

Act Now or Pay Later:

Protecting a billion people
in climate-threatened
coastal cities

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aid

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Cover: In August 2012, extreme monsoon rainfall devastated the Philippines' National Capital Region, Metro Manila, forcing close to three quarters of a million people to evacuate their homes.

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Summary

'Every \$1 spent on reducing the risks from disasters now will save around \$7 of damages later'

More than a billion people across the world are living in cities seriously threatened by climate change. These are coastal cities, and most are already experiencing increased flooding, extreme weather and storm surges.

In the run-up to the World Humanitarian Summit, UN Secretary General Ban Ki-moon has given a timely reminder that every \$1 spent on reducing the risks from disasters now will save around \$7 of damages later.¹ It's essential that we act urgently to prevent the suffering of millions of poor and vulnerable people.

Mega-cities such as Kolkata, Lagos and Dhaka are already facing serious climate threats, and there are hundreds of smaller cities at risk across Asia, Africa and South America. Although US and Chinese coastal cities will face the biggest financial losses, it's the poorest urban dwellers who have the most to lose.

For people already living in severe hardship, it may be almost impossible to recover from such disasters without significant help. With

the number of urban poor predicted to swell in coming decades, this is a humanitarian crisis waiting to happen.

The good news is that improvements in science make the impacts of climate change increasingly predictable. It is possible to put measures in place now to identify the most vulnerable people and places and minimise the impacts.

The first action has to be to reduce carbon emissions rapidly and limit temperature increase by encouraging a shift in investment from fossil fuels to low-carbon energy sources. Next is to help vulnerable communities survive and thrive, by better protecting their homes and livelihoods. Finally, is to put in place agreed, international systems that support communities to recover from ultimate loss and damage caused by devastating storms and floods.

Metro Manila, in the Philippines, encompasses 16 cities and is home to 20 million people. It's one of the most crowded metropolitan areas in the world. Flooding is now common along sections of Metro Manila's Marikina River.

The urban billion at risk from coastal climate change



'A recent study shows that between 2000 and 2030 the global exposed population could rise by more than 50%

The rapid growth of urban populations along the world's coastlines – a result of natural population growth and economic migration – combined with the increasing threats from climate change, are set to expose more than a billion people to coastal flooding by 2060.

In 2014, 54% of the global population lived in cities (up from 34% in 1960). In absolute numbers, most of this urban population growth is concentrated in the less-developed regions of the world. It's estimated that by next year, even in the least developed countries, the majority of people will be living in urban areas.²

Much of this urban growth is taking place along coastlines that will be coming under increased pressure from climate change – through rising sea levels, extreme weather and flooding. During the course of this century, people living in these places will be forced to find ways of coping with the encroachment of water or to abandon some areas altogether.³ A recent study⁴ (see Appendix, table 1) shows that even under the lowest growth assumptions, between 2000 and 2030 the global exposed population could rise by more than 50% – from 625 million to 880 million. By 2060, more than a billion people worldwide could be living in low-lying coastal zones.

Most of these will be in Asia. The top five most exposed countries are from the region, with China and India topping the list. But the US comes in 8th and even the much less populous Great Britain makes the top 25, with nearly 9 million people projected to be living in exposed coastal areas.

The exposure of people and assets to coastal risks has been growing rapidly and, because coastlines are vulnerable areas, it is often the very poorest people who move there. The trend is expected to continue, with the effects of climate change raising sea levels for centuries to come (see 'Climate change and sea-level rise', page 5).

Add to this the dangers caused by an expanding coastal population's inevitable destruction of existing coastline mangrove forests and flood plains. These have long-acted as natural protections to the effects of extreme weather. Traditionally such areas were sparsely populated precisely because they were seen as relatively more exposed to climate risk.

Kolkata, regarded as India's intellectual and cultural capital, is also among the world's most flood-prone cities. By 2070 it is expected to rank as the most vulnerable city in the world in terms of exposure of its population, and fourth most vulnerable in terms of exposure of its assets.



Climate change and sea-level rise

At the UN COP21 climate summit in Paris in December 2015, a target was set to limit global temperature rise to below 2°C, and to pursue efforts to stay below the much safer limit of 1.5°C. However, the UN Environment Programme (UNEP)⁵ has estimated that based on achieving the emissions reductions actually pledged by UN nations, we are still heading for a temperature increase this century of about 3°C. It's clear that there needs to be a significant increase in ambition, by all countries, for cutting carbon emissions rapidly. This means an urgent shift away from fossil fuels to investment in renewable energy, with the intention of achieving zero-carbon economies.

A World Bank assessment estimates that if global temperatures rise by 2°C by 2100, the average sea-level rise will be about 79cm above the average levels between 1980–99. But scenarios that approach 4°C warming by 2100 lead to a rise of nearly 1m.⁶ Without drastic emissions cuts, by 2100 hundreds of millions

of people will be affected by coastal flooding and will be displaced due to land loss, the majority of them in Asia. These projections are scary enough, but more recent studies have suggested we may be facing even more drastic sea-level rise – of more than double these predictions.^{7,8}

Not only does sea-level rise bring flooding, it also brings higher and much stronger storm surges, which can drive a wall of seawater kilometres inland, such as the storm surge that devastated areas of the Philippines during Typhoon Haiyan in 2013. The UK Met Office estimated that sea-level rise increased the storm surge for Hurricane Sandy, in 2012, by 50%.

Even with meaningful action to reduce emissions now, a significant amount of sea-level rise this century is irreversible and unavoidable. We still need to protect people in coastal areas – the question is whether we'll act before disaster strikes or delay until after.

Polar regions are especially vulnerable to a warming atmosphere. Melting ice-sheets are increasing the sea-level rise, and the World Bank assessments estimate that a 4°C warming by 2100 would lead to a rise in sea-levels of nearly a metre.

Who's going to suffer?

'Although huge financial assets are at risk... and many large and famous cities, it is the poorest people with the fewest assets who have the most to lose'

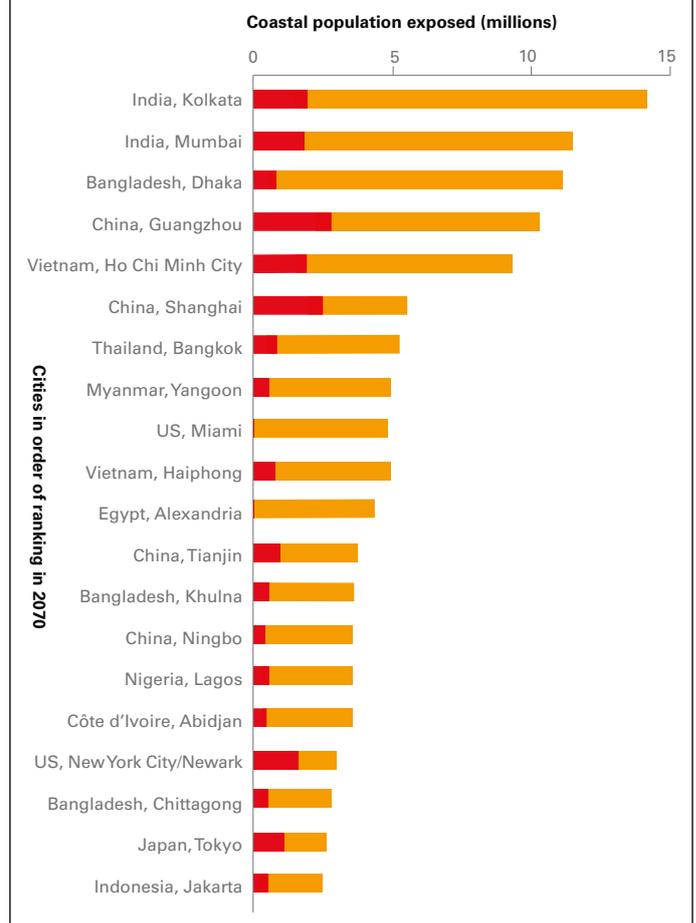
US, China and India top the rankings of coastal climate-change impact

Ironically the three countries with the cities likely to suffer the most from coastal climate change are three of the biggest emitters of greenhouse gases. Today's two biggest emitters, China and the US, are set to take a financial hammering because of the value of exposed property, business, investment and other assets. India, currently fourth and rapidly increasing its carbon pollution, is likely to bear the brunt of the human cost. According to projections supported by the Intergovernmental Panel on Climate Change (IPCC),⁹ Kolkata and Mumbai will top the list of world cities with the most exposed populations to coastal flooding, with 14 million and 11.4 million vulnerable people respectively. Bangladesh's Dhaka will sit in close third place with 11.1 million. The next five cities on the list are also from Asia, until the US's Miami appears at number nine with 4.8 million.

Financially the US is in line to be paying a hefty bill for its world-leading per capita carbon emissions. Miami tops the list of exposed assets in 2070 (including property and businesses) with an eye-watering \$3.5tn, followed in third place by New York with \$2.1tn. Splitting the two is China's Guangzhou with \$3.4tn. In total, of the top 20 most financially vulnerable cities half are from either of these two countries: four from the US, six from China.

Miami, south Florida, ranks number one in terms of assets vulnerable to rising seas. The daily high-water mark in the Miami area has been rising at an average of 0.36 inches a year for the past 25 years.¹⁰

Top 20 cities ranked in terms of population exposed to coastal flooding in 2010/2070 (including the effects of both climate change and socio-economic change).¹¹
See Appendix for detailed data.



In terms of most vulnerable continents, Asia will bear the brunt of the suffering, as it contains 15 of the world's top 20 cities for projected population exposure and 13 of the top 20 for asset exposure. There is also a notable, tenfold increase in the exposure of the big African cities of Lagos and Abidjan.

All these cities are also characterised by rising inequalities, with large numbers of very poor inhabitants who are generally the most exposed to impacts. Although huge financial assets are at risk, running into trillions of dollars, and many large and famous cities, it is the poorest people with the fewest assets who have the most to lose.

While more than a billion people are exposed, and US and Chinese cities may foot hefty bills, wealthier countries and people will have options to relocate or receive insurance protection. Wealthier people will also live in safer areas and have more robust infrastructure. Evidence shows that, from New Orleans to Dhaka, it's the poorest who are by far the most vulnerable. They tend to live on more-exposed land, often in informal settlements with poorly built infrastructure that is easily damaged by flooding, extreme weather and storm surges. They are also the least able to recover, with no insurance cover, poor land tenure, and no social or financial safety nets.



London at risk

London is a vulnerable city. An independent assessment of the climate change risks to London identified the following concerns:¹³

Tidal flooding: Although not coastal, London sits along a stretch of the River Thames with tidal ebbs and flows that are strongly affected by the Thames Estuary. It is currently well protected by the Thames Barrier. Climate change could put this protection at risk. The Thames Estuary 2100 project, established by the Environment Agency, has the remit to tackle tidal risk in London for the 21st century. It is estimated that 1.25 million people and half a million properties are on floodplains in London.

Surface flooding: There is risk from increased rain putting pressure on the city drainage and infrastructure. An estimated 800,000 properties in London are vulnerable to surface-water flooding.

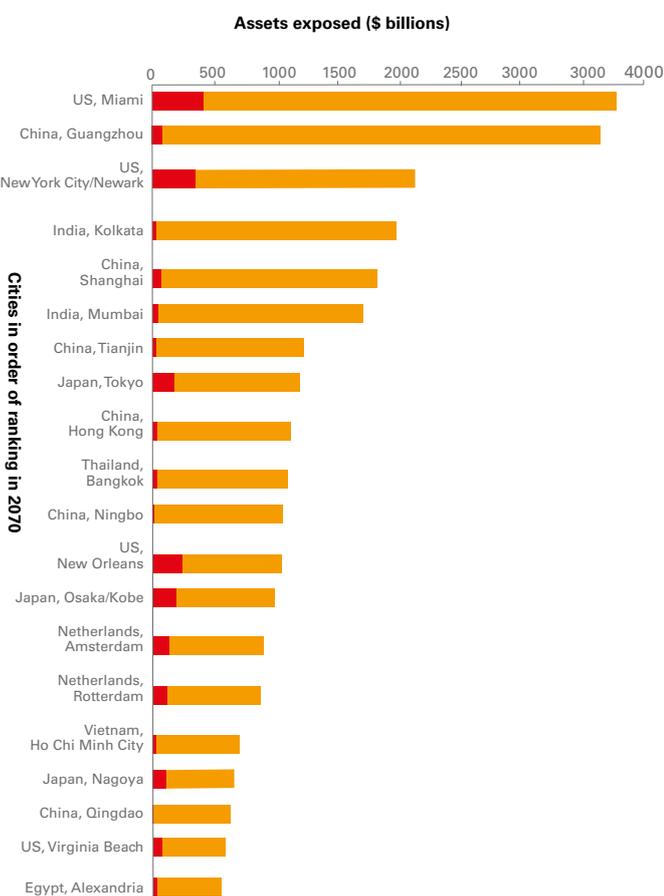
Health risks: As summers get hotter, there is increased risk, especially for already vulnerable groups. By 2050 it is expected that one in three summers will exceed current Met Office heatwave temperatures.

Water shortages: These are possible, as we experience increasingly hot and dry summers. London is already an area of serious water stress, and a combined increase in population, water demand, and reduced water resources due to drought, could pose a serious threat.

Business risk: Rapid climate change and related extreme weather pose a significant risk to investments and businesses around the world, and thereby to London's global financial sector.

These risks are not exclusive to London. Sao Paulo, Brazil, has experienced acute water shortages in recent years; Manila, Philippines, regularly experiences severe flooding, and a heatwave in northern Europe caused thousands of deaths in 2003.¹⁴ These are predictable impacts. With the right measures in place, adaptation can be implemented ahead of the climate extremes predicted for coming decades.

Top 20 cities ranked in terms of assets exposed to coastal flooding in 2010/2070 (including the effects of both climate change and socio-economic change).¹² See Appendix for detailed data.



‘Women should be involved in decision making and planning, and their skills used in disaster preparedness and response’



Women more than men

Men and women are affected differently by climate-related disasters.¹⁵ On the whole, women’s vulnerability to disaster is greater both during and after the event. Numerous studies have found that women often make up a disproportionate number of casualties of natural disasters: in the 2004 tsunami in Aceh, Indonesia, women made up around 55-70% of casualties. When Hurricane Katrina struck Louisiana and Mississippi in the US in 2005, single African-American women were most affected. The commonly higher proportion of women victims is directly linked to levels of gender inequality in the affected areas.¹⁶

There are some cases where men suffer the greatest loss – for example, during Typhoon Haiyan in the Philippines, when men stayed behind to protect their property.¹⁷

In addition to inherent gender inequality in many countries, women are often at greater risk in times of disaster. For example, when populations are displaced, women as the primary carers have the main responsibility for children and the elderly; and social and cultural expectations make it harder for women to be mobile or to access health and other services they need. It’s therefore essential that responses to floods and disasters are gender responsive, meeting the needs of men and women and people of all ages. Women should be involved in decision making and planning, and their skills used in disaster preparedness and response.

Migrants who have already lost their homes to river erosion live along this flood-defence embankment in the coastal city of Khulna, Bangladesh. The country’s ‘floating population’ are forced to move time and again from one vulnerable piece of land to another.

Lagos under threat

Nigeria, Africa’s most populous country, ranks 8th on the list of the most exposed coastal populations by 2060, with 57.7 million people predicted to be at risk. Unlike London, Nigeria’s coastal capital, Lagos, doesn’t have an expensive Thames Barrier to regulate tides. As a result, the city is vulnerable to storm surges made worse by sea-level rise. The Lagos Metropolitan area is currently home to 21 million people and it is the city’s urban poor who are increasingly at risk from flooding. Adding to Lagos’ vulnerability is the uncontrolled expansion of its built-up area in recent years, the lack of infrastructure, and the failure not only to expand stormwater drainage but also to maintain existing drainage systems. As well as the human lives at risk, Lagos is Nigeria’s key commercial and political hub, housing around 65% of the country’s industrial establishments. Climate change-induced flooding has the potential to have an impact on the Nigerian economy, the largest in Africa.

Gender and climate change in Bangladesh

In the immediate aftermath of heavy floods or cyclones, women in Bangladesh suffer from limited access to critical services and facilities, such as family planning and sanitation systems, which can have subsequent health consequences.

The long-term impacts of floods and cyclones on women's livelihoods include the destruction of houses, loss of income from damage to valuable assets such as crops and livestock, and reduced employment opportunities – especially for women working in agriculture. Increased coastal flooding is causing, or worsening, salinity of groundwater commonly used for drinking. Women are usually responsible for providing drinking water and have been reported to walk up to 10km to search for it every day.

Women in Bangladesh often play a leading role in re-establishing households and in rallying community action after natural disasters. Evidence of social change suggests that many communities are increasingly preparing women to lead local risk-reduction activities. Oxfam reports women organising flood preparation committees and receiving training to make portable clay ovens, to raise their houses, save seeds, use radios to hear of possible floods, and train in disaster-risk management. Christian Aid partner Sushilan provides human rights and leadership training, in addition to gardening and veterinary skills training, so as to empower women to step into leadership roles to respond to climate change.



Morsheda Bwgum (above, centre) cares for her children alone. She lives on a low-lying river island (char) formed from sedimentation. The tides, and an ever-changing climate, expose the chars to regular, increasingly unpredictable periods of flooding. Over the years, Morsheda has lost her home to flooding several times.



Practical solutions

Putting vulnerable people at the heart of the solution

Christian Aid's response to disaster risk is to put affected communities and vulnerable people at the heart of the solution. We have developed a 'resilience framework'¹⁸ to ensure our programmes help to strengthen communities to withstand threats and dangers, such as those posed in low-lying coastal cities. At the core of our framework is our belief that individual and community resilience can be enhanced by empowering poor and vulnerable women, men and children to manage risks and improve their welfare, so that they can live with dignity. We believe we can promote a virtuous circle, whereby people are supported to strengthen their livelihoods while simultaneously managing risks that threaten them.

We define resilience as the process of building strengths, skills and resources so that individuals and communities can better anticipate, organise for and adapt to change. For example, this might include putting in place community-focused risk management measures, such as early warning systems and disaster-proof infrastructure.

Christian Aid in Bangladesh: raising homes and creating hope

Bangladesh is one of the poorest and most vulnerable countries to climate change in the world. Ranked 142nd out of 187 countries on the UN's Human Development Index, it has the third-highest low-lying coastal population in the world. The Bangladesh National Action Programme

of Adaptation (NAPA) has projected that the country may experience up to an 83cm rise in sea levels by 2100, which would inundate one-fifth of the coastal areas of Bangladesh, forcing 35 million people from their homes.

This underlines how crucial it is that practical assistance is provided for the most vulnerable. Christian Aid is helping in a variety of ways and supporting communities to build resilient livelihoods so they can escape the flood threats for good.

Christian Aid's partner GUK has helped communities in Bangladesh to develop early-warning systems and contingency planning, and provided emergency shelters. A crucial aspect of the project has also been the raising of people's homesteads, so that their homes, animals and crops are protected, above the floodwaters. In the past, these would likely have been washed away.

Feroza Begum and her family are among those people living on the watery front line of climate change. She says: 'Before we had our home raised it was affected by the floods. Two-thirds of my house was under water, so we had to leave it and go to a temporary place with my relatives. After 10 days we came back, but within a month there was another flood and my home was under

Flooded out of their former home, Feroza Begum and her family arrived on the river island of Bazetilcupi char, Bangladesh, with next to nothing. Christian Aid partner GUK gave Feroza cattle and poultry, raised her homestead and gave her training in worm-composting and agricultural adaptation. Now Feroza owns land and has status in her community.

water for 18 days. The bed, and other things, we had to tie to the roof of the house, but the bamboo got smashed [from the impact of the floods]. At that time [in my life] we constantly feared that our house would be washed away.' Thanks to a new plinth under her house, and the land raised nearby, Feroza's prospects are looking up. She explains: 'Because of this plinth, I feel better. Now I have been able to make a small plantation and grow some vegetables. I am doing much better and feel much safer.'

Feroza's fortunes have been transformed, thanks to her entrepreneurial spirit and some ingredients from GUK to get her income generation up and running. Before GUK identified her as one of the 'ultra-poor' and in need of support, she had just one goat and a household income of 66p a day. 'I feel like crying when I think of those times,' she says. Feroza was given support to buy a cow, another goat, some ducks and chickens, and some summer and winter vegetable seeds. She's now diversified her income and built a life for herself, which means she has the ability to move permanently to a more secure location. Now her assets are worth more than £3,500.

Christian Aid in the Philippines: the power of advocacy

The Philippines is no stranger to coastal storms, but it was not ready for the devastating impact of Typhoon Haiyan, the strongest ever to make landfall, when it struck in 2013. At the same time, the nations of the world were meeting in Warsaw, Poland, for the annual climate change talks, and the tearful speech by the Philippines negotiator Yeb Sano made headlines around the world.

'We've learnt about our rights and we know them now, so we can push for them'

The 12 million residents of Metro Manila were not in the pathway of Haiyan, but many face continual threat of flooding from the city's rivers and increasingly frequent extreme weather. Life is especially precarious for marginalised communities forced to live near the city's waterways.

Marilou Soriano recalls how the region's extreme weather hangs over her, both physically and mentally: 'Whenever there is a typhoon, there is always fear,' she says. 'During Typhoon Ketsana, in 2009, the waters flooded our home.'

Thanks to the work of Christian Aid partner Urban Poor Associates (UPA), local people have received a solution to their problems from the government. UPA has encouraged these marginalised groups to harness their political power and use their rights as citizens to lobby the government for better homes. Despite their predicament, the Barangay-slum community had previously been ignored by officials. With some training from UPA, they were able to pressurise the government into building flood-resistant homes.

Known as micro-medium-rise buildings, these three-storey homes are more secure places to live. They allow the residents to remain in their communities, close to work, and provide access to clean water and electricity. They accommodate urban vegetable gardens and the ground floor can be used as commercial space. By organising



The fragile riverbanks of Metro Manila, in the Philippines, are home to more than 3 million informal settlers. Most have migrated from the countryside in search of work and have been forced to set up camp on the only land available to them.

the residents into groups, training them in their legal rights and connecting them to the relevant government agencies, UPA facilitated a democratic solution to people's adaptation needs.

Soriano is pleased with her new home. She says: 'I feel happy, that we'll be protected, especially from the typhoons. UPA have been very helpful. They are committed to helping us and they have helped us talk to the government. They are helping poor people to move to new homes. We've learnt about our rights and we know them now, so we can push for them. The association has been important. Without them, the new homes would not have become a reality.'

Filomena Cinco was made leader of the Barangay group. She says: 'Thanks to UPA, I have the confidence; I have the back up and guidance. They gave me back my self-esteem. Here I am as a Barangay official, despite being from a slum. It means a lot. We were looked down on as an uneducated community, but even though we are poor, we are human and have dignity. We're proud of who we are.'

Christian Aid in El Salvador: turning weather science into early warnings

El Salvador suffers more than most from climate-change-induced coastal flooding. Battered by coastal hurricanes, made worse by sea-level rise, its mangrove forests act as natural storm buffers. But these have been illegally cut down at such speed that the country has the second-fastest deforestation rate in Latin America, leaving it even more exposed. The Salvadoran Ministry of Environment and Natural Resources estimates that, over the next century, El Salvador will lose somewhere between 10% and 28% of its coastal territories as a result of rising seas.

One of the biggest problems for coastal dwellers is wave surges. Triggered by large storms out at sea, they can create huge waves that push inland for up to 150 metres.

In his 59 years, fisherman Adan Morales Saracay hadn't seen anything like the last wave surge, which almost killed his family: 'It was a Saturday around 2pm. We saw that the waves started getting much larger. Within minutes they came into our houses. By the time the night came, we had to evacuate our entire families. The waves were about 13-14 metres high. We were in panic for the love of our families, we didn't want to lose anyone. So we decided to abandon everything, but it was very scary. Never in my life have I seen any waves like this before.' He adds: 'For the past ten years, the weather has been less predictable. We don't have anywhere to go.'

'Saving lives is the most important thing, but here people's livelihoods are very vulnerable due to the rising seas'



Adan Morales Saracay stands on the shore of the Pacific Ocean, El Salvador. Following a wave-surge, his home was buried under layers of sand and sediment. The waves also threaten his livelihood as a fisherman. After large wave surges, the fish swim deeper and may not rise closer to the surface for several weeks.

Thanks to Christian Aid partner the Salvadoran Ecological Unit (UNES), working with the San Salvador Met Office, an early warning system has been introduced to help give communities a vital heads-up if they need to evacuate, thus saving lives. Using latest scientific monitoring of wave speed and strength, UNES knows when to warn residents. It has also run training in evacuation procedures to reduce panic during a crisis. Jorge Diaz lives in a community supported by UNES. He says: 'We have the early-warning system and there's a guide for evacuation. Everyone is calm as they know what to do. The almond tree shelter is where people meet. It's a place to register the families.'

Saving lives is the most important thing, but here people's livelihoods are very vulnerable due to the rising seas.



Policy solutions

Addressing coastal climate change

As well as help on the ground, Christian Aid recognises the route to lasting structural improvement is through policy and political change. Here are four things that policymakers could do to help prevent the worst of coastal flooding:

Invest at least \$1bn to protect the billion people

As Ban Ki-moon, Secretary-General of the United Nations, reminds us in the run up to the World Humanitarian Summit, every \$1 spent on reducing the risks from disasters now will save about \$7 of damages later (studies give a range of \$4 to \$24 of savings). It's essential that we act now or many millions of poor and vulnerable people will pay later. He calls for the percentage of official development assistance (ODA) allocated for disaster risk reduction to be doubled to at least 1% by 2020. Based on 2014 levels of ODA this would bring the figure to \$1 billion. Christian Aid and ACT Alliance, however, are advocating that while this is a step in the right direction, it is not ambitious enough. We are calling for 5%.

There is an urgent humanitarian need to reduce the risks faced by vulnerable populations by investing in

'To meet the need for better adaptation urgently, governments must deliver more climate finance to meet their obligations and ensure that up to 50% goes to adaptation projects by 2020'

Sandwiched between the sea and a large lake, Metro Manila, in the Philippines, is surrounded by a vast and complex river system. This swells dramatically throughout the monsoon and typhoon seasons, causing severe flooding in some urban areas.

humanitarian aid before disaster strikes. However, most of these cities are growing rapidly and face huge infrastructure needs. The result of this is that major decisions – which if done well could be tailored to reduce vulnerability – are made by private sector investors in partnership with local governments alone, rather than with the input of humanitarian actors. The UN must develop common global principles for responsible investment that outline the humanitarian and climate risks.

As climate risk grows, there is an urgent need to increase international climate finance to adapt and protect vulnerable people. However, the amount of climate finance falls far short of what is needed; and the allocation of just 16% of climate finance for adaptation in 2013/14 is a major imbalance. To meet the need for better adaptation urgently, governments must deliver more climate finance to meet their obligations and ensure that up to 50% goes to adaptation projects by 2020.

Putting vulnerable people at the heart of solutions – 20% by 2020

There is no technological-fix for the poorest people – communities themselves need to be in control and empowered to make themselves safe. To have effective, lasting, informed responses to humanitarian crises we need to put vulnerable people at the heart of the solutions. The UN Secretary-General's report ahead of the World Humanitarian Summit¹⁹ agrees:

'Put people at the centre: build community resilience. People are the central agents of their lives and are the first and last responders to any crisis. Any effort to reduce the vulnerability of people and strengthen their resilience must



Flooding in Metro Manila, in the Philippines. Local people and services can step in when disaster strikes. What they need is more direct funding rather than being dependent on the response of international actors.

begin at the local level first, with national and international efforts building on local expertise, leadership and capacities. Affected people must be consistently engaged and involved in decision-making, ensuring participation of women at all levels.'

This is endorsed by Christian Aid, and now needs a fully funded plan to ensure action to support communities to recover from increased exposure to climate disasters in coming decades. The humanitarian sector needs a shift in power towards the global South, and national and local non-governmental organisation [NGO] partners need to be accorded greater respect and resources. Christian Aid and ACT Alliance,²⁰ along with local partners, are calling for 20% of humanitarian funding to go directly to national and local NGOs by 2020. Currently, the woefully low figure of 0.2% of humanitarian funding goes directly to national and local NGOs, because the system is monopolised by the big UN agencies and the big international NGOs. We argue that proper funding for local organisations enables local actors to be first responders – getting to affected people days before assessment teams from the UN and external humanitarian agencies arrive.

Local organisations are able to shape programmes in a contextually appropriate, culturally sensitive way, based on a community's own understanding of its needs. Local partners, closer to and more trusted by communities, are better-positioned to ensure accountability to affected populations and to take a long-term perspective on building and maintaining resilience. In addition, the rise in number and complexity of emergencies mean the international system isn't able to respond in all settings all of the time, implying a need to strengthen local capacities to respond.

Stop climate change in its tracks

The Paris Agreement on climate change, which was approved by almost 200 countries at the UN COP21 climate summit in 2015, called for the need to keep global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C. This will require all

countries to move to zero-carbon economies by the second half of the century. However, according to the UN Environment Programme (UNEP), if all the nationally determined commitments (NDCs) made at COP21 in Paris are fully implemented, the world will still be on track for a temperature rise of more than 3°C by 2100.²¹

Therefore, ahead of the 2020 start date of the Paris Agreement, every effort must be made to ratchet up the ambition on carbon reduction – setting higher goals for domestic emissions reduction and putting in place international support for developing and middle-income countries to take a low-carbon pathway. This should start at the 2018 stocktake of the NDCs.

Prepare for 'Loss and Damage'

The priority must be to halt climate change and to minimise impacts on vulnerable people, but there are already cases of communities experiencing impacts from which they cannot recover. The United Nations Framework Convention on Climate Change deals with this through something called 'Loss and Damage' (L&D), a mechanism drawn up in 2013 at COP19 in Warsaw.

Loss and Damage refers to losses and damages resulting from adverse climate change impacts, such as extreme weather and slow-onset events that were not prevented by mitigation or adaptation. The Paris Agreement fully acknowledged the need for a response to L&D, and at COP22 in Marrakesh, in November 2016, the Warsaw International Mechanism on L&D will be discussed. This will be a key opportunity to clarify the legal framework for L&D, its financing and the main response measures that L&D will trigger. It is essential that L&D is established to support the most vulnerable communities to move forward from devastating events.

Conclusion

Climate change is not an abstract concept, it is increasingly a reality felt by millions of people around the world. For those living in coastal regions it is threatening their lives and their livelihoods, and this report shows how that impact is only going to get more severe. Climate change will play an increasing role in causing – and exacerbating – humanitarian disasters, especially along coastlines. That's why it's vital that we have some joined-up thinking and that climate mitigation and adaptation become a key part of national and international efforts to tackle humanitarian crises. It is welcome that in the year the Paris climate-change agreement is signed, we also have the first World Humanitarian Summit. If we want to ensure coastal populations remain resilient in the face of humanitarian threats, it's essential that these two strands work together as one.

Table 1. Countries anticipated to have the highest numbers of people living in low-lying coastal zones by 2030/2060

Country rankings in 2060	Coastal population exposed by 2000 (in millions)	Coastal population exposed by 2030 (in millions)	Coastal population exposed by 2060 (in millions)
1. China	144.0	204.1	244.8
2. India	63.9	120.8	216.4
3. Bangladesh	63.1	85.1	109.5
4. Indonesia	39.3	61.9	93.7
5. Vietnam	43.1	58.7	80.4
6. Egypt	25.5	45.0	63.5
7. Nigeria	7.4	19.8	57.7
8. US	23.4	34.0	43.9
9. Thailand	16.4	24.7	36.8
10. Philippines	13.0	23.8	34.9
11. Japan	30.2	32.1	32.7
12. Pakistan	4.6	12.7	30.1
13. Myanmar	12.5	16.4	22.8
14. Senegal	2.9	8.5	19.2
15. Brazil	11.6	15.8	18.7
16. Iraq	2.7	9.3	18.1
17. Benin	1.4	5.4	15.0
18. Tanzania	0.6	2.8	14.0
19. Netherlands	11.6	12.3	11.8
20. Malaysia	5.2	7.8	11.3
21. Somalia	0.6	2.2	9.8
22. United Kingdom	7.1	8.0	8.8
23. Côte d'Ivoire	1.2	3.0	7.6
24. Argentina	3.8	5.6	7.6
25. Mozambique	2.3	4.4	7.5
TOTAL FOR TOP 25	509.9	824.2	1216.6

Table 2. Top 20 cities ranked in terms of population exposed to coastal flooding showing numbers for 2010 and those anticipated for 2070s (including the effects of both climate change and socio-economic change)

Cities in order of ranking in 2070	Population exposed 2010	Population exposed 2070
1. India, Kolkata (Calcutta)	1,929,000	14,014,000
2. India, Mumbai (Bombay)	2,787,000	11,418,000
3. Bangladesh, Dhaka	844,000	11,135,000
4. China, Guangzhou	2,718,000	10,333,000
5. Vietnam, Ho Chi Minh City	1,931,000	9,216,000
6. China, Shanghai	2,353,000	5,451,000
7. Thailand, Bangkok	907,000	5,138,000
8. Myanmar, Yangon (Rangoon)	510,000	4,965,000
9. US, Miami	2,003	4,795,000
10. Vietnam, Haiphong	794,000	4,711,000
11. Egypt, Alexandria	1,330	4,375,000
12. China, Tianjin	956,000	3,790,000
13. Bangladesh, Khulna	441,000	3,641,000
14. China, Ningbo	357,000	3,229,000
15. Nigeria, Lagos	357,000	3,229,000
16. Côte d'Ivoire, Abidjan	519,000	3,110,000
17. US, New York City/Newark	1,540,000	2,931,000
18. Bangladesh, Chittagong	255,000	2,866,000
19. Japan, Tokyo	1,110,000	2,521,000
20. Indonesia, Jakarta	513,000	2,248,000

Table 3. Top 20 cities ranked in terms of assets exposed to coastal flooding in the 2070s (including the effects of both climate change and socio-economic change) and showing present-day exposure

Cities in order of ranking in 2070	Assets exposed 2010 (\$ billions)	Assets exposed 2070 (\$ billions)
1. US, Miami	416.29	3,513.04
2. China, Guangzhou	84.17	3,357.72
3. US, New York City/Newark	320.20	2,147.35
4. India, Kolkata (Calcutta)	31.99	1,961.44
5. China, Shanghai	72.86	1,771.17
6. India, Mumbai	46.20	1,598.05
7. China, Tianjin	29.62	1,231.48
8. Japan, Tokyo	174.29	1,207.07
9. China, Hong Kong	35.94	1,163.89
10. Thailand, Bangkok	38.72	1,117.54
11. China, Ningbo	9.26	1,073.93
12. US, New Orleans	233.69	1,013.45
13. Japan, Osaka-Kobe	215.62	968.96
14. Netherlands, Amsterdam	128.33	843.70
15. Netherlands, Rotterdam	114.89	825.68
16. Vietnam, Ho Chi Minh City	26.86	652.82
17. Japan, Nagoya	109.22	623.42
18. China, Qingdao	2.72	601.59
19. US, Virginia Beach	84.64	581.69
20. Egypt, Alexandria	28.46	563.28

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