

Climate change: study maps those at greatest risk from cyclones and rising seas

The first global study to identify populations at greatest risk from rising sea levels and more intense cyclones linked to climate change will be published next month in the peer-reviewed journal *Environment and Urbanization*.

The research shows that 634 million people — one tenth of the global population — live in coastal areas that lie within just ten metres above sea level.

It calls for action to limit the effects of climate change, to help people migrate away from risk and to modify urban settlements to reduce their vulnerability. But it warns that this will require enforceable regulations and economic incentives, both of which depend on political will, funding and human capital.

Key findings of the study by Gordon McGranahan of the International Institute for Environment and Development (UK) and his colleagues, Deborah Balk and Bridget Anderson, at the City University of New York and Columbia University, are that:

- Nearly two-thirds of urban settlements with more than 5 million inhabitants are at least partially in the 0-10 metre zone.
- On average, 14 percent of people in the least developed countries live in the zone (compared to 10 percent in OECD countries).
- 21 percent of the urban populations of least developed nations are in the zone (11 percent in OECD countries).
- About 75% of people in the zone are in Asia.
- 21 nations have more than half of their population in the zone (16 are small island states).
- Poor countries — and poor communities within them — are most at risk.

The study will be published on 14 April along with papers that focus on specific cities, including Cotonou (Benin), Dhaka (Bangladesh), Mumbai (India) and Shanghai (China).

“Urban development in the coastal zone brings multiple risks,” says McGranahan. “It exposes people to seaward hazards such as storms, flooding and cyclones, and it can damage sensitive ecosystems including those such as mangrove forests that protect the coastline.”

“One in ten people, and one out of every eight urban dwellers, live on the coast no more than ten metres above sea level, but that number is increasing,” says McGranahan. “People are running towards risk, particularly in China but also in other parts of the world such as Bangladesh, where more 40% of the land area is within ten metres above sea level.”

China’s economic boom has been driven by policies that promote coastal development and which have encouraged one of the largest coastward migrations ever. The study says that unless action is taken that China’s economic success will be placed at risk.

Last month the Intergovernmental Panel on Climate Change’s (IPCC) latest report warned that sea levels could rise by tens of centimetres this century, making coastal populations more vulnerable to flooding and storm surges. It also predicted more intense tropical cyclones (typhoons and hurricanes).

“The IPCC is aware that there are high population densities in coastal areas, but it has not yet recognised the links to urbanisation, and the implications for adaptation to climate change,” says co-author Deborah Balk, the acting associate director of the Institute for Demographic Research at the City University of New York.

The new study highlights the importance of “the three Ms”: mitigation, migration and modification.

"It is too late to rely solely on a reduction in greenhouse gas emissions to mitigate climate change, although this is clearly an imperative," says McGranahan. "Migration away from the zone at risk will be necessary but costly and hard to implement, so coastal settlements will also need to be modified to protect residents."

"Of the more than 180 countries with population in the low-elevation coastal zone, 130 of them — about 70% — have their largest urban area extending into that zone," adds Bridget Anderson, research associate at Columbia University's Center for International Earth Science Information Network. "Furthermore, the world's large cities — those with more than 5 million residents — have, on average, one-fifth of their population and one-sixth of their land area within this coastal zone."

Many of the countries with the most people in the 0-10 metre zone are large Asian nations with densely populated river deltas, while many nations with the greatest proportion of their people in the zone are small island states.

"Climate change is not a natural disaster but has largely been caused by wealthy countries emitting greenhouse gases during their industrialisation," says McGranahan. "Yet the poorest countries that have contributed least to the problem are most vulnerable to its effects. It is therefore incumbent on rich nations to help poorer ones to adapt to the changes ahead."

McGranahan and colleagues analysed the GRUMP (Global Rural-Urban Mapping Project) databases of fine-scale information on population and urban extent along with elevation data derived from NASA's Satellite Radar Topography Mission, and World Bank data on national income.

"Carefully combining spatial data layers allows us to calculate the distribution of each country's population and urban settlements by elevation along a narrow coastal strip of land in most places," notes Balk. "These kinds of estimates are impossible to derive from national-level data."

"The ability to map both human activities and environmental conditions globally has revolutionary possibilities – and is very timely given the emergence of global environmental challenges such as climate change."

To request an embargoed copy of the paper by McGranahan, Balk and Anderson please contact:

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NOTES TO EDITORS

The International Institute for Environment and Development (IIED) is an independent, non-profit research institute. Set up in 1971 and based in London, IIED provides expertise and leadership in researching and achieving sustainable development (see: <http://www.iied.org>).

The Millennium Ecosystem Assessment concluded that coastal ecosystems are among the most threatened by human settlement (see: <http://www.maweb.org/en/index.aspx>).

Between 1994 and 2004, about one-third of the 1,562 flood disasters, half of the 120,000 people killed and 98% of the two million people affected by flood disasters were in Asia.

Between 1990 and 2000, the populations in the 0-10 metre zones of Bangladesh and China grew at more than twice the national population growth rate.

The ten countries with the largest number of people living within ten metres of the average sea level are: China (143,888,000); India (63,188,000); Bangladesh (62,524,000); Vietnam (43,051,000); Indonesia (41,610,000); Japan (30,477,000); Egypt (25,655,000); United States (22,859,000); Thailand (16,468,000); and the Philippines (13,329,000).

The ten countries with the largest share of their population living within ten metres of the average sea level are: Bahamas (88%); Suriname (76%); Netherlands (74%); Vietnam (55%); Guyana (55%); Bangladesh (46%); Djibouti (41%); Belize (40%); Egypt (38%); and the Gambia (38%).

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