthesises that the current era of floods will soon be succeeded by an era of drought. "By the 2050s, freshwater availability in Central, South, East and South-East Asia, particularly in large river basins, is projected to decrease." (112)

Top-Down And Bottom-Up: Researcher Mohammad Shamsuddoha of the Dhaka-based Equity and Justice Working Group (EJWG) affirms that coastal islands like Bhola were not previously vulnerable to erosion: "The erosion of Bhola only started in the 1960s. Before that the size was stable and the extent of erosion negligible. But from the mid-1960s the erosion began, and over the years the

rate has accelerated. Huge quantities of meltwater from the Himalayas are crashing into coastal estuaries and are speeding up river erosion across Bangladesh through the Ganges and Brahmaputra. Additionally, large coastal areas are being gradually submerged due to global warming and rising sea levels. The collision between downward currents of freshwater and upward pressures of saltwater creates strong twirling and severe erosion. In short, Bangladesh is suffering from 'double erosion,' crumbling from the top down through increasing glacial meltwater run-off, as well as from the bottom up through rising sea levels." (113)



■ **Dalalkandi (Tajumuddin), Bohla:** Abdul Mannan (top) points out signs of extreme erosion. Coastal dwellers (bottom) are balancing their lives on the very cutting edge of climate change, daily losing more and more ground.

Big Bhola Breakdown: According to Shamsuddoha's research at the Dhaka-based NGO The Coast Trust, the Island of Bhola has been cut down from a land area of 6,400 square kilometres in the 1960s to 3,400 square kilometres in 2004. Once thriving population centres like Old Daulatkhan, Mirzakalu, Molongchara, etc. have been permanently lost to the sea. Shamsuddoha warns: "If this rate of erosion continues, the entire island of Bhola could be lost within the next 40 years." ⁽¹¹⁴⁾ What will become of Bhola's two million islanders?



Photos: J. Luetz

■ **Dalalkandi (Tajumuddin), Bohla:** Abdul Mannan (bottom left) says: "The place where I was born lies 5 kilometres out in the sea. People are constantly moving back. This family left last week. All that's left is their toilet pit." (top)

Eroding Existence: Dalalkandi on the Island of Bhola has a population of 2,000. The tidal difference in this coastal village in the subdistrict of Tajumuddin is enormous – as is the extent of coastal erosion. Everyday the river reverses course with the tide twice, zipping 3–4 metres up and down over the riverbank. The pressures of river currents and tidal forces acting in concert are constantly undercutting the soft soils, causing extreme erosion. As a community elder of Dalalkandi, Abdul Mannan (55) speaks for many in his community: "The place where I was born lies five kilometres out in the sea. I've already moved my home and family four times. This is my fifth house." He points to an area behind the embankment. "Soon I will have to move again." The villagers seated around him nod in unison. They are all leading what has become known as a "floating existence" – a landless life of constant moving away from the advancing waters. Despite some land accretion in parts of Bhola caused by siltation, Abdul Mannan is certain that the overall land area is fast decreasing – the eroding coast is lined with abandoned plots of land, some of which evacuated only days ago. He can name more families who have lost land and livelihoods in recent days than he can count on his fingers. "Many families left last week: family Halim, Yusuf, Jamal, ..." – These villagers are already living the reality of global warming as "climate change refugees." ^(a) Many of them are moving to the cities. ⁽¹¹⁵⁾

Slow And Silent: River erosion is a slow and silent disaster but its effects are rapidly speeding up. According to the Centre for Environment and Geographic Information Services (CEGIS), every year 100,000 people become homeless from the effects of river erosion. ⁽¹¹⁶⁾ According to UNICEF Emergency Specialist Mohammad Zulfikur Ali Khan, river erosion is causing countless poor farmers to become "undone" and migrate to the cities as environmental refugees, adding further to the intense pressures of ramshackle slum settlements. With few saleable skills and having lost their farmland to the ocean or rivers, unschooled peasants have few options but to "sell their physical labour and pull rickshaws." ⁽¹¹⁷⁾

“Around the world vulnerability is on the increase due to the rapid development of megacities in coastal areas. Many cities are overwhelmed [by] a burgeoning number of people, many of whom take up shelter in flimsy shanties. Combine this trend with rising sea levels and the growing number and intensity of storms and it is the recipe for a disaster-in-waiting, with enormous potential to create waves of environment-driven migration.” ⁽¹¹⁸⁾

—Dr. Oliver-Smith, United Nations University

Burigonga River in Dhaka, Bangladesh: Waves of people are returning home during the Muslim religious festival Eid


Photo: Amio Ascension

Waves Of People

“As ever larger numbers of these people pass thresholds in terms of their ability to cope, societal tipping points will be crossed, resulting in the sudden mass movements of entire villages, towns and even cities in coastal regions towards safety. While the actual triggers of migration are complex, historical evidence ... indicates that population movements tend to take place in waves, often towards ... urban areas.” ⁽¹¹⁹⁾ (Dr. Sudhir Chella Rajan)

Maximum Megacities: According to the United Nations Populations Fund (UNFPA), the coming two decades will see Asia's urban population grow from 1.36 billion in 2000 to 2.64 billion in 2030. By then, Africa and Asia will include almost seven out of every ten urban inhabitants in the world. ⁽¹²⁰⁾ The current trend of coastward people movements means people are moving *toward* risk – when they should be guided to migrate *away* from it. Politically incentivised coastward construction in the context of predicted coastal catastrophe puts the clear onus on governments to urgently educate, warn and prepare coastal communities – including inland urban population centres. Shamsuddoha who has extensively studied flooding issues in coastal areas, was recently quoted by the Washington Post: “We're already seeing hundreds of thousands of climate refugees moving into slums in Dhaka. What will happen when things get *really* bad?” ⁽¹²¹⁾ Dr. Rajan highlights a

possible scenario: “In South Asia, large coastal cities such as Dhaka, Mumbai, and Kolkata are at average elevations of 2-10 metres; overall, some 47 million live in urban areas in the [Low Elevation Coastal Zone], half of whom are in cities larger than 5 million in population. It is not inconceivable therefore that a 3-5 metre rise in average sea level by the end of the century could effectively de-urbanise the major population centres of the region along the coast. If that were the case, it is likely that the major population movements will occur towards other large urban settlements in the interior of the country rather than get dispersed in the hinterland of existing coastal cities. Under these circumstances, it is likely that large cities such as Delhi, Bangalore ... which already have serious resource constraints of their own, by the middle of the century, will have to be prepared to accommodate enormous numbers of migrants from the coasts.” ⁽¹²²⁾

A young girl with curly hair and a beaded necklace is smiling broadly. In the background, a man is partially visible, looking towards the camera. The image is set against a dark background.

“ The promotion of a culture of prevention, including through the mobilization of adequate resources for disaster risk reduction, is an investment for the future with substantial returns. Risk assessment and early warning systems are essential investments that protect and save lives, property and livelihoods, contribute to the sustainability of development, and are far more cost-effective in strengthening coping mechanisms than is primary reliance on post-disaster response and recovery. ”

—World Conference on Disaster Reduction, General Considerations, Hyogo Framework for Action 2005-2015

Island of Petats, Papua New Guinea: Girl on the Island of Petats where World Vision has made significant water and sanitation investments

Photo: Pamela Sitko

PROTECT DEVELOPMENT

In a matter of minutes, decades of development gains can be lost. The 12 November 1970 cyclone was the deadliest wind storm to hit Bangladesh in the 20th century. ⁽¹²³⁾ Winds in excess of 190 km/h, combined with an exceptionally high storm surge of five to six metres, drove millions of tonnes of seawater into coastal communities, causing widespread flooding and killing 300,000 people. The greatest loss of life and destruction occurred on Bhola and other low-lying islands of the Ganges Delta south of Dhaka. Almost all the livestock in the affected area were killed, and most of the fishing fleet was destroyed. The event is likely to have been the deadliest tropical cyclone in history and is believed to have set development back by four to five years. ⁽¹²⁴⁾ On 2 May 2008 Cyclone Nargis made headlines around the world when it left nearly 140,000 people dead or missing and became the worst natural disaster in the history of Myanmar. ⁽¹²⁵⁾ Disasters destroy development. Preparedness protects progress. Overcoming the climate change challenge is a critical component of disaster preparedness. Citing IPCC calculations which tally the bill at "less than 0.1 percent of global GDP a year," the Executive Director of the United Nations Environment Programme, Achim Steiner, recently called climate change preparedness the "bargain of the century." ⁽¹²⁶⁾

PROTECT PREVENT



Photo: Hendro Suwito

FROM RUBBLE

Protect Development

“At times of disaster, impacts and losses can be substantially reduced if authorities, individuals and communities in hazard-prone areas are well prepared and ready to act and are equipped with the knowledge and capacities for effective disaster management.” (World Conference on Disaster Reduction, Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters, 2005) ⁽¹²⁷⁾

Disasters Destroy Development: Disasters can wipe out decades of development in mere minutes. It follows that reducing disaster risk and raising readiness and resilience are not optional extras but extra obligations. They are at the heart of sustainable development.

Preparedness Pays: Referring to global disaster losses in 2007 of more than US\$ 62 billion, the Director of the United Nations International Strategy for Disaster Reduction (ISDR) Salvano Briceño recently reminded the world that the figures were an expression of “what could have been saved if we had invested more in disaster risk reduction measures.” ⁽¹²⁸⁾ In 2005, global economic losses from disasters reached a record high of US\$ 225 billion – half arising from damage from Hurricane Katrina in the U.S. ⁽¹²⁹⁾ There is a strong business case for disaster prevention. Emergencies are expensive, preparedness pays off.

Preparing Versus Repairing: Disaster response operations routinely divert resources away from long-term development programming to short-term disaster management. Seed capital is eaten up rather than invested in future development. Stunted economic growth, distress sales of private assets, school absenteeism, family breakdowns, loss of livelihoods, protracted periods of unemployment and health-related ill-effects, including lifelong psychological trauma, are only some of the many opportunity costs associated with disaster losses. Over the last 50 years, World Vision has invested heavily in transformational development to open up new opportunities for the poor and usher in lasting change. Currently World Vision’s Humanitarian and Emergency Affairs (HEA) division spends 45 percent of its annual outlay on disaster preparedness and 55 percent on disaster response. ⁽¹³⁰⁾ More preparedness investments are needed if decades of development gains are not to be lost.



HALTING THE CYCLE
DESTRUCTION
RECONSTRUCTION

TO REBUILDING

World Vision-built houses in Banda Aceh Photo: Maida Erawani

World Vision Asia Tsunami Response

Following the 26 December 2004 Tsunami, World Vision implemented an integrated recovery programme across the countries worst affected by the tsunami (Indonesia, Sri Lanka, India, Thailand, Myanmar). The response encompassed emergency relief, community rehabilitation, livelihood recovery and infrastructure reconstruction. Protection, conflict sensitivity, HIV/AIDS, gender and advocacy were cross-cutting components of the programme. Until December 2007, World Vision...

- **Built** more than 12,000 homes, and provided transitional accommodation to thousands of households
- **Constructed** 84 schools, 33 preschools, 27 health clinics, community halls, child care centres, bridges, canals, roads, warehouses and large-scale water and sanitation projects
- **Provided** vocational training and employment opportunities for more than 40,000 people
- **Distributed** assets such as fishing boats, global positioning systems (GPS), canoes, water pumps, welding plants, gem cutters, vegetable carts, sewing machines, diving kits, food processors, carpentry equipment, computers, etc.
- **Restored and/or constructed** a fishing harbour, boat-building centre, agricultural trading house, rural development training centre, farms, and factories
- **Provided** educational support to more than 2,000 teachers and 137,000 children (incl. school supplies, tuition, etc.)
- **Held** child rights awareness sessions for more than 27,000 parents, community leaders, teachers and government officials
- **Conducted** community evacuation drills and disaster management training for 10,000 people
- **Provided** 20 ambulances, hundreds of hospital beds, pharmaceuticals, medical equipment, mobile blood bank and health clinics, and a pathology laboratory and trauma centre
- **Implemented** health promotion and interventions for 440,000 people
- **Replanted** 56,000 mangroves to reclaim coastal areas and to help build a natural buffer zone
- **Established** twelve community broadcast centres with integrated disaster warning systems
- **Secured** thousands of land certificates for families and new birth certificates for over 500 children

Poverty – Poor Protection: In many instances people never recover from disaster impacts. While rich households more rapidly restore their livelihoods, the poorest are often forced into coping strategies which lead to long-term losses in nutrition and health, making the complete rebuilding of their lives difficult or impossible. Citing a severe flood that devastated Bangladesh in 1998, the UN Human Development Report notes that "affected children may never be in a position to recover [even as] many adults are living with the consequences of the deprivation they suffered as children." (131) The lifetime of a storm may be brief – for the poor it can become the storm of a lifetime. While infrastructural disaster damage can be assessed in quantitative terms, the qualitative toll is difficult to gauge. Economic disaster losses reflect only insured properties of the asset-rich and shed little light on long-term human costs borne by the asset-poor. Hence economic impacts are skewed towards the rich – low asset losses simply mean poor people have no financial safety nets to fall back upon. Poverty is the overwhelming reason why people cannot absorb the shocks of disaster events. Being poor connotes being poorly protected.



■ **The Poor:** "Plastic is the most valuable – I can earn 1700 Riels (0.42 USD) per kilo." As a scrap collection girl, 13-year-old Sear Kim walks barefoot on dangerous streets searching for recyclable products. Poor people like Sear are extremely vulnerable to disasters. World Vision's *Combating Worst Forms of Child Labour Project* intervenes.

Political Investment: Proactive mitigation measures minimize future disaster losses, wherefore related expenditures can be viewed as strategic political investments. The United Nations International Strategy for Disaster Reduction (ISDR) notes: "If we compare the cost of improving the fire safety of the school with the costs associated with a fire damaging the school, and the subsequent required reconstruction, it is clear to see that the cost of mitigation is lower. The cost of damage reconstruction, of disruption to education, and the cost of lives lost or damaged by the fire would outweigh the cost of structural safety measures." (132)

Reaping the Rewards: Multiple studies have shown the extraordinary returns which investments in pre-disaster preparedness can yield. One study showed returns on investment in the order of 320-370 percent (133) – an ISDR spokeswoman recently asserted that "for every dollar spent on disaster prevention, an estimated \$4-7 could be saved in reconstruction costs." (134) The 2007/2008 UN Human Development Report also affirms the cost-benefit yield of pre-disaster preparedness investment. One study shows that for every dollar invested in pre-disaster risk reduction activities in developing countries seven dollars in losses can be prevented. (135) Another case study reveals "evidence from a mangrove-planting project designed to protect coastal populations from storm surges in Viet Nam [with] estimated economic benefits that were 52 times higher than costs." (136) And a study in India carried out by Tearfund and the Overseas Development Institute found that "preparing for disasters was thirteen times more cost-effective than responding afterwards." (137)

Pennies for Prevention? Accrued investment yields of 320-5200 percent underscore the enormous economic payoff of pre-disaster preparedness. However, most donor funding comes in response to appeals *after* major disasters, making the shift from post-disaster recovery to pre-disaster preparedness one of the most critical success factors facing governments and aid agencies today. The growing number of climate disasters makes this an urgent priority.



PROTECT CHILDREN

Kreung Tunong School, Banda Aceh, Indonesia:

December 2004: The tsunami completely destroys the school and kindergarten, killing 200 students and leaving only foundations.
November 2007: World Vision hands over the newly constructed school and kindergarten to the department of education.

Photo: Maida Irawani

Protect, Promote, Prioritise

“We owe our children – the most vulnerable citizens in any society – a life free from violence and fear.” (Nelson Mandela) ⁽¹³⁸⁾ It is clear that ... efforts are as necessary today as [when the Convention on the Rights of the Child entered into force]. We will only achieve a world fit for children when we have succeeded in protecting every child from exploitation, violence, abuse and neglect.” (Carol Bellamy, United Nations Children’s Fund, UNICEF) ⁽¹³⁹⁾

Championing Children: To prepare means to protect. And to protect means to promote, preserve and prioritise that which is most *precious* – the world’s children. Children – those under the age of 18 – make up the largest demographic group in most disasters. ⁽¹⁴⁰⁾ Their age, size and dependency also make them the most vulnerable group. As such, children need particular prioritisation in preparedness planning – before, during and after disaster events. Since natural disasters degrade the natural fibre of family units, children’s vulnerabilities become more exposed during periods of protracted disaster distress. Hence the active *participation* of children in preparedness programmes is not an optional extra but an extra obligation and the point of preparedness itself – preserving a future in which today’s children can flourish and play the leading role. Children must be moved from the fringes to the forefront. It is both their right and the right priority. ⁽¹⁴¹⁾

Preparedness Protects Progress: Governments and the development community must be more assertive in pursuing, implementing and enforcing policies that promote children’s rights and protection. As the international development community repositions to meet the challenges of the 21st century, the past policy proclivity – dollars for disasters, pennies for prevention – must be abjured so that strategic reinforcements can be financed before they become needed. With the likelihood of more frequent and severe climate disasters looming, increased funding needs to be allocated to pre-disaster preparedness planning. Future climate disasters threaten to undo the very development gains World Vision and others have made in the last 50 years. Disasters dilute development gains, but preparedness protects progress. Prioritising preparedness connotes a sound *prepositioning* posture – predict, prevent, prepare, protect.



“ Research: Develop improved methods for predictive multi-risk assessments and socioeconomic cost-benefit analysis of risk reduction actions at all levels; incorporate these methods into decision-making processes at regional, national and local levels. ”

—World Conference on Disaster Reduction, Priorities for Action, Hyogo Framework for Action 2005-2015

Morrelgonj, Bangladesh: [Baleswar River] Shrimp fry harvesting in coastal areas of Bangladesh is believed to deplete stocks and degrade the environment Photo: Amio Ascension

RESEARCH PRIORITIES, PROBABILITIES & POSSIBILITIES

The word "research" is derived from obsolete French "cercher" (search) and "re" (expressing 'intense force'). According to the Oxford Dictionary, "research" denotes a "systematic investigation." ⁽¹⁴²⁾ Research reasons: What are the potentialities of certain disaster types crashing into certain disaster environments? What are the most prevalent disaster types, the most vulnerable disaster environments, the most densely settled – and least resilient – population centres? What future forecasts can be inferred from past progressions and time trends? What are tomorrow's global disaster hotspots? What areas should be prioritised in terms of political preparedness? While our interconnecting world adds a myriad of new stresses, in the area of research it adds a myriad of new solutions, a fact noted in a recent publication: Modern researchers have never found it easier to connect, communicate and collaborate cross-continently, "tapping into each other's knowledge pools [and] churning out ... volumes of ingenious inventions, innovations, and imaginations ... best practices can flourish and flow freely across the world for the common good of all [because] all of us together are smarter than one of us alone." ⁽¹⁴³⁾ – Proactive research probes probabilities, priorities and possibilities.

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 ⁽¹⁴⁴⁾ database, at least one of the following criteria must be fulfilled:

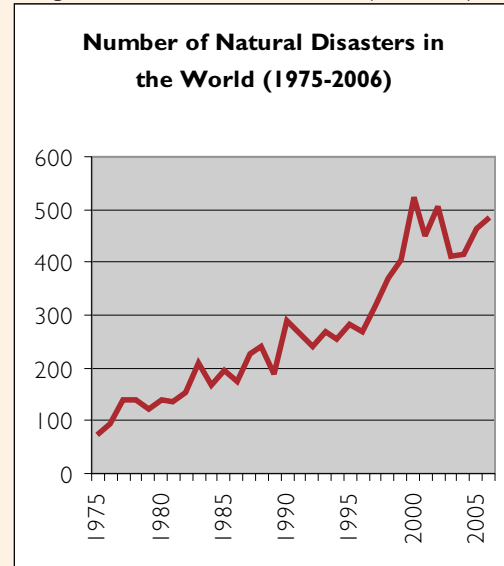
- 10 or more people reported killed
- 100 people reported affected
- Declaration of a state of emergency
- Call for international assistance

Natural disasters which are entered into the database include the following disaster types (in alphabetical order): droughts, earthquakes, epidemics, extreme temperatures, floods, insect infestations, slides, volcanic eruptions, extreme high waves/surges, wild fires, and wind storms.

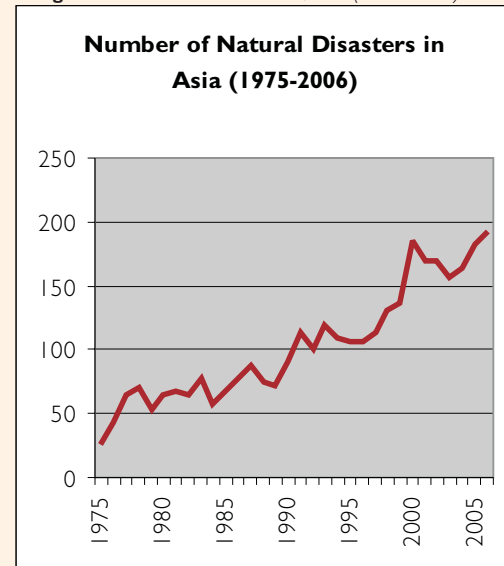
Natural Disasters In Asia: Using this definition, over recent decades, the number of natural disasters has steadily risen, both globally (figure 3) and regionally (figure 4). In 2007 Asia was the hardest hit region in the world in terms of the percentage of people killed by natural disasters, accounting for 74.8 percent of all fatalities recorded worldwide. ⁽¹⁴⁵⁾

Looking back, the years 1990-2007 have seen Asia impacted by a cumulative total of 2,501 natural disasters. While the bulk of damage is caused by the increasing number of recurrent small- and medium scale natural disasters which fly under the international radar and feature little in world news, over time the compounded losses are enormous when added together (figure 5). The pie charts show the prevalence of natural catastrophes by disaster types (figure 6) and the overall number of people affected by them (figure 7).

■ **Figure 3:** Natural disasters trend, World (1975-2006) ⁽¹⁴⁶⁾



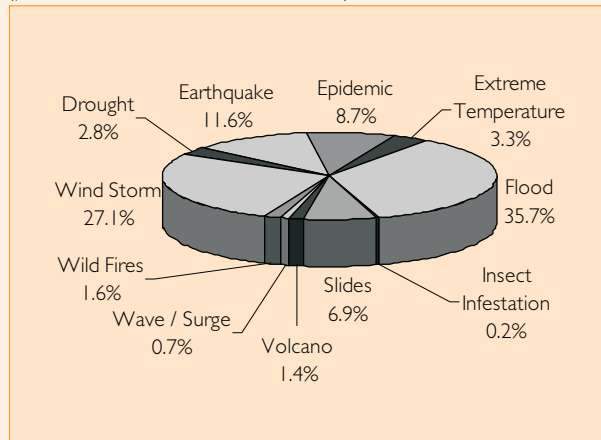
■ **Figure 4:** Natural disasters trend, Asia (1975-2006) ⁽¹⁴⁷⁾



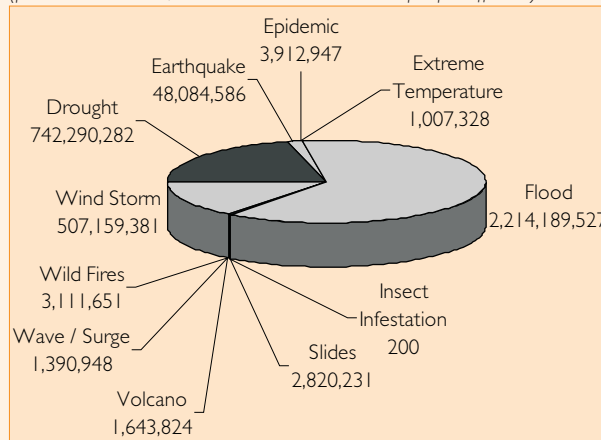
■ **Figure 5:** Impact from 2,501 natural disasters in Asia (summary for period 1990-2007) ⁽¹⁴⁷⁾

| Human Impact | Cumulative Total | Annual Average |
|--------------------|------------------|-------------------|
| 1. People killed | 757,539 | 42,086 |
| 2. People affected | 3.53 billion | 196 million |
| 3. Damage caused | US\$ 620 billion | US\$ 34.4 billion |

■ **Figure 6:** Prevalence of natural disasters in Asia by types (period: 1990-2007; total: 2,501 disasters) ⁽¹⁴⁷⁾



■ **Figure 7:** Number of people affected in Asia by natural disaster types (period: 1990-2007; cumulative total: 3.53 billion people affected) ⁽¹⁴⁷⁾



Coastal Carnage: The figures show that from 1990-2007 floods (35.7 percent) and wind storms (27.1 percent) were the two most prevalent disaster types in Asia, with floods alone affecting a staggering 2.2 billion people. The Director of the Centre for Research on the Epidemiology of Disasters (CRED) Professor Dr. Debarati Guha-Sapir recently summarised the 2007 fallout: "Floods and wind storms remain the most important source of casualties and economic damages. They accounted for more than 86% of the overall disaster mortality and hydro-meteorological disasters accounted for more than 98% of total affected. Once again, Asia was the region hardest hit by natural disasters; especially by the major summer floods that particularly affected China, India and Bangladesh. These floods killed more than 4,200 persons and affected over 168 million others." ⁽¹⁴⁸⁾ "Asia is the region which pays the highest toll in terms of flood impacts. During the last decade, over 96% of people affected by floods in the world live in Asia." ⁽¹⁴⁹⁾

Past Century: Mega-disasters – sometimes called "disasters of the century" – occur less frequently, but their destructive force can overpower vulnerable communities. Figures 8 and 9 show two perspectives of the top three natural disasters in Asia since record-keeping began in 1900. [Based on EM-DAT statistics and definitions.] ⁽¹⁵⁰⁾

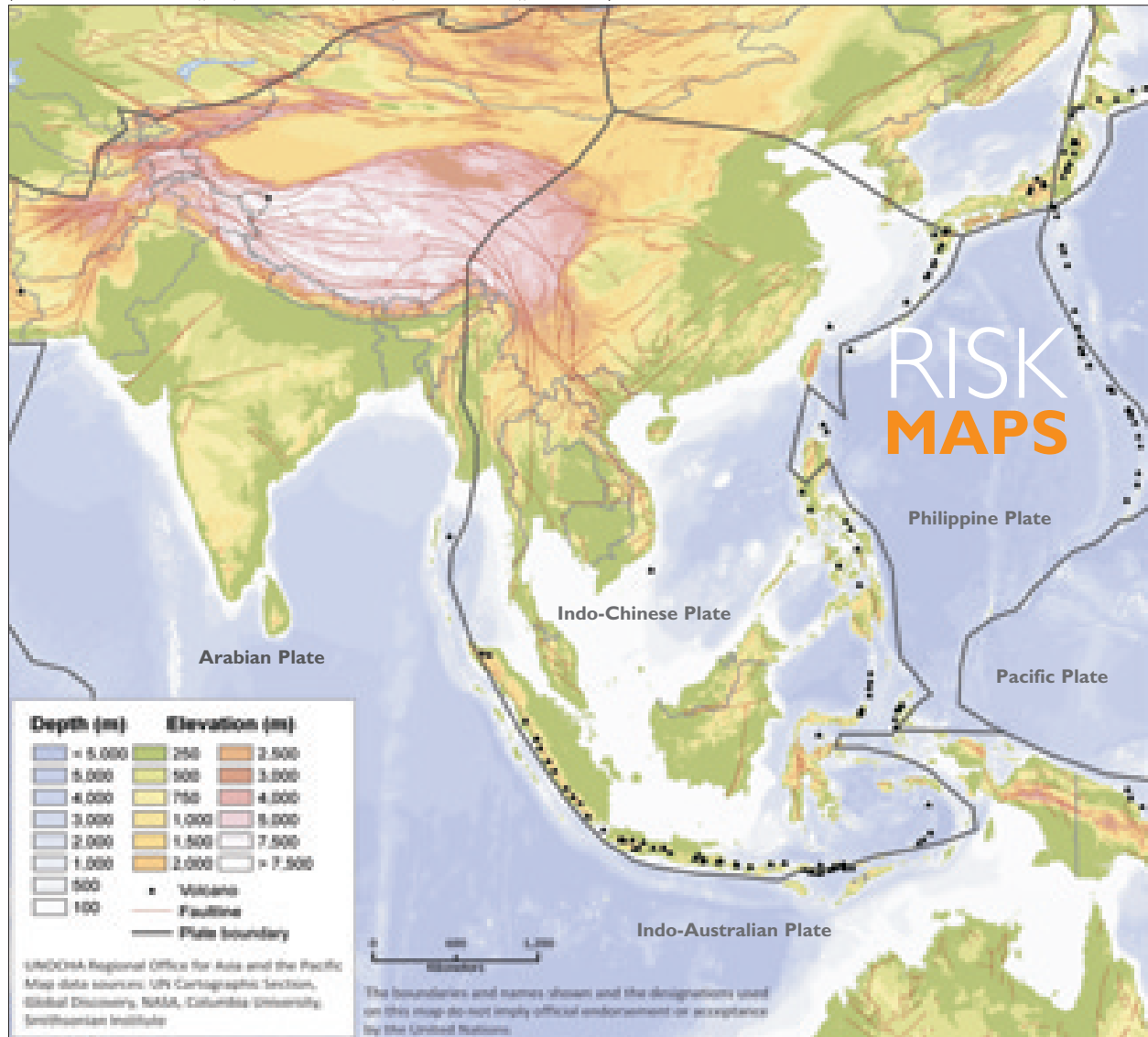
■ **Figure 8:** Worst disasters (by people killed; period: 1900-2007)

| Top Three Disasters (Date) | People killed |
|-----------------------------------|---------------|
| 1. China P Rep, Drought (1928) | 3 million |
| 2. Soviet Union, Epidemic (1917) | 2.5 million |
| 3. China P Rep, Flood (July 1959) | 2 million |

■ **Figure 9:** Worst disasters (by people affected; period: 1900-2007)

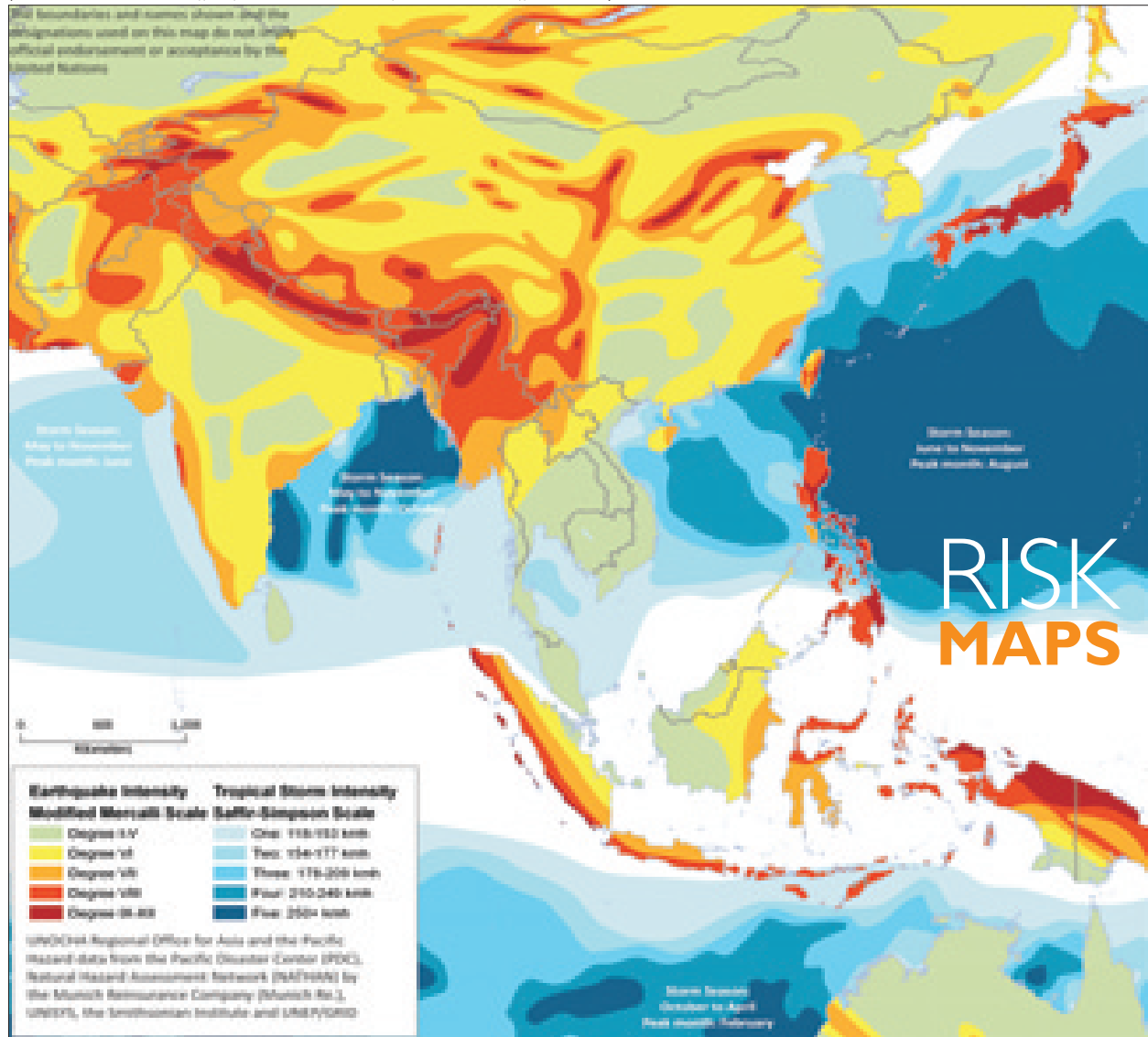
| Top Three Disasters (Date) | People affected |
|-------------------------------------|-----------------|
| 1. India, Drought (May 1987) | 300 million |
| 2. India, Drought (July 2002) | 300 million |
| 3. China P Rep, Flood (1 July 1998) | 239 million |

■ **Figure 10:** Tectonic Plates and Fault Lines in Asia Pacific
 (Source: United Nations Office for the Coordination of Humanitarian Affairs, OCHA) (151)



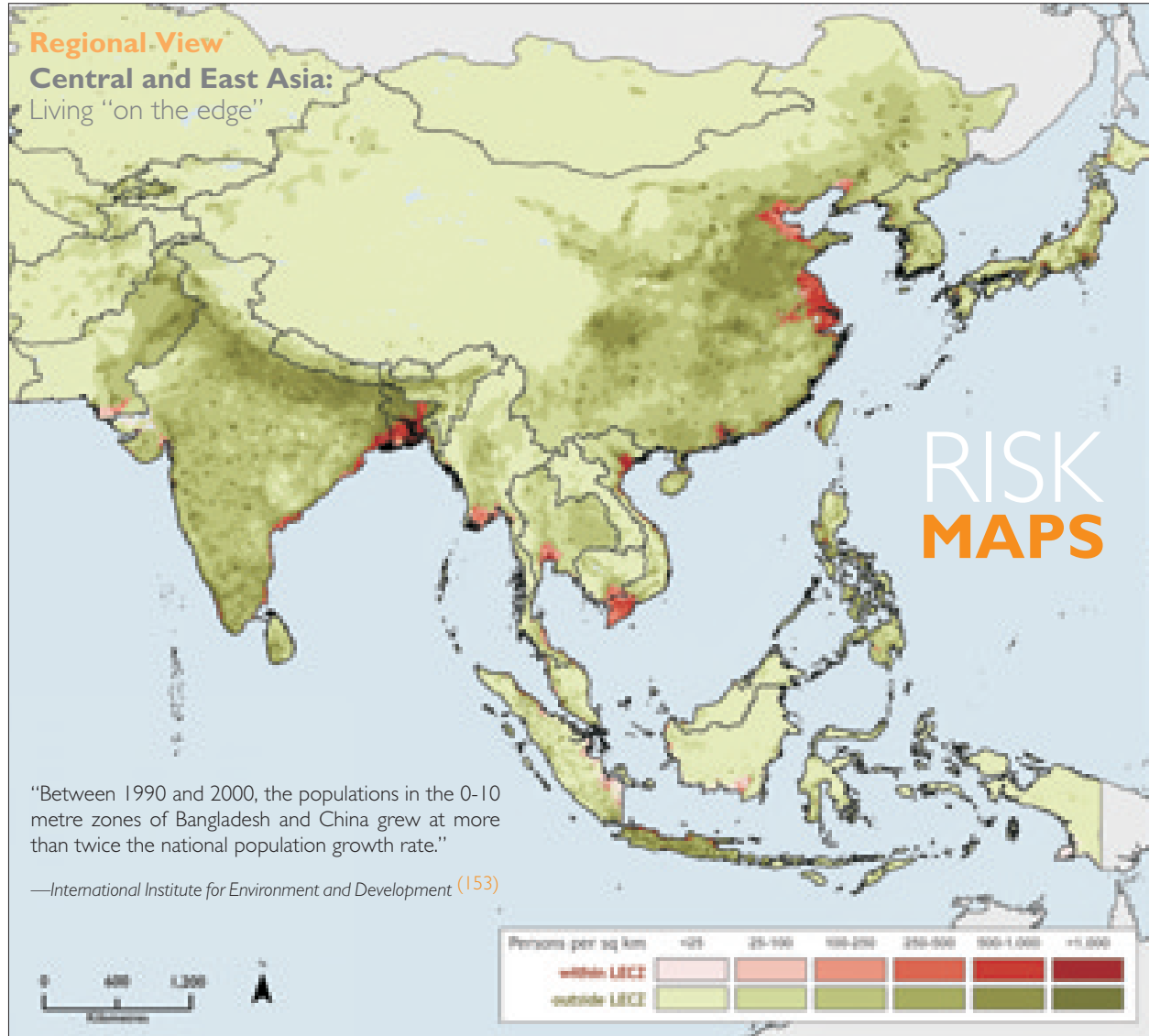
■ **Tsunami Risk:** The Asia Pacific is home to the world's most active seismic and volcanic activity. The Pacific Ring of Fire is home to 90 percent of the world's earthquakes. Undersea earthquakes or volcanic eruptions can cause waves to become powerful walls of water as they reach shallow water.

■ **Figure 11:** Seismic and Climatic Hazard Risk in Asia Pacific
 (Source: United Nations Office for the Coordination of Humanitarian Affairs, OCHA) (151)



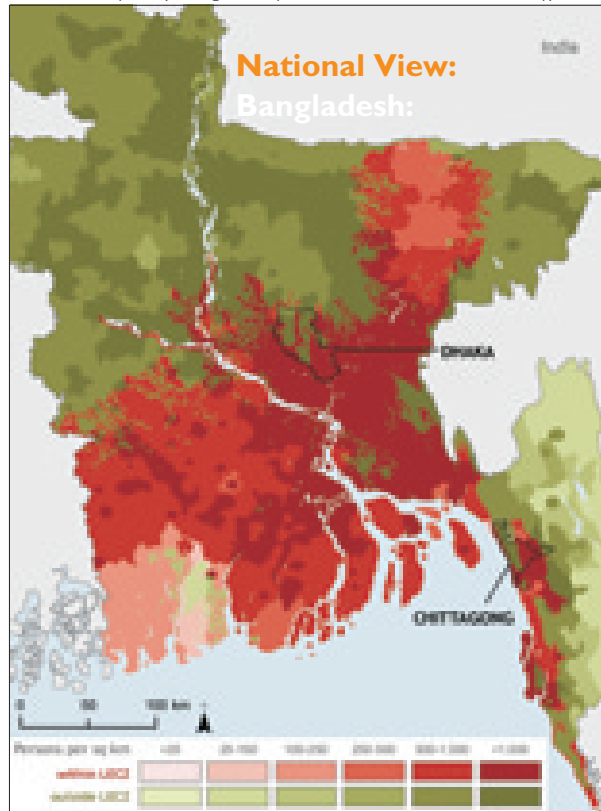
■ **Earthquakes And Wind Storms:** Communities across the Asia Pacific are vulnerable to earthquake activity; coastal communities face added risk from tropical storms which form over warm water. Due to the Coriolis force of the Earth's rotation, tropical storms do not usually form at the equator.

■ **Figure 12:** Population Density within and outside of a 10m Low Elevation Coastal Zone (LECZ)
 (Source: Center for International Earth Science Information Network (CIESIN), Columbia University ⁽¹⁵²⁾)



■ **Rising Sea Levels:** The three South Asian coastal countries India, Pakistan and Bangladesh concentrate 130 million people in low-lying land near the sea (70 million in Bangladesh alone). These populations are extremely vulnerable to tropical storm surges, large-scale flooding and sea level rises.

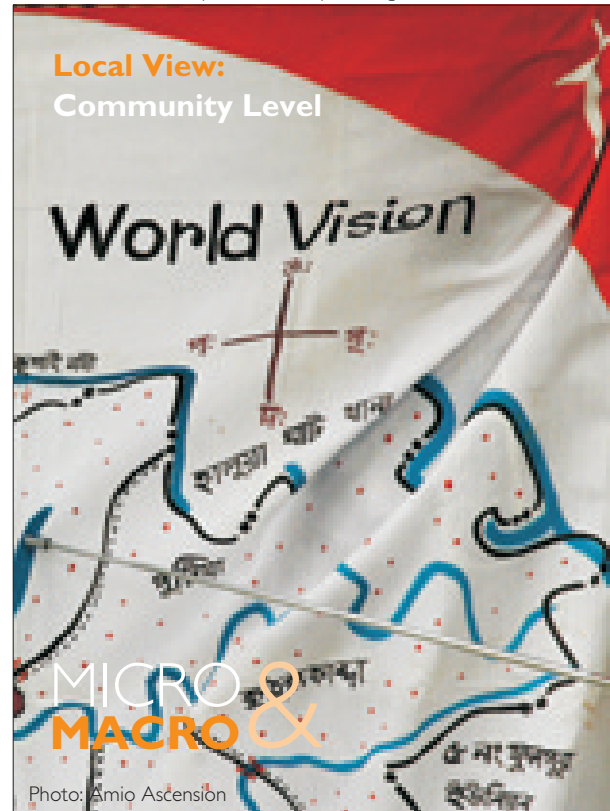
■ **Figure 13:** Population Density within and outside of a 10m Low Elevation Coastal Zone (LE CZ), Bangladesh (Source: CIESIN, Columbia University) ⁽¹⁵⁴⁾



Triple Trouble: 1. *Low-lying coastal areas are hazardous:* King tides, cyclonic surges, coastal erosion, land loss, etc. are only some of many hazards affecting coastal communities. More than 40 percent of Bangladesh ⁽¹⁵⁶⁾ and huge cities like Dhaka, Mumbai, Kolkata lie less than ten metres above sea level and are subject to those hazards.

2. *Coastal cities are vulnerable:* Coastal development degrades sensitive ecosystems such as mangrove forests and coral cover which typically protect coastlines. "China's economic boom has been driven by policies that promote coastal development and which have encouraged one of the largest coastward migrations ever." ⁽¹⁵⁷⁾ High levels of

■ **Figure 14:** Community level risk and resource map identifying hazards, vulnerable areas and capacities in Phulpur, Bangladesh. ⁽¹⁵⁵⁾



coastal urban development aggravates existing vulnerabilities.

3. *South Asian coastal populations have low capacity:* South Asia is home to the largest number of people living in poverty – many of whom live in the coastal zone. High poverty means low capacity. The net effect is dire: hazards combine with vulnerabilities and are countered with little capacity. $[Disaster Risk = (hazards \times vulnerability) / capacity]$.

Summary: Hazard maps identify priorities from 30,000 feet and from the trenches. Research is best when it is comprehensive: micro and macro, desk and field, theory and practice, notebook and notepad.

“Ensure equal access to appropriate training and educational opportunities for women and vulnerable constituencies; promote gender and cultural sensitivity training as integral components of education and training for disaster risk reduction.”

—World Conference on Disaster Reduction,
Priorities for Action, Hyogo Framework for
Action 2005-2015

Kolkamanda, Bangladesh: World Vision has supported children from this poor rural community to receive an education and become more resilient. Photo: Amio Ascension

EMPOWER COMMUNITIES & WOMEN

Community empowerment is not something that development agencies *do* to communities. Rather community empowerment is an outlook and framework *from* which action is taken. It is an attitude which views poor people as intrinsically powerful, responsible and resourceful to promote and enact their own development and disaster preparedness. Poor people don't want handouts. Poor people want engagement. They want to be coached and empowered to make their own decisions and solve their own problems, a fact noted by Iqbal Quadir, founder of Grameen Phone in Bangladesh: "Poor people are recipients? Poor people are a resource! Services cost too much for the poor? Their involvement reduces the costs! The poor are uneducated and cannot do much? They are very eager learners and very capable survivors!" ⁽¹⁵⁸⁾ Empowerment begins when developing agencies view the poor not as helpless victims to be pitied but as resilient entrepreneurs to be engaged. By engaging en par with the poor, development organisations create more dignity both for them – and for themselves. The virtues of equality and empowerment are not the promise but the premise.

ENGAGE COMMUNITIES



Phulpur, Bangladesh: World Vision volunteer using a risk and resource map to train local women about how to face disaster events in their area.

Photo: Amio Ascension

“... build disaster response on local capacities.”

—IFRC Code of Conduct, Article 6

Empower Communities

“Disasters cannot always be prevented, but the resilience of communities can always be enhanced. In the past, we considered communities in affected areas primarily as victims of disasters. Through a new paradigm we are viewing them as first responders to disasters. Communities own resources to manage their own recovery and increase their local capacity.” (Jimmy Nadapdap, World Vision Disaster Risk Reduction Instructor) ⁽¹⁵⁹⁾

Communities Are The Core: Communities are the principle drivers of disaster preparedness at the grassroots. Following a disaster event, international relief agencies take hours, days or weeks to arrive – local communities are already there, able to engage long before external assistance arrives. In the case of the Asia tsunami response, practically “all immediate life-saving actions and initial emergency support in the first few days (and weeks in some cases) was provided by *local people* ... [and the] international response was most effective when *enabling, facilitating and supporting* these actors, and when accountable to them.” ⁽¹⁶⁰⁾ Local disaster response ownership is a core principle of international development and is expressed in numerous codes of conduct for humanitarian response, including the International Federation of Red Cross and Red Crescent Societies ⁽¹⁶¹⁾ and the Good Humanitarian Donorship (GHD) initiative. ⁽¹⁶²⁾

Change Takes Time: Through community-level development programmes which typically stretch across a 10-15-year time horizon, World Vision is well-positioned to reach deep into local community life, building local capacity, raising resilience and promoting lasting change. Jimmy Nadapdap, Humanitarian & Emergency Affairs Relief Director for Indonesia, with more than 10 years experience working as a disaster risk reduction instructor, stresses the importance of *time*. “Rebuilding communities and livelihoods is more complex than rebuilding houses or distributing goods. Effecting community-level change takes time and the commitment must be *long-term*. Development agencies must earn the ‘right’ to be heard before they can coach communities in areas of disaster preparedness. It is through trust relationships that communities become open to listen and learn. Hit-and-run-aid forestalls the critical influence which relationships can yield over time.” ⁽¹⁶³⁾

Disaster Workshops: Through Community-Based Disaster Risk Management workshops, Nadapdap equips local leaders across Indonesia with the critical knowledge of averting or minimising disaster impacts at the grassroots community level. Participants include officials from local government and meteorological offices, search and rescue personnel, police officers, members of the armed forces and development programme officers. Training in risk-mapping activities brings preparedness components into sharp focus: What are the vulnerabilities? What are the hazards? What are the local capacities? What are the gaps that need to be bridged? At the end of the workshops, participants are familiar with the level of disaster risk in their respective areas. As a final step, the participants create a disaster management plan which comprises three stages of action – before, during, and after a potential disaster. The participants decide on all important activities to be carried out during each stage, identifying available resources, putting relevant people in charge and determining indicators to monitor achievements and evaluate outcomes.

Broad Participation: Nadapdap says that cross-sectoral corporate ownership is important. "The more diverse the participants, the better the workshop results. Everybody and every institution can contribute, including players from the private sector. When people speak the same language about potential disasters in their area, they build networks which link available groups and resources together. The point is to actively engage and connect communities in disaster-prone areas to identify, analyse, monitor and evaluate disaster risks in order to reduce vulnerability and build capacity." ⁽¹⁶⁴⁾ With almost 60 percent of World Vision's community level Area Development Programmes (ADPs) regularly affected by recurring disasters, ⁽¹⁶⁵⁾ community-based disaster preparedness is an important priority as it ensures that development gains are not needlessly lost to disasters. Championing *local* level leadership gives villagers the dignity to manage their own affairs and recognises that communities are resourceful, responsible and response-able to enact their own development.

Information Is Power: Accessing information empowers people at the "bottom" vis-à-vis those who want to wield influence "over" them. It improves the bargaining between the poor and politicians and ultimately leads to a more level playing field. In short, information is an effective weapon against helplessness because it empowers those who have access to it. In its final assessment of the 2004 Asia tsunami response, the Tsunami Evaluation Coalition (TEC) notes: "Information is power. Access to high quality information enables affected people to define and demand accountability, based on their own expectations and standards. It also allows them to plan their own recovery." The report goes on to bemoan that multiple development agencies failed "in the modest objective of informing affected people in an accurate, timely and comprehensive manner ... A lack of information to affected populations about reconstruction plans greatly limits their capacity to proceed with their own [development] projects." ⁽¹⁶⁶⁾ Being informed means being *empowered*. It is a strong case for education and the sharing of best practices.

Local Language: Community-based disaster risk reduction activities are most effective when teaching terms are directly related to local community life. For instance, the term "climate change" sounds quite abstract and people often have no clear concept of its meaning or wider implications. Translating such phenomena into local lingo can empower communities to see the world through a grid of perception they know and understand. In all societies, *seeing is believing*. Development agencies in Papua New Guinea have been successful at tackling complex issues through mobile cinema programmes. ⁽¹⁶⁷⁾ Screening climate change documentaries in local dialects at village level can raise awareness. Temitope Adepoiyibi from World Vision Papua New Guinea says: "Being able to *visually feel* what other countries are experiencing from the consequences of climate change can raise concern and place pressure on local leaders." ⁽¹⁶⁸⁾ If communities take appropriate mitigation measures *prior* to being affected by disasters, the scale of devastation can be less extensive.



GENDER JUSTICE

“The Convention requires that women be given an equal start and that they be empowered by an enabling environment to achieve equality of results.”

—CEDAW, General Recommendations, Article 4, Paragraph 1

Palani, India: World Vision has set up a Computer Centre where girls from the community learn publishing skills

Photo: Anish Premson

Empower Women

On 10 December 1948, the General Assembly of the United Nations solemnly adopted and proclaimed the Universal Declaration of Human Rights. Article 1 states: “All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood.” (Adopted and proclaimed by General Assembly resolution 217 A,III) (169)

Why Not Women? Judging from annual events like International Women's Day (8 March) and numerous international instruments which enshrine the rights of women such as the UN Charter, the Universal Declaration of Human Rights, or the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW), it could appear that all is well with the state and status of women in the world – the mere fact that 185 states have accepted CEDAW suggests quasi-universal endorsement of its prescriptive norms. But although much progress has been made toward equality, all is *not* well with the status of women in the world. Widespread discrimination against women persists in law and practice, directly or indirectly, all across the world. Louise Arbour, United Nations High Commissioner for Human Rights, recently reminded the world that much ground remains to be covered when two out of three children not in school are girls; when 70 per-

cent of the world's poor are women; and when women own only 1 percent of the world's titled land. She stressed that a key component of women's disenfranchisement in many countries was the limitation placed on their ability to “own or manage property, and their lack of entitlements to property, including inheritance, following divorce or the death of kin.” She said: “Many states still grant nationality and citizenship of children exclusively through the male line ... Governments must show their determination to empower more than half of the world's population, and thus enable women to enjoy their human rights and contribute to the welfare of all.” (170) According to *Disappearing Daughters*, a report by the UK charity ActionAid and the International Development Research Centre (IDRC), gender discriminating sex-detection-sex-selection is fast leading to a frightening imbalance in India's girl-boy ratio (in several survey sites there are less than 800 girls for 1,000 boys). (171)

Equality In Emergencies? If discrimination remains deep-seated when times are good, it will come as no surprise that it is exacerbated when times are bad – as in the aftermath of natural disasters. As families are separated and law and order break down, women and girls become more vulnerable to abuse from their own immediate or extended male family members. In such an environment, poor women and young girls are at higher risk of sexual violence, exploitation and trafficking. Moreover, abuse and discrimination against women with disabilities become more pronounced. Usually those with less education, financial autonomy, social support and lower status are at greatest risk. Furthermore, disasters tend to leave a leadership vacuum which means that perpetrators of violence can strike with impunity. In short, disasters magnify the subordinate role often ascribed to women by society.

Fast-Track Change: Disasters can fast-track equality by changing societal perceptions. During the 2004 tsunami, many women in Indonesia drowned, but according to a survey in one village in Sumatra, only 20 percent of girl children are taught to swim. ⁽¹⁷²⁾ Simple forms of empowerment like swimming lessons can generate forceful ripple effects and open up new opportunities. As confident swimmers, women in The Andamans could learn to sail fishing boats and generate income. "The public recognition of women as fishing members of the community and crucially, as boat owners in their own right (both socially and legally in government records), increases resilience to future hazards, large and small." ⁽¹⁷³⁾ Disasters can create socially acceptable and legitimate reasons for women to get into the public arena. While it remains the obligation of governments to respect, endorse and enforce women's human rights, the development community can take advantage of opportunities for better build-back in the aftermath of disasters. Gender-inclusive assessment teams can explore and identify pertinent opportunities (all-male teams would likely be "gender-biased" and unable to "assess female vulnerability" ⁽¹⁷⁴⁾ or identify maximum female potential or aspiration).

High Expectations: Deputy Speaker Francesca Semoso is a high-calibre political leader in the House of Representatives in Buka, Papua New Guinea. In an interview she said that women's aspirations are far higher than many men credit them to be. "Empowering communities begins with empowering women. As the women are empowered, their families are empowered. Women are good administrators who know how to spread out scarce supplies over long periods of time to feed their families. Family health begins with the health of women – and family planning begins with women telling their husbands to 'space' their babies. Arming women with information, knowledge, and financial empowerment can enable them to achieve far more than many men dream possible." ⁽¹⁷⁵⁾ Semoso is currently implementing a "fisherwomen" project which enables women from coastal communities to catch and sell fish on 23-foot 'bananaboats' – a groundbreaking concept in an all-male community of fishermen! She said: "Women who are part of the formal workforce and earn a steady income are far more resilient in times of disaster distress than women who are marginalised. Ending discrimination implies promoting sustainable development models which empower women across all spheres of society." A recent paper showed that women cope better in disasters when they are collectively organised and have received prior training to adequately respond to situations that may emerge on the ground (as for example, an increase in household violence in the aftermath of a disaster). ⁽¹⁷⁶⁾ Preparing and empowering women leads to empowered families – which leads to empowered and disaster resilient communities.



Bogra, Bangladesh: World Vision women development group



“ Partner: Promote and improve dialogue and cooperation among scientific communities and practitioners working on disaster risk reduction, and encourage partnerships among stakeholders, including those working on the socioeconomic dimensions of disaster risk reduction. ”

—World Conference on Disaster Reduction, Priorities for Action, Hyogo Framework for Action 2005-2015

Bhururia, Nagari, Bangladesh: Children playing together and clapping with joy as they win in a local village game called *Kopal Tukka*

Photo: Amio Ascension

PARTNER AND NETWORK

Children in Bangladesh know playing games is most fun when they do it *together*. Partnering is a bit like playing together. It gets the ball rolling and draws participating players into the process. According to the Oxford Dictionary, the word "partner" is derived from Anglo-Norman French *parçener* which means "joint heir." ⁽¹⁷⁷⁾ This understanding is significant because people everywhere on the planet are joint heirs of their collective decisions, actions and resultant consequences. Only if multilateral partnerships, involving multisectoral players, come together, will the world be able to tackle the awesome challenges of worsening climate disasters. The UN 2007/2008 Human Development Report notes that "climate disasters are heavily concentrated in poor countries. Some 262 million people were affected by climate disasters annually from 2000-2004, over 98 percent of them in the developing world." ⁽¹⁷⁸⁾ It is through partnership that the world must address the imbalance. By connecting, collaborating and coordinating a response – sourcing wisdom from the best and brightest brains all over the planet – global partnerships can unite the viewpoints of practitioners and theoreticians, private and public sector professionals and global citizens from the East, West, North and South.



Photo: NASA

“Climate change threatens the entire human family. Yet it also provides an opportunity to come together and forge a collective response to a global problem. It is my hope that we will rise as one to face this challenge, and leave a better world for future generations.” ⁽¹⁷⁹⁾

—Ban Ki-moon, Secretary-General of the United Nations

CROSS-CUTTING

“360-Degree-Responsibility”

“In a world that is so divided by inequalities in wealth and opportunity, it is easy to forget that we are part of one human community. As we see the early impacts of climate change registering across the world, each of us has to reflect what it means to be part of that family ... We can – and must – work together to ensure that [it] does not throw human development into reverse gear.” (Archbishop Emeritus of Cape Town, Desmond Tutu) ⁽¹⁸⁰⁾

Planet Partner: Perhaps no other photo depicts the sheer necessity for planetary *partnership* as pictographically as NASA’s “blue marble” photo (cutout above) – the most detailed true-colour image of the Earth to date. ⁽¹⁸¹⁾ Scientists and visualisers stitched together months of observations of the land surface, oceans, sea ice, and clouds into a seamless, true-color mosaic of every square kilometre of our planet – our *shared* home.

Collective Ownership: The Earth’s atmosphere is razor-thin – and fast filling with pollution. Al Gore has quoted: “If you had a globe covered with a coat of varnish, the thickness of that varnish would be about the same as the thickness of the Earth’s atmosphere compared to the Earth itself.” ⁽¹⁸²⁾ With more than 6.7 billion individuals spread out across more than 190 countries, the Earth’s atmosphere does not differentiate greenhouse gases by

countries of emission. One tonne of greenhouse gases from the United States carries the same weight as one tonne of greenhouse gases from China – every milligramme is absorbed by the same thin layer of atmosphere which all people on Earth *collectively* own.

Apocalypse Now? Climate disasters affect regions very differently. The 2007/2008 UN Human Development Report underscores that for some of the world’s poorest countries “the consequences could be apocalyptic.” ⁽¹⁸³⁾ In many least developed nations the costs of adaptation are becoming increasingly prohibitive. The early warning signs are impossible to miss and are beginning to undermine development agency efforts to reduce extreme poverty and help poor people build better lives for themselves. Since one country’s emissions today trigger another country’s emergencies tomorrow, the world needs to work *together*.



ONE
earth
ONE
chance

COLLABORATION

Photo: NASA

Circumspect Behaviour

“When factories pollute rivers or the air, the ‘polluter pays’ principle is applied to cover the costs of cleaning up. If... climate change [damages] were neatly contained within one legal jurisdiction, those who had created the damage would be faced with a legal obligation to compensate ... That would place an obligation on rich countries ... to stop harmful practices ... [and] compensate for damage...” (2007/2008 Human Development Report) ⁽¹⁸⁴⁾

Reciprocal Responsibility: In Bangladesh, 80 percent of flooding is caused by rainfall in India. ⁽¹⁸⁵⁾ Numerous studies have shown that even modest rises in sea level would inundate tens of thousands of square kilometres of land and displace up to 75 million people in Bangladesh. ⁽¹⁸⁶⁾ Dr. Sudhir Chella Rajan, Professor of Humanities and Social Sciences at IIT Madras, recommends that India seek proactive policy options in the international arena: “Given the proximity of Bangladesh to India and the large land area that would be inundated, it is also likely that the bulk of these people will end up being migrants in India, particularly in large cities in the interior...” ⁽¹⁸⁷⁾ Stated simply, India’s rains are Bangladesh’s floods – Bangladesh’s climate refugees will be India’s migrants. – China’s coal-fired power stations will fuel America’s hurricanes – America’s fuel-inefficient cars will ratchet up China’s floods. Cross-cutting collaboration is not a contingency but an imperative.

Acting As One: The International Energy Agency (IEA) recently noted that if per capita oil demand in China and India were to rise to current U.S. levels, total world demand would “deplete proven oil reserves in 15 years.” ⁽¹⁸⁸⁾ The 2007/2008 UN Human Development Report estimates that “if all of the world’s people generated greenhouse gases at the same rate as some developed countries, we would need nine planets.” ⁽¹⁸⁹⁾ Since today’s investments lock into place tomorrow’s emissions, there is no alternative to paving the way to the future with clean energy infrastructure. This calls for unprecedented global leadership and partnership to achieve unprecedented action on greenhouse gas emissions reductions ⁽¹⁹⁰⁾ and an unprecedented global rollout of clean energy infrastructure which must include developing countries and must preclude coal – unless CO₂ is captured. ⁽¹⁹¹⁾ Ominous tipping points loom, imploring the world to act as one...



“We know climate change is happening, and right now, the changes are gradual, but there will be a breaking point, and when you get to the edge of that cliff, you go straight down. Until you get to the edge though, you can still backtrack.” ⁽¹⁹²⁾

—Prof. Peter Ng, National University of Singapore

Arctic Sea: According to a new scientific study, polar bears have been drowning, swimming longer distances from floe to floe. In some places, the edge of the ice is “30-40 miles from the shore.” Studies show that Arctic ice could “completely disappear each year during the summertime.” ⁽¹⁹³⁾ (Photo: Jan Will)

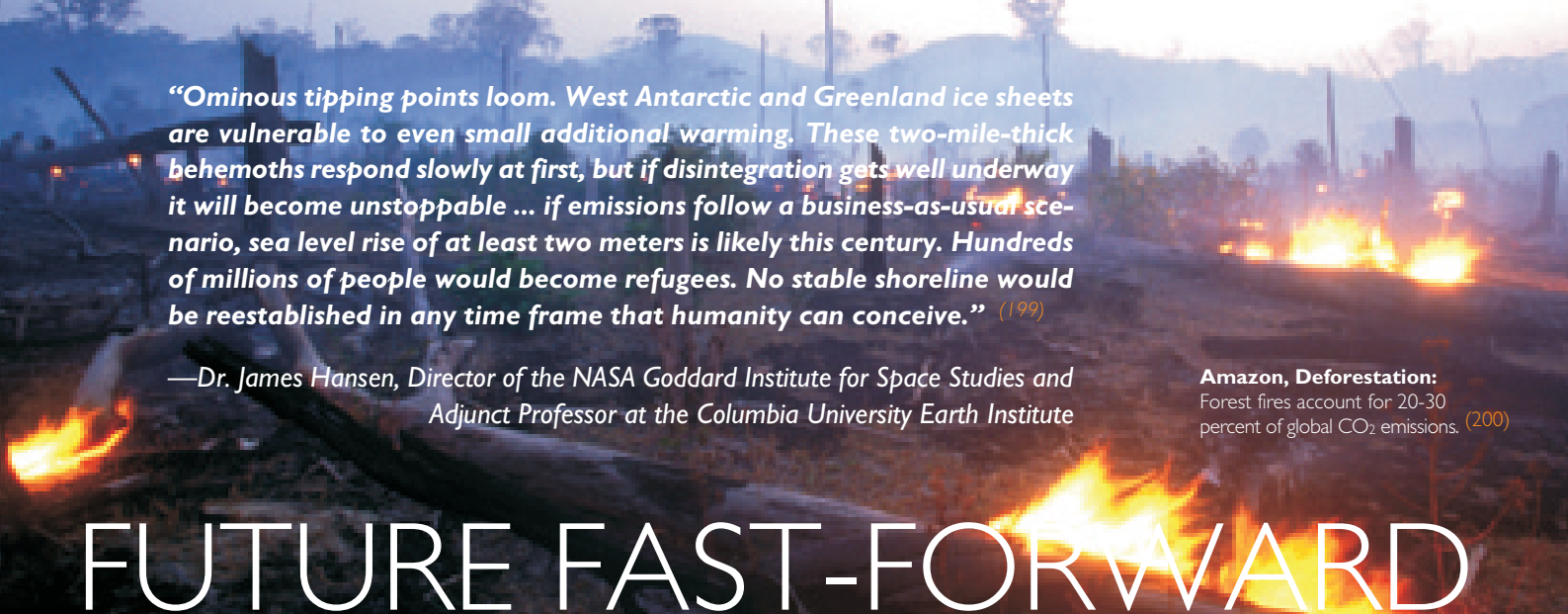
FEEDBACKS ▶▶

Cold Facts

“Of extreme concern is the finding that anthropogenic [human] factors could lead to some impacts that are abrupt or irreversible ... For instance, partial loss of ice sheets on polar land could imply metres of sea level rise, major changes in coastlines, and inundation of low-lying areas, with greatest effects in river deltas and low-lying islands.” (R. K. Pachauri, Chairman of the Intergovernmental Panel on Climate Change, Nobel Lecture) ⁽¹⁹⁴⁾

Pole Position: Planetary partnership is urgently needed. There are indications that the Earth's poles are in a precarious “pole position” for melting that could fast accelerate. “Positive feedback” denotes a process whereby warming becomes self-reinforcing. The negative effect of positive feedback is that small perturbations are “amplified” and produce big changes. This happens when polar ice melts. Whereas ice reflects most of the incoming solar radiation – “like a giant mirror” ⁽¹⁹⁵⁾ – dark water absorbs most of the heat. The more open water is exposed, the more solar energy goes into heating the ocean, putting even more melting pressure on adjacent ice. This so-called ice-albedo feedback denotes a loop of progressively faster warming, melting, and ice sheet disintegration. ⁽¹⁹⁶⁾ The process is reinforced by pools of meltwater that form on top of ice sheets. As the water slices through the ice sheet, cutting deep crevasses and lubricating the bedrock, the ice sheet

becomes “unstable.” Once ice sheet disintegration gets underway the process irreversibly picks up pace and feeds on itself until meltdown is complete. Although the melting dynamics of the East and West Antarctic ice sheets and Greenland may be dissimilar, their demise would be disastrous. Dr. James Hansen, Director of the NASA Goddard Institute for Space Studies and Adjunct Professor at the Columbia University Earth Institute warns: “Thick ice sheets provide not only a positive feedback, but also the potential for cataclysmic collapse.” ⁽¹⁹⁷⁾ If Greenland melted, sea levels worldwide would rise by 7 metres. If the West Antarctic ice sheet melted, sea levels worldwide would rise by 6 metres. If the East Antarctic ice sheet melted – although this is considered less likely – sea levels worldwide would rise by more than 50 metres. ⁽¹⁹⁸⁾ Climate history warns that this has happened before. Climate science warns that it can happen again.



“Ominous tipping points loom. West Antarctic and Greenland ice sheets are vulnerable to even small additional warming. These two-mile-thick behemoths respond slowly at first, but if disintegration gets well underway it will become unstoppable ... if emissions follow a business-as-usual scenario, sea level rise of at least two meters is likely this century. Hundreds of millions of people would become refugees. No stable shoreline would be reestablished in any time frame that humanity can conceive.” ⁽¹⁹⁹⁾

—Dr. James Hansen, Director of the NASA Goddard Institute for Space Studies and Adjunct Professor at the Columbia University Earth Institute

Amazon, Deforestation: Forest fires account for 20-30 percent of global CO₂ emissions. ⁽²⁰⁰⁾

FUTURE FAST-FORWARD

Pressure Cooker

“Soon will come a day when climate change escapes all control. We are on the verge of the irreversible. Faced with this emergency, the time is not for half-measures. The time is for a revolution: a revolution of our awareness, a revolution of the economy, a revolution of political action.” (Jacques Chirac, former French President, commenting on the Fourth Assessment Report of the UN Intergovernmental Panel on Climate Change, 2007) ⁽²⁰¹⁾

Paying For Sins Of Emissions: Another driver for feedback is the accelerated thawing of permafrost in parts of the Arctic which is triggering the release of vast amounts of methane – a powerful greenhouse gas – into the Earth's atmosphere. This sets in motion a vicious warming circle: More and more thawing permafrost releases more and more methane, which locks in more and more warming, which thaws more and more permafrost, etc. Recent years have seen record thawing of permafrost in Alaska and Siberia. ⁽²⁰²⁾ No one knows how much methane is stored in the world's permafrost regions, but estimates run from 450 billion ⁽²⁰³⁾ to 730 billion tonnes. ⁽²⁰⁴⁾ (For reference, the Carbon Dioxide Information Analysis Center (CDIAC) estimates that since the start of the industrialisation in the mid-1800s total global carbon emissions run to 315 billion tonnes.) ⁽²⁰⁵⁾ "Water-vapor feedback" is another trigger. Since warmer air holds more moisture, higher tempera-

tures "moisturise" the atmosphere with higher concentrations of water vapor, which is itself a greenhouse gas. ⁽²⁰⁶⁾ The interplay between climate change and the carbon sink capacity of forests provides yet another powerful source of possible feedback. Since rainforests can be thought of as vast "carbon banks" (next chapter), their ongoing demise contributes carbon from these reservoirs into the atmosphere. Trees in the Amazon alone store more than 49 billion tonnes of carbon. ⁽²⁰⁷⁾ Illegal logging, coupled with temperature rises, could turn 30-60 percent of the Amazon into savannah. Since rainforests take up carbon and recycle more than 50 percent of rainfall back into the atmosphere, their continued contraction will increasingly contribute to CO₂ concentrations in the Earth's atmosphere. ⁽²⁰⁸⁾ Unless the world acts as one to tackle the looming climate crisis, "fast feedbacks" will fast-forward its detrimental effects. Energy partnerships will be pivotal.

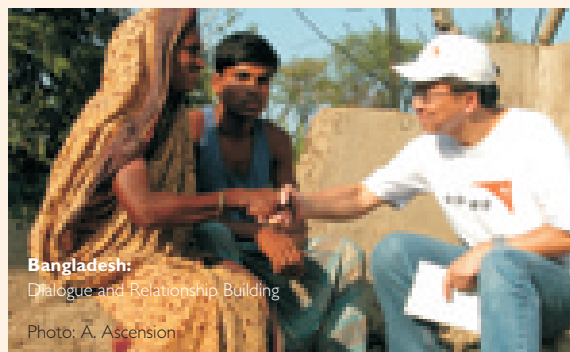


Nepal:
World Vision-led
fire drill



Photo: D. Harris

Cox Bazar, Bangladesh:
World Vision-led cyclone simulation; local fire brigade provide "rain"



Bangladesh:
Dialogue and Relationship Building

Photo: A. Ascension

■ **Cross-Sectoral Training Exercises:** Through fire drills (top), cyclone simulations (middle) and community dialogue (bottom), World Vision is partnering with communities across Asia Pacific for better disaster preparedness.

Fossil Fuel Freedom: NASA climate scientist Dr. James E. Hansen pleads to the G8 leaders to acknowledge "fossil fuel facts." He says: "Leadership failed to address the energy/climate problem with a carbon tax during the past quarter century. The price is now being paid for that leadership failure; waste of cheap fossil fuels created dependency, reduced the supply, and increased demand. Resulting high prices now go to coffers in the Middle East and other oil-exporting nations. It is too late to cry over spilled milk, or wasted oil, but there is still, barely, time to transition off fossil fuels, thus solving the global warming problem and increasing *energy independence* ... If we continue to build coal-fired power plants without carbon capture, we will leave for our children a situation not of their making but out of their control...." (209) Phasing out polluting energy generation (see page 93) and rolling out a clean global energy grid requires unprecedented planetary partnership. Since many poor nations struggle to provide stable electric power supply, such partnership holds the dual promise of both halting climate change and empowering "powerless" communities.

Multistakeholder Partnership: Climate change confronts humanity with intersecting realities from numerous fields of study. Planetary preparedness in the 21st century will require unprecedented collaboration through multistakeholder partnerships, involving the *whole* universe of stakeholders. As a member of the Inter-Agency Working Group (IWG), (210) World Vision remains committed to building and nurturing relationships with other players and colleague organisations around the world. Through the exchange of best practices and lessons learned, inter-agency collaboration has long inspired new ideas and added critical core competencies to the mix of humanitarian missions. Partnering together also makes practical sense since some specialised NGOs address only one area of disaster management, such as the provision of health services, whereas other civil societies are positioned to strengthen local response capacities or advocate for policy changes. A growing amalgamation of contributions will be needed to complement a growing contingency of requirements.


Ground-Up Partnership: The All India Disaster Mitigation Institute notes that the Hyogo Framework for Action (HFA) as a global platform for disaster risk reduction needs to be embraced by political leaders *and* civil society: "We, as a collective civil society, as individuals, and as humanitarian practitioners, need to reclaim the [Hyogo Framework for Action] as our own, not by arguments but by action, and not through contestation but through cooperation ... In the end, the HFA must remain in our *joint* custody, a shared heritage of civil society." (211) Preparedness is a planetary assignment which needs to be owned both at macro policy and micro community levels.

Beneficiary-Driven Partnerships: People affected by natural disasters are the best judges of their own interests. When affected communities are enabled and invited to identify the changes they want to see, and contribute to decision-making processes *before* projects get underway, impacts are likely to be greater and more sustainable. Conversely, when people are not involved, a response can miss its mark, leave out vulnerable groups, waste money or needlessly prolong hardship or injustice. Communities that have been involved in designing their development projects are more likely to take full responsibility and ownership for them. Partnering with local communities is especially critical when development agencies supply equipment such as water pumps, latrines, etc. which require long-term maintenance by the community.

Listening And Learning: Partnership succeeds when it stimulates *dialogue* with communities. It is not sufficient to merely send messages *out*. Instead, it is important to sit down with communities to listen, learn and take information *in*, recording felt needs and expected outcomes. It is critical that development agencies don't superimpose "correct" solutions on the communities concerned. In the final analysis, it is the "beneficiaries" who need to stimulate the formation of appropriate partnerships, not vested donor interests. Partnership is most effective when it combines global awareness with local knowledge and capacity.



■ **Multistakeholder Risk Reduction Workshops:** World Vision-led workshops in Indonesia, Sri Lanka, Bangladesh, etc. involve diverse stakeholders (army, Dept. of Social Welfare, church youth leaders, search & rescue, etc.)



“ Speak up for those who cannot speak for themselves, for the rights of all who are destitute. Speak up and judge fairly; defend the rights of the poor and needy. ”

—The Bible; Proverbs 31:8-9

Excerpt World Vision Cyclone Sidr Response (from 15 November 2007)

- *Activated* Disaster Response Teams and evacuated 30,000 people to 33 cyclone shelters
- *Sent out* 10 Rapid Community-Based Needs Assessment Teams
- *Dispatched* Immediate Survival Packages to 14,115 people
- *Distributed* 10,000 blankets to 10,000 households
- *Provided* dry-food and non-food items to 100,000 individuals
- *Dispensed* temporary housing materials to 64,625 individuals
- *Offered* children rehabilitation through 9 Child Friendly Spaces programmes

West Bajua, Bangladesh: Her tiny mirror was one of the few things Supria Mondol could salvage from the ruined remains of her bamboo home. Photo: Amio Ascension

ADVOCATE

JUSTICE & CHANGE

World Vision advocates with and on behalf of the poor. According to the Oxford Dictionary, advocacy has a dual definition, denoting "a person who publicly supports or recommends a particular cause or policy" or "a person who pleads on someone else's behalf." ⁽²¹²⁾ Advocacy looks at the world and why it is the way it is – and then tries to find better ways of doing things. Practices that perpetuate inequality and deny justice need to be challenged and *changed*. Advocacy gives voice to the voiceless and creates a forum for the invisible. It deals with structures, systems, policies and attitudes. Advocacy is a ministry of influence. Its tools are persuasion. Its targets are policies. Its allies are people. Its goals are transformation and *justice* – a strong theme in the Bible rooted in the self-sacrificial character of Christ. Justice looks out for the poor, the abused, the excluded and the exploited. Justice reconciles, restores, rebuilds, protects and dignifies. Justice is personal and political. It is granted in courts or denied in them. It is offered in laws or withheld in them. Its bearing is local, regional and global. Justice is a God-given right. – The climate crisis deprives millions of the poorest people of justice and threatens to leave a legacy of destruction for today's children and their descendants. Unless it is curbed, climate change is set to reverse progress built up over generations and become the greatest wholesale violation of human rights in history.



WANTED: LEADERSHIP

“When you were born, you cried and the world rejoiced. Live your life in such a way that when you die, the world cries and you rejoice.”

—American Indian Tribal Saying

Sundarbans, Bangladesh: The world's largest mangrove forest is threatened by climate change and rising sea levels

Photo: Philip Gain

Larger-Than-Life Leaders

“The starting point for action and political leadership is recognition on the part of governments that they are confronted by what may be the gravest threat ever to have faced humanity ... The starting point is political leadership ... Government leaders need to send a clear signal that the battle against climate change has been joined – and that the future will look different to the past.” (2007/2008 UN Human Development Report) (213)

Leaders or Laggards? It would be premature to delve into a discussion of the needed political actions without pausing to reflect on the breed of political leaders needed to legislate them. There are no rewind buttons for running down emitted greenhouse gas stocks which remain in the Earth's atmosphere for a very long time. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) makes this clear: "Both past and future anthropogenic CO₂ emissions will continue to contribute to warming and sea level rise for more than a millennium, due to the time scales required for the removal of this gas from the atmosphere." (214) Elsewhere the report notes that sea level rise caused by thermal expansion (warmer water occupies more space) will "continue for many centuries due to the time required to transport heat into the deep ocean." (215) In other words, humanity is committed to rising temperatures and rising sea levels for

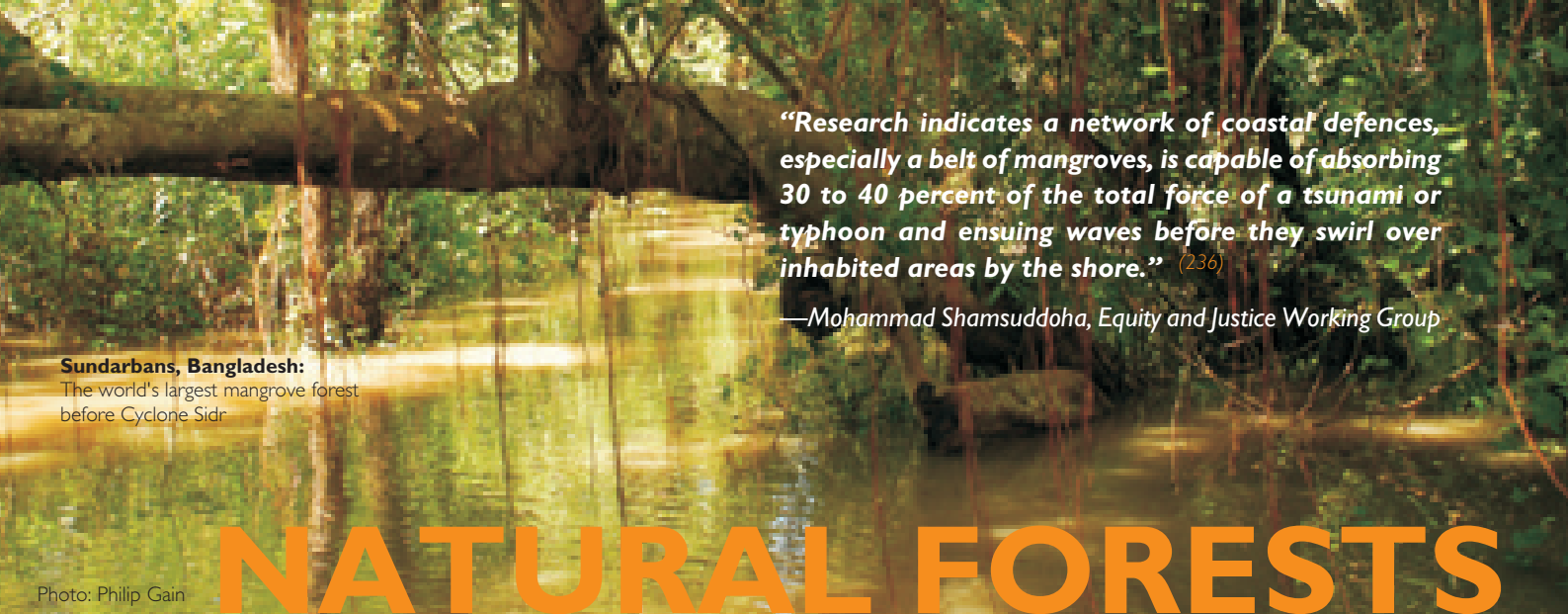
many decades to come, even *if* serious political measures to curb emissions were legislated with immediate effect. The 2007/2008 UN Human Development Report notes: "Even stringent mitigation measures will not materially affect average temperature changes until the mid-2030s – and temperatures will not peak until 2050. In other words, for the first half of the 21st century the world in general, and the world's poor in particular, will have to live with climate change to which we are already committed." (216) In light of such realities it is apparent that viewing the political process in terms of electoral cycles which typically span time horizons of 4-8 years is vastly inadequate. What the world needs is political leaders who can look beyond their terms of office in government, beyond their political careers, beyond their own lifetimes and beyond their grandchildren's generations. Larger-than-life-leadership is a matter of justice.

Only Luke-Warm Words? On 10 May 1940, Winston Churchill became the British Prime Minister. Knowing that the world faced a lethal storm from fascism he was frank to address his Cabinet on 13 May 1940 with words that have become famous the world over: "I have nothing to offer but blood, toil, tears and sweat." (217) His years in office saw his electoral promise fulfilled – and the world liberated from fascist oppression. To address today's storm of climate change will require similarly bold leaders who dare their societies to forego short-term gratification for long-term survival. Sustainable emissions pathways will have to be followed not for years but over generations. The tasks will be difficult, the measures inconvenient, the costs high, the sanctions unpopular, the restrictions unpleasant, the outcomes uncertain and the opposition severe. But measured against the criterion of "justice" it is evident that the present political path of short-term incrementalism is failing to deliver the "big changes and ambitious new policies" which the Executive Director of the United Nations Environment Programme, Achim Steiner, asserts the world urgently needs. (218) Expressed in diplomatic language, today's political leaders are not adequately addressing the issue of climate change. Three constituencies are at highest risk because the world's leaders do not hear their cries – the poor, future generations, and millions of creatures implied by the term "biodiversity." Justice demands urgent legislation in key areas which mitigate both climate change and the disasters it drives.

Start Afforestation: According to the IPCC, carbon dioxide (CO₂) is "the most important" greenhouse gas driving global warming. Between 1970 and 2004, annual emissions have grown by 80 percent and atmospheric concentrations from the burning of fossil fuels now "exceed by far the natural range over the last 650,000 years." (219) Since plants "inhale" carbon dioxide – and "exhale" oxygen which humans need – the world needs to plant trees to bend down the CO₂ emissions curve. Since trees act as "carbon sinks" it is expedient to calculate how many trees are needed to absorb CO₂ from the atmosphere, as from the

use of a car. Each litre of petrol burnt by a car releases 2.36 kilogrammes of CO₂ into the Earth's atmosphere, and it is estimated that a hectare of growing trees (1,000 trees) can take up about 20,000 kilogrammes of CO₂ each year. (220) A simple calculation illustrates: a car travelling 10,000 kilometres per year and burning 1 litre of petrol per 10 kilometres would require a forest of 118 growing trees to neutralize its CO₂ emissions. As it turns out, the world needs to grow much more new forest, and fast. According to the New York Times, the city of Beijing alone "adds up to 1,200 cars and trucks every day." (221) BBC News notes: "Over 400,000 new cars drove onto the streets of Beijing in 2006, bringing the city's total to more than three million." (222) According to the above computation, just to keep pace with Beijing's growing CO₂ emissions from new cars would take 47,200 hectares of *additional* trees each year. Given the significance of forests in sinking or "sequestering" carbon, it would not be unreasonable to expect political leaders worldwide to be doing everything in their power to conserve forests. Statistics tell a different story.

Stop Deforestation: The world's forests are disappearing at an alarming rate. From 2000-2005, 73,000 square kilometres of forest was lost annually – an area the size of Sierra Leone. (223) Rainforests are shrinking at about 5 percent per year. (224) "Between 2000 and 2005, Vietnam lost 51 percent of its remaining primary forests ... while Cambodia lost 29 percent. It is evident that logging and land clearance continue to strip the last forests of the Mekong." (225) This destructive development is significant because the world's forests are vast repositories for carbon. While forests vary in the amount of carbon they store, "pristine rainforest can store around 500 tonnes of CO₂ per hectare." (226) This means that each hectare of pristine rainforest slashed and burned releases up to 500 tonnes of CO₂ into the Earth's atmosphere where it will hang heavy for centuries to come, hiking up temperatures and sea levels. A recent article published in TIME magazine found that if the world's forests were a single country, that nation would be one of the top emitters, accounting for 20 percent of all carbon emissions



“Research indicates a network of coastal defences, especially a belt of mangroves, is capable of absorbing 30 to 40 percent of the total force of a tsunami or typhoon and ensuing waves before they swirl over inhabited areas by the shore.” ⁽²³⁶⁾

—*Mohammad Shamsuddoha, Equity and Justice Working Group*

Sundarbans, Bangladesh:

The world's largest mangrove forest before Cyclone Sidr

NATURAL FORESTS

Photo: Philip Gain

due to slash-and-burn logging. ⁽²²⁷⁾ Forest fires have made Indonesia one of the top three emitters in the world in carbon emissions ⁽²²⁸⁾ – with Brazil ranking fourth, primarily from its vast-scale destruction of the Amazon. ⁽²²⁹⁾ Deforestation in Indonesia and Brazil alone offsets about 80 percent of annual greenhouse gas reduction targets for Annex I (industrialised) countries in the Kyoto Protocol. ⁽²³⁰⁾

"Lose-Lose Lunacy": Forest slashing is undertaken by illegal loggers and land clearers because markets do not attach monetary value to standing forests. With the exception of a handful of illegal loggers and corrupt officials all other stakeholders lose out in what can be thought of as an insane 'lose-lose' situation: The world is losing immense reserves for carbon mitigation, countries are losing immeasurably valuable assets, forest-dwelling indigenous peoples are losing their livelihoods, and the world is losing a matchless storehouse of biodiversity. Thousands of birds, wildlife and pristine sanctuaries are burned alive, while forest dwellers are pushed closer and closer to the edge of survival, being subjected to various human rights violations. ⁽²³¹⁾ Justice demands that forests be conserved, forest dwellers protected, forestry laws bolstered, compliance enforced, and monitoring mechanisms installed. Philip Gain, Executive Director of the Society for Environment and Human De-

velopment (SEHD) in Bangladesh stresses that converting forest into plantations of monoculture falls short of the values and requirements of conservation. ⁽²³²⁾ "Forests are our mother stocks of species and seeds. We can plant trees, but we cannot create forests. It is very important that we try to save our last forests." ⁽²³³⁾ The June 2007 McKinsey & Company Report concludes that protecting standing forests – together with large-scale reforestation – could be the single largest contributor to climate solutions between now and 2030 simply because the opportunities are so vast and the costs so low. ⁽²³⁴⁾

"Beautiful Forest": Forests have another important role to play apart from "sinking" carbon, mitigating global warming and providing a fertile spawning ground for many plants and animals. Forests act as a first line of defence against floods and storms. Recent cyclones have made their significance clear. The Sundarbans mangrove forest in Bangladesh (from Bangla *Sundar Bon*, meaning *beautiful forest*) is a case in point. Measuring 6,017 square kilometres, the Sundarbans is the largest mangrove forest in the world. To protect its unique biodiversity which includes endangered species such as the Bengal tiger and the estuarine crocodile, in 1997 UNESCO inscribed the Sundarbans on its World Heritage List. ⁽²³⁵⁾



Sundarbans, Bangladesh:
The world's largest mangrove forest after Cyclone Sidr

Photo: Phillip Gain

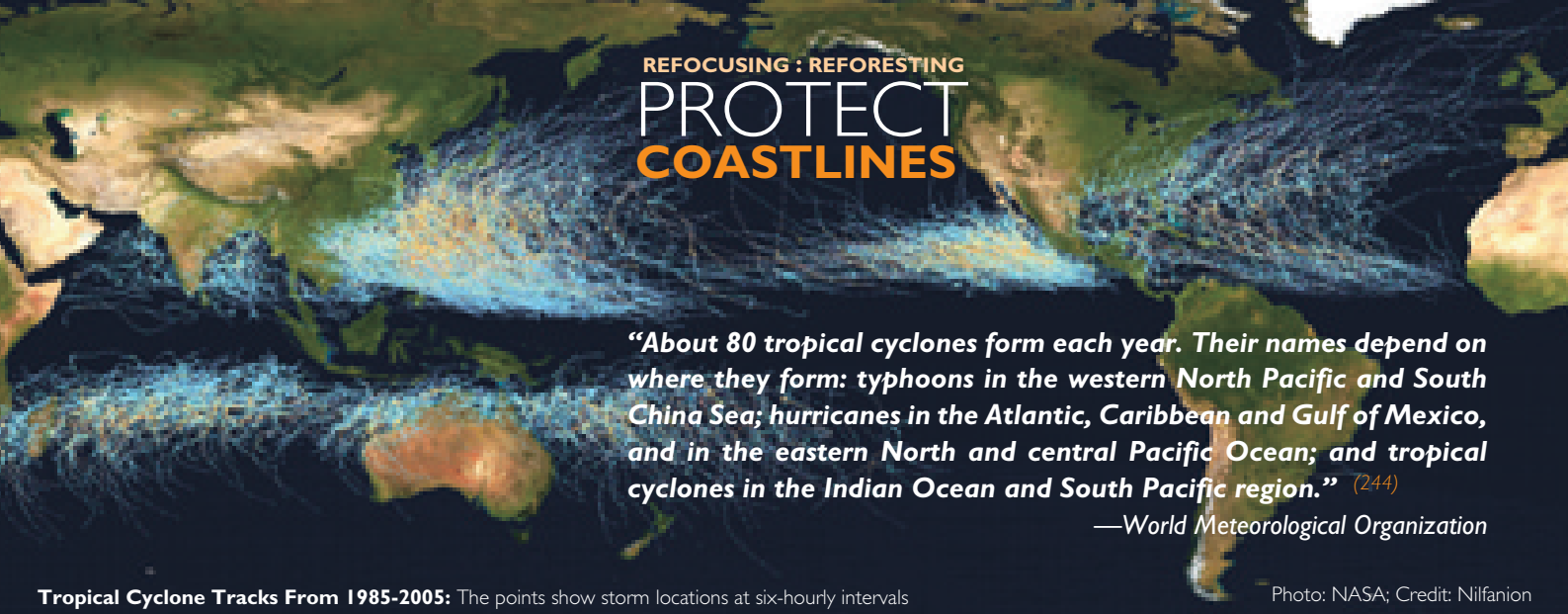
NATURAL DEFENCES

Friendly Forests

“Natural ecosystems such as coastal forests, coral reefs, mangrove belts, beach ridges, sand dunes or forested slopes are effective barriers against many types of natural disasters. Such reinforcements can be a cost-effective insurance against storm surges, tsunami and sea-level rise for coastal communities that cannot afford expensive infrastructural protection.” (Poh Poh Wong, Intergovernmental Panel on Climate Change, Lead Author) (237)

Mangrove Forests – Coastal Shelterbelts: On 15 November 2007, Cyclone Sidr crashed into the densely populated coastal belt of Bangladesh, hitting the Sundarbans hard while whirling its way inland. It killed 4,234 people, injured 55,282, affected 8,978,541 and caused US\$ 2.3 billion in damages. (238) Sidr, a category five tropical cyclone – the highest possible rating – was the strongest cyclone to hit Bangladesh since 1991. Phillip Gain says that the fallout from wind speeds of up to 250 kilometres per hour and a 5-metre storm surge would have been much worse if the mangrove forest had not provided a natural shield of protection: "Had the forest not been there, the cyclone could have been deadly for the nearby towns – Khulna, Mongla, and Bagerhat. The forest took the brunt of the winds and tidal surges, and saved these towns from severe devastation." (239) Dr. Saiful Islam, Director of the Forest Academy in Chittagong, notes that dense mangrove

forest can "break" and decelerate high velocity winds. Its ecologically adapted root system is capable of dissipating powerful waves by providing a strong "anchor against frequent river bank erosion." He urges more commitment to protect mangroves: "The cyclonic devastation could have been much less if human-induced damage of the forest had been kept under control." (240) Altafur Rahman of the government Legal Department in Dhaka says, "emphasis should be given to *thick* vegetation ... for creating an impenetrable barrier. Cyclone wind is most destructive ... in open space ... If we can encircle open spaces with thick forestation, the impact of wind can be lessened." (241) According to assessments Cyclone Sidr degraded 25-40 percent of the Sundarbans forest. (242) Its role as a key "shelterbelt" against tsunamis, cyclones and storm surges is perhaps best summarised by an article published in The Daily Star which concludes: "It saved many lives at the cost of its own death." (243)



REFOCUSING : REFORESTING
**PROTECT
COASTLINES**

“About 80 tropical cyclones form each year. Their names depend on where they form: typhoons in the western North Pacific and South China Sea; hurricanes in the Atlantic, Caribbean and Gulf of Mexico, and in the eastern North and central Pacific Ocean; and tropical cyclones in the Indian Ocean and South Pacific region.” ⁽²⁴⁴⁾

—World Meteorological Organization

Tropical Cyclone Tracks From 1985-2005: The points show storm locations at six-hourly intervals

Photo: NASA; Credit: Nilfanion

Coastal Ecosystems

“Coastal communities are at risk from natural disasters such as hurricanes, cyclones, tsunamis, and storm surge flooding, as well as losses incurred from ... shoreline erosion. Losses of habitats such as mangrove forests (35% have disappeared in the last two decades) threaten the safety of people ... Mangroves ... serve as a buffer from storm damage for these communities.” ^(United Nations Environment Programme) ⁽²⁴⁵⁾

Consolidating Coastlines: Although mangrove ecosystems mitigate storms and have tremendous value for coastal communities and associated species, they are being destroyed at an alarming rate. Population pressures, pollution and habitat conversion have led to the loss of 35 percent of mangrove forests in the last two decades at the rate of 2.1 percent, or 2,834 square kilometres per year. In some countries, more than 80 percent of mangrove cover has been lost to deforestation or conversion to aquaculture. ⁽²⁴⁶⁾ Coral reefs are similarly threatened. As the “rainforest of the sea,” coral cover can cause waves to break before they reach populated shores, but according to the Millennium Ecosystem Assessment, 20 percent are severely damaged (“unlikely to recover”) and 70 percent are “destroyed, critical, or threatened.” ⁽²⁴⁷⁾ Unless the world’s political leaders take action, all optimal growing areas in the world for coral could completely disappear by 2050. ⁽²⁴⁸⁾

"Catching Up The Law": World Vision Advocacy Director for the Asia Pacific region Laurence Gray says that advocacy is not necessarily confrontational. “Often governments are aware of challenges and will welcome help. Sometimes new laws simply need to catch up with new realities. Recognising the rights of environmentally displaced people is a case in point. Unlike victims of political upheaval or violence, environmental “refugees” ^(a) are neither recognised in world conventions nor included in the preparedness horizon of the Hyogo Framework for Action. Whereas victims of disaster can benefit from the mobilisation of relief, millions of gradually uprooted environmental migrants receive no support and are not recognised as “refugees” with the benefits that would bestow. Thousands of displaced people today migrate within their borders. International instruments are urgently needed to protect the rights of a growing number of climate migrants.” ⁽²⁴⁹⁾

Tropical Cyclone Sidr in the Bay of Bengal, seen by the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument aboard NASA's Terra Satellite on 14 November 2007, 04:45 UTC, one day before making landfall in Bangladesh

DISASTER DISSIPATION

“Tropical cyclones are areas of very low atmospheric pressure over tropical and sub-tropical waters which build up into a huge, circulating mass of wind and thunderstorms up to hundreds of kilometres across. Surface winds can reach speeds of 200 km/h or more. The combination of wind-driven waves and the low-pressure of a tropical cyclone can produce a coastal storm surge – a huge volume of water driven ashore at high speed and of immense force that can wash away everything in its path.” ⁽²⁵⁰⁾

—World Meteorological Organization

Photo: NASA

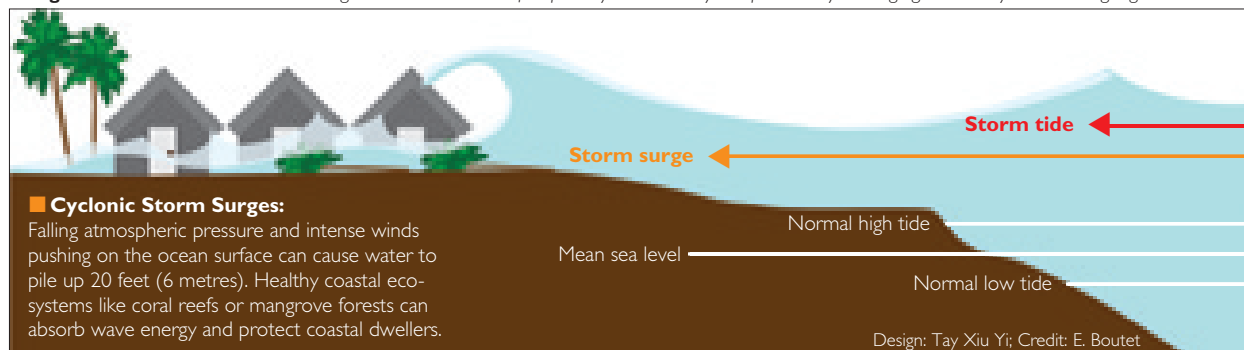
Reinforcing Forests

“Reforestation has two significant purposes. It sinks or ‘sequesters’ CO₂ from the atmosphere, and it raises up a natural buffer against natural disasters. ‘Agriculture, Forestry and Other Land Use’ (AFOLU) is a double-edged sword to fight climate change because it holds the dual promise of climate change mitigation and adaptation in the context of the developing world.” (Laurence Gray, World Vision Regional Advocacy Director) ⁽²⁵¹⁾

Summary: Given Asia's preponderance of floods and wind storms, the significance of standing forests, mangrove belts and coral cover can hardly be overstated. Natural ecosystems are natural defences against natural disasters.

Reinforcing coastal ecosystems is a "win-win" move of mitigation and adaptation. Avoiding deforestation, accelerating reforestation and promoting afforestation ^(b) emerge as the three legs of a solid policy tripod for coastal protection.

■ **Figure 15:** The most severe storm surges occur as a result of tropical cyclones – they are particularly damaging when they occur during high tide ⁽²⁵²⁾



“Disaster-prone developing countries, especially least developed countries and small island developing States, warrant particular attention in view of their higher vulnerability and risk levels, which often greatly exceed their capacity to respond to and recover from disasters.”

—World Conference on Disaster Reduction, *Priorities for Action, Hyogo Framework for Action 2005-2015*

Jakarta, Indonesia:

These young girls walk through a toxic mix of trash and raw sewage as the water starts rising and flooding their home. Muara Baru is one of Jakarta's worst waterfront slums, confronting a number of urban problems: repeated tidal flooding, poor infrastructure, limited access to clean water or services

“Floods threaten human life and property worldwide. Some 1.5 billion people were affected by floods in the last decade of the 20th century.” ⁽²⁵³⁾

—World Meteorological Organization

Photo: Jacqueline M. Koch

REINFORCE DISASTER DEFENCES

According to the Oxford Dictionary, the verb "reinforce" has a dual definition, meaning either to "strengthen or support ... with additional personnel or material," or to "strengthen [a] feeling, idea, or habit." (254) In other words, "reinforcement" can refer to ideas or things, mind or matter, software or hardware. In the context of disaster preparedness, to "reinforce" means to build up disaster prepared mindsets and disaster resistant infrastructure. The "software" includes people in communal structures who can coordinate controlled disaster management – before, during, and after an emergency event – because they have proactively prepared themselves through awareness campaigns, disaster drills, evacuation exercises, first aid courses, emergency education, and leadership training and positioning. Disaster resistant "hardware" includes heavy infrastructure like flood barriers, escape roads, sea walls, cyclone shelters, early warning systems, solid houses built on strong foundations in safe locations and in adherence to building code regulations, and emergency supply pre-positioning warehouses. By necessity, the notion of "reinforcement" implies both the assumption that a disaster will occur and the resolute resolve to end up on top of it rather than be toppled by it.

“Developing countries generally contribute very little to anthropogenic climate change, but they still have to adopt comprehensive adaptation measures which they often cannot afford... For that reason, adaptation measures in these countries should be co-financed by the international community.” ⁽²⁵⁷⁾

—German Advisory Council on Global Change (WBGU)

LENDING HELPING HANDS

Jakarta, Indonesia: Young boy in North Jakarta's garbage-choked stilt-house slum Muara Baru waits for the flood waters to recede

Treading Water:

Residents of Muara Baru endure weeks of flooding every year. The ailing sea wall can do little to keep the rising sea at bay. Rapid urban growth and rising sewage are pushing the seaside slum beyond its limits.

Photo: Jacqueline M. Koch

Raising Adaptive Capacity

“In the event of mitigation efforts failing, climate-induced security risks will begin to manifest themselves in various regions of the world from around 2025-2040. The key challenge is to take resolute climate policy action within the next 10-15 years, in order to avert the socioeconomic distortions and implications for international security that will otherwise intensify in subsequent decades.” (German Advisory Council on Global Change) ⁽²⁵⁵⁾

The Rising Tide: Because coastal areas abound with resources and trading opportunities, populations have long preferred to live within 100 kilometres of coasts and near major rivers. ⁽²⁵⁶⁾ But megacities in coastal proximity are environmental disaster hotspots which are becoming even more vulnerable to climate change-driven events like tropical storms, floods and rising sea levels. Although mitigation is the best means of minimising future climate change impacts, due to the inertia built into climate systems it is already too late to rely solely on mitigation. While earnest mitigation may forestall dangerous climate change in the second half of the 21st century – and is non-negotiable for long-term survival – for the first half there is no alternative to climate change adaptation. Unless swift action is taken to raise adaptive capacity, by the time the dangers become more apparent, many of the easier options for disaster preparedness will have been foreclosed. The world no

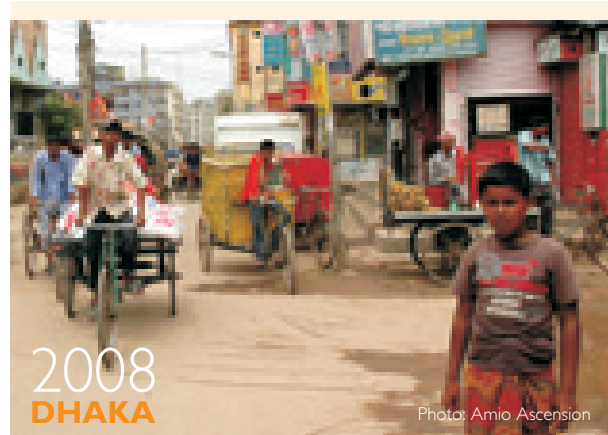
longer has a choice about *whether* to adapt, but it can still determine the timing, method, and stance it espouses – proactive or reactive, assertive or tentative, leading or lagging. Given the long lead times for climate change mitigation and adaptation, it is paramount to avoid unnecessary delays. A major reason for the growing threat is rapid and self-reinforcing urbanisation. The more urbanised a coastal community becomes, the more it draws other job seekers and enterprises into the suction of its magnetic field. The results are explosive population growth, haphazard over-development and an increasing exposure to seaward environmental hazards [32 percent of the population of large Asian cities over 5 million now reside in a “contiguous area along the coast that is less than 10 metres above sea level” – in Bangladesh, the population in this area grew at “almost twice the national population growth rate between 1990-2000.”] ⁽²⁵⁷⁾ Poor countries need a helping hand to adapt.

Macro Challenges: Cities that extend into this low-lying area known as the "low elevation coastal zone" (257) (e.g. Bangladesh's capital Dhaka) face numerous challenges. A recent World Bank study identified Dhaka as "the fastest growing mega-city in the world, with an estimated 300,000-400,000 new migrants, mostly poor, arriving to the city annually, [aggravating] large slums, poor housing, excessively high land prices, traffic congestion, water shortages, poor sanitation and drainage, irregular electric supply, unplanned construction, increasing air pollution and poor urban governance which results in growing problems of law and order." The study notes: "As migrants continue to arrive, they often end up in illegal settlements on precarious lands with major environmental concerns. The slums are located throughout the city with few services offered at high prices through middlemen, also called musclemen or *mastaans*, using illegal methods ... Access to basic services such as water, sanitation, electricity, health and education by the poor is limited. Because most slums are not recognized as legal lands, the Government, NGOs and Donors generally do not provide services in these areas. As a result, a parallel structure has emerged with *mastaans* providing services for a high fee." (258)

Micro Opportunities: In such conditions, the poorest are afflicted hardest. Being forced to source basic services outside of government supply grids, the poor often pay far higher prices for basic services than the wealthy. (259) Reducing risk means reducing poverty, and this must reach beyond immediate crisis relief to intermediate sustainable development. Given their closeness to the people at the grassroots level, NGOs are well-positioned to explore new avenues – in conjunction with governments – to bridge existing service supply gaps or provide basic necessities for the poor. Since poverty is the overwhelming reason why people are unable to absorb the shocks of extreme weather events, disaster risk is best ameliorated through poverty reduction and comprehensive development. It stands to reason that if poor people are prepared to pay *mastaans* exorbitant fees for basic necessities, they would even more willingly engage with non-profit organisations. Since many NGOs are locally known and trusted, they are in a good position to create coherent structures that can strengthen the resilience of communities from within (e.g., microfinance, new delivery mechanisms, mobile health units, libraries, community-based learning centres, etc).



■ **Bashaboo, Bangladesh, 2004:** World Vision provided food and non-food relief to 103,555 families during the worst floods since 1988 which affected more than 36 million people



■ **Bashaboo, Bangladesh, 2008:** Recurrent flooding is a source of great hardship for many countries in the world (Note: Both photos are taken from the same vantage point.)

Stronger Living: To reinforce coastal communities means to steel them for future disasters and prepare them to re-emerge and rebuild with less pain. What allows natural events to become natural disasters – and humanitarian emergencies – is that many people don't have the means to make adequate preparations to protect their lives and livelihoods. Reinforcements must therefore focus on a blend of measures involving stronger financial instruments, microinsurance mechanisms, stronger homes and shelters, seamless early warning systems and a smart approach to future development planning.

Microinsurance: While microcredit schemes have lifted millions of poor people out of poverty by creating sustainable livelihoods, the domain of *microinsurance* is still largely in its infancy. Following a hurricane in the U.S., people can collect insurance money to restore their assets and rebuild their lives. However, given the poor financial infrastructure of most developing countries, the majority of the world's poor have nowhere to turn to hedge against disaster risks. Although their assets such as cows, chickens, fishing boats, etc. may appear comparatively more humble than insurable production plants in industrialised countries, their centrality to livelihood sustenance is equally critical. Sadly, the insurance industry in poor countries is vastly underdeveloped. A recent World Bank Report compiled by the Independent Evaluation Group (IEG) states: "There is no private insurance against hazard risks in most developing countries. While about half of these costs of natural disasters are covered by insurance in the United States, less than 2 percent of the costs are covered in the developing world." (260) The regular periodicity of many disaster types makes hedging against natural hazard risks an urgent priority for the preservation of hard-won development gains. Otherwise disasters may slow, stall or reverse human development progress.

"Disaster recovery should be judged not merely by how swiftly physical infrastructure is rebuilt – only to be destroyed again by the next disaster – but by how strategic reinforcements contribute to long-term sustainable development. The mainstreaming of microinsurance into development programming is a key missing link in the reinforcement chain." (Richard Rumsey, World Vision Humanitarian & Emergency Affairs Director for Asia Pacific)

Limiting Losses: Ongoing economic development tends to decrease disaster deaths, but it also tends to increase economic losses. The mainstreaming of *microinsurance* into development programming is a key missing link in today's recovery and reinforcement chain. As the largest external financier of disaster reconstruction, the World Bank advocates a long-term "proactive and strategic," rather than short-term "reactive and tactical" posture. It urges: "The types of activities that can have the greatest impact on reducing vulnerability, such as building code development or revision, development of hazard risk management institutions, and development of insurance and other mechanisms for laying off risk, are precisely those for which borrowers are least likely to borrow. The Bank needs to find ways to encourage such activities." (261) Another World Bank-published paper highlights that while "informal" or "self-insurance" mechanisms (i.e. informal risk pools, credit markets, or buffer stocks) may be expedient in some situations, "formal insurance is the best." The report insinuates that the creation of insurance products for poor countries should be viewed as a form of "desirable diversification for international insurers." (262) Governments and development agencies should be more assertive in exploring, developing and mainstreaming *microinsurance* mechanisms into the fabric of their development programming.

Innovating Insurance: In Cambodia, the World Vision-initiated *VisionFund* – a global microfinance institution – has close to 70,000 loan clients. It aims to cover its entire client base with *micro-life insurance* and in so doing benefit more than 200,000 beneficiaries (currently 50,000 clients are covered). Through partnership with WING, a subsidiary of ANZ Australia, *VisionFund* is also targeting to bring financial services to rural communities across Cambodia. *VisionFund* Executive Director for Cambodia, Bora Omseng, says:

"Mobile phone banking will enable us to deliver micro-finance services with greater accuracy, simplicity and efficiency. This will extend our financial infrastructure, enhance our loan disbursement and collection, and help our account holders pay their utility bills, transfer money, or purchase tools in outlets across Cambodia. This engagement will increase our outreach in remote communities and improve the lives of Cambodia's poorest. As we gain more experience in the field of *microinsurance*, we endeavour to broaden the scope of our product portfolio, creating crop, health, and calamity insurance. We want to help people hedge against disaster risk." (263)

Financial Structures: Largescale *microinsurance* coverage is one of the most urgently needed reinforcements for more effective disaster preparedness. The need was recently reiterated by former British Prime Minister Tony Blair who called for a Global Adaptation Framework to "devise ways to come up with a global insurance plan and *microinsurance* schemes." (264) The *Hyogo Framework for Action* – a global disaster risk reduction roadmap adopted by 168 countries – underscores this priority in its catalogue of recommendations: "Promote the development of financial risk-sharing mechanisms, particularly *insurance* and *reinsurance* against disasters ... Promote an environment that encourages a culture of *insurance* in developing countries." (265) While it is sometimes maintained that risks can be "so high in some areas that they are uninsurable," (266) let it be remembered that this was the same caveat Dr. Muhammad Yunus disproved by founding the Grameen Bank for the poor. His ground-breaking concept initialised a paradigm shift from regarding the poor as helpless victims to be pitied ("not creditworthy") to viewing them as trustworthy entrepreneurs to be engaged ("to give them credit"). In less than three decades his idea attracted a following of 12,000 institutions worldwide and won him the 2006 Nobel Peace Prize. (267) The photo (upper right) depicts a Bangladeshi fisherman's livelihood which six months after Cyclone Sidr – in the absence of *microinsurance* – still remains torn asunder. (268)



Reinforcing Livelihoods, Living Spaces and Lands: Microinsurance could reinforce people's livelihoods (top), good building practices, their living spaces (middle), and environmental engagement and awareness, their lands (bottom).



Reinforcing Heavy Infrastructure For More Safety: Government-built infrastructure reinforcements can protect people from cyclones (top), tsunamis (middle, bottom), etc. In many places, more capacity is needed.

Stronger Homes: Evidently, homes made from flimsy metal sheeting are far more easily destroyed than stronger ones built in compliance with building code regulations. A good example of a handbook that "homes in on homes" is the UN construction manual "Good Building Design and Construction." (269) It is amply illustrated with photos that depict real life examples of good and bad building practices. The underlying idea is to guide communities to integrate disaster risk reduction into the early construction stage, instead of retrofitting buildings to comply with building codes – although that is often unavoidable. Sadly, the best time to "build back better and stronger" is in the wake of a natural disaster. However, care must be taken that lives are built back *beyond* the former status quo, which means that people, governments, and development agencies need to expend sufficient time to conduct assessments and feasibility studies. It also means that governments protect ownership and inscribe the names of husbands *and* wives in the official land title registries. Tragically, the 2004 Asia Tsunami disaster set many people back from "ground zero" to "zero ground" as they could not prove legal land ownership. Countless widows struggled to assert legal claims as their properties had been registered in the name of their deceased husbands only. (270)

Stronger Shelters: Research in Morrelganj, one of the districts hardest hit by Cyclone Sidr, revealed the need for additional disaster reinforcements, as headmaster Abdul Bari Khan (56) of the Chapabaraikhali High School explains. "There are 10,000 people in this area, but the government-built cyclone shelter can only accommodate 300. Since it is the only shelter in this area and shelters people on a "first-come-first-served" basis, it fast filled to capacity when Sidr struck. This forced 9,700 people to wait out the storm in their brittle homes. It was terrible. Trees fell on people. The waters washed 150 buffalo and 250 cows away. After the storm surge subsided 20-25 minutes later, 10 people were dead and 300 fishermen missing, never to be recovered. We are 'lucky' the cyclone hit during a low tide. Otherwise the destruction would have been far worse. We

need more cyclone shelters and safer buildings." (271) In Amtoli, a rural community of more than 2,000 people in Morrelganj, people share similar difficulties as community leader Dilder Ahmad (45) recounts: "In our community everybody heard the warning messages, but the nearest cyclone shelter is 4-5 kilometres away. There have been so many past false alarms that few people were prepared to abandon their houses and trek to the shelter. Many people also stayed near their assets to save their boats or animals. If there had been a cyclone shelter nearby, we could have taken our animals with us. This is what people in other communities do. We do not want to go too far because we are concerned someone might steal our animals while we take shelter. Our 150 goats and 600 chickens died because we could not protect them. It would be best to have a cyclone shelter nearby, no more than 1 kilometre away." Abdul Hossain (22) adds: "We heard the signals through "miking" [volunteers with megaphones] and coming from the speakers at the mosque, but we didn't understand them because we don't know how to interpret the meaning of the warning messages." Feroza Begum (40) explains the difficulties of women: "In our community all women can swim, but with our small children and saris it is more difficult not to go under during a storm surge. Cyclones always cause more deaths among women. We would like training and learn how to save our lives and animals." (272)

Stronger Mindsets: World Vision Project Officer Jubayed Hossain (32) says he and others have begun responding to many such requests by training people throughout Morrelganj. "World Vision only came to this district after Cyclone Sidr had struck. Now we realise that the people want training. We are teaching them how to

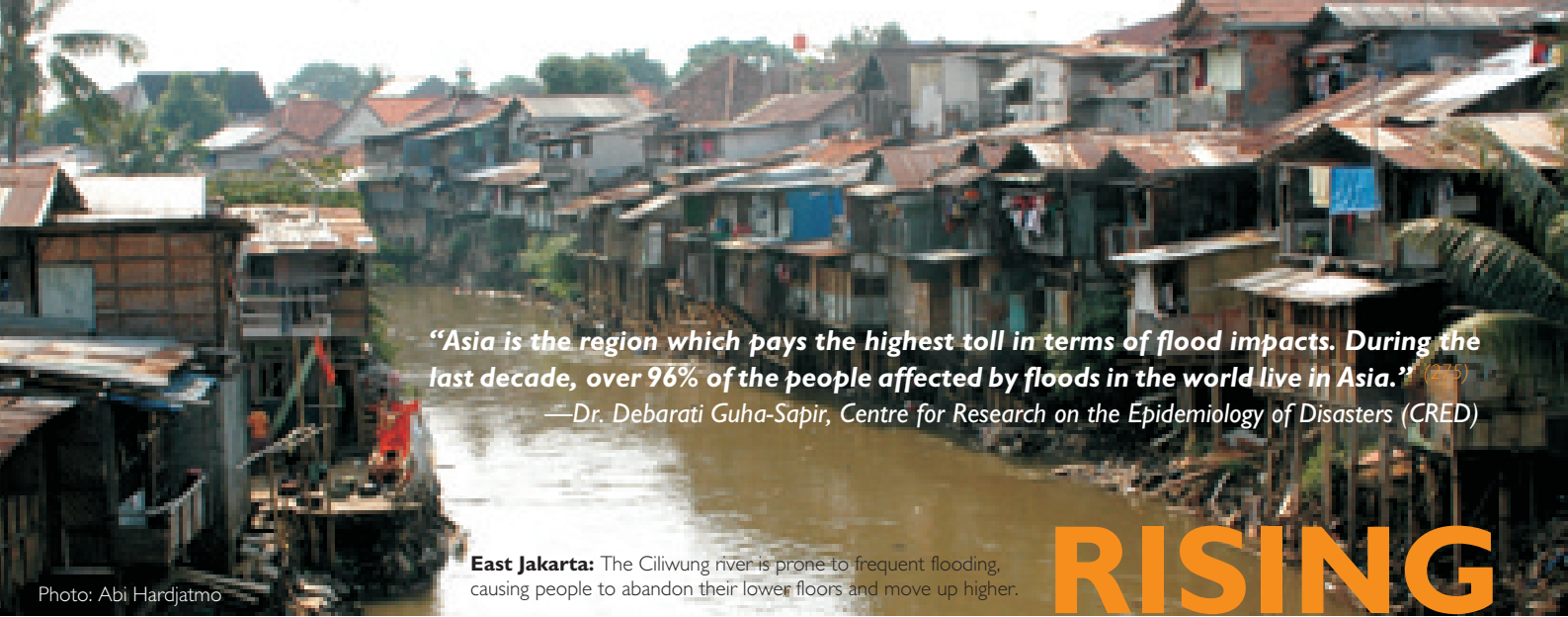
recognise their vulnerabilities, map hazards in their area and build stronger houses. We will also guide them through a process of identifying leaders who can train others and organise the community. We are currently developing a curriculum to teach school children the basics of disaster risk reduction. People increasingly realise that we need to reinforce defences and be better prepared. Initiatives such as the National Day of Disaster Risk Reduction and Tree Plantation Week are hopeful signals that our country is moving in the right direction." (273)

"The reconstruction and recovery period is the most opportune time to incorporate risk reduction. Political will and public awareness are high and often additional resources are available. However, there is great pressure to get homes assembled and infrastructure systems running very quickly so there can be a return to normalcy, with the result that [disaster risk reduction] does not often take place during recovery. If risk reduction is not incorporated at this time, it's likely that vulnerabilities will merely be rebuilt rather than reduced." (Inter-Agency Task Force on Climate Change and Disaster Risk Reduction)

Comprehensive Reinforcement:

Maxwell Sibhensana, World Vision Programme Officer in Banda Aceh, Indonesia, urges all-around reinforcement. "At times, governments or development organisations deal with the little things that provide 'visibility' but leave the big issues untouched. All players in our sector need to beware of sacrificing humanitarian relevancy on the altar of political expediency. But if stakeholders partner together with an honest interest to raise reinforcements and not just 'jostle for space,' they can pool resources and leapfrog the development of their beneficiaries. Community sewage systems could be afforded, not just septic tanks. Piecemeal can bring

wells – comprehensive strategising can bring water and sanitation solutions. Addressing poverty at the root by stimulating 'partners with potential' to move into existing leadership vacuums is what counts. An early warning database with upstream and downstream data flows is a case in point. Such comprehensive reinforcements require collaboration, collective ownership and expansive input. If everybody could tap into a seamlessly integrated early warning network, uploading and downloading early warning-relevant data, a storehouse of 'early warning-wisdom' could be built up for the benefit of all." (274)



“Asia is the region which pays the highest toll in terms of flood impacts. During the last decade, over 96% of the people affected by floods in the world live in Asia.” ⁽²⁷⁵⁾

—Dr. Debarati Guha-Sapir, Centre for Research on the Epidemiology of Disasters (CRED)

East Jakarta: The Ciliwung river is prone to frequent flooding, causing people to abandon their lower floors and move up higher.

RISING

Photo: Abi Hardjatmo

Worldwide Early Warning: The creation of a comprehensive early warning system has strong backing. In its publication "World in Transition: Climate Change as a Security Risk," the German Advisory Council on Global Change (WBGU) recommends the development of a transnational and trans-sectoral *global* warning network. "The system should not be confined to individual risks but should address threats to human security on a comprehensive basis. This early warning system should provide information about all types of natural hazard, epidemics and technological risks, and also take account of slowly advancing environment changes ... the system must provide processed data on expected regional climate impacts, especially for developing countries which lack adequate capacities of their own to model and evaluate these data. This type of database should collate regional forecasts, with all their uncertainties, and make them accessible in an easy-to-understand format for users. In order to establish this type of global information and early warning system, the activities of existing UN institutions (e.g. WMO, FAO, UNDP, UNEP, UNFCCC) and other forums such as ISDR or IPCC must be properly coordinated." ⁽²⁷⁶⁾ The system should also solicit contributions from humanitarian agencies as the inclusion of their grassroots perspectives and field experiences can expand the preparedness horizon of all.

Signalling – Short-Straight-Simple: Research among Cyclone Sidr-affected communities in Bangladesh highlighted "simplicity" as an important aspect of early alert messaging. Many villagers deem the current warning system deficient and "too complex." ⁽²⁷⁷⁾ The minutiae conveyed throughout the ten-scale signalling process ⁽²⁷⁸⁾ is far beyond the receptiveness of many illiterate villagers. [According to a 2001 government census, 37.7 percent of the population cannot read or write; according to the United Nations Educational, Scientific and Cultural Organization (UNESCO), the illiteracy rate for people over 15 years of age is 52.5 percent. ⁽²⁷⁹⁾] While the cyclone warning messages do appear to percolate through to the majority of people, the survey shows that "84 percent of respondents are dissatisfied with the effectiveness of the present early warning system [because] they don't know the significance of storm or wind by number." The survey recommends that the "port-based" warning system be converted to a "people-based" warning system with simple information on timing, wind speeds, and the expected cyclone intensity and storm surge height. The information "should be disseminated in easy language understandable to the common people." ⁽²⁸⁰⁾ Villagers also believe that the country-wide dissemination ("broadcasting") of early warning alerts through SMS text messages to all logged mobile



“Future climate change presents... the strong likelihood of an increase in quantity and severity of flooding events.” ⁽²⁸¹⁾

—Dr. Debarati Guha-Sapir (CRED)

“Climate change over the next century is likely to adversely affect hundreds of millions of people through increased coastal flooding.” ⁽²⁸²⁾ —Intergovernmental Panel on Climate Change

WATERS

East Jakarta: Floods in 2007 made Kampung Melayu one of the worst affected districts. The water levels of the Ciliwung river rose five metres high, triggering large scale evacuations and the biggest World Vision Indonesia flood response with funding amounting to US\$ 450,000.

Photo: Abi Hardjatmo

phone users could be effective and should be tried. [With more than 250,000 so-called "telephone ladies" vending mobile telephone calls throughout Bangladesh, ⁽²⁸³⁾ and 50 million subscribers projected by the end of the year, ⁽²⁸⁴⁾ Bangladesh is sufficiently saturated with mobile phone users to merit trials. SMS early warning text messages in a subscriber's preselected language of choice could close yet another gap on the last leg of early warning dissemination.]

Building A Smart Future: The notion of reinforcement presupposes an earnest commitment to foreshadow the future and plan ahead. Only under the assumption that a disaster will strike can the political will for extensive and expensive reinforcements be garnered. Professor of Geology Hugh Davies at the University of Papua New Guinea, urges that new construction be planned with rising sea level in mind. "Data for the Greenland Ice Sheet show that in 1996 it contributed 0.23 mm/year to sea level rise. By 2005 the rate had increased to 0.57 mm/year. While the increased rate of rise, 0.57 mm/year, may seem trivial the message behind the numbers is that the rate of loss of the ice sheet has more than doubled in 9 years. We do not know what the next 9 years will bring. Will there be a linear progression or might something more dramatic develop? Accelerated melting has also been documented in

the Antarctic. The ice sheets of both the East Antarctic (EAIS) and the West Antarctic (WAIS) are becoming thinner and are contributing to sea level rise. There are indications that the WAIS could become unstable and might collapse, thereby cause a rapid rise in sea level of the order of 5 m. ... In previous intervals of global warming, such as that which followed the last great ice age 18,000 years ago, sea level has risen at rates of 11-20 mm per year ... If such a rate were to develop ... [coastal] countries would face the need to make significant adjustments in the time frame 2010-2030 ... On the national level, plans need to be developed to cope with rising sea level. We should plan for a rise of some tens of cm, and at the same time develop contingency plans for a rise of a metre or more. The first activities should include preparing an inventory of those areas and those communities that will be affected, and drawing up plans for their possible relocation. The continued viability of all coastal facilities, such as ports and harbours, bulk fuel installations, and coastal commercial centres, needs to be reviewed and plans developed for remedial or defensive action. Any new development on the coast must be planned with the rising sea level in mind." ⁽²⁸⁵⁾ Indications are that such warnings are beginning to filter through to coastlying cities across Asia such as Jakarta which are already suffering from an increase in flooding.

Fishing For Hope: Sifting through the floating trash around her home, this young girl hopes to find bits of plastic and aluminium which she can recycle for small change. Muara Baru is one of Jakarta's worst waterfront slums, confronting a number of urban problems: repeated tidal flooding, poor infrastructure, limited access to clean water or services.

LOATHSOME LIVELIHOODS

Photo: Jacqueline M. Koch

Mitigation–Modification–Migration

“Fact: 40 percent of the Indonesian capital city of Jakarta is between one to one and a half meters below sea-level. Add to that an ever-growing population, densely-populated residential areas, rapid infrastructural development, a diminishing number of green areas and catchments, plus six months of near-constant rain – and you have a recipe for flood disasters which literally paralyze the city.” (World Bank Report) ⁽²⁸⁶⁾

Boomtown On The Edge: With 13 rivers and situated only metres above sea level – and 40 percent below sea level – floods in Jakarta can be devastating. The February 2007 flood made 450,000 people homeless and caused US\$ 879 million in damages. More than 70 percent of the city was inundated. ⁽²⁸⁷⁾ Built on the edge of the sea, coastlying cities like Jakarta face double jeopardy, contending with both seaward hazards like rising sea levels and tidal floods, and a trend termed "land subsidence" – sinking land. In 1993 Central Jakarta lay 3.42 metres above sea level, by 2005 it had "dropped" 102 cm to 2.40 metres above sea level. ⁽²⁸⁸⁾ The Straits Times recently headlined: "Over-development of Jakarta is causing the city to sink. On Dec. 6, 2025, the next peak of an 18.6-year astronomical cycle, sea levels will rise enough to engulf much of the low-lying Indonesian capital ... A World Bank study shows that unless action is taken ... much of the coastal city of 12 million will be

submerged by sea water." Although climate change is contributing to the sea level rise, the study says the main problem is that "Jakarta is sinking under the weight of out-of-control development." According to Janjaap Brinkman, flood management expert of independent Dutch institute Delft Hydraulics, who worked on the study, the city's swelling over-development is compressing the land it is built on. The problem is exacerbated by wealthy residents, factories and hotels drilling deep-water bores to bypass the city's shambolic water grid, sucking out groundwater and causing further subsidence. Mr. Brinkman warns: "If you do nothing about the groundwater problem, parts of Jakarta will sink 5m (by 2025)." ⁽²⁸⁹⁾ Connecting the dots is easy: a sinking coastal city and rising ocean do not bode well together. According to the Jakarta Post, floods are already made worse by the inability of many rivers to handle a surplus of water because they are "almost entirely

clogged with mud." (290) Risyana Sukarma, senior infrastructure expert with World Bank Indonesia, recently revealed plans for an extensive river dredging campaign to increase the capacity of Jakarta's rivers and ease the flooding problems which have become a national issue. While the World Bank has called for a halt to deep groundwater withdrawal, far-reaching education campaigns are needed to raise awareness among inner-city dwellers of their environmentally hazardous behaviour. El Khobar, a civil engineering lecturer at University of Indonesia, says that dumping rubbish into the rivers raises both the riverbeds and water levels, leading to a reduction in river capacity. "I once asked a neighbour not to toss his household garbage into a nearby river, and he was deeply offended ... My neighbour understood that tossing garbage into sewers would clog drainage, but didn't realize that the same rules applied to rivers until I politely explained that to him." (291)

Counting The Cost: Professor Poh Poh Wong, Coordinating Lead Author of the Intergovernmental Panel on Climate Change and expert on coastal issues, says there are only three ways that coastal cities or communities can respond to rising sea levels – plan a managed retreat (move inland), accommodate the changes (build 'stilt' houses), or controvert the extrusion (build sea walls). "Most countries have no choice but to choose the first or second option. Heavy infrastructure is very expensive. Few countries can afford 'hard' engineering measures." (292) Amri Susandi, meteorologist at Indonesia's Bandung Institute of Technology, recently warned that by 2050, 24 percent of Jakarta could disappear, forcing the capital to move to Bandung 180 km away. (293) Coastal communities are faced with difficult decisions. Creativity will be critical to envisioning a fair and feasible future. Reinforcement is not a contingency but an imperative which will require multiple means and methods. The International Institute for the Environment and Development (IIED) recommends a trinity of measures – mitigation, modifica-

tion, and migration. If taken with sufficient political forethought, migration could even redress regional inequalities. "At the national level, measures to support previously disfavoured inland urban settlements, away from the large cities on the coast, could not only reduce risks from climate change but also support a more balanced and equitable pattern of urban development." (294)

Positioning For Tomorrow: World Vision Australia's Policy Position on Climate Change concludes: "Climate change represents one of the greatest challenges humanity has faced. It raises profound scientific, ethical, economic and developmental questions which we are only beginning to appreciate. Its implications may well dominate the political

landscape of the 21st century and beyond. It is likely to be a time of upheaval, in which the poor are particularly vulnerable. World Vision will be needed more than ever, and we commit ourselves to strengthening our capacities to respond to the challenges." (295) Organisations like World Vision will likely be in high demand in the world of tomorrow. Through vast expansion plans of its Global Pre-Positioning Resource Network (GPRN), a supply chain

of four integrated warehouses on three continents with stockpiled emergency relief supplies from tents to trucks to toys, World Vision recognises the need to scale up capacity to respond to more and larger emergencies. Plans are currently underway to reinforce GPRN capacity to reach a capability target of four large-scale emergencies – simultaneously – twice a year. The expansion plan nearly doubles GPRN's annual operating budget by 2012 and targets to reach up to 500,000 disaster victims within 72 hours of a World Vision-declared catastrophe. (296) In the final analysis, reinforcing disaster defences simply means prepositioning software and hardware for heightened preparedness, reducing risks, raising resilience, retrofitting structures, releasing resources, innovating financial instruments and becoming stronger, better, faster and smarter.



School reconstruction builds a brighter future for children:

Agamathi Balika all-girls school in Sri Lanka sustained damage from the tsunami. The new 28,000 square foot World Vision-funded building has 12 new classrooms, an improved library, and multimedia unit. With 2,000 enrolled students it is the second largest school in the district.

“ Use knowledge, innovation and education to build a culture of safety and resilience at all levels. ”

—World Conference on Disaster Reduction, Priority 3, Hyogo Framework for Action 2005-2015

Photo: Paul Bettings

EDUCATE

SCHOOL CHILDREN

The power of educating children for the build-up of societal resilience has been known for millennia. More than 2,300 years ago, the Greek philosopher Aristotle (384-322 BC), student of Plato and one of the most influential teachers of all times, identified education as the kingpin of societal transformation: "All who have meditated on the art of governing mankind have been convinced that the fate of empires depends on the education of youth ... Those who educate children well are more to be honored than parents, for these only gave life, those the art of living well ... Education is an ornament in prosperity and a refuge in adversity." – In the context of disaster preparedness, the knowledge of what to do can be a literal "refuge in adversity." – According to the Oxford Dictionary, the verb "to educate" is derived from Latin "educere," meaning "to lead out." ⁽²⁹⁷⁾ This meaning is significant because education not only "leads out" into a life of opportunity, but can "lead out" of precarious disaster situations to safety. Educated people can create smart policies to govern themselves out of poverty, and identify smart escape routes to guide themselves out of danger. Children are change agents. Promoting a culture of disaster readiness in children is pivotal to raising up a new generation of resilient people who are ready, responsible and response-able.



Baghdabra Village, India: Children with disaster preparedness book

“Train a child in the way he should go, and when he is old he will not turn from it.”

—Proverbs 22:6

Photo: Kit Shangliang

Championing Children

“When you have only a few minutes, it is important to know the actions you must take to reduce your risk, such as running to higher ground ... Many children have learnt to live with natural hazards ... Everybody should have this basic knowledge ... If we educate our children, there is hope that we can build a culture of prevention for future generations.” (Salvano Briceño, Director UN International Strategy for Disaster Reduction, ISDR) (298)

Can-Do Kids: At the tender age of ten, British schoolgirl Tilly Smith can say in her résumé what few people can claim even in the autumn of their lives – that she is credited with saving nearly 100 tourists at Maikhao Beach (Thailand) by raising the alarm minutes before the deadly tsunami waves crashed into their hotel. On 26 December 2004, while on the beach in Phuket with her parents, Tilly sensed something was wrong. As the sea receded and had “froth on it like you get on the top of a beer,” Tilly immediately recognised the telltale signs of an impending tsunami and pleaded with her parents to flee from the beach. Remembering the words of her geography teacher, Andrew Kearney, who showed the class a video of a tsunami in Hawaii, Tilly quickly connected the dots: “I was hysterical. I was screaming. I didn’t want to leave my mom ... I said, ‘Seriously, there is definitely going to be a tsunami.’” (299) Tilly’s adamant warnings alerted her parents, who warned others, including the hotel staff.

The beach was evacuated before the tsunami reached shore, and was one of the few beaches on Phuket with no reported casualties. Tilly’s mother Penny (43) says she is proud of her daughter’s quick thinking, as she herself did not recognise the danger signs: “She was screaming at us to get off the beach ... I didn’t know what a tsunami was, but seeing my daughter so frightened made me think something serious must be going on.” (300) Tilly received numerous awards (301) and was given the honour of closing the First Anniversary Tsunami Commemorations in Khao Lak, Thailand, on 26 December with a poem before thousands of specators. Former U.S. President Bill Clinton observed: “Tilly’s story tells us about the importance of teaching young people about natural hazards. All children should be taught disaster reduction so they know what to do when natural hazards strike. Tilly’s story is a simple reminder that education can make a difference between life and death.” (302)

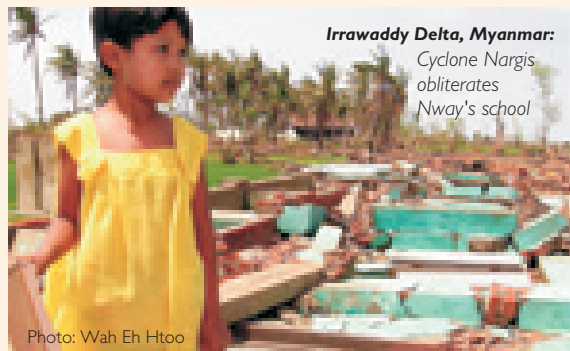
Structural School Safety: Since schools are the best venues for sowing seeds of conventional knowledge and collective values, they need to set the highest standard both for disaster risk reduction and disaster risk education. Seismic dangers cut across coastal and non-coastal communities alike (see figure 11 on page 41). Many students live in constant fear of being trapped in collapsing school buildings. In a handwritten letter published in a study carried out by the 30-nation Organisation for Economic Co-operation and Development (OECD) in 2004, Asian student Sony pleads for both better school safety and better disaster risk education: "I think that it is our right to know about earthquakes. This is because when earthquake comes, everybody including our parents and teachers will try to save their own lives. At that time they may not take care of us. So we ourselves need to know what to do during earthquakes. – Also it is our right to have a safe school. We don't build our school buildings ourselves. But if it is very weak then earthquake will destroy it and kill us. Why should we children die from weakness which other create? That is not because of our fault. It is their fault who build houses. So we request all our parents, teachers to build safe buildings for us." (303)

The study goes on to note: "Few individuals will contest the importance of protecting society's most valuable and vulnerable members, children; and few will contest the importance of providing compulsory education for all children. Even fewer people will argue with the fact that earthquakes kill people and damage property. But these three essential principles do not hold up in modern society. In many earthquake-prone countries, a surprisingly high number of school buildings are not constructed to withstand the most moderate of earthquakes. The fundamental question that we must ask ourselves is "Why is it so simple to acknowledge the importance of the education and safety of our children, yet so difficult to ensure?" (304)

"... schools built world-wide routinely collapse in earthquakes due to avoidable errors in design and construction ... because existing technology is not applied and existing laws and regulations are not sufficiently enforced ... Unless action is taken immediately to address this problem, much greater loss of life and property will occur." (Report on Earthquake Safety in Schools, Organisation for Economic Cooperation and Development OECD)

Trembling With Fear: The recent earthquakes across China's Sichuan Province are a tragic reminder that serious flaws in school buildings worldwide still make them death traps. Under the frontpage headline "Schools of Death," The Straits Times recently reported on the inconsolable grief parents suffered as they stood in silence waiting for rescuers to pull one teenage corpse after another from the wreckage of the collapsed Juyuan Secondary School where 900 students lay buried under a mountain of rubble: "All it took was a single telltale sign – a bag, a shoe or a shirt – for hearts to shatter as the lifeless body of a son or daughter was recognised. The wailing would draw other parents to crowd around, as if to make sure the victim was not their child. 'He is such an outstanding boy! Such an outstanding boy!' the mother ... wailed, throwing herself over her child's body." (305)

Amid rising anger over "buildings that were like tofu," many people around the world are asking how many more children have to needlessly die in schools that crumble in earthquakes before remedial action is taken to strengthen school structures to withstand tremors. One construction expert said: "Looking at pictures of the collapsed buildings, it's unlikely that any of them had followed even basic requirements to withstand tremors." (306) Given China's one-child policy, thousands of couples lost their only child. – Approximately 7,000 schools were destroyed in the earthquake that struck Sichuan Province on 12 May 2008. (307) The toll is a stark reminder that school buildings are a matter of life and death. The enormous loss of life in collapsed schools could have been significantly reduced by observing simple construction principles or retrofitting existing structures to be earthquake resistant. The death of 17,000 children crushed to death in collapsed schools (308) is especially tragic in light of the fact that students are the very essence of what propels a country from poverty to prosperity.



■ Future Learning Builds On School Safety:

Schools in coastal communities are in danger from the land, the air and the sea. They need to be built or retrofitted to withstand powerful forces of nature like tremors, tsunamis and cyclones.

Education In Ruins: While earthquake hazards traditionally receive most attention, less emphasis is focused on meteorological hazards (wind storms, lightning strikes, floods, etc.) and geophysical hazards (landslides, volcanic eruptions, tsunamis, etc.) Schools in coastal proximity can be particularly vulnerable, being exposed to hazards from the land, the air and the sea. A short excerpt from a long list compiled by the Inter-Agency Network for Education in Emergencies (INEE) reveals "education in ruins": *Some 500 schools were destroyed and more than 2,000 damaged by Cyclone Sidr in Bangladesh (2007); some 10,000 school buildings were destroyed by a severe earthquake in Pakistan, killing 17,000 students and seriously injuring or disabling 50,000 (2005); more than 850 schools were destroyed and over 2,100 damaged by the Asian Tsunami, leaving 150,000 children without schools (2004); more than 1,200 school buildings were lost to floods in Bangladesh, 24,200 were damaged (2004); severe floods affected more than 500,000 students in 1,000 schools in Cambodia (2000).* The list goes on. (309)

Culture of Safety: More recently, the United Nations Children's Fund (UNICEF), highlighted that more than 4,000 schools were destroyed or damaged by Cyclone Nargis in Myanmar, affecting a staggering 1.1 million children (2008). (310) [See Nwai's Story on the next page.] These snapshot figures pertaining to the dawn of the *third* millennium represent an unacceptable loss of life and hope. According to the INEE, 875 million of the world's school-age children live in countries with high levels of seismic risk, with additional millions regularly affected by floods and cyclones. The study says: "Many students drop out, never to return." (311) According to the Director of the United Nations International Strategy for Disaster Reduction (ISDR) Salvano Briceño, "several hundred million children ... attend schools in buildings that are unable to withstand the forces of nature." (312) If the second Millennium Development Goal ("achieve universal primary education") is to be reached, it must be reached in *safe* schools. This requires a stronger commitment to stronger construction.

**“Every child has the inherent right to life.”
 “Make primary education compulsory and
 available free to all.”** ⁽³¹³⁾

—Articles 6 & 28, Convention on the Rights of the Child

Irrawaddy Delta, Myanmar: Cyclone Nargis took Nway's (7) home, parents and three siblings. Her dream of becoming a doctor is still alive.

Photo: Ashley Clements

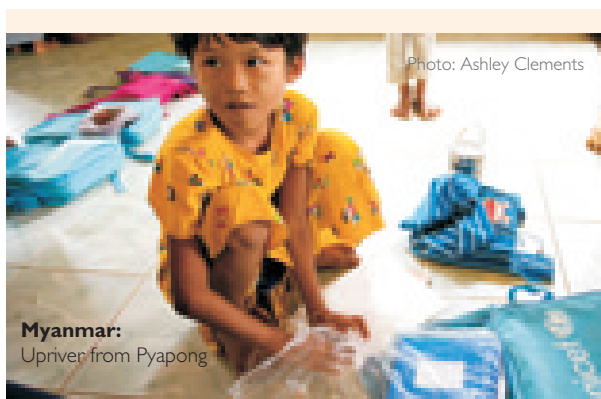
Nway's Story

“I want to be a doctor.” This time last year was the most exciting time in Nway's life – she had just been enrolled with fifty other children in the L-shaped school of her small village of Nat Sin in the tranquil Irrawaddy Delta on Myanmar's coast. “I loved going to school,” Nway remembers with a smile. Surrounded by rice paddies and the Bogale river, the one-storey brick building seemed like paradise to the seven-year-old girl... ⁽³¹⁴⁾

Broken Dreams: One year on, the school where Nway used to have fun with books and games lies in pieces on the ground. Even worse, Nway has no home or family left. Cyclone Nargis took everything away from her. These days Nway comes to her old school not to learn but to search through the debris, the adults in the village too busy scratching up a living to offer education to the children. (See photo, lower left.) Coming from a rice-farming family near Bogale, Nway was the second youngest of four children. On 2 May she was with her aunt as the wind started blowing around 4 pm. At first villagers thought it was just another thunderstorm, but then the wind became increasingly ferocious and the water began to rise. After hours of tearing winds and torrential rains, most houses in the village had already lost their roofs. Nway recalls: “As our house started breaking to pieces, my uncle took me to the house of the village head, a two-storey brick building 100 meters away. It was dark and

noisy. The water was already 1.5 metres deep and we went under several times. Water came into my mouth.” Nway remembers waiting and praying in the house of the village head, squeezed with more than 100 villagers. Outside the waters continued rising to 3.5 metres. At midnight the wind stopped – nobody dared to go outside. When the sun finally came up, Nway discovered that the village head's house was the only building left. A quarter of the population of 400 had drowned, among them Nway's parents and three siblings. The storm surge had swept everything away – people, rice, farming tools, cows, buffalos... Normally, this is the planting season and people are working and children are studying. But now the fields are damaged and the school is gone. Asked about her future dreams, Nway hesitantly answers: “I want to be a doctor...” But that dream has never been more elusive as the middle school of Nat Sin – once teeming with 1,000 school children – lies in ruins. ⁽³¹⁴⁾

Valuable And Vulnerable: Nway's story shows that the economic loss of a disaster-destroyed school is but the tip of a huge iceberg of human bereavement. In all societies, children represent the joy of today and the hope for tomorrow. Schools provide children with the hope that has inspired generations of poor people around the world – hope of obtaining education and thereby escaping the clutches of poverty. If the schools are crushed, so are the dreams of a brighter tomorrow. Nowhere else is the prospect of a friendlier future more grievously foreclosed than in the crumble of crushed schools. If we consider that the loss of each child represents the loss of 40-60 years of life and productivity – benefiting family, community and economy – the opportunity costs to society are clearly prohibitive. Cutting construction corners and risking disaster-destroyed schools is a surefire recipe for stunted economic growth and human development reversals. What is needed is a firm dual commitment on the part of duty bearers to construct disaster resistant schools and mainstream disaster risk education into school curricula.



Myanmar:
Upriver from Pyawng

■ **“School-In-A-Box”:** A girl at one of 84 World Vision “Child Friendly Spaces” programme sites presents the contents of a UNICEF-provided school kit: bag, exercise book, pens, pencils, erasers, ruler, sharpener, umbrella / rain coat, slippers. In one night, many children lost their homes, possessions, schools, and two generations of their families. Forty percent of those affected by Cyclone Nargis are children. (315)

Down With Downtime: Educational wastage is also incurred by idle or misappropriated schools. In the aftermath of many disasters nearby schools are often “taken over” and “converted” (if buildings remain intact). Governments need to calculate carefully the total “cost” of assigning schools secondary or multipurpose roles. Save the Children Sri Lanka observes that converting schools into reception camps or welfare centres for displaced people denies children their right to an uninterrupted education. “Schools used as temporary shelters deprive thousands of children of their place to study.” (316) Over time, recurrent disruptions to education lead to lower quality education. A study carried out in Cambodia shows that 60 percent of schools in disaster-prone areas are closed for more than two months annually due to flooding (only 10 percent can relocate to secondary venues). Road damage and river crossings impede access to education further, leading to “high absenteeism rates especially among poor students.” (317) Children who are prevented from attending school are afforded fewer opportunities and are less likely to find employment as adults. The long-term psychological and societal ill-effects on people precluded from education can be severe. Existing data from the Ministry of Education in Myanmar shows that Cyclone Nargis destroyed or damaged 75 percent of schools in affected areas. (318) If deficiencies on that scale are not decisively counteracted, natural disasters can transmute into macroeconomic disasters. But creative innovations are being spawned. If Mohammed Rezwan has proved that schools can be put “on boats,” (next page) the United Nations Children’s Fund (UNICEF) has proved that they can also be put “in boxes.” Emergency school bags (‘School-in-a-box’) are increasingly successful initiatives by the international development community collaborating with governments to downscale downtime. At the time of writing, World Vision is partnering with UNICEF to distribute 10,000 emergency school kits through 84 World Vision-run “Child Friendly Spaces” programmes. The “spaces” offer safety, space, toys, play, protection and a return to normalcy to 12,000 children in Yangon and the Irrawaddy Delta. (319)



FUTURE FLOATING

Bangladesh, Boat Schools: The fleet currently offers education to 1,530 students and books to 13,560 library users

(Photo: Abir Abdullah)

“Protecting our children during natural hazards ... requires two distinct yet inseparable priorities for action: disaster risk education and school safety.” (320)

—Salvano Briceño, Director UN ISDR

Rivers Of Information

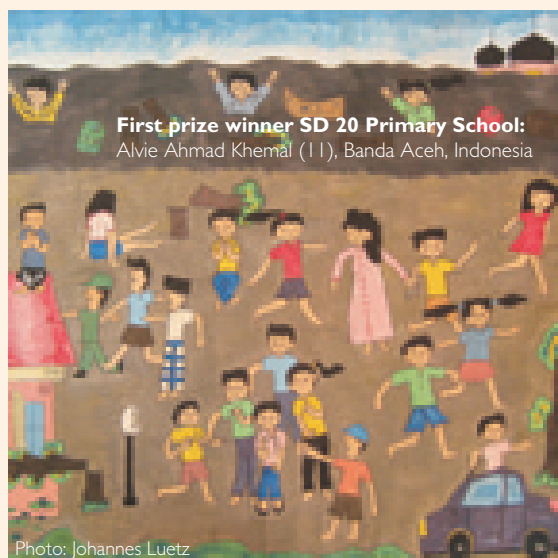
“Climate change has increased flooding in recent years – now we have floods two to three times a year. Over the next 10-20 years, 20 percent of our land will be lost to the sea because of climate change – issues like this need local solutions by local people ... We hope our work in using boats to adapt and cope with climate change and improve the quality of life will serve as an inspiration.” (Mohammed Rezwan, Founder Shidhulai) (321)

Fleeing Flooding: With hundreds of schools under floodwater annually during the monsoon, Bangladesh recently innovated a revolutionary solution to adapt to its worsening flood problems: a flat-bottomed fleet of 42 boats that are school bus and schoolhouse in one, providing education and other services to more than 1,500 students in nearly 400 villages and benefiting 88,000 families. Fiction? “The future!” says Mohammed Rezwan, Executive Director of Shidhulai Swanirvar Sangstha NGO, meaning “self-reliant organisation.” Using custom-built, indigenous boats, Shidhulai brings education to children who would otherwise go without. Mohammed Rezwan says: “I thought that if the students cannot come to the school for lack of transportation, then the school should come to them.” With roads impassable for 3-4 months annually during the monsoon, students often cannot make the trek to school, leading to high dropout rates. “How can you ac-

cept this situation?” Rezwan says. “I’ve seen many friends and relatives just fall by the wayside, forced to embrace a wretched, miserable life simply because they were denied access to education. But our rivers do not have to be barriers to information. They can become channels of communication.” (322) According to the Network for Information, Response and Preparedness Activities on Disaster, the 2007 floods saw 332 schools in Bangladesh destroyed and 4,893 damaged. (323) According to the Intergovernmental Panel on Climate Change (IPCC), things will get worse: “Coastal areas, especially heavily populated megadelta regions in South, East and South-East Asia, will be at greatest risk due to increased flooding from the sea and, in some megadeltas, flooding from the rivers.” (324) Bangladesh is squeezed between surging glacial meltwaters from the north and rising sea levels from the south. As the waters move up and the rivers widen – several of them are more



Photo: (UNDP)
Asri Wijayanti



First prize winner SD 20 Primary School:
Alvie Ahmad Khemal (11), Banda Aceh, Indonesia

Photo: Johannes Luetz

■ **Disaster Games Can Be ‘Serious Fun’:** (329)

Palang Merah Indonesia (PMI) "Snake Game" (top) and drawing competitions (bottom) can arouse children's innate curiosity

than 10 kilometres wide – more and more land is being pulled from underneath an increasingly deracinated population. According to one source, 100,000 people become homeless from the effects of river erosion annually. (325) What seems like a post-modern replica of Noah's ark or a post-apocalyptic snapshot from the 1995 movie "Waterworld" in which the continents are submerged by rising sea levels and the survivors live on a floating atoll at sea, is proof to Rezwan that living on water is possible. He says: "The future is afloat. Climate change leaves us no choice. River erosion claims more than 100 square kilometres of land each year, sometimes swallowing entire towns. We have to learn to live on water." (326) In 2005 the boat schools received the "Bill & Melinda Gates Foundation Access To Learning Award" in recognition of "floating" information technology to empower some of the country's most disadvantaged communities.

Expanding Horizons: The best time to teach children about disaster risk reduction is at an early age. As instructed and empowered children grow up, they are in a strong position to share their knowledge with families and friends. As a result, "the entire community can learn and benefit from the knowledge of how they can best reduce hazard impacts, potentially saving their lives." (327) Reaching and teaching children when they are young can also expand their worldviews with liberating ideas and forestall the formation of unsound attitudes or gender biases. Patriarchal attitudes and discrimination against women can significantly impede a community's response to a disaster. A focus group discussion with a community development group in Bangladesh brought to light that many women, "when the [cyclone] evacuation signal is given ... have to wait at home until a man in the family 'allows' them to leave... to the cyclone shelter." (328) Gender biases and discrimination against women are more difficult to unlearn during adulthood than during childhood. While it is never too late to invest in value formation, teaching children early in life is clearly the most opportune time to inculcate in society a wholesome and equitable culture of safety.



“The creation of a thousand forests is in one acorn.” (333)

—Ralph Waldo Emerson

Banda Aceh, Indonesia: Classroom-based disaster preparedness teaching

PLANTING PREPAREDNESS

Photo: Asri Wijayanti (UNDP)

Seriously Good Fun

“Education and training: Promote the inclusion of disaster risk reduction knowledge in relevant sections of school curricula at all levels and the use of other formal and informal channels to reach youth and children with information; promote the integration of disaster risk reduction as an intrinsic element of the United Nations Decade of Education for Sustainable Development (2005–2015).” (Hyogo Framework for Action) (330)

Engendering Engaging Education: An important part of teaching children the basics of disaster preparedness is to make it serious fun! Arts and crafts, essay competitions, story telling sessions, quizzes, drawing contests, poetry compositions and public recitals, poster designs, evacuation exercises, disaster drills, exhibitions, fairs, road shows, awareness weeks, fire fighting drills and extinguishing exercises, first aid simulations, road safety walks, group games, disaster libraries, movie screenings, hazard mapping exercises, singing contests, skits, role plays, stage performances, swimming lessons, dances, and earthquake simulations in quivering contraptions (i.e., shaking car), etc. are only some of many teaching activities that can be 'seriously good fun.' Designating prizes or inviting parents, special guests of honour, fire fighters, police officers or local politicians to officiate at award ceremonies or preside as juries can create media interest and far-reaching ripple effects.

Playful Participation: The UN International Strategy for Disaster Reduction (ISDR) stresses the value of *involving* children: “Their *participation* in disaster reduction is ... essential to increase the long-term resilience of communities.” (331) Preparedness education means championing a new generation of can-do kids who can squarely face adversity and 'keep cool' in the heat of the moment. According to UNESCO Asia Pacific Director Dr. Sheldon Shaeffer, children are “tomorrow's leaders” and today's “key agents for change.” (332) Given the enormous preparedness pay-off, more efforts are needed to mainstream disaster risk reduction into school curricula. Fostering societal transformation and resilient communities begins at the grassroots. As the theme for the World Disaster Reduction Campaign states: “Disaster Risk Reduction Begins at School.” (334) A single seed of educated thinking – as Tilly Smith has shown – can sprout to protect a large community from disaster.



Excerpt World Vision Cyclone Nargis Response (as of 6 August 2008):

- *Distributed* food to 322,300 people (target number: 338,166 beneficiaries)
- *Dispatched* shelter materials to more than 40,000 households
- *Established* 84 Child Friendly Spaces (CFS) programmes
- *Offered* 12,000 children safety and rehabilitation through CFS sites
- *Involved* more than 600 national staff; 9 international staff
- *Budgeted* US\$28.5 million for relief and recovery operations

“ Let my heart be broken by the things that break the heart of God. ”

—Dr. Bob Pierce
Founder of World Vision

Irrawaddy Delta, Myanmar: Cyclone Nargis caused widespread destruction. This boy stands in front of the remains of his village church.

Photo: Ashley Clements

SYNTHESIS: CONVERGING FORCES

With a worldwide length of one million kilometres – 25 times the Earth's circumference – (335) coastlines have attracted human settlements for millennia. With ten percent of people worldwide living less than ten metres above sea level (75 percent of whom live in Asia) (336) and 21 percent living less than 30 kilometres from the sea, (337) the extreme popularity of coastal regions is perhaps best evidenced by population growth rates of around "twice the global average." (338) While coastlines have long been vulnerable to natural disasters such as tsunamis, wind storms, floods and erosion, recent years have introduced a new threat which is fast converging on coastal communities: climate change. The word "converge" is derived from Latin "con" (together) and "vergere" (incline). According to the Oxford Dictionary the verb "converge" denotes a situation when several things "come together from different directions so as eventually to meet." (339) Explosive population growth, haphazard over-development, proliferation of slum settlements, city subsidence, degraded ecosystems, intensifying wind storms and rising sea levels are fast "coming together from different directions so as eventually to meet." Cyclone Nargis was a "curtain raiser" on the future.

FAST PACED DEVELOPMENT



(Photo: Amio Ascension)

Dhaka, Bangladesh: Cities in the "low elevation coastal zone" experience unprecedented urbanisation. With 300,000-400,000 new migrants arriving annually, Dhaka is the fastest-growing megacity in the world.

UNPRECEDENTED

URBAN

“Urban Millennium”

“The increase of large-scale disasters in recent years [shows] dramatically how the ongoing global environmental change and also inadequate coastal defence, lack of early warning and unsustainable practices ... affect people all over the world ... We do not only need to think the unthinkable, and prepare to face it should it occur, but we need to explore how to be better prepared.” (Dr. Hans van Ginkel, United Nations University) ⁽³⁴⁰⁾

Megacities: Preparing coastal communities for future catastrophes requires an understanding of the forces converging on them. The year 2007 represents a turning point: for the first time in the history of Planet Earth the majority of people live in cities – the “urban millennium” has dawned. The United Nations Human Settlements Programme (Habitat) projects that by 2030, 5 billion people will be living in cities. ⁽³⁴¹⁾ According to the Director of the Centre for Livable Cities, Andrew Tan, urbanisation is heavily concentrated in Asia. He says: “Today, Asia has more than half of the world’s largest cities, including 10 megacities ... By 2015, Asia is expected to have 12 megacities. The UN estimates that Asian cities will double in size by 2030.” ⁽³⁴²⁾ According to the Vice President of the Asian Development Bank, Ursula Schaefer-Preuss, about 1.1 billion more people will be living in Asia’s cities within the next 20 years, ratcheting up both congestion and pollution. She says: “Cit-

ies and their inhabitants are responsible for about three-quarters of the world’s greenhouse gas emissions. And cities, especially in Asia, will be hardest hit when sea levels rise, with tens of millions of people likely to be forced from their homes ... The world simply cannot sustain current urban development trends ... Every five to seven years, the number of cars on Asia’s roads doubles. In some countries the rate is even faster. Car population has been forecast to increase by 15 times in China and 13 times in India over the next 30 years, unless there is a change in current trends. [The city of Beijing alone adds 1,200 new cars to its roads daily. ⁽³⁴³⁾ Even if financing and land were available, it is not feasible to build enough roads to keep pace with such demand. The resulting traffic congestion and pollution would be unimaginable. And with more cars come more greenhouse gas emissions.” ⁽³⁴⁴⁾ Big things are happening in Asia and coastal communities will feel the heat.



(Photo: Andrea Dearborn)

“A one metre sea level rise would result in nearly 6,000 square kilometres in India alone being flooded, including parts of major cities such as Mumbai, Kolkata and Chennai.” ⁽³⁴⁵⁾

—Dr. Sujatha Byravan, Science, Technology and Development Advisor

VULNERABILITY

Chennai, India: Poor community along the banks of the Cooum River. South Asia is home to the largest number of people living in poverty, many of whom live in the coastal zone.

Sprawling Slum Settlements

“Climate change and urbanisation are dominant trends of global change. The interplay of the two trends in the major coastal cities of the developing world could cause an almost unmanageable situation, particularly if the arsenal of responses is limited by social, economic and institutional deficits.” (German Advisory Council on Global Change; *The Future Oceans – Warming Up, Rising High, Turning Sour*) ⁽³⁴⁶⁾

Mega-Challenges: Not only is the world urbanising at an unprecedented rate – it is also doing so *towards the coast*. By the year 2030, approximately 50 percent of the world population could be living within 100 kilometres of the coast. ⁽³⁴⁷⁾ Megacities in the “low elevation coastal zone” (LECZ) such as Dhaka, Jakarta, Manila, Mumbai, Kolkata, Beijing, Shanghai, etc. are on the frontlines of future climate changes that will render more people more vulnerable to more disasters. Even though such cities may sit well away from the coast, they still fall within the LECZ on account of their low-lying land and are at great risk. Secretary-General Ban Ki-moon synthesises: “urban slums are expanding into areas vulnerable to floods, landslides, industrial pollution and other hazards.” ⁽³⁴⁸⁾ The rapid proliferation of slum settlements in the developing world dramatically exacerbates existing vulnerabilities. UN Habitat predicts that 95 percent of the world’s urban growth in the

next two decades “will be absorbed by cities of the developing world, which are least equipped to deal with rapid urbanization.” ⁽³⁴⁹⁾ Habitat says the growth in slums is unprecedented: “Nearly one billion people alive today – one in every six human beings – are slum dwellers, and that number is likely to double ... Unprecedented urban growth in the face of increasing poverty and social inequality [will] increase ... the number of people living in slums to about 2 billion by 2030.” ⁽³⁵⁰⁾ Furthermore, extreme high levels of development and excessive groundwater withdrawals are working in concert to cause several coastal cities across Asia to subside (e.g. Jakarta, page 76). According to a recent World Bank report, Shanghai subsided by “as much as 2.8 m during the 20th century,” promoting “a substantial increase in the incidence of flooding.” The report says other coastlying “sinking cities” include Tokyo (5 m), Osaka (2.8 m), Bangkok (1.6 m), Tianjin (2.63 m), Manila (0.40 m), etc. ⁽³⁵¹⁾

“Climate change is not just an environmental issue, as too many people still believe. It is an all-encompassing threat. It is a threat to health, since a warmer world is one in which infectious diseases such as malaria and yellow fever will spread further and faster. It would imperil the world’s food supply, as rising temperatures and prolonged drought render fertile areas unfit for grazing or crops. It could endanger the very ground on which nearly half the world’s population live – coastal cities... which face inundation from sea levels rising as a result of melting icecaps and glaciers. All this and more lies ahead. Billion-dollar weather-related calamities. The destruction of vital ecosystems such as forests and coral reefs. Water supplies disappearing or tainted by saltwater intrusion.” ⁽³⁵²⁾

—Kofi Annan, Seventh United Nations Secretary-General

FUTURE VISIONS

Sherpur District, Bangladesh: The harvest is near. (Photo: Amio Ascension)

Emissions Decreases Requested

“We, the human species, are confronting a planetary emergency – a threat to the survival of our civilization that is gathering ominous and destructive potential even as we gather here. But there is hopeful news as well: we have the ability to solve this crisis and avoid the worst – though not all – of its consequences, if we act boldly, decisively and quickly.” (Al Gore, Nobel Peace Prize Laureate 2007, Nobel Lecture) ⁽³⁵³⁾

Cautious: For the past 20 years political leaders have reiterated statements of principle, calling for global greenhouse gas emissions reductions. For the past 20 years global greenhouse gas emissions have continued to top annual records, rising from 23 gigatonnes (1990) to 32 gigatonnes (2008, est.). ⁽³⁵⁴⁾ Comparing the situation now to that of 20 years ago, NASA-scientist Dr. James E. Hansen highlights the only tangible difference: “The difference is that now we have used up all slack in the schedule for actions needed to diffuse the global warming time bomb.” ⁽³⁵⁵⁾ Even as political warm words continue to abound, a synthesised projection of future world energy demand – the main source of CO₂ emissions – points coastal communities in a worrying direction. According to the Fourth Assessment Report of the UN Intergovernmental Panel on Climate Change (IPCC), global temperatures will increase by 1.8-4°C during the 21st century. The IPCC cautions that a

“dangerous” threshold of 2°C warming must not be crossed. Given the longevity of CO₂ in the atmosphere – 1/3 remains in the air after a century and 1/5 after a millennium ⁽³⁵⁶⁾ – much unavoidable warming from past emissions is already in the “pipeline.” The IPCC report warns that preventing global warming from crossing the perilous 2°C threshold requires keeping atmospheric CO₂ concentrations below 350 ppm (parts per million). The problem is, they already stand at 385 ppm (2008), rising by 2 ppm annually. Since there are no rewind buttons for running down emitted greenhouse gas stocks, implicational reasoning suggests immediate and stringent emissions cuts. According to the IPCC, global greenhouse gas mathematics mandate global emissions reductions of 50-85 percent by 2050 (based on 2000 emissions). ⁽³⁵⁷⁾ [Reputable scientists are warning that even the 2-degree-threshold may likely not be safe enough to avoid “global disaster.” ⁽³⁵⁸⁾]

“There remains a frightening lack of leadership ... The question is not whether climate change is happening or not, but whether, in the face of this emergency, we ourselves can change fast enough.” ⁽³⁵⁹⁾

—Kofi Annan, Seventh United Nations Secretary-General



OR HALLUCINATIONS

Desert Wasteland:
(Photo: Clint Spencer)

Emissions Increases Projected

“A level of per capita income comparable with that of the industrialised countries would, on today’s model, require a level of energy use beyond the world’s energy resource endowment and the absorptive capacity of the planet’s ecosystem.’ ... It is impossible to go on as now.” (Michael Richardson, Institute of Southeast Asian Studies, synthesising the *World Energy Outlook 2007* of the International Energy Agency, IEA) ⁽³⁶⁰⁾

Carbonacious? The Nobel Peace Prize-winning directive of 2,500+ IPCC scientists from 130 countries points in the direction of immediate and stringent greenhouse gas emissions cuts. World trends point everywhere else. Power generation is the main source of CO₂, accounting for 40 percent of global emissions. There is broad agreement that world electricity demand will double by 2030. The International Energy Agency (IEA) projects cumulative investments to meet future world electricity demand to run to US\$11 trillion from 2005 to 2030. ⁽³⁶¹⁾ The IPCC-estimate for the same period is US\$20 trillion. ⁽³⁶²⁾ Coal is the world’s most widely used and most carbon-intensive source of power generation. In 2006, China built two new coal-fired power plants every week. Hundreds more are planned worldwide. ⁽³⁶³⁾ Locking CO₂-intensive energy infrastructure into place implies a strong commitment to future CO₂ emissions. According to the U.S. Energy Information

Administration (EIA), annual coal consumption is set to “increase from 123 quadrillion BTU [British Thermal Units] in 2005 to 202 quadrillion BTU in 2030” and oil consumption could surge from 87 to “112.5 million barrels per day in 2030.” ⁽³⁶⁴⁾ According to energy specialist Michael Richardson, even more dramatic scenarios are conceivable: “If per capita oil use in China and India were to increase to the current level in the U.S., their oil demand would rise [to] almost twice the present level of world oil consumption [and] would deplete remaining proven world reserves of conventional oil in less than 15 years.” ⁽³⁶⁵⁾ The EIA says global CO₂ emissions will increase “from 28.1 billion metric tons in 2005 to ... 42.3 billion metric tons in 2030 – an increase of 51 percent.” ⁽³⁶⁶⁾ The synthesis: The IPCC says global CO₂ emissions decreases of 50-85 percent by 2050 are *indispensable*. The EIA says global CO₂ emissions increases of 51 percent by 2030 seem *inescapable*.

“As the oceans get warmer, storms get stronger ... A growing number of scientific studies are confirming that warmer water in the top layer of the ocean can drive more convection energy to fuel more powerful hurricanes.” ⁽³⁶⁸⁾

—Al Gore, Nobel Peace Prize Laureate 2007

Tropical Cyclone Nargis in the Bay of Bengal, three days before making landfall in Myanmar. Photographed 30 April 2008 from aboard the International Space Station (ISS). Winds gusting to 148.4 kilometres per hour, forecast to strengthen; max. wave height: 8.2 metres. (Photo: NASA, ISS orbit altitude: 350 kilometres)

Intensifying Wind Storms

“The destructive force of ... weather extremes increases as a direct consequence of sea level rise ... Changes in oceanic and atmospheric circulation patterns caused by climate change can influence storms and their destructive potential at regional and local scale. For example, an increase in the strength of tropical cyclones is anticipated.” (German Advisory Council on Global Change) ⁽³⁶⁹⁾

Implicational Corollary: Unless there is an immediate political sea change towards decarbonising the global economy, greenhouse gas trajectories are poised to lock the Earth into "runaway climate change" on an order of magnitude NASA-scientist Dr. James E. Hansen says could "spiral dynamically out of humanity's control ... Elements of a 'perfect storm,' a global cataclysm, are assembled." ⁽³⁷⁰⁾ Global warming is a global warning. Holistic, whole-of-government approaches are needed. Coal exporting nations like Australia need to consider that the mass incineration of export coal overseas (Australia's annual coal exports are expected to increase to 287 million tonnes by 2010) ⁽³⁷¹⁾ will boomerang back to fuel extreme weather events at home. The implications for coastal communities are twofold: first, growing certainty of accelerating ice sheet melt-down with many metres of sea level rise, and second, steep influx in intensifying wind storms. The IPCC projects

both: "increased incidence of extreme high sea level" and "intense tropical cyclone increases." ⁽³⁷²⁾ The German Advisory Council on Global Change synthesises the science: "Theory, observational data and model calculations ... indicate that climate warming leads to stronger hurricanes [cyclones, typhoons]. The effects revealed by measured data are even stronger than theoretically expected. With a warming of the tropical sea-surface temperature of only 0.5°C the hurricane energy has increased globally by 70 percent in recent decades ... A new data analysis also confirms that the temperature rise is the main reason for this observed energy increase." ⁽³⁷³⁾ According to Munich Re, the world's largest reinsurance company, the first year of 2008 has already been marked by "a large number of weather-related natural catastrophes ... To this extent, the year is following the *long-term trend towards more weather catastrophes*, which is influenced by climate change." ⁽³⁷⁴⁾



PLANT TREES



Irrawaddy Delta, Myanmar: Mangroves are salt-tolerant coastal forests. Their partially submerged root systems protect coasts from erosion and flooding. This satellite photo (3 March 2000) shows how the destruction of mangroves has left the low-lying delta exposed to the sea. Mangrove forests appear deep green, traced by blue-green, sediment-laden streams; bare ground appears pinkish tan. ⁽³⁷⁵⁾

Photo: NASA, Landsat 7

Degraded Ecosystems

“It’s nearly impossible to work legally in a region where the majority of land has no clear owner. The guy who doesn’t have any title to the land just cuts it all down because the land doesn’t even belong to him, and so there’s nobody to fine.” (F. Sufredi, Sawmill Owner) ⁽³⁷⁶⁾ “The question of who owns the carbon – whether emitted or avoided – has been little debated...” (Rights and Resources Initiative, RRI) ⁽³⁷⁷⁾

Eco-Collapse: According to the Rights and Resources Initiative (RRI), a global coalition of environmental and conservation NGOs, forests cover 30 percent of the world’s land area and provide more than one billion people with food and income. ⁽³⁷⁸⁾ For coastal communities the degradation of mangrove forests and coral reefs implies the progressive removal of nursery grounds and “safe havens” for juvenile fish which later migrate to deeper water, as well as the thinning out of coastal shelterbelts which offer protection from floods and storms. Researchers in Myanmar estimate that 83 percent of mangroves in the Irrawaddy delta were destroyed between 1924 and 1999, falling prey to agricultural encroachment, aquaculture farms and urban development. ⁽³⁷⁹⁾ Mangroves also absorb pollutants and heavy metals. The Post-Nargis Joint Assessment (PONJA) report notes their benefits: “Mangrove forests ... can dissipate the force of storm surges and heavy winds by virtue

of their stilt roots, and broad branches and trunk structure. Their ability to serve as windbreaks when they occur in dense stands of tall-canopied trees makes them particularly beneficial during cyclones, and their capacity to trap sediments in their prop roots and accelerate the accretion of coastline seaward makes them a first line of defence against sea level rise and adaptation to climate change. An important supplemental dividend is their ability to store carbon from the atmosphere, creating the opportunity for carbon emission credits to communities who restore and protect them.” ⁽³⁸⁰⁾ The Rights and Resources Initiative advocates recognising and strengthening the territorial rights of indigenous forest dwellers as a crucial first step towards “putting the forest sector on a sound institutional footing [and achieving] effective public governance.” ⁽³⁸¹⁾ The world needs to protect forests so that forests can protect vulnerable populations.

“What we are witnessing is not an aberration, but rather a ‘curtain raiser’ on the future. These events are not abnormal; they’re what I call the ‘new normal.’ The number of recorded disasters has doubled from approximately 200 to over 400 per year over the past two decades. Nine of out every ten disasters are now climate related. Last year, my office at the UN issued an unprecedented 15 funding appeals for sudden natural disasters, five more than the previous annual record. 14 of them were climate-related.” (382)

—Sir John Holmes, UN Under-Secretary General for Humanitarian Affairs and Emergency Relief Coordinator

 50 km

Photo: NASA, MODIS Rapid Response Team

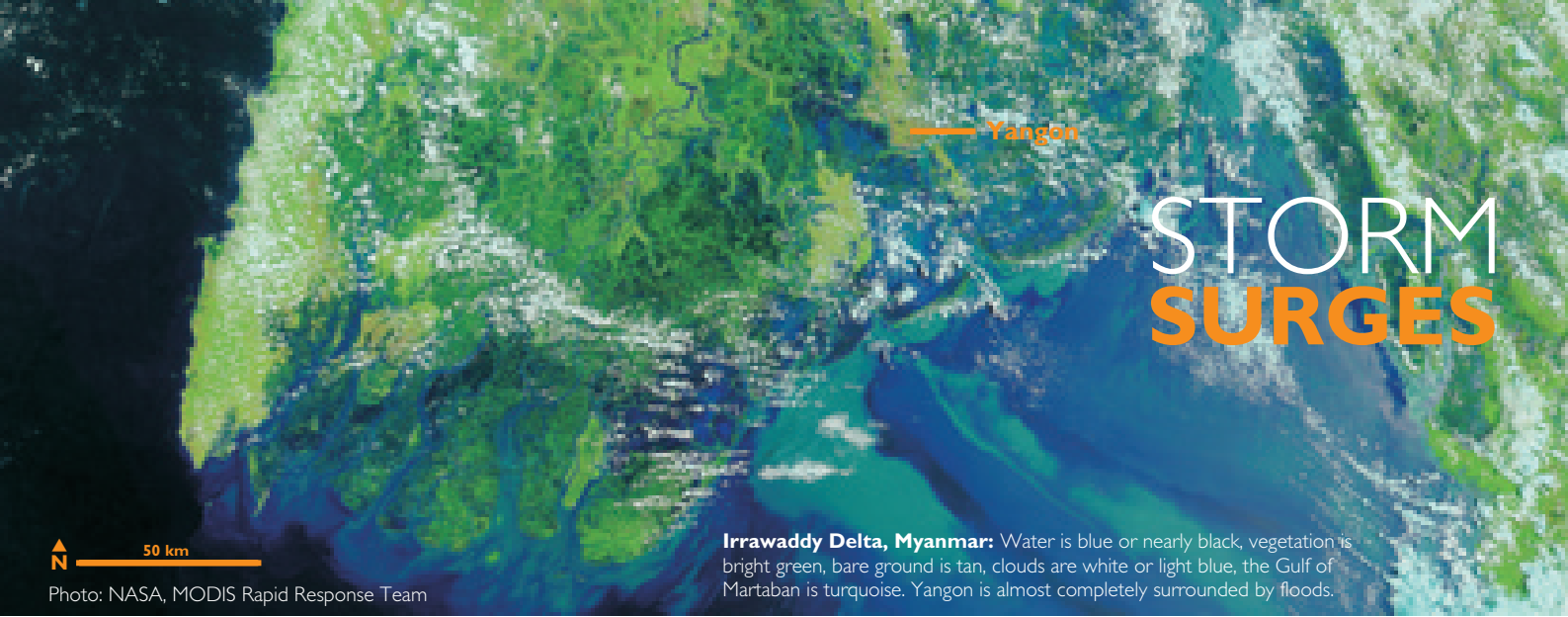
Irrawaddy Delta, Myanmar: These infrared light-enhanced images from the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite show the delta before (15 April 2008) and after (5 May 2008) Cyclone Nargis.

“Curtain Raiser”

“Climate change doesn’t happen in a vacuum. Rapid urbanisation, haphazard development, sprawling slums, city subsidence, pollution, degraded ecosystems, intensifying wind storms and rising sea levels are converging on coastal communities. Jointly these forces are setting the stage for future disasters, ‘coming together from different directions so as eventually to meet.’” (Dr. Brett Parris, World Vision Australia, Chief Economist) (383)

Cyclones: The noun "cyclone" traces its roots to Greek "kukloma" (wheel, coil of a snake) and "kuklos" (circle), (384) but it was the 19th-century British-Indian eccentric, Henry Piddington, who first coined it in Calcutta (now Kolkata) to represent "whirling storms." Piddington, purportedly one of the earliest storm chasers to gain prominence, was besotted with a circular phenomenon he once likened to a "beautiful meteorite." According to Indian novelist Amitav Ghosh, "Piddington was among the earliest to recognise that a cyclone wreaks most of its damage not through wind but through water, by means of the devastating wave known as a 'storm surge.' In 1853, when the British colonial authorities were planning an elaborate new port on the outer edge of Bengal's mangrove forests, he issued an unambiguous warning: 'Everyone and everything must be prepared to see a day when, in the midst of the horrors of a hurricane, they will find a terrific mass of salt water rolling

in...' But his warning was neglected and Port Canning was built, only to be obliterated by a cyclonic surge in 1867." Ghosh notes further: "The phenomenon of the storm surge has been extensively researched since Piddington's day, yet few public response systems have drawn the obvious lesson. To this day, the warnings that accompany a storm's approach typically say nothing about moving to high ground: Their prescription is usually to seek shelter indoors. As a result people tend to hunker down in the strongest structure within reach – only to find themselves trapped when the surge comes sweeping through." (385) (See figure 15 on page 65.) According to the recently published "Natural Disaster Hotspots" World Bank report, "millions of people have drowned due to storm surges around the world ... However, most fatalities have occurred in Asia, and the major hotspot for fatalities due to storm surges is the Bay of Bengal." (386)



STORM SURGES

Irrawaddy Delta, Myanmar: Water is blue or nearly black, vegetation is bright green, bare ground is tan, clouds are white or light blue, the Gulf of Martaban is turquoise. Yangon is almost completely surrounded by floods.

50 km
Photo: NASA, MODIS Rapid Response Team

Cyclone Nargis: According to the Australian Government Bureau of Meteorology, the "paths of cyclones are often erratic, which makes it hard to forecast exactly when and where [they] will cross the coast. This makes it difficult to predict how high the astronomical tide will be when the storm surge strikes, since the time difference between high and low tide is only a few hours ... The worst impacts occur when the storm surge arrives on top of a high tide." (387) According to the Bureau's Coordinator of Tropical Cyclone and Severe Thunderstorm Warning Services, Alan Sharp, "the majority – probably well over 90 percent – of the deaths [caused by Cyclone Nargis] would have been the direct consequence of storm surge ... The flat nature of the delta region, cleared of mangroves for agriculture, offers no impedance to the force of the storm surge, allowing it to penetrate well inland ... I am led to believe that the rainfall was not extreme, hence much of the inundation observed from the satellite imagery would be due to penetration of sea water." (388) Examining Terra and Aqua satellite observations, researchers have concluded that "Cyclone Nargis flooded about 14,402 square kilometres in the Irrawaddy River Delta," an area equal to one third of Switzerland. (389) According to the United Nations Food and Agriculture Organisation (FAO), about 2,000 square kilometres, or 16 percent of the delta's agricultural land,

were severely damaged in the Cyclone. Many fields suffered severe salinity damage from the surge that swept salt water up to 35 kilometres inland and will require "environmental remediation." (390) Survivors who managed to stay afloat during the storm often found themselves swept many kilometres from their homes when the waters receded. Frank Smithuis, head of mission in Myanmar for medical charity Médecins Sans Frontières, says the vast majority of the 140,000 people killed stood little chance: "We saw very, very few serious injuries – You were dead or you were in O.K. shape." (391) And Osamu Kunii, chief of the health and nutrition section of the United Nations Children's Fund (UNICEF) in Myanmar, says: "Only people who could endure the surge and high winds could survive. In one village with a pre-cyclone population of 700, all children under 7 died." (392) There is widespread agreement that climate change will exacerbate storm surge risk. The "Natural Disaster Hotspots" World Bank Report states: "By far the most certain aspect of climate change that will influence surge characteristics is global-mean-sea-level rise ... The overall conclusion is that the surge hazard will evolve significantly throughout the 21st century." (393) The German Advisory Council on Global Change notes: "In most cases the most destructive results of sea level rise will [be] the increasing occurrences of storm surges." (394)

FOREST MATTERS

“Trees can mean the difference between life and death.” ⁽³⁹⁵⁾

—Ashley Clements, World Vision Advocacy Advisor

Bogalay Township, Myanmar: 14-year-old Koko with his sister Pont Pont

Photo: Ashley Clements

“Cyclone Tree Survivor”

Pont Pont is two years old, too young to know that her mother and youngest brother disappeared in a devastating storm surge. She is also too young to realise that her 14-year-old brother saved her life when Cyclone Nargis swept tonnes of saltwater through her village, drowning her family and leaving only Koko. “Koko” means “big brother” in Myanmar – a fitting name as Pont Pont will one day find out... ⁽³⁹⁶⁾

On the night of 2-3 May 2008, Myanmar's Irrawaddy Delta experienced a phenomenon that the survivors will never forget. After fueling energy over the warm waters of the Bay of Bengal and veering off its original course, Cyclone Nargis made landfall on the coast of the low-lying river delta, releasing torrential rains and wind gusts of more than 200 kilometres an hour while pushing a terrific mass of saltwater 3-4 metres high, many kilometres inland. The cyclonic surge left 140,000 people dead or missing, among them Koko's family. He relates the events as they unfolded in his small village of Kunthee Chaung in Bogalay township:

“Around four o'clock water came rushing up from the river. A few minutes later the water was already up to my neck. As our house began to sway I urged my mother to follow me and climb up a tree. She followed me up the tree with my youngest brother in her arms. From the treetop we watched as our

house was swept away by the raging waters. A neighbour whose family had already disappeared in the floods was perched on a higher branch. Not long after, my mother lost hold of my four-month-old brother who fell into the rushing floodwaters. Immediately she jumped into the water to rescue him... I also wanted to jump in and save them but my neighbour screamed: 'Don't go after them, you will also drown!' So I just sat there with my arms tightly wrapped around my little sister. All I could do was watch my mother disappear in the floods, clutching a large plastic water container and hugging her son. I never saw her again – Heavy rains followed, it hurt me like acid. We felt very cold at night. When morning came and the water had receded, I just slumped down from the tree and passed out. My arms were without strength after hugging my sister and the tree for so many hours. Thankfully, my neighbour helped me hold Pont Pont for part of the night. When I came to myself I found that Pont

Pont and my neighbour were the only people around. My ears were full of blisters. We walked towards the river through the debris of tree trunks, wooden poles and dead animals and found a stranded boat. With no strength left and nothing to do we got in and just drifted downriver, eventually landing at Mawlgyn where my neighbour found some food for us. After a few days at a camp we returned to our village where, thankfully, we found my grandmother alive. I still don't know what happened to my father. On the day of the storm he left Kunthee Chaung together with my ten-year-old brother. I never saw them again. I don't want to believe my family mem-

bers are all dead... What will I do? Of course, I will farm the land. And I will look after Pont Pont."

Koko says the place he remembers from his childhood now looks like a haunted village. Some of his friends are gone. Out of nearly two thousand people, seven hundred are dead. Twisted trees and flattened buildings are vivid reminders of the destruction Nargis caused. With only Pont and his grandmother left, Koko is grateful for food, clothing, tarpaulins and temporary shelter that organisations like World Vision provided for the villagers. ⁽³⁹⁶⁾



■ **Low Elevation Coastal Zone:** This Ikonos Satellite image (14 December 2002) shows an area of agricultural land in the southern part of Yangon Division *before* Cyclone Nargis flooded and salinated it with seawater.



■ **Low Elevation Coastal Zone:** This Ikonos Satellite image (7 May 2008) shows the area four days *after* Cyclone Nargis. The photo shows the combined devastating effect of tree cover decimation and storm surge flooding.



“ Should we start mainly from the question ‘What can the economy cope with?’ or from the question ‘What is needed to avoid disaster and how can we make it happen?’ ... The economics of wartime are different from the business-as-usual economics of peacetime ... **A General Mobilisation** requires governments to take the threat seriously, to show leadership in communicating to the public and to industry what needs to be done, and to make tough decisions about how to do it. ”

—*Make Poverty History, See The Bigger Picture – Act On Climate Change* ⁽³⁹⁷⁾

Gazipur, Bangladesh: Five-year-old Mohammad Mosharaf enjoys a glass of fresh milk after his family received a cow from World Vision

Photo: Amio Ascension

CONCLUSION: LEADERSHIP MATTERS

The manner in which climate change has made its debut in the international arena is reminiscent of what the German Philosopher Arthur Schopenhauer (1788-1860) said was the inevitable lot of all truth. He said: "All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident." ⁽³⁹⁸⁾ Over recent decades, climate change gradually worked its way from ridicule and opposition to quasi-universal scientific assent. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) which took 2,500+ scientists from 130 nations six years to compile in four Nobel Peace Prize-winning volumes, can be regarded as the final nail in the coffin of a protracted climate change debate: "Warming of the climate system is unequivocal." ⁽³⁹⁹⁾ – The debate is over. Today, the biggest priority for humanity is translating the scientific consensus into decisive political action and comprehensive societal reform. Since systems, structures and markets conspire to maintain the status quo and prevent change, unprecedented leadership is needed to prepare coastal communities and the planet at large for the future. As one of the world's leading development organisations, World Vision is positioning to play its part in areas discussed in *Planet Prepare* – protection, research, empowerment, partnership, advocacy, reinforcement and education.



WANTED: LEADERSHIP

**“Courage is not the absence of fear –
it is inspiring others to move beyond it.”**

—Nelson Mandela, *Lessons of Leadership* ⁽⁴⁰⁰⁾

Irrawaddy Delta, Myanmar: The storm surge from Cyclone Nargis severely salinated many fields

Photo: Ashley Clements

Courageous Leadership

“The climate change that the world is already locked into has the potential to result in large-scale development setbacks, first slowing, then stalling and reversing progress in poverty reduction, nutrition, health, education and other areas ... Hoping – and working – for the best while preparing for the worst, serves as a useful first principle for adaptation planning.” (2007/2008 UN Human Development Report) ⁽⁴⁰¹⁾

Mitigation And Adaptation: Two predominant priorities for action emerge: mitigation and adaptation. The IPCC defines *mitigation* as “implementing policies to reduce greenhouse gas emissions and enhance sinks” ⁽⁴⁰²⁾ and *adaptation* as “initiatives and measures to reduce the vulnerability ... against ... climate change effects.” ⁽⁴⁰³⁾ Mitigation and adaptation are two sides of the same climate coin. Stated simply, adaptation deals with the effects of a disease that can only be cured through mitigation. As this report has shown, unavoidable climate change is locked into the climate system from past emissions. Even stringent emissions cuts cannot bend back temperature increases until they peak in the 2050s. In other words, for the first half of the 21st century the world is forced to *adapt* to changes long locked into the world’s climate “pipeline.” As this report has also shown, climate change is a one-way ticket to poverty for millions of people who are increas-

ingly feeling the heat. Climate change is real, and it is happening right now: Islands are becoming uninhabitable, islanders are evacuating their atolls, coastal populations are moving inland, coastal erosion is eating away properties, agricultural land is being salinated, freshwater supplies are being contaminated, a growing number of deracinated people are on the move, climate disasters are on the increase, “climate refugees” ^(a) are fleeing environmental decay, etc. In simple terms, *mitigation* addresses the climate change cause, *adaptation* soothes its effects. As one of the world’s largest development agencies, World Vision urges unprecedented global action in the areas of mitigation and adaptation if decades of development gains are not to be lost. *With regard to mitigation, World Vision urges policy makers to demonstrate courageous leadership to cut greenhouse gas emissions by 25-40 percent by 2020, and by 80-95 percent by 2050 (based on 1990 emissions).* ⁽⁴⁰⁴⁾

WORLD VISION'S RECOMMENDATIONS

In the area of *mitigation*, industrialised nations – as the main contributors to the climate crisis – carry a moral responsibility to inspire, lead and finance a global revolution of decarbonisation. Given the immensity of this task, nothing short of a mobilisation commensurate to a wartime General Mobilisation will suffice. In the area of *adaptation*, strong leadership is essential on numerous fronts. What follows is a summary of the main points and World Vision's recommendation for urgent action:

I. Protect Development: Emergencies are expensive – preparedness pays. According to figures consolidated by the World Bank's Independent Evaluation Group (IEG), the present-day costs of disasters are "now 15 times higher than they were in the 1950s – US\$652 billion in material losses in the 1990s." (405) Cumulative disaster losses now often reach macroeconomic dimensions, especially in Small Island States. (406) At present, only 4 percent of an estimated US\$10 billion in annual humanitarian assistance is devoted to preparedness. (407) Failure to halt the vicious circle of destruction and reconstruction continually drains off all hopes of a better tomorrow for millions of disaster-affected people. Since every dollar invested in disaster preparedness saves many dollars in disaster losses, World Vision recommends that donor governments allocate "new and additional" adaptation financing in the form of grants to help poor communities make adequate climate change preparations. Present commitments fall short of future requirements. *World Vision recommends global adaptation financing on the order of the post-WWII Marshall Plan.* (408)

2. Research Priorities, Probabilities & Possibilities:

Professor Poh Poh Wong, Coordinating Lead Author of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report paints a possibility-picture: "Coastal communities face the inevitable and seem helpless. But we should think and act more positively. Using the Chinese art of war perspective, we should fight water with water. A rising sea level means more area eventually flooded by seawater which can be utilised for aquaculture and related economic uses. The transition from dry land to drowned areas should be fully investigated for opportunities to provide better livelihoods to the coastal communities. Some coastal communities know their coasts better than the scientists. They have traditional ecological knowledge of the coastal and marine environment that can be further developed or adapted to a rising sea level. We need to document and identify this valuable information before it is lost ... If we think and act positively for the coasts, coastal communities will have a better future." (409)

World Vision recommends a holistic approach to coastal zone management and advocates that comprehensive research be carried out with built-in livelihood linkages in view.



Photo: World Vision Myanmar

■ **Yangon, Myanmar:** Tim Costello, CEO of World Vision Australia, visits Myanmar in the aftermath of Cyclone Nargis as Partnership Representative to assess the damage.

3. Empower Communities And Women: Communities are the first responders to disasters. Community empowerment begins with development agencies viewing the poor not as helpless victims to be pitied but as resourceful entrepreneurs to be engaged. It succeeds when poor communities are viewed as intrinsically powerful to enact their own development and disaster preparedness. Empowerment involves championing local level leadership which creates dignity both for the communities and development agencies partnering with them. Over time, trust relationships yield resilient, resourceful, responsible and response-able communities. Empowered women are at the centre of disaster-prepared communities. *World Vision calls on governments to uphold and fulfill women's rights as set out by the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW). By encouraging and insisting that women be consulted and engaged on disaster preparedness at the community level, governments can enable women to enjoy their human rights and contribute to the wider welfare of their families and communities.*

4. Partner And Network: The climate crisis calls for unprecedented global energy partnership. Many of the poorest countries struggle to provide stable electric power supply and are pathetically circumscribed by all prospects of human development. ⁽⁴¹⁰⁾ Energy generation accounts for 40 percent of global greenhouse gas emissions with global demand projected to double from 17.3 trillion kilowatt-hours in 2005 to 33.3 trillion kilowatt-hours in 2030. ⁽⁴¹¹⁾ Without comprehensive Carbon Capture and Storage (CCS) capabilities coal-fired power generation is on course to ignite a coal-carbon time bomb that will defeat all hope of avoiding cataclysmic climate change. Notwithstanding, the world needs more "light," not more "heat." *Recognising electric power supply as a necessary requisite to human development, World Vision recommends the unprecedented global rollout of a low-loss energy grid that supplants fossil fuels and coal in favour of clean renewable energies. Extending electrification to communities presently eclipsed is as critical as leap-frogging polluting technologies.* ⁽⁴¹²⁾

5. Advocate Justice And Change: Scientists estimate that without a change in business as usual, "more than half of the Amazon forest would be logged by 2030, releasing 20.5 billion tons of CO₂ into the atmosphere." ⁽⁴¹³⁾ CO₂ emissions from forest fires in Indonesia alone amount to 2.5 billion tonnes annually. ⁽⁴¹⁴⁾ Protecting forests and forest dwellers is a matter of justice in line with Millennium Development Goal 7 ("Ensure Environmental Sustainability"). The Rights and Resources Initiative (RRI) observes: "Ironically, after centuries of serving the interests of others, forest dwellers and other rural peoples might hold in their hands the fate of the wider world." ⁽⁴¹⁵⁾ As forests thin out, their protective cover thins out concurrently. Measures are needed to strengthen the rights of ethnic forest dwellers who are in the strongest position to steward their environmental resources. Avoiding deforestation, accelerating reforestation and promoting afforestation ^(b) are the three legs of a solid policy tripod both for carbon sequestration and coastline protection. *World Vision recommends the creation of an international framework to strengthen the position of forests and forest dwellers and advocates more international debate about the question of who owns emitted or conserved carbon.*

Moreover, research indicates that sea level rise will render millions landless during the 21st century. Researchers Sujatha Byravan and Sudhir Chella Rajan conclude: "No matter how aggressive future climate change mitigation strategies may be, we can be sure that by the end of the century there will be millions of 'boat people' from developing countries looking for safer ground." ⁽⁴¹⁶⁾ "Under international law, refugees are strictly considered to be those who have been forced to flee their homes as a result of war or persecution and have the possibility of return when things get better in the future ... But when a person's home, land or indeed entire country is wiped out by a phenomenon such as rising seas there is no hope or chance that the person will ever be able to return home. Such individuals will therefore essentially have become 'climate exiles' who will have no legal status ... unless the international community

develops early strategies to address their legal needs." (417) *World Vision recommends the coordinated development of a new international framework to enshrine the rights of 21st century "climate refugees." The clear onus is on countries with high levels of emissions to show high levels of solidarity. There is widespread agreement that states must make a "binding commitment to assume responsibility for these people in line with their greenhouse gas emissions."* (418)

6. Reinforce Disaster Defences: Disaster reinforcements encompass software and hardware, disaster prepared mindsets and disaster resistant structures. By necessity, the notion of "reinforcement" implies both the assumption that a disaster will occur and the resolute resolve to end up on top of it rather than be toppled by it. Two elements are critical: government leadership and community mobilisation. Strong government structures are necessary to translate preparedness policies into infrastructural measures like cyclone shelters, escape roads, early warning systems, building codes, flood defences and other protective bulwarks. Macroeconomic policies can focus development in safe areas and create incentives that attract people away from vulnerable coastlines. The Hyogo Framework for Action 2005-2015 and ASEAN Disaster Management Plans are useful instruments to translate systemic responsibility into sound protective systems that enlist the support of civil society organisations. Community mobilisation is the second supporting leg for a comprehensive reinforcement strategy. Community-based leadership development in the area of disaster preparedness can strengthen possible responses. *World Vision recommends that governments increase their investments to build additional structural and non-structural capacity, giving priority to financial instruments like microinsurance schemes, comprehensive early warning mechanisms and more disaster shelters.*

7. Educate Children: Children are both the hope for the future and the most vulnerable population group during disasters. By extension, empowering children requires two distinct yet inseparable priorities for action: school

safety and disaster risk education. Tens of thousands of schools worldwide are considered "unsafe." According to the Asian Disaster Preparedness Centre, in India alone, 125,000 existing schools remain "unsafe and in need of retrofit." (419) Moreover, the effects of climate change will be borne disproportionately by future generations. By emitting record amounts of CO₂, today's adult generation is leaving behind a large and looming carbon liability which future generations will bear. Therefore, preparing today's children for future climatic upheaval is a core responsibility of today's adult generation. Teaching children disaster preparedness is pivotal to raising up a new generation of resilient people who can take cool, calm, calculated action in the face of future climate disasters. Teaching children early in life is the most opportune time to forestall the formation of unsound attitudes and inculcate in society a wholesome and equitable culture of safety. *As a child-focused organisation World Vision recommends that schools be reassessed, retrofitted or rebuilt to meet highest possible safety standards. Moreover, World Vision recommends the mainstreaming of disaster risk reduction and climate change preparedness into school curricula at all levels.*



Photo: Michelle Tam

■ **Tonggu County, Jiangxi Province:** Third graders receive safety handbook after attending a "serious fun" World Vision Child-focused Disaster Preparedness Workshop

GOING FORWARD

“When it comes to the future, there are three kinds of people: those who let it happen, those who make it happen, and those who wonder what happened.” ⁽⁴²⁰⁾

—John Richardson

Life is a Beach: Fostering a friendly future is possible

Photo: Christine Balderas

Postscript

“Everything that has ever happened in all of human history has happened on that tiny [planet]. All the triumphs and tragedies. All the wars. All the famines. All the major advances. It is our only home. And that is what is at stake. Our ability to live on planet Earth – to have a future as a civilisation. I believe this is a moral issue.” (Al Gore, Nobel Peace Prize Laureate 2007) ⁽⁴²¹⁾

Picturing Tomorrow: Aristotle (384-322 BC) has said: “The soul never thinks without a picture.” Many people have pointed to Cyclone Nargis as a mental picture of future climate catastrophes. While it is true that Cyclone Nargis provides a vivid image of the kind of disaster type lurking on the threshold to tomorrow, it is worth remembering that while natural disaster events are largely inevitable, they need not evolve into humanitarian emergencies. If communities prepare and steel themselves against disasters, disasters need not steal progress made in human development. Bangladesh lends itself as a hopeful example. On 12 November 1970, Bangladesh's coast was ravaged by what may have been the world's worst cyclone on record. With between 300,000 ⁽⁴²²⁾ and 500,000 people killed, ⁽⁴²³⁾ the sheer scale of the destruction stimulated the “building of robust shelters... as well as improvements in warning systems.” ⁽⁴²⁴⁾ Following the 29 April 1991

cyclone with 140,000 casualties, ⁽⁴²⁵⁾ Bangladesh made further improvements in disaster preparedness, such that when Cyclone Sidr struck on 15 November 2007 with similar force, fewer than 4,300 people were killed. ⁽⁴²⁶⁾ Bangladesh's preparedness programmes have proved time and again that preparedness pays off. Trihadi Saptoadi, National Director of World Vision Indonesia, says that to prepare for tomorrow the two streams of relief and development must be integrated. He says: “Disaster management and community development are inseparably intertwined. Holistic approaches are needed. Even as natural forces converge on coastal communities, the world can converge its defensive forces to *prepare* for the future and be one step ahead of the next disaster. We should not allow the future to dictate its terms to us. We have the power to mold the future if we choose to be well-prepared. It lies in our hands.” ⁽⁴²⁷⁾

“
*The cynic says, ‘One man can’t do anything.’
I say, ‘Only one man can do anything.’*”

—John W. Gardner

Endnotes

“The future is knocking at our door right now. Make no mistake, the next generation will ask us one of two questions. Either they will ask: ‘What were you thinking; why didn’t you act?’ Or they will ask instead: ‘How did you find the moral courage to rise and successfully resolve a crisis that so many said was impossible to solve?’”
(Al Gore, Nobel Peace Prize Laureate 2007, Nobel Lecture) ⁽³⁵³⁾

- (1) The New Oxford American Dictionary. Second Edition. Oxford University Press. 2005. New York. ISBN 978-0-19-517077-1. {Page 481.}
- (2) Chambers Dictionary of Etymology. The H. W. Wilson Company. 2004. Previously published as the Barnhart Dictionary of Etymology. New York. ISBN 0-550-14230-4.
- (3) Disaster Risk Reduction and Climate Change Adaptation. Ban Ki-moon. Secretary-General, United Nations, 2007. (Accessed 18 Aug 2008 @ http://siteresources.worldbank.org/PHILIPPINESEXTN/Resources/01_ISDRArticle_Climat.pdf)
- (4) Fighting climate change: Human solidarity in a divided world. Human Development Report 2007/2008. (Accessed 22 Aug 2008 @ <http://hdr.undp.org/en/reports/global/hdr2007-2008/>)
- (5) Based on present-day world oil consumption of 87 million barrels per day {Cited in (360).}
- (6) Based on averaged crude oil price on 13 August 2008
- (7) Based on annual emissions (est.) for 2008 of 32 gigatonnes {See note (354).}
- (8) Based on annual melting of Greenland (240 km³) and Antarctica (152 km³). {See notes (45) and (46).}
- (9) Based on annual deforestation of 73,000 square kilometres {See note (223).}
- (10) Based on annual displacement of 100,000 Bangladeshis {See note (116).}
- (11) Based on annual average for the decade 1998-2007. EM-DAT Database Query on 12 August 2008. {See note (123).}
- (12) Based on World Vision Annual Review 2007.
- (13) International Institute for Environment and Development. Press Release. Climate change: study maps those at greatest risk from cyclones and rising seas. 28 March 2007.
- (14) IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. Geneva, Switzerland. {Pages 13 and 53.}
- (15) United Nations. 2005. Message from the Seventh Secretary General. International Day for Disaster Reduction. 12 October 2005. Kofi Annan.
- (16) Tsunami Evaluation Coalition. Joint evaluation of the international response to the Indian Ocean tsunami: Synthesis Report: Executive Summary. July 2006. London, UK. ISBN 0-85003-807-3. {Pages 16-17.}
- (17) Cited on pages 16 and 20 in (16)
- (18) Cited on page 17 in (16)
- (19) Cited on page 1808 in (1)
- (20) Tsunami! Second Edition. Walter C. Dudley and Min Lee. University of Hawai'i Press. 1998. Honolulu, USA. ISBN 0-8248-1969-1. {Page 51.}
- (21) Cited on page 1535 in (1) and on page 51 in (20)
- (22) Cited on page 61 in (20)
- (23) Few tsunamis are higher than 10-12 metres. Some conditions, however, can trigger tsunami waves piling dozens of metres high (e.g. asteroid impacts). The highest wave that has ever been known was triggered in Lituya Bay, Alaska, when a mountainside collapsed on 9 July 1958. The ensuing wave removed all vegetation up to an elevation of 524 metres above sea level, felling millions of trees. {Cited on pages 73-79 in (20); Also cited in: World's Biggest Tsunami. Geology.com (accessed 23 Jul 2008 @ <http://geology.com/records/biggest-tsunami.shtml>)
- (24) Cited on page 62 in (20) [See Figure 10 on page 36 and Reference.]
- (25) Cited on page 55 in (20)
- (26) Power of tsunami earthquake heavily underestimated. Maggie McKee. New Scientist. 9 February 2005. (Accessed 23 Jul 2008 @ <http://www.newscientist.com/article.ns?id=dn6991>)
- (27) Intergovernmental Panel on Climate Change (IPCC). The Nobel Peace Prize 2007. Nobel Lecture. R. K. Pachauri. 10 December 2007. (Accessed 8 Jan 2008 @ http://nobelprize.org/nobel_prizes/peace/laureates/2007/ipcc-lecture_en.html)
- (28) United Nations Office for the Coordination of Humanitarian Affairs (OCHA). Myanmar Cyclone Nargis. OCHA Situation Report No 40. 17 July 2008.
- (29) Natural Disaster Hotspots. Case Studies. Disaster Risk Management Series No 6. Chapter 3: Storm Surges in Coastal Areas. Robert J. Nicholls. Page 80. World Bank. 2006. Washington, USA. ISBN 978-0-8213-6332-4. (Accessed 27 Jun 2008 @ <http://go.worldbank.org/XHHBRBCL80>)

- (30) Myanmar: Food assistance "likely" for up to a year. IRIN humanitarian news and analysis. UN Office for the Coordination of Humanitarian Affairs. 9 June 2008. (Accessed 24 Jul 2008 @ <http://www.irinnews.org/report.aspx?ReportId=78631>)
- (31) Hurricane Season 2008: Tropical Storm Nargis (Indian Ocean). 20 May 2008. Combination Satellite Image Gives Clearer Image of Cyclone Nargis Floods. NASA's Goddard Space Flight Center. Michon Scott and Rebecca Lindsey. (Accessed 24 Jul 2008 @ http://www.nasa.gov/mission_pages/hurricanes/archives/2008/h2008_nargis.html)
- (32) The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones. McGranahan, G., D. Balk and B. Anderson. 2007. *Environment & Urbanization* 19(1): 17-37 (2007). International Institute for Environment and Development (IIED). (Referenced: New Scientist Environment. Coastal living – a growing global threat. 28 March 2007. *NewScientist.com*. Catherine Brahic. Accessed 8 Jan. 2008 @ <http://environment.newscientist.com/channel/earth/dn11483-coastal-living--a-growing-global-threat-.html>)
- (33) Philippines Environment Monitor 2005. Coastal and Marine Resource Management. The World Bank Group. Washington, USA. December 2006. Page vii. <http://go.worldbank.org/5PW01WKQL0> (Accessed 27 Mar 2008 @ <http://siteresources.worldbank.org/INTPHILIPPINES/Resources/PEM05-complete.pdf>)
- (34) Cited on page 9 in (33)
- (35) Integrated Regional Information Networks (IRIN). Humanitarian news and analysis. UN Office for the Coordination of Humanitarian Affairs. Bangladesh: Live-saving Sundarbans may take years to recover from cyclone. 12 December 2007. (Accessed 29 Mar 2008 @ <http://www.irinnews.org/Report.aspx?ReportId=75833>)
- (36) Integrated Regional Information Networks (IRIN). Humanitarian news and analysis. UN Office for the Coordination of Humanitarian Affairs. Global: Drowning in urban disaster. 18 September 2007. (Accessed 29 Mar 2008 @ <http://www.irinnews.org/Report.aspx?ReportId=73998>)
- (37) British Antarctic Survey. Rapid Temperature Increases Above The Antarctic. *ScienceDaily*. 30 March 2006. (Accessed 7 Apr 2008 @ <http://www.sciencedaily.com/releases/2006/03/060330181319.htm>)
- (38) An Inconvenient Truth. The Planetary Emergency of Global Warming And What We Can Do About It. Al Gore. Bloomsbury Publishing. London. 2006. ISBN 9780747589068. Page 190.
- (39) United Nations Environment Programme (UNEP). Melting Ice – A Hot Topic? New UNEP Report Shows Just How Hot It's Getting. *World Environment Day* 2007. 4 June 2007. Pages 2-3. (Accessed 2 Apr 2008 @ <http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=5112&ArticleID=5599&I=en>)
- (40) Cited on page 3 in (39) and on pages 190-196 in (38)
- (41) Cited on page 196 in (38)
- (42) Cited on pages 8 and 45 in (14)
- (43) Cited on pages 13 and 54 in (14)
- (44) Cited on page 8 in (14)
- (45) Chen, J.L., Wilson, C.R., and Tapley, B.D., (2006) "Satellite Gravity Measurements Confirm Accelerated Melting of Greenland Ice Sheet." *Science*, Vol. 313. No. 5795. 29 September. Pages 1958-1960. (Referenced in (295).)
- (46) The Future Oceans – Warming Up, Rising High, Turning Sour. Special Report. German Advisory Council on Global Change. 2006. ISBN 3-936191-14-X. {Page 35.} (Available 29 Jul 2008 @ http://www.wbgu.de/wbgu_sn2006_en.pdf)
- (47) Antarctic ice sheet losing mass, says University of Colorado study. 2 March 2006. (Accessed 2 Apr 2008 @ <http://www.colorado.edu/news/releases/2006/86.html>)
- (48) References: (1) Alley, R.B., Clark, P.U., Huybrechts, P. and Joughin, I., (2005) "Ice-Sheet and Sea-Level Changes", *Science*, Vol. 310, No. 5747. 21 October. Pages 456-460. (2) Bamber, J.L., Alley, R.B. and Joughin, I., (2007) "Rapid Response of Modern Day Ice Sheets to External Forcing", *Earth and Planetary Science Letters*, Vol. 257, No. 1-2. 15 May. Pages 1-13. (3) Shepherd, A. and Wingham, D., (2007) "Recent Sea-Level Contributions of the Antarctic and Greenland Ice Sheets", *Science*, Vol. 315. No. 5818. 16 March. Pages 1529-1532. (4) Truffer, M. and Fahnenstok, M., (2007) "Rethinking Ice Sheet Time Scales", *Science*, Vol. 315. No. 5818. 16 March. Pages 1508-1510. (5) Fricker H.A., Scambos, T., Bindschadler, R., and Padman, L., (2007) "An Active Subglacial Water System in West Antarctica Mapped from Space", *Science*, Vol. 315. No. 5818. 16 March. Pages 1544-1548. (6) Howat, I.M., Joughin, I., and Scambos, T.A., (2007) "Rapid Changes in Ice Discharge from Greenland Outlet Glaciers", *Science*, Vol. 315. No. 5818. 16 March. Pages 1559-1561. (7) Zwally, H.J., Abdalati, W., Herring, T., Larson, K., Saba, J., and Steffen, K., (2002) "Surface Melt-Induced Acceleration of Greenland Ice-Sheet Flow", *Science*, Vol. 297, No. 5579. 12 July. Pages 218-222. (Referenced in (295).)
- (49) Vaughan, D.G. and Arthern, R., (2007) "Why Is It Hard to Predict the Future of Ice Sheets?" *Science*, Vol. 315. No. 5818. 16 March. Pages 1503-1504. (Referenced in (295).)
- (50) Cited on page 2 in (47)
- (51) United Nations Development Programme (UNDP). Human Development Report 2007/2008. Fighting climate change: Human solidarity in a divided world. Published 2007. New York. USA. ISBN 978-0-230-54704-9. {Pages 36-37.}
- (52) National Snow and Ice Data Center (NSIDC). Larsen B Ice Shelf Collapses in Antarctica. 18 March 2002 (Accessed 31 March 2008 @ <http://nsidc.org/iceshelves/larsenb2002/index.html>)
- (53) National Snow and Ice Data Center (NSIDC). Antarctic Ice Shelf Disintegration Underscores a Warming World. 25 Mar 2008. (Accessed 31 March 2008 @ http://nsidc.org/news/press/20080325_Wilkins.html)
- (54) Cited on page 180 in (38)

- (55) E-mail Interview with Armin Rose. 2 April 2008. {Photograph taken during ANT XXIII/8 expedition of RV Polarstern German icebreaking research vessel between Nov. 2006 and Jan. 2007. Picture depicts mountains of Antarctic Peninsula near Larsen B (view direction NW). According to Rose, since the ice shelf collapsed in 2002, the seafloor fauna (benthos) has become easily accessible to scientific research.
- (56) Antarctic glaciers surge to ocean. Martin Redfern (Rothera Research Station, Antarctica). UK scientists working in Antarctica have found some of the clearest evidence yet of instabilities in the ice of part of West Antarctica. BBC News. 24 February 2008. (Accessed 31 March 2008 @ <http://news.bbc.co.uk/2/hi/science/nature/7261171.stm>)
- (57) Contd. e-mail Interview with Armin Rose. 3 April 2008. {Photograph taken on King George Island in March 2005.}
- (58) Science Daily. West Antarctic Glaciers Melting At 20 Times Former Rate, Rock Analysis Shows. 2 March 2008. (Accessed 8 Apr 2008 @ <http://www.sciencedaily.com/releases/2008/02/080229075228.htm>)
- (59) Cited on page 190 in (38)
- (60) Cited on page 37 in (51)
- (61) Cited on pages 5, 37, 72 in (14)
- (62) Overpeck, J.T., Otto-Bliesner, B.L., Miller, G.H., Muhs, D.R., Alley, R.B. and Kiehl, J.T., (2006) "Paleoclimatic Evidence for Future Ice-Sheet Instability and Rapid Sea-Level Rise", *Science*. Vol. 311. No. 5768. 24 March. Pages 1747-1750. {Referenced in (295).}
- (63) Kerr, R.A., (2007) "Pushing the Scary Side of Global Warming", *Science*. Vol. 316. No. 5830. 8 June. Pages 1412-1415. {Referenced in (295).}
- (64) IPCC, 2007: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp. ISBN 978-0-521-88009-1. {Pages 387 and 409.}
- (65) On-site interview with Island Chief John Kela on the Island of Matsungan, Bougainville. 14 March 2008. {The National Statistical Office pinpoints the population of Matsungan at 562 islanders. The formula used to "determine" population growth over a five-year time horizon is $x * 1.333$.}
- (66) On-site interview with Pastor Sialis Tonge of Tanei village, Island of Petats, Bougainville. 16 March 2008. {The National Statistical Office pinpoints the population of Petats at 1,294 islanders. See note (65).}
- (67) On-site interview with Island Chief Joash Kela on the Island of Torotsian (Saposa), Bougainville. 14 March 2008. {The National Statistical Office pinpoints the population of Torotsian at 672 islanders. See note (65).}
- (68) On-site interview with Francis Giran and Lawrence Belleh on the Island of Pororan, Bougainville. 16 March 2008. {The National Statistical Office pinpoints the population of Petats at 1,388 islanders. See note (65). Lawrence Belleh took a "personal census" at the time of the last elections in 2005 and found the number of islanders to be 1,526.}
- (69) Face-to-face interview with Ursula Rakova at the office of Tulele Peisa NGO, Buka, Bougainville. 17 March 2008. Supplementary telephone interview 10 April 2008.
- (70) Vanishing Islands. Tamar'i Tutangata describes how rising seas are already beginning to overwhelm Pacific island nations. (Accessed 1 Feb 2008 @ http://www.unep.org/ourplanet/imgversn/103/06_van.htm)
- (71) Face-to-face interview with Paul Tobasi at the Atolls District Office, Buka, Bougainville. 14 March 2008.
- (72) Cited on page 100 in (51)
- (73) Cited on page 1 in (70)
- (74) *Climate Change and Sea Level. Part One: Physical Science*. Edited By T.H. Aung, C. Kaluwin and G.W. Lennon. 1998. National Tidal Facility. ISBN 0-7258-0636-2. {Page xi.}
- (75) Face-to-face interview with Prof. of Environmental Science at the University of Papua New Guinea, Chalapan Kaluwin, Port Moresby. 20 March 2008. {Additionally cited on page 97 in (74).}
- (76) *Sea Level & Climate: Their Present State*. Pacific Country Report. Papua New Guinea. Chalapan Kaluwin. June 2006. Paper. {Page 14}
- (77) Cited on page 409 in (64)
- (78) Cited on page 387, 408, 411, 416f in (64)
- (79) Cited on page 2 and 22 in (76)
- (80) Ninth Annual Global Development Conference – Security for Development: Confronting Threats to Survival and Safety. 27 Jan. - 2 Feb. 2008. Paper prepared by Prof. Chalapan Kaluwin. Page 8. {Additionally cited on page 9 in (64) and one page 2 in (70).}
- (81) A Sinking Feeling. The floods are getting worse in Tuvalu. As scientists argue over climate change and struggle to measure rising seas, Samir S. Patel meets the locals of this tiny island nation. *Nature*. Vol 440. 6 April 2006. Page 735.
- (82) *Climate Change and Sea Level. Part Two: Social Science*. Edited By C. Kaluwin, T.H. Aung and G.W. Lennon. 1998. National Tidal Facility. ISBN 0-7258-0637-0. {Page 70.}
- (83) Cited on page 3 of (39)
- (84) *Heating up the Planet. Climate Change and Security*. Alan Dupont, Graeme Pearman. Lowy Institute for International Policy. Double Bay. 2006. ISBN 1-921004-22-3. {Page vii.}
- (85) Cited on page 12, 49 and 52 in (14)
- (86) Graphic based on representation on page 97 in (74) {Additional resource used: Earth Tok 2, earth structure, processes and hazards from a Papua New Guinea perspective. Hugh Lucius Davies. University of Papua New Guinea. 2006. ISBN 9980-84-761-1. Pages 111-112.}
- (87) Cited on page 1 in (84)

- (88) Based on (69) and multiple secondary sources, including this source from Papua New Guinea: {Carteret Islands sinking fast. The National / Pacnews. 17 October 2007. Accessed 5 Feb. 2008 @ http://www.islandsbusiness.com/archives/index_dynamic/containerNameToReplace=MiddleMiddle/focusModuleID=130/focusContentID=10446/tableName=mediaRelease/overrideSkinName=newsArticle-full.tpl}.
- (89) Tuvalu feeling the effects of climate change, sea level rising fast. Pacnews. 2nd Ed. 3 April 2008. Page 4 © PINA 2008. Suva, Fiji. www.pinanius.com.
- (90) Tuvalu struggles to hold back tide. BBC News. 22 January 2008. Environment correspondent David Shukman. (Accessed 11 Apr 2008 @ <http://news.bbc.co.uk/2/hi/science/nature/7203313.stm>)
- (91) Regional Impacts of Climate Change (IPCC). North America. 1998. {Source: Bruun, 1962.} (Accessed 22 February 2008 @ <http://www.grida.no/climate/ipcc/regional/221.htm>)
- (92) The Philippines: A Climate Hotspot. Climate Change Impacts and the Philippines. Greenpeace. April 2007. (Accessed 20 February 2008 @ <http://www.greenpeace.org/raw/content/seasia/en/press/reports/the-philippines-a-climate-hot.pdf>) {Page 11.}
- (93) Dasgupta, S., Laplante, B., Meisner, C., Wheeler, D. and Yan, J., (2007) "The Impact of Sea Level Rise on Developing Countries: A Comparative Analysis", Policy Research Working Paper No. 4136. Washington D.C., World Bank. February. From page 51. {Referenced in (295).}
- (94) South Asia in climate "crisis". Amitabha Bhattasali. Calcutta. A Greenpeace report on climate change says that if greenhouse gas emissions grow at their present rate, South Asia could face a major human crisis. BBC News. 25 March 2008 (Accessed 27 March 2008 @ http://news.bbc.co.uk/2/hi/south_asia/7313239.stm)
- (95) Two sources for reference:
1. Refer to (84). (Accessed 1 April 2008 @ <http://www.lowyinstitute.org/PublicationGet.asp?i=391>)
2. World in Transition – Climate Change as a Security Risk: Summary for Policy Makers. German Advisory Council on Global Change (WBGU). (Accessed 1 April 2008 @ http://www.wbgu.de/wbgu_jg2007_kurz_engl.pdf).
- (96) Labutali village to be relocated inland. The National (PNG). Bonnie Abola. (Accessed 31 Jan 2008 @ <http://www.thenational.com.pg/012908/Nation%206.htm>). In areas of discrepancy, preference was given to findings from primary research as denoted by (97)
- (97) On-site interviews of all people quoted. Labutali / Puwamo. 19 March 2008. Accompanying guides: Mondo Siga (Chairman Labutali Community-Based Organisation), Thomas Warr (Village Development Trust NGO), David Hapato (World Vision PNG). The total number of villagers was estimated by Mondo Siga to be "about 2,500."
- (98) Face-to-face interview with Dr. Hugh Lucius Davies. Executive Manager Geological Survey and Prof. at University of Papua New Guinea. Port Moresby. 20 March 2008. Supplementary e-mail interview 30 March 2008.
- (99) As Ranks of "Environmental Refugees" Swell Worldwide, Calls Grow for Better Definition, Recognition, Support. United Nations University UNU-EHS Institute for Environment and Human Security. UN Day for Disaster Reduction: Weds. Oct. 12, 2005. {Page 3.} (Accessed 10 Apr 2008 @ <http://www.ehs.unu.edu/file.php?id=58>)
- (100) Blue Alert. Climate Migrants in South Asia: Estimates and Solutions. A Report by Greenpeace. Sudhir Chella Rajan. Chennai, India. Page 1. (Accessed 15 Apr 2008 @ <http://www.greenpeace.org/raw/content/india/blue-alert-report.pdf>)
- (101) United Nations Development Programme (UNDP). Human Development Report 2007/2008. Bangladesh. {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.}
- (102) UNDP. Human Development Report 2007/2008. Bangladesh. {Source: World Bank. 2007b. World Development Indicators 2007. CD-ROM. Washington, D.C. (Data refers to most recent year available during the period specified, 1990-2005.)}
- (103) Cited in (32)
- (104) Maplecroft Map. Issue Report. Climate Change. Feb. 2007. Page 14. {Maplecroft.net.}
- (105) Death toll from South Asian floods rises to 925, millions stranded. 26 July 2004. {Source: Agence France-Presse}. Helen Rowe. (Accessed 15 Apr 2008 @ <http://www.reliefweb.int/rw/rwb.nsf/db900sid/LSGZ-639HBL?OpenDocument>)
- (106) Doing More for Those Made Homeless by Natural Disasters. Roy Gilbert. The World Bank. Disaster Risk Management Working Paper Series No. 1/26182. May 2001. Pages iii, 1. (Accessed 25 Feb 2008 @ http://www-wds.worldbank.org/servert/WDSContentServer/WDSP/IB/2003/09/06/000094946_03062504024862/Rendered/PDF/multi0page.pdf)
- (107) Two References: 1. Cited in (94) and 2: "Greenpeace report estimates climate impacted migration to be 10 times worse than Partition. 25 March 2008. (Accessed 15 Apr @ <http://www.greenpeace.org/india/greenpeace-report-estimates-cl#>)
- (108) IRIN. Humanitarian News and Analysis – UN Office for the Coordination of Humanitarian Affairs. Bangladesh: Cyclone-damaged embankments urgently need repair. Naya Para. 7 Dec. 2007. (Accessed 7 Jan 2008 @ <http://www.irinnews.org/Report.aspx?ReportId=75735>)
- (109) Cited on page 49 in (14)
- (110) Cited on page 50 in (14)
- (111) On Thin Ice. Gaumukh. Vanishing Ice Caps. When Glaciers melt... The Straits Times. Special on Climate Change. Nirmal Ghosh. 23 June 2007. Pages S2-S3.
- (112) Cited on pages 11 and 50 in (14)
- (113) Face-to-face interview with Mohammad Shamsuddoha (at the office of The Coast Trust NGO), General Secretary of the Equity and Justice Working Group (EJWG). Dhaka, Bangladesh. 20 April 2008. {Additionally cited in secondary research: Rising Sea Levels Erode Half of Bangladesh's Biggest Island: Study. 15 Jun 2005. Agence France-Presse. <http://www.terradaily.com/news/climate-05zzx.html>}

- (114) Climate Change Impact and Disaster Vulnerabilities in the Coastal Areas of Bangladesh. Md. Shamsuddoha and Rezaul Karim Chowdhury. Dhaka, Bangladesh. Nov. 2007. Page 23.
- (115) On-site interview with Abdul Mannan in Dalakandi on the Island of Bhola (Tajumuddin Upazila), Bangladesh. 22 April 2008. (The population of Bhola is estimated at 1.6-2.2 million.)
- (116) Climate Change Would Intensify River Erosion in Bangladesh. Campaign Brief 6, November 2007. Coast Trust fact sheet edited by Mohammad Shamsuddoha. Page 1.
- (117) Face-to-face interview with UNICEF Emergency Specialist Mohammad Zulfikur Ali Khan. Field Operations Section UNICEF. Dhaka, Bangladesh. 20 April 2008.
- (118) Cited on page 3 in (99)
- (119) Cited on page 7 in (100)
- (120) United Nations Populations Fund (UNFPA). State of World Population 2007. Urbanization's Second Wave: A Difference of Scale. (Accessed 29 Mar 2008 @ http://www.unfpa.org/swp/2007/english/chapter_1/urbanization.html)
- (121) In Flood-Prone Bangladesh, a Future That Floats. Emily Wax. 27 September 2007. The Washington Post. (Accessed 25 March 2008 @ http://www.washingtonpost.com/wp-dyn/content/article/2007/09/26/AR2007092602582_pf.html)
- (122) Cited in (100)
- (129) Asia hardest-hit by disasters in 2007, group says. {Source: Reuters.} Stephanie Nebehay. 18 January 2008. (Accessed 25 Jan. 2008 @ <http://www.altertnet.org/thenews/newsdesk/L18838393.htm>)
- (130) World Vision Position on Climate Change Response. Christopher Shore and Joe Muwonge. Page 3.
- (131) Cited on page 88 in (51)
- (132) Can preparedness pay? Recovery and mitigation expenditure as political investment. International Strategy for Disaster Reduction (ISDR). Disaster Reduction in Asia & Pacific. ISDR Informs. Issue 3, 2007. Education Issue. {Pages 57-58.}
- (133) Cited on page 58 (left column) in (132)
- (134) Cited in (129)
- (135) Cited on page 176 in (51) {Source: Jha, S. Kumar. 2007. "GFDRR. Track II. Multi-donor Trust Fund for Mainstreaming Disaster Reduction for Sustainable Poverty Reduction." ISDR and the Global Facility for Disaster Reduction and Recovery. The World Bank Group.}
- (136) Cited on page 176 in (51) {Source: International Federation of the Red Cross and Red Crescent Societies (IFRC). World Disasters Report 2002. Geneva.}
- (137) 'Disaster Preparedness programs in India: a cost benefit analysis' Network Paper No 49. Cabot, C and Venton, P. London: Tearfund and Overseas Development Institute. 2004. From: 'Eliminating World Poverty: People and Planet.' {Referenced: Australia Responds: Helping Our Neighbours Fight Climate Change. The Climate Change And Development Roundtable. Page 11. ISBN 978-0-85802-141-9.}

Protect Development

- (123) 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. (The database can be queried by country, disaster type and disaster event @ <http://www.emdat.be>)
- (124) Maplecroft Map. Issue Report. Natural Disasters. Feb. 2007. Page 16. {Maplecroft.net.}
- (125) Retrospective disaster figures for Myanmar based on (123), au courant disaster figures for Cyclone Nargis based on (28)
- (126) Cited on page 2 in (39)
- (127) World Conference on Disaster Reduction. 18-22 January 2005. Kobe, Hyogo, Japan. Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters. {Page 12.}
- (128) Disaster Figures for 2007. Asia continues to be hardest hit by disasters. United Nations International Strategy for Disaster Reduction (ISDR). Secretariat Geneva. Press Release. Brigitte Leoni. 18 January 2008.
- (138) World Report On Violence And Health. World Health Organization. Foreword by Nelson Mandela. Page ix. Geneva. 2002. ISBN 92-4-154561-5
- (139) Child Protection – A Handbook For Parliamentarians. Page 4. New York. 2004. ISBN 92-806-3796-6.
- (140) International Federation of the Red Cross and Red Crescent Societies (IFRC). World Disasters Report 2007. Focus on Discrimination. Geneva. ISBN 9-9139-16-3
- (141) The Convention on the Rights of the Child is the principal legal framework prioritising child protection. (Accessed 17 Jul 2008 @ <http://www.unhcr.ch/html/menu3/b/k2crc.htm>)

Research Priorities

- (142) Cited on page 1439 in (1)
- (143) Opportunities for Global Poverty Reduction in the 21st Century. The Role of Policy Makers, Corporations, NGOs, and Individuals. Johannes Luetz. 2007. Berlin. Germany. ISBN 978-3-86682-107-1. {Page 170f.}

- (144) See note in (123) for database background. Technological disasters were not considered.
- (145) 2007 disasters in numbers. CRED Releases 2007 Disaster Statistics at UN Press Conference in Geneva. (Accessed 16 April 2008 @ www.cred.be)
- (146) Database queried Dec. 2007. Nations in database (123) include: "all"
- (147) Database queried Feb. 2008. Nations queried under "Asia" include: "Afghanistan; Armenia; Azerbaijan; Bahrain; Bangladesh; Bhutan; Brunei Darussalam; Cambodia; China P Rep; Cyprus; East Timor; Georgia; Hong Kong (China); India; Indonesia; Iran Islam Rep; Iraq; Israel; Japan; Jordan; Kazakhstan; Korea Dem P Rep; Korea Rep; Kuwait; Kyrgyzstan; Lao P Dem Rep; Lebanon; Macau; Malaysia; Mongolia; Myanmar; Nepal; Oman; Pakistan; Palestine (West Bank); Philippines; Saudi Arabia; Singapore; Syrian Arab Rep; Taiwan (China); Tajikistan; Thailand; Timor-Leste; Turkey; Turkmenistan; United Arab Emirates; Uzbekistan; Viet Nam; Yemen; Yemen Arab Rep; Yemen P Dem Rep."
- (148) CRED CRUNCH – Disaster Data: A Balanced Perspective. Issue No 12. April 2008. (Accessed 16 April 2008 @ <http://www.emdat.be/Publications/credcrunch.html>)
- (149) CRED CRUNCH – Disaster Data: A Balanced Perspective. Issue No 11. January 2008. (Accessed 16 April 2008 @ <http://www.emdat.be/Publications/credcrunch.html>)
- (150) Database (123) queried according to "Natural Disaster Profile – Group Disasters." Top 10 most important natural disasters for period 1900 to 2008, sorted by numbers of people killed / affected at country level.
- (151) Regional risk map produced for World Vision by Craig Williams, OCHA Regional Office for Asia Pacific, and Akiko Harayama, ReliefWeb Map Centre United Nations. Thank you! (<http://ochaonline.un.org/roap>)
- (152) Cited in (32) – Regional risk map produced for World Vision by Valentina Mara, Bridget Anderson and Gregory Yetman. Center for International Earth Science Information Network (CIESIN). Columbia University, New York. Thank you! {Webaddress: <http://sedac.ciesin.columbia.edu/gpw/lec2.jsp>}
- (153) Cited on page 3 in (13)
- (154) Cited in (32) and accessed on 5 March 2008 @ http://sedac.ciesin.columbia.edu/gpw/maps/lec2/Bangladesh_10m_LECZ_and_population_density.jpg
- (155) Community-based disaster risk assessment map. Village women learn how to face disaster situations at World Vision's Phulpur ADP, Bangladesh.
- (156) Cited in (32)
- (157) Cited in (13)
- (158) The co-founder of Grameen Phone explains triple impact of bringing cell-phone service to rural areas of Bangladesh. TED Conference. July 2005. Iqbal Quadir. Oxford. England. {Referenced on pages 50-53 and 70-79 in (143).}
- (159) Community-Based Disaster Management. Internal paper compiled by World Vision disaster risk reduction instructor Jimmy Nadapdap. 2008.
- (160) Cited on page 18 in (16)
- (161) International Federation of Red Cross and Red Crescent Societies. Code of Conduct. Accessed 29 Apr @ <http://www.ifrc.org/publicat/conduct/code.asp>
- (162) Principles and Good Practice of Humanitarian Donorship. {More info @ <http://www.goodhumanitarianandonorship.org/>}
- (163) Face-to-face interview with World Vision Humanitarian & Emergency Affairs / Relief Director Jimmy Nadapdap. 15 January 2008. Banda Aceh, Indonesia.
- (164) Indonesia: Communities Trained to Anticipate Disasters. Yacobus Runtuwene and Jimmy Nadapdap. Internal World Vision paper. 2007.
- (165) Future - Present: 2007 Annual Review. Humanitarian & Emergency Affairs. Page 5. (Another HEA publication suggests "more than 50 percent": Strength Amidst the Storm. 2006 Annual Review. World Vision Humanitarian & Emergency Affairs. Page 25.)
- (166) Cited on page 19 in (16)
- (167) Anglicare Stop AIDS conduct mobile cinema programmes in Papua New Guinea to raise awareness in villages with low literacy rates.
- (168) Interview with Temitope Adepoiyibi, World Vision National TB ACSM Project Coordinator (by e-mail, 13 February 2008).
- (169) Universal Declaration of Human Rights. (Accessed 19 Apr 2008 @ <http://www.un.org/Overview/rights.html>)
- (170) Sex discrimination remains deep-rooted. By Louise Arbour For The Straits Times. 10 March 2008. The Straits Times. Page 25.
- (171) Disappearing Daughters. ActionAid and the International Development Research Centre (IDRC). Pages 1-28. (Accessed 16 July 2008 @ http://www.actionaid.org.uk/doc_lib/disappearing_daughters_0608.pdf)
- (172) On-site interview with elders from the village of Lhuet (population: 852), Lamno, Aceh. Indonesia. 15 January 2008.
- (173) Cited on pages 27-28 in (132)
- (174) Impact Measurement and Accountability in Emergencies. The Good Enough Guide. Emergency Capacity Building Project. Dorset, UK. 2007. ISBN 978-0-85598-594-3. Pages 14 and 37.
- (175) Face-to-face interview with Deputy Speaker of the House of Representatives of the Autonomous Bougainville Government Francesca Semoso. Buka, Papua New Guinea. 18 March 2008.
- (176) Tools for Change: Emergency Management for Women. Expert paper presented at the UN Expert Group Meeting on Environmental Management and the Mitigation of Natural Disasters: a Gender Perspective. Ankara, Turkey. November 2001. UN Doc: EGM/NATDIS/ 001/EP. {Referenced on pages 125-127 in (140)}

Empower Women And Communities

Partner And Network

(177) Cited on page 1241 in (1)

(178) Cited on page 16 in (51)

(179) Cited on page 11 in (51)

(180) Cited on page 26 in (51)

(181) Visible Earth. NASA images and animations of our home planet. The Blue Marble. Credit: NASA Goddard Space Flight Center Image by Reto Stöckli. (Accessed 8 Mar 2008 @ http://visibleearth.nasa.gov/view_rec.php?id=2429)

(182) Cited on page 22 in (38)

(183) Cited on page 3 in (51)

(184) Cited on page 186 in (51)

(185) Mentioned during interview (117)

(186) Studies dealing with the issue of climate refugees in Bangladesh include the following:

- a) A World Bank Study referenced on page 11 in (114) estimates that 20 million people will become environmental refugees by a 1m rise in sea level.
- b) The UN Human Dev. Report (51) estimates (page 100) that "over 70 million people" in Bangladesh could be affected by a 1m rise in sea level.

(187) On page 10 of (100) Rajan presents the following estimates for people likely to be displaced by sea level rises: 1 metre (42 million), 3 metres (58 million), 5 metres (75 million).

(188) Avoiding a catastrophe. OECD Observer No. 264/265. Dec. 2007-Jan. 2008. (Accessed 30 Jul 2008 @ http://www.oecdobserver.org/news/fullstory.php/aid/2413/Avoiding_a_catastrophe.html) {Source: IEA (2007), World Energy Outlook 2007: China and India Insights, Paris. ISBN 9789264027305.}

(189) Cited on page 3 in (51)

(190) Greenhouse gas emissions cuts framed by the Kyoto Protocol must be implemented and followed by deeper, earlier and more comprehensive cuts. {Ref: Target atmospheric CO₂: where should humanity aim? J. Hansen, M. Sato, P. Kharecha, D. Beerling, R. Berner, V. Masson-Delmotte, M. Raymo, D.L. Royer, J.C. Zachos, <http://arxiv.org/abs/0804.1126> and <http://arxiv.org/abs/0804.1135>}

(191) A letter to leader of Japan before the G8 meeting, James Hansen. (Accessed 30 Jul 2008 @ http://www.columbia.edu/~jeh1/mailings/20080703_DearPrimeMinisterFukuda.pdf)

(192) Is Singapore Ready For The Next Big Flood? Straits Times Special On Climate Change. Arti Mulchand. 24 June 2007. The Straits Times. Page 12.

(193) Cited on page 146 in (38) and (199)

(194) Cited in (27)

(195) Cited on pages 144-145 in (38)

(196) Climate change and trace gases. James Hansen, Makiko Sato, Pushker Kharecha, Gary Russell, David W. Lea, Mark Siddall. Phil. Trans. R. Soc. A (2007) 365. Pages 1925-1954. doi:10.1098/rsta.2007.2052. 18 May 2007. (Accessed 29 Jul 2008 @ http://pubs.giss.nasa.gov/docs/2007/2007_Hansen_etal_2.pdf)

(197) Cited on page 1935 in (196)

(198) Cited on page 33 in (46)

(199) Global Warming Twenty Years Later: Tipping Points Near. Briefing before the Select Committee on Energy Independence and Global Warming, U.S. House of Representatives. National Press Club on June 23. J. Hansen. (Accessed 31 Jul 2008 @ http://www.columbia.edu/~jeh1/2008/TwentyYearsLater_20080623.pdf)

(200) Cited on pages 220-231 in (38) and in (227)

(201) In quotes: Reaction to climate warning. BBC News. 2 February 2007. (Accessed 31 Jul 2008 @ <http://news.bbc.co.uk/2/hi/science/nature/6323653.stm>)

(202) Warming hits 'tipping point.' Siberia feels the heat -- It's a frozen peat bog the size of France and Germany combined, contains billions of tonnes of greenhouse gas and, for the first time since the ice age, it is melting. The Guardian. 11 August 2005. (Accessed 30 Jul 2008 @ <http://www.guardian.co.uk/environment/2005/aug/11/science.climatechange1>)

(203) Field Notes From A Catastrophe. A Frontline Report On Climate Change. Elizabeth Kolbert. London, 2007. ISBN 978-0-7475-8550-3. Page 22.

(204) An Inconvenient Truth. DVD. Paramount Pictures. 2007

(205) Global Fossil Fuel CO₂ Emissions. Carbon Dioxide Information Analysis Center (CDIAC). (Accessed 30 Jul 2008 @ http://cdiac.ornl.gov/trends/emis/tre_glob.html)

(206) Cited on page 108 in (203)

(207) Cited on page 38 in (51)

(208) See (207) and: Amazon rainforest could turn to savannah. World Wildlife Fund (WWF). 21 March 2006. (Accessed 31 Jul 2008 @ http://www.wwf.org.uk/news/n_00000002416.asp)

(209) Cited in (191)

(210) The Inter-agency working group and sub groups (Interagency Working Group on Emergency Capacity {<http://www.ecbproject.org>}, Inter-Agency Working Group on Children's Participation {<http://www.iawgcp.com>}, and Inter-Agency Working Group (IAWG) on Disaster Preparedness {<http://www.humanitarianinfo.org/iawg-nairobi/index.asp>}) provide fora for NGOs, development organisations, the Red Cross and UN Agencies to enhance information exchange and regional coordination.

(211) The Hyogo Framework for Action: reclaiming ownership? Mihir R. Bhatt. All India Disaster Mitigation Institute (AIDMI). Paper. Pages 1-4.

Advocate Justice And Change

- (212) Cited on page 24 in (1)
- (213) Cited on pages 15 and 157 in (51)
- (214) Cited on page 47 in (14) {See also (356).}
- (215) Cited on page 46 in (14)
- (216) Cited on page 4 in (51)
- (217) Blood, Toil, Tears and Sweat. First Speech as Prime Minister to House of Commons. May 13, 1940. (Accessed 5 May 2008 @ <http://www.winstonchurchill.org/4a/pages/index.cfm?pageid=391>)
- (218) Cited on page vi in (51)
- (219) Cited pages 5, 36, 37 in (14)
- (220) Cited on pages 76-105 in (82)
- (221) Beijing's Olympic Quest: Turn Smoggy Sky Blue. New York Times. Asia Pacific. Jim Yardley. 29 December 2007. (Accessed 5 May 2008 @ <http://www.nytimes.com/2007/12/29/world/asia/29china.html>)
- (222) Record car ownership in Beijing. BBC News. Asia Pacific. 14 January 2008. (Accessed 5 May 2008 @ <http://news.bbc.co.uk/2/hi/asia-pacific/7186635.stm>)
- (223) Cited on pages 157-158 in (51) {Root source: Food and Agriculture Organization of the United Nations (FAO). 2007b. "Forest Resources Assessment." Correspondence on carbon stocks in forests. Extract from database. August 2007. Forestry Department. Rome. Italy.}
- (224) Cited on page 158 in (51)
- (225) Illegal logs from Laos fuel Mekong region's furniture industry. Huge volumes of hardwood trees being felled in a graft-riddled trade. The Straits Times Singapore. 22 March 2008. Nirmal Ghosh. Page 15.
- (226) Cited on page 158 in (51)
- (227) The Clean Energy Scam. TIME. By Michael Grunwald. 27 March 2008. (Accessed 12 May 2008 @ <http://www.time.com/time/magazine/article/0,9171,1725975,00.html>)
- (228) Cited on page 158 in (51) {Root source: PEACE (Pelangi Energi Abadi Citra Enviro). 2007. "Indonesia and Climate Change." Working Paper on Current Status and Policies. Department for International Development, World Bank, and State Ministry of Environment in Indonesia, Jakarta.}
- (229) Cited in paragraph 2 of (227)
- (230) Tropical Deforestation and the Kyoto Protocol. Climatic Change, Vol. 71, No. 3, August 2005. Pages 267-276. Santilli, M., Moutinho, P., Schwartzman, S., Nepstad, D., Curran, L. and Nobre, C. (Also: Saving the Rainforest. 22 July 2004. The Economist. Available: http://www.economist.com/opinion/displaystory.cfm?story_id=EI_NJQTVRD).
- (231) Cited on page 159 in (51) {Root sources: (1) Thematic Paper. Giulio Volpi. 2007. "Climate Mitigation, Deforestation and Human Development in Brazil." (2) Chomitz, Kenneth M. with Piet Buys, Giacomo de Luca, Timothy S. Thoas and Sheila Wertz-Kanounnikoff. 2007. At Loggerheads? Agricultural Expansion, Poverty Reduction, and Environment in the Tropical Forests. A World Bank Policy Research Report. World Bank, Washington, DC. (3) Tauli-Corpuz, Victor and Parshuram Tamang. 2007. "Oil Palm and Other Commercial Tree Plantations, Monocropping: Impacts on Indigenous People's Land Tenure and Resource Management Systems and Livelihoods." Paper presented to the Sixth Session, United Nations Permanent Forum on Indigenous Issues, 14-25 May 2007, New York.}
- (232) Face-to-face interview with SEHD Executive Director Philip Gain. Dhaka, Bangladesh. 20 April 2008.
- (233) Stolen Forests. Philip Gain. Page 186. Society for Environment and Human Development (SEHD). 2006. Dhaka, Bangladesh. ISBN 984-494-029-9.
- (234) A Cost Curve for Greenhouse Gas Reductions. Per-Anders Enkvist, Tomas Nauclér, and Jerker Rosander. McKinsey Quarterly. 2007. No. 1. Pages 35-45. (Available: http://www.mckinseyquarterly.com/A_cost_curve_for_greenhouse_gas_reduction_1911_abstract)
- (235) Cited on page 82 in (233) {Referenced: Sundarbans World Heritage site devastated by cyclone, according to UNESCO experts who visited the site. UNESCO Press Release No. 2007-156. 12 December 2008. Accessed 5 May 2008 @ http://portal.unesco.org/en/ev.php-URL_ID=41428&URL_DO=DO_TOPIC&URL_SECTION=201.html}
- (236) The Sundarban of Bangladesh. Salinity threatens the World Heritage. Impact of Climate Change in Bangladesh. Campaign Brief 4. Coast Trust fact sheet edited by Mohammad Shamsuddoha. November 2007. Page 1. {Referenced in (243)}
- (237) Face-to-face interview with Professor Poh Poh Wong at the National University of Singapore (NUS). 8 May 2008.
- (238) EM-DAT Database Query, referenced in (123)
- (239) Sidr and the Sundarbans. Philip Gain makes a painful visit to find the World Heritage Site devastated, though hope still flickers. Published in Forum, Vol. 2 Issue 2. Pages 23-30. January 2008. The Daily Star. Dhaka, Bangladesh.
- (240) Healing of the Sundarbans following Sidr. Section: Environment. Dr. Saiful Islam. The Daily Star. 28 December 2007.
- (241) Reducing the destructive force of cyclones. Section: Environment. Altafur Rahman. The Daily Star. 22 February 2008.
- (242) Cited in (232), (235), (239), (240), (241), (243)
- (243) Sunderban and our survival. Point Counterpoint Section. Zulfiqer Ahmed Amin. The Daily Star. 28 December 2007. (Accessed 12 May 2008 @ <http://www.thedailystar.net/story.php?id=16737>)
- (244) Natural hazards. World Meteorological Organization. (Accessed 6 May 2008 @ http://www.wmo.ch/pages/themes/hazards/index_en.html)

- (245) United Nations Environment Programme (UNEP). Marine and coastal ecosystems and human well-being: A synthesis report based on the findings of the Millennium Ecosystem Assessment. 2006. Nairobi, Kenya. {Pages 4, 35.}
- (246) Cited on pages 11 and 18 in (245)
- (247) Cited on page 11 in (245)
- (248) Cited on page 169 in (38)
- (249) Telephone interview with Laurence Gray, Regional Advocacy Director for the Asia-Pacific region. 2 May 2008. {Referenced in (99).}
- (250) Cited in (244)
- (251) Mentioned during telephone interview (249)
- (252) Information based on: "Extreme Events." South Pacific. Sea Level and Climate Monitoring Project. Fact Sheet. AMSAT. Curtin, ACT, Australia. (Graphic based on schematic representation by Emmanuel Boulet. June 2007. Available: <http://en.wikipedia.org/wiki/Image:Surge-en.svg>)

Reinforce Disaster Defences

- (253) Cited on page 2 in (244)
- (254) Cited on page 1428 in (1)
- (255) Cited on pages 6 and 12 in (95) no 2
- (256) A global analysis of human settlement in coastal zones. C. Small and R. J. Nicholls. *Journal of Coastal Research*. Vol. 19. No 3. 2003. Pages 584-599. Also: Continental physiography, climate and the global distribution of human population. Small, Christopher and Joel Cohen. *Current Anthropology*. Vol. 45. No 2. 2004. Pages 269-277. {Referenced on page 18 in (32).}
- (257) Cited on pages 30-36 in (32)
- (258) Dhaka: Improving Living Conditions for the Urban Poor. Bangladesh Development Series. Paper No 17. Judy L. Baker. The World Bank Office. Dhaka. June 2007. Pages xiii-xvi. (Accessed 1 May 2008 @ <http://go.worldbank.org/DBWCSG4ES0>)
- (259) In an interview Judy Baker mentions that the poor pay 2 Taka for a bucket of water, whereas the wealthy can purchase 1,000 litres through the official grid for 4.5 Taka (Accessed 20 May 2008 @ <http://siteresources.worldbank.org/BANGLADESH/EXTN/Resources/295759-1182963268987/3930437-1182979937422/fullinterview.mp3>)
- (260) Hazards of Nature, Risks to Development. An IEG Evaluation of World Bank Assistance for Natural Disasters. Independent Evaluation Group (IEG). The World Bank. Washington. USA. 2006. Page xx. (Accessed 14 Jul 2008 @ http://www.worldbank.org/ieg/naturaldisasters/docs/natural_disasters_evaluation.pdf)
- (261) Cited on pages xxi-xxii in (260)
- (262) Managing Disaster Risk in Emerging Economies. Disaster Risk Management Series No 2. Chapter 11: Risk and Insurance by the Poor in Developing Nations. J.G.M. (Hans) Hoozeveer. Pages 123-125. The World Bank. Washington. 2000. ISBN 0-8213-4726-8.
- (263) Face-to-face interview with Bora Omseng, Executive Director VisionFund. VisionFund Headquarters #20, St. 71, Sangkat Tonle Bassac, Khan Chamkarmon, Phnom Penh, Cambodia. 11 July 2008.
- (264) Global: Balm to help ease way to climate change deal before G8? 4 July 2008. (Accessed 22 Jul 2008 @ <http://www.irinnews.org/Report.aspx?ReportId=79103>)
- (265) Cited under (ii) (k) on page 11 and "F. Resource Mobilization" 34 (e) on page 19 in (127)
- (266) Natural Disaster Hotspots: A Global Risk Analysis. Synthesis Report. International Bank for Reconstruction and Development/The World Bank and Columbia University. 2005. Page 26. (Available 27 Jun 2008 @ <http://sedac.ciesin.columbia.edu/hazards/hotspots/synthesisreport.pdf>)
- (267) Cited on pages 70-79 in chapter "Microcredit -- Financing Entrepreneurial Endeavors" in (143)
- (268) On-site interviews with community leaders in Purba Amtoli, Khawlia, Morrelganj, Bangladesh. 24 April 2008. (The official population of Purba Amtoli is 2,254; 2001 government census).
- (269) Handbook on Good Building Design and Construction. Aceh and Nias Islands. UNDP Regional Centre in Bangkok / The Secretariat of the International Strategy for Disaster Reduction (ISDR) Geneva, Switzerland. 80 pages. 2007. ISBN 974-94873-5-4.
- (270) (1.) Commentary: Land Titles In Aceh: So Much Hope, But More Action Needed. The World Bank. (Accessed 20 May 2008 @ <http://go.worldbank.org/TZDRC9HKJ0>). (2.) Reconstruction of Aceh Land Administration System (RALAS). The World Bank. (Accessed 20 May 2008 @ <http://go.worldbank.org/1XV3QQBWU0>)
- (271) On-site interview with Abdul Bari Khan and community leaders. Chapabaraikhal, Khawlia, Morrelganj, Bangladesh. 24 April 2008. (The official population of Chapabaraikhal is 9,426; 2001 government census).
- (272) On-site interview with mentioned community leaders. Purba Amtoli, Khawlia, Morrelganj, Bangladesh. 24 April 2008. (The official population of Purba Amtoli is 2,254; 2001 government census).
- (273) Face-to-face interview with World Vision Officer Jubayed Hossain. Amtoli, Morrelganj, Bangladesh. 24 April 2008.
- (274) Face-to-face interview with World Vision Programme Officer Maxwell Sibhensana. Banda Aceh, Indonesia. 15 January 2008.
- (275) Cited in (149)
- (276) Cited on page 11 in (95) no 2
- (277) Random community member interviews at the villages of Chapabaraikhal and Amtoli, Morrelganj, Bangladesh. 24 April 2008.

- (278)** Storm Warning Signals For Maritime Ports of Bangladesh:
1. *Distant Cautionary*: This indicates that ships may be exposed to danger after they have left the harbour as there is a region of squally weather in the distant sea where a storm may form.
 2. *Distant Warning*: This indicates that ships may be exposed to danger after they have left the harbour as storm has formed in the distant sea.
 3. *Local Cautionary*: This indicates that the port itself and the ships therein may be threatened as the port is threatened by a squally weather.
 4. *Local Warning*: This indicates that the port is threatened by a storm, but it does not appear that the danger is as yet sufficiently great to justify extreme measures of precautions.
 5. *Danger*: This indicates that the port will experience severe weather from a storm of slight or moderate intensity that is expected to cross the coast to the south of the port.
 6. *Danger*: This indicates that the port will experience severe weather from a storm of slight or moderate intensity that is expected to cross the coast to the north of the port.
 7. *Danger*: This indicates that the port will experience severe weather from a storm of slight or moderate intensity that is expected to cross over or near to the port.
 8. *Great Danger*: This indicates that the port will experience severe weather from a storm of great intensity that is expected to cross the coast to the south of the port.
 9. *Great Danger*: This indicates that the port will experience severe weather from a storm of great intensity that is expected to cross over or near to the port.
 10. *Failure of Communication*: This indicates that the communications with the meteorological warning centre have broken down and the local officer considers that there is danger of bad weather.
- (279)** UNDP. Human Development Report 2007/2008. Bangladesh. {Source: adult literacy rates from UNESCO (United Nations Educational, Scientific and Cultural Organization) Institute for Statistics, 2007a. Adult and youth literacy rates. May, Montreal.}
- (280)** 65pc people got warning before 24hrs of Sidr, Survey reveals. The Daily Star. 23 April 2008. (Also available 7 May 2008 @ <http://www.thedailystar.net/story.php?nid=33418>)
- (281)** Cited in (149)
- (282)** Cited on page 65 in (14)
- (283)** Cited on page 78 in (143)
- (284)** Grameenphone zooms in on rural areas. Star Business Report. The Daily Star. 24 April 2008. (Also available 14 May 2008 @ <http://www.thedailystar.net/story.php?nid=33519>)
- (285)** Paper prepared for the Papua New Guinea National Disaster Committee. Planning for rising sea level. Hugh Davies. 18 May 2007. Page 2.
- (286)** Dredging for a Better Jakarta. The World Bank. 15 April 2008. (Accessed 18 Apr 2008 @ <http://go.worldbank.org/5LTBJ9B2T0>)
- (287)** Statistics from EM-DAT International Disaster Database (123) and article (288)
- (288)** Jakarta's Vulnerability to Global Warming. The Jakarta Post. 28 Apr. 2007.
- (289)** Dec. 6, 2025: Jakarta Under Water. Sinking City. The Straits Times. 16 April 2008. Page 6.
- (290)** Once pristine, Cisadane river now a muddy swamp. Multa Fidrus. The Jakarta Post. 19 January 2008. Page 5.
- (291)** Cited in (286)
- (292)** Mentioned in face-to-face interview (237)
- (293)** Feature-Climate change may wipe some Indonesian islands off map. Reuters. Sugita Katyal and Adhityani Arga. 3 Dec 2008. (Accessed 15 Jan 2008 @ <http://www.alertnet.org/thenews/newsdesk/JAK155078.htm>)
- (294)** Cited on page 35 in (32)
- (295)** World Vision Australia's Policy Position on Climate Change. 2nd Edition. 3 December 2007. Compiled by Dr. Brett Parris. {Page 50}
- (296)** GPRN Business Plan. Global Pre-positioning Resource Network. World Vision International. Humanitarian & Emergency Affairs (HEA). Draft v. 3.5. 14-March-2008. Pages 6 and 67.

Educate School Children

- (297)** Cited on page 539 in (1)
- (298)** International Strategy for Disaster Reduction (ISDR). Press Release. 3 October 2005. Page 2. (Accessed 21 May 2008 @ <http://www.unisdr.org/eng/media-room/press-release/2005/pr-2005533-Tilly-NY.pdf>)
- (299)** Award for tsunami warning pupil. BBC News. 9 September 2005. (Accessed 20 May 2008 @ <http://news.bbc.co.uk/1/hi/uk/4229392.stm>)
- (300)** Tsunami Family Saved by Schoolgirl's Geography Lesson. National Geographic News. James Owen. 18 January 2005 (Accessed 5 Mar 2008 @ http://news.nationalgeographic.com/news/2005/01/0118_050118_tsunami_geography_lesson.html)
- (301)** Awards: Marine Society, UK's largest maritime charity; "Child of the Year," French magazine Mon Quotidien; according to the National Aeronautics and Space Administration (NASA), Asteroid 20002 Tillysmith has been named after her for "alerting beachgoers ... [and saving] many lives..." {Cited: 20002 Tillysmith (1991 EM). Main-belt Asteroid. NASA. (Accessed 20 May 2008 @ <http://ssd.jpl.nasa.gov/sbdb.cgi?sstr=20002+Tillysmith>)}
- (302)** Cited on page 1 in (298)
- (303)** Acknowledging the Importance of Improving Earthquake Safety in Schools. Organisation for Economic Cooperation and Development (OECD). Hannah von Ahlefeld. 2004. Page 20. (Accessed 15 May 2008 @ <http://www.oecd.org/dataoecd/43/10/33628793.pdf>)
- (304)** Cited on page 20 in (303) (Executive Summary Pages 8-17)
- (305)** Schools of Death. Field turned into a makeshift morgue with bodies of students carried into tent every few minutes. Chua Chin Hon. The Straits Times. 14 May 2008. Frontpage.

- (306) Anger rises over 'buildings that were like tofu.' Caryn Yeo. The Straits Times. 16 May 2008. Page 6.
- (307) Two References: (1) Flaws in school buildings worldwide make them death traps. New York Times. {In: The Straits Times. 15 May 2008. Page 4.} (2) Sichuan's shattered schools restart classes. Tracy Quek. The Straits Times. 22 May 2008. Pages 1-2.
- (308) From death traps into havens. Experts work to strengthen school buildings and save lives. Andrew C. Revkin. Bangkok Post. 5 June 2008. Page "Outlook" 03.
- (309) Disaster-resilient Education and Safe Schools. What Educational Authorities Can Do. Draft 1.3. 19 May 2008. Inter-Agency Network for Education in Emergencies (INEE). Pages 4-5.
- (310) UNICEF to focus on damaged schools in unreached areas of Myanmar. 28. May 2008. (Accessed 27 Jun 2008 @ <http://www.reliefweb.int/rw/RWB.NSF/db900SID/EGUA-7F3NPB?OpenDocument>)
- (311) Cited on page 2 in (309)
- (312) 2006-2007 World Disaster Reduction Campaign. Disaster risk reduction begins at school. UN-ISDR. Page 3. (Accessed 18 Jul 2008 @ http://www.unisdr.org/eng/public_aware/world_camp/2006-2007/pdf/WDR-2006-2007-English-fullversion.pdf)
- (313) Convention on the Rights of the Child. Office of the High Commissioner for Human Rights. General Assembly resolution 44/25 of 20 November 1989, entry into force 2 September 1990 (Accessed 17 Jul 2008 @ <http://www.unhcr.ch/html/menu3/b/k2c2rc.htm>)
- (314) Compiled June 2008. World Vision Communications. (All names and/or places changed according to World Vision's Child Protection Policy.)
- (315) Delivery of aid supplies "critical for survival." The Straits Times. Nimal Ghosh. 9 May 2008. ASIA. Page 6.
- (316) Towards Our Own Safety. Save the Children Sri Lanka. Video-CD. 2006.
- (317) Cited on page 15 in (309) {Ref: A Study on the Impact of Disasters on the Education Sector in Cambodia. Consultation Version 1.1. 2008. Bangkok.}
- (318) 'Cyclone Nargis, Myanmar': ASEAN emergency rapid assessment team mission report, 09-18 May 2008. III. Key Findings of ASEAN-ERAT. 9 Education. (Accessed 28 Jul 2008 @ <http://www.reliefweb.int/rw/rwb.nsf/db900sid/LSGZ-7ESGDE?OpenDocument>)
- (319) Friendly centres protect children in Myanmar. Kristin Tamblyn and Stephanie Zito. 14 July 2008. Connections. World Vision Relief.
- (320) Cited on page 3 of (312)
- (321) UNEP Sasakawa Prize Winners 2007. United Nations Environment Programme (UNEP). [Land-loss statistics updated by M. Rezwani by e-mail on 5 August 2008.] (Accessed 25 Jun 2008 @ <http://www.unep.org/sasakawa/index.asp?ct=laureates&lau=shidhulai>)
- (322) Telephone interview with Mohammed Rezwani, Executive Director of Shidhulai Swanirvar Sangstha. 1 July 2008. (Shidhulai.org)
- (323) Bangladesh: Flood 2007 SitRep No. 12. 19 August 2007. (Accessed 26 Jul 2008 @ <http://www.reliefweb.int/rw/rwb.nsf/db900SID/EK0I-76W9T5?OpenDocument>)
- (324) Cited on pages 11 and 50 in (14)
- (325) Cited in (116)
- (326) Telephone interview (322) {Data referenced page 1 in: Shidhulai Swanirvar Sangstha, Bringing Information Technology to Rural Bangladesh by Boat. Arshad Mahmud. Council on Library and Information Resources. 2006. Bill & Melinda Gates Foundation Access to Learning Award Recipient 2005. (Accessed 25 Jun 2008 @ <http://www.clir.org/pubs/reports/pub136/pub136.pdf>)
- (327) 2006 International Day for Disaster Reduction. Cited on pages 36-37 in (132)
- (328) Snapshots of CBDRM in World Vision Asia Pacific. Findings of the consultation on Community Based Disaster Risk Reduction Practice and Capacity 2007. Debs Harris. Page 39.
- (329) Increasingly internet-based disaster games (e.g. stopdisastersgame.org) are raising awareness through interactive fun pastime.
- (330) Cited on page 9 in (127)
- (331) Cited on page 36 in (327) and (132)
- (332) Cited on page 2 in (132)
- (333) Quote from essay "History," published in 1841. (cf. Stanford Encyclopedia of Philosophy accessed 23 May 2008 @ <http://plato.stanford.edu/entries/emerson/>)
- (334) Towards a Culture of Prevention: Disaster Risk Reduction Begins at School. Good Practices and Lessons Learned. International Strategy for Disaster Reduction (ISDR). Geneva. Switzerland. 2007. (Accessed 18 Jul 2008 @ http://www.unisdr.org/eng/about_isdr/isdr-publications/11-education-good-practices/education-good-practices.pdf)

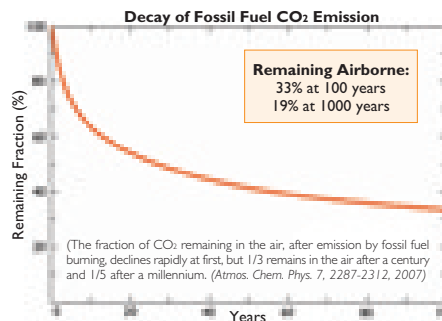
Synthesis: Converging Forces

- (335) Cited on page 40 in (46)
- (336) Cited on page 17 in (32)
- (337) Cited on page 40 in (46)
- (338) Bijlsma, L., Ehler, C. N., Klein, R. J. T., Kulshrestha, S.M., McLean R.F., Mimura N., Nicholls R.J., Nurse L.A., Perez Nieto H., Stakhiv E.Z., Turner R.K., Warrick R.A. (1996): 'Coastal zones and small islands.' In Watson R.T., Zinyowera M.C., and Moss R.H. (eds), Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analysis. Cambridge University Press. Cambridge, New York. Pages 289-324. {Cited on page 40 in (46).}
- (339) Cited on pages 371-372 in (1)

- (340) Measuring Vulnerability to Natural Hazards. Towards Disaster Resilient Societies. Jörn Birkmann (Editor). United Nations University Press. 2006. ISBN 978-92-808-1135-5. {Cited on page xx.}
- (341) Urbanization: A Turning Point In History. UN-Habitat State of the World's Cities 2006/7. (Accessed 4 Aug 2008 @ http://www.unhabitat.org/downloads/docs/4631_89382_GC%2021%20Urbanization%20a%20Turning%20Point.pdf)
- (342) Urban Management: Mega-challenges for megacities. Andrew Tan. In: The Straits Times. 27 June 2008. Page 30.
- (343) Cited in (221) and (222)
- (344) Global Warming: Cities can and must cut energy use. Ursula Schaefer-Preuss. In: The Straits Times. 25 June 2008. Page 26.
- (345) The Social Impacts of Climate Change in South Asia. Sujatha Byravan and Sudhir Chella Rajan. Paper. March 2008. (Accessed 24 Jul 2008 @ http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1129346)
- (346) Cited on page 63 in (46)
- (347) Small, C. and Nicholls RJ. 2003. A global analysis of human settlement in coastal zones. *Journal of Coastal Research* 19. Pages 584-99. {Cited on page 40 in (46).}
- (348) Global Report on Human Settlements 2007. UN-Habitat. Foreword Ban Ki-moon. (Accessed 4 Aug 2008 @ http://www.unhabitat.org/downloads/docs/5206_77609_GR%201.pdf)
- (349) Press Release: Slum Dwellers suffer from an Urban Penalty: They are as badly if not worse off than their rural relatives according to UN-Habitat's State of the World's Cities 2006/7. (Accessed 4 Aug 2008 @ http://www.unhabitat.org/cdrom/docs/pr_SOWCR_2006.pdf)
- (350) Slum Dwellers to Double by 2030: Millennium Development Goal Could Fall Short. UN-Habitat. Twenty First Session of the Governing Council. 16-20 April 2007. Nairobi, Kenya. (Accessed 4 Aug 2008 @ http://www.unhabitat.org/downloads/docs/4631_46759_GC%2021%20Slum%20dwellers%20to%20double.pdf)
- (351) Cited on page 82 in (29)
- (352) Citing 'Frightening Lack of Leadership' on Climate Change, Secretary-General Calls Phenomenon an All-Encompassing Threat in Address to Nairobi Talks. 15 November 2006. Kofi Annan, Secretary-General SG/SM/10739. ENV/DEV/904. (Accessed 14 Jul 2008 @ <http://www.un.org/News/Press/docs/2006/sgsm10739.doc.htm>)
- (353) Al Gore. The Nobel Peace Prize 2007. Nobel Lecture. Oslo. 10 December 2007. (Accessed 21 Jan 2008 @ http://nobelprize.org/nobel_prizes/peace/laureates/2007/gore-lecture_en.html)
- (354) Emissions estimate based on published data in the 2007/2008 Human Development Report (annual emissions of 29 gigatonnes [2004] adjusted for global annual increase of 2 percent and above average increases in China (8 percent), India (7 percent), etc during period 1990-2004). {Cited on pages 310-313 in (51).}

(355) Cited in (199)

(356) Global Warming 20 Years Later: Tipping Points Near. Jim Hansen. 23 June 2008. National Press Club, and House Select Committee on Energy Independence & Global Warming. Washington D.C., USA. PowerPoint Presentation. (Accessed 31 Jul 2008 @ http://www.columbia.edu/~jeh1/2008/TippingPointsNear_20080623.ppt) [Slide 28]



(357) Cited on page 20 in (14)

(358) Cited in (191) and (199), etc.

(359) Cited in (352)

(360) Economic giants' oil-guzzling unsustainable. Michael Richardson (energy and security specialist, Institute of Southeast Asian Studies). In: The Straits Times. 25 June 2008. Page 26. {See also: (188)}

(361) Energy Policies of IEA Countries. 2006 Review. OECD (Organisation for Economic Co-operation and Development)/IEA, Paris. {Cited on page 133 in (51).}

(362) Cited on page 15 in (14)

(363) Cited on page 133 in (51)

(364) International Energy Outlook 2008. Energy Information Administration (EIA). Official Energy Statistics from the U.S. Government. Report #:DOE/EIA-0484 (2008). (Accessed 5 Aug 2008 @ <http://www.eia.doe.gov/oiaf/ieo/highlights.html> and <http://www.eia.doe.gov/oiaf/ieo/index.html>)

(365) Cited in (360) and (188)

(366) Cited in (364)

(367) Emanuel K. 2005. Increasing destructiveness of tropical cyclones over the past 30 years. *Nature* 436: Pages 686-688. {Cited: <http://www.climate-crisis.net/thescience>}

(368) Pages 80-81 in (38)

(369) Cited on page 40-41 in (46) {Source: Jimenez J.A. and Sanchez-Arcilla A. 1997. Physical impacts of climate change on deltaic coastal systems (II): driving terms. *Climatic Change* 35. Pages 95-118.}

- (370) Cited in (199)
- (371) Greenpeace (2005). A way forward for coal communities. {Referenced: Australia Responds: Helping Our Neighbours Fight Climate Change. The Climate Change And Development Roundtable. Page 11. ISBN 978-0-85802-141-9.}
- (372) Cited on pages 13 and 53 in (14)
- (373) Cited on page 38 in (46)
- (374) Disaster deaths worse so far in 2008 than tsunami year: Munich Re. (Accessed 14 Jul 2008 @ <http://www.reliefweb.int/rw/rwb.nsf/db900SID/MUMA-7GE2VV?OpenDocument&RSS20=02-P>)
- (375) Irrawaddy Delta, Burma. NASA image by Robert Simmon, based on Landsat-7 data. Caption: Rebecca Lindsey. (Accessed 24 Jun 2008 @ http://earth-observatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=18035)
- (376) Seeing People Through The Trees. Scaling Up Efforts to Advance Rights and Address Poverty, Conflict and Climate Change. Rights And Resources Initiative (RRI). Washington D.C. ISBN 978-0-615-21842-7 (Accessed 15 Jul 2008 @ <http://www.rightsandresources.org/documents/index.php?pubID=737>) {Cited on page 4.}
- (377) Cited on page 30 in (376)
- (378) Introduction to RRI. Global Challenge, a Global Opportunity. (Accessed 15 Jul 2008 @ <http://www.rightsandresources.org/pages.php?id=92>)
- (379) Ravaged coastal buffer left land vulnerable. Decline of mangroves is viewed as a factor in storm devastation. Jane Spencer. In: The Wall Street Journal. 9-11 May 2008. Page 28. {According to the Ecological Mangrove Restoration Project, the rate of decline was 87.7 percent for the period 1924-1995. Page 4. Accessed 25 Jun 2008 @ <http://www.mangrove-actionproject.org/files/map-asia/MSNrestorationprogressreport.pdf>}
- (380) Post-Nargis Joint Assessment Report. Tripartite Core Group comprised of Representatives of the Government of the Union of Myanmar, the Association of Southeast Asian Nations (ASEAN) and the United Nations. {Cited on pages 124-125.} (Accessed 14 Aug 2008 @ http://gfdm.org/docs/Post-NargisJointAssessment_July_21_08.pdf)
- (381) Cited on page 4 in (376)
- (382) Sir John Holmes, UN Under-Secretary General for Humanitarian Affairs and Emergency Relief Coordinator. DIHAD 2008 Conference. 8 April 2008. Opening Remarks. (Accessed 2 Aug 2008 @ <http://ochaonline.un.org/OchaLinkClick.aspx?link=ocha&docId=1088217>)
- (383) Quoted from an e-mail interview with Brett Paris, Chief Economist World Vision Australia. 22 August 2008.
- (384) Cited on page 421 in (1)
- (385) Natural Disasters: Taking the sting out of the storm. Amitav Ghosh. In: The Straits Times. 12 May 2008. Page 22. (Also in: The New York Times.)
- (386) Cited on pages 94-95 in (29)
- (387) Storm Surge Preparedness and Safety. Australian Government Bureau of Metereology. (Accessed 16 Jun 2008 @ <http://www.bom.gov.au/weather/cyclone/about/storm-surge/storm-surge.shtml>)
- (388) Quoted from an e-mail interview with Alan Sharp, Coordinator of Tropical Cyclone and Severe Thunderstorm Warning Services. Bureau of Metereology. Melbourne, Australia. 29 May 2008.
- (389) Cited in (31)
- (390) Cited in (30)
- (391) Myanmar's recovery better than expected. Resourceful villagers and private aid mitigated suffering, relief groups say. International Herald Tribune. 18 June 2008. Page 1.
- (392) Cited on page 6 in (391)
- (393) Cited on page 90 in (29)
- (394) Cited on page 41 in (46)
- (395) Quoted from an e-mail interview. 13 August 2008.
- (396) Compiled 30 June 2008. World Vision Communications. (All names and/or places changed according to World Vision's Child Protection Policy.)

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- (397) See the Bigger Picture – Act On Climate Change. Make Poverty History. Australian Action on Climate Change: A Guide for Gamaut and the Government. Cited on page 7.
- (398) Cited on page 139 in (143)
- (399) Cited on pages 2, 30, 72 in (14)
- (400) Mandela. His 8 Lessons of Leadership. As he celebrates his 90th birthday, the world's greatest moral leader reflects on a lifetime of service – and what the rest of us can learn from it. Richard Stengel. Time. 21 July 2008. Page 20.
- (401) Cited on page 198 in (51)
- (402) Cited on page 84 in (14)
- (403) Cited on page 76 in (14)
- (404) Cited on page 20 in (14)
- (405) Cited on page xix, 3 and 162 in (260)
- (406) Cited on pages 17-18 in (124): "Small Island Developing States (SIDS) are at the highest risk. These countries are often particularly exposed to natural hazards, especially wind storms – the most destructive natural hazards in economic terms – and also have high vulnerability. Much of the infrastructure in these countries is in coastal regions, where it can be particularly heavily hit by storms and floods. The 20 countries at highest risk from economic losses from natural disasters, according to Maplecroft's Natural Disaster

Economic Loss Index, are: Tokelau (0.00), Montserrat (1.39), Cayman Islands (2.38), Grenada (2.42), Bermuda (2.46), Saint Kitts and Nevis (2.46), Saint Lucia (2.47), Maldives (2.47), American Samoa (2.47), Antigua and Barbuda (2.48), Cook Islands (2.49), Tonga (2.49), Samoa (2.49), Guam (2.49), Anguilla (2.50), Saint Vincent and The Grenadines (2.50), Virgin Islands (US) (2.50), Armenia (2.50), Dominica (2.50), British Virgin Islands (2.50)."

(407) A needless toll of natural disasters. Eric Schwartz. 23 March 2006. The Boston Globe. (Accessed 15 Jul 2008 @ http://www.boston.com/news/globe/editorial_opinion/oped/articles/2006/03/23/a_needless_toll_of_natural_disasters)

(408) The Marshall Plan, known officially as the European Recovery Program (ERP), was the primary plan of the United States for rebuilding Europe after World War II. The initiative was named after United States Secretary of State George Marshall and was set up to provide U.S. finance to rebuild Europe largely through grants rather than loans. The plan was in operation for four fiscal years beginning in July 1947. During that period some \$13 billion of economic and technical assistance, equivalent to about \$130 billion in 2006 when adjusted for inflation, was given to help the recovery of the European countries (more than 1 percent of GNP). In a speech delivered in 1947, U.S. Secretary of State George Marshall stated the underlying logic:

"Europe's requirements for the next three or four years of foreign food and other essential products – principally from America – are so much greater than her present ability to pay that she must have substantial additional help or face economic, social and political deterioration of a very grave character. (...) Our policy is directed ... against hunger, poverty, desperation and chaos. Its purpose should be the revival of a working economy in the world so as to permit the emergence of political and social conditions in which free institutions can exist. (...) It is virtually impossible at this distance merely by reading, or listening, or even seeing photographs or motion pictures, to grasp at all the real significance of the situation. And yet the whole world of the future hangs on a proper judgment. It hangs, I think, to a large extent on the realization of the American people of just what are the various dominant factors. What are the reactions of the people? What are the justifications of those reactions? What are the sufferings? What is needed? What can best be done? What must be done? Thank you very much."

(Excerpt taken from George Marshall's speech "Against Hunger, Poverty, Desperation and Chaos" delivered at a Harvard University commencement ceremony in June 1947. George Marshall was U.S. Secretary of State from 1947 to 1949 and U.S. Secretary of Defence from 1950 to 1951. In 1953 he was awarded the Nobel Peace Prize. He died in 1959. {Cited on pages 30 and 220-221 in (143).}

(409) Face-to-face interview with Professor Poh Poh Wong at the National University of Singapore (NUS). 8 May 2008.

(410) Cited on page 69 and 186ff in (143) and Box 1.2 on page 45 in (51)

(411) Cited in (364)

(412) Cited in (191) and (199). {If every country contributes 1 percent of its GNP to the effort, the endeavour can be fair, feasible and affordable (408).}

(413) The Secret Life of Trees. Bryan Walsh, Nusa Dua. TIME Magazine. 14 December 2007. (Accessed 14 Jul 2008 @ <http://www.time.com/time/print-out/0,8816,1694814,00.html>)

(414) Cited on page 42 in (51)

(415) Ref.: <http://www.un.org/millenniumgoals/> {Cited on page 4 in (376).}

(416) Sujatha Byravan and Sudhir Chella Rajan. Providing New Homes for Climate Change Exiles. Climate Policy. Vol. 6. Pages 247-252. 2006. (Accessed 24 Jul 2008 @ http://papers.ssm.com/sol3/papers.cfm?abstract_id=950329)

(417) Cited in (345)

(418) Cited on page 98 in (46) {Note: Numerous academics have proposed that "climate refugees" be defined as "people who have to leave their habitats, immediately or in the near future, because of sudden or gradual alterations in their natural environment related to at least one of three impacts of climate change: sea-level rise, extreme weather events, and drought and water scarcity." Rather than extending the existing definition of "refugees" under the 1951 Geneva Convention Relating to the Status of Refugees, the authors call for a "new legal instrument specifically tailored to the needs of climate refugees – a Protocol on Recognition, Protection and Resettlement of Climate Refugees to the United Nations Framework Convention on Climate Change." [Source: Preparing for a Warmer World. Towards a Global Governance System to Protect Climate Refugees. Frank Biermann and Ingrid Boas. Global Governance Working Paper No 33. November 2007. Amsterdam et al.: The Global Governance Project. (Accessed 18 Jul 2008 @ <http://www.glogov.org/images/doc/WP33.pdf>)]}

(419) Cited in (308)

(420) Cited on page 139 in (143)

(421) Cited on page 298 in (38)

(422) EM-DAT Database, queried 18 August 2008, referenced in (123)

(423) Cited on pages 95 and 102 in (29)

(424) Cited on page 102 in (29)

(425) EM-DAT Database, queried 18 August 2008, referenced in (123)

(426) EM-DAT Database, queried 18 August 2008, referenced in (123)

(427) Face-to-face interview. WV Indonesia National Office. 18 January 2008.

(428) Emily and her father Paul who photographed and "photoshopped" the images have no affiliation with World Vision. Emily's text was shortened but left unedited and uncorrected. Paul says he did not tell Emily what to write or what it was for. The computer auto-spell check corrected some mistakes. This is the plastic ball Emily was holding when her father photographed her hands.

(a) The term "climate refugee" is used in this report on the understanding that World Vision does not endorse this term but rather recognises its usage by various commentators. World Vision acknowledges the legal definition of refugees as rendered by the 1951 Convention on Refugees.

(b) The Intergovernmental Panel on Climate Change (IPCC) defines the terms (1) "deforestation," (2) "reforestation," and (3) "afforestation" as follows: (1) "Conversion of forest to non-forest." {Page 79 in (14).} (2) "Planting of forests on lands that have previously contained forests but that have been converted to some other use." {Page 86 in (14).} (3) "Planting of new forests on lands that historically have not contained forests." {Page 76 in (14).}



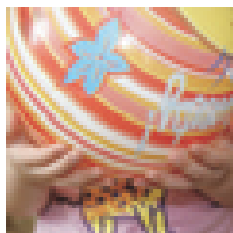
WHAT I WANT THE WORLD TO BE LIKE

As a child-focused organisation it is fitting to give the final word to a child. Given that the effects of climate change will be borne disproportionately by future generations, we urge today's leaders to hear from future generations *today*. Emily is the little cover girl who is delicately balancing the Earth in her hands. She makes her home in England and was happy to write an essay about "What I want the world to be like" and say a wish for the children of Asia. ⁽⁴²⁸⁾

“ I would like there to be not as many bad things happening. Every time my Dad watches the News on TV it is bad. It is always about bad people and bad things happening in the world, like terrorists and bad weather and earthquakes and people getting killed. The fumes from cars and factories have ruined the air and the scientists say that this is making the weather bad. Sometimes when the bad weather comes people lose their houses or die in the storms and that is our fault. We should look after the world and take care of it so this does not happen.

The scientists say that the world is running out of oil and that it will be bad when we don't have any left because the cars will not be able to go any more. Lots of people will not be able to make any money any more, like petrol stations, when the oil runs out. I think this will be good as the cars won't be able to make any more fumes and the air will get better. People should be interested in the world and not just money. That is what I want every one to do. I want the world to be a much safer place where there aren't as many bad things happening around the entire world. It would be a nice place from then on, to me it would be great. It would be very good to live in a safe place. My wish for you children in Asia is... that you all have a nice house to live in with clean water and enough food to eat and that you all can be happy. (Emily Marie Willows, 8) (428)

”



Photos: Paul Willows and NASA

■ **Planet Prepare:** The Asia Pacific Disaster Report is a joint initiative by regional World Vision players. Partnering together, Advocacy, Communications, Humanitarian and Emergency Affairs (HEA), and World Vision Singapore are aiming to position for heightened disaster preparedness in the region. 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.

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