Low coastal zone settlements

Gordon McGranahan, Deborah Balk and Bridget Anderson describe the distribution of human settlements in low elevation coastal zones around the world

bout one person in ten lives in a coastal zone at less than ten metres of elevation, although this low elevation coastal zone (LECZ) only accounts for about 2.2 per cent of the world's land area. Human settlement has long been drawn to coastal areas, which provide many resources and trading opportunities, but also expose residents to various hazards. The hurricane hitting New Orleans in the United States in 2005 provided a well-publicized demonstration of how vulnerable even comparatively affluent settlements can be.

Some coastal hazards, including sea-level rise and extreme weather events, are expected to increase as a result of climate change. Yet increasing trade and market-driven movements are still attracting people to the coast. The coastal provinces of China, for example, experienced a net in-migration of about 17 million people between 1995 and 2000, creating pressures in an already crowded area. Globally, coastal zones have higher population densities than any other major ecologically defined zone, except for urban zones themselves. Small island states are raising public awareness of coastal vulnerabilities, but this article shows that significant populations of many other countries also live in potentially vulnerable low elevation coastal zones.

MAIN POINTS

• The authors explain how one person in ten lives in a coastal zone at less than ten metres of elevation

Low-income

countries and Least **Developed Countries** have particularly high shares of their overall populations in low el-

evation coastal zones.

• It is concluded that, whilst small island states are raising awareness of coastal vulnerabilities, many people in larger countries also live in coastal zones and are potentially vulnerable.

This article calculates population and land area in the LECZ by overlaying gridded geographic data and constructing totals within the zone by country. We define the LECZ as contiguous land area up to 100 kilometres from the coast that is ten metres or below in elevation. All data are expressed at one kilometre resolution (see data sources on page 26).

The LECZ contains some ten per cent of the world's population and 13 per cent of the urban population. This amounts to about 600 million people, of which 360 million are urban. There is considerable variation between countries in the shares of population, land and urban settlement in this LECZ. Thus, of the 215 countries for which there are data on all of the principal indicators being presented in this article, 39 are landlocked countries with none of their population living in the LECZ, while 19 have more than 50 per cent of their population in this zone (ten

РОГ	PULATIO	NS AND LA	ND AREAS	S IN THE LC	W ELEVATION	COASTAL ZON	E BY REGION	ı
Populations and land areas in the LECZ					Shares of population and land in the LECZ			
Region	Popula- tion (10 ⁶)	Urban pop- ulation (10 ⁶)	Land (10 ³ km ²)	Urban land (10 ³ km ²)	Share of regional population	Share of region's urban population	Share of re- gion's land	Share of re- gion's urban land
Africa	55	40	206	15	8.2%	14.5%	0.9%	7.9%
Asia	438	232	819	109	12.3%	17.7%	3.3%	11.7%
Europe	48	38	459	54	7.1%	8.1%	2.1%	7.0%
Latin America	28	22	372	32	6.1%	6.9%	2.0%	6.6%
Austrialia/New Zea- land	3	3	134	6	13.8%	14.4%	1.7%	13.4%
North America	25	22	523	52	7.8%	8.5%	2.8%	5.9%
Small island states	6	4	56	5	13.1%	14.0%	16.3%	13.1%
World	602	361	2,571	274	10.5%	13.5%	2.2%	8.2%

Note: The regions are based on, but not identical to, the IPCC regions. Countries not included in the Intergovernmental Panel on Climate Change (IPCC) list were assigned to one of the IPCC regions. Russia, which is split into two regions by the IPCC (Europe and Asia), is entirely attributed to Europe. The small island states region has 66 members, some of which are not listed as small island states in the IPCC regional listing.

of these are small island states).

Information presented here relies heavily on summary statistics for country groupings. These hide much of the variation within groupings. The table above provides a selection of statistics by region. In absolute numbers, Asia accounts for about a third of the world's land in the LECZ, but because of far higher population densities it accounts for almost two thirds of the urban population, and three quarters of total population in the zone. The region with the highest share of its total land area in the zone is the small island states region with about 16 per cent - roughly five times the share in Asia. On the other hand, the share of the total and urban populations of the small island states that are in the zone are only slightly more than the world average. Africa, the only region with less than one per cent of its land in the zone, and one of the lowest population shares in the zone, has over 14 per cent of its urban population in the zone.

In addition to geographic location, a country's vulnerability to coastal hazards depends in part on its per capita income. The table on page 25 provides summary statistics for countries grouped according to the World

Bank's national income classification (the world totals are slightly less in this table due to missing income data). The low-income group has a higher share of its population living in the LECZ than the world as a whole, and the highest share of urban population of any group. Overall, there are about 246 million people in low-income countries living in the zone, of which some 107 million are urban.

In climate change negotiations, the Least Developed Countries – a group of about 50 very low-income countries - are explicitly recognized as vulnerable to climate change. This group also has a particularly high share of its population and urban population in the LECZ (16 and 23 per cent respectively), despite a comparatively modest land share (1.7 per cent). Organization for Economic Cooperation and Development countries, by contrast, only have ten per cent of their overall population and 11 per cent of their urban population in the zone, with about 2.7 per cent of land in the zone

As indicated above, these averages hide a great deal of variation, with some countries having far larger shares or quantities of land and population in the zone than others in the same group. Figures for the Least Developed Countries, for example, are heavily influenced by Bangladesh, which accounts for over half of the group's population in the LECZ.

The table on page 26 presents the ten countries with the largest populations in the

LECZ and the ten with the largest population shares in the LECZ. The top ten in terms of population are mostly large Asian countries with significant delta regions. The LECZ's of these top ten countries combine to account for about 435 million people, or about 72 per cent of the people who live in the zone globally. The ten countries with the largest share of their population in the zone are a different set from those with large populations in the LECZ, with the exception of Bangladesh and Vietnam (shaded blue in the table).

Several features can lead a country to have a large share of its urban and rural populations in the LECZ. These include long coastlines (relative to the country's size), wide and heavily populated coastal lowlands and sparsely populated interiors. The results suggest that these factors relate to three different types of countries. There are the islands, such as the Maldives and the Bahamas, with their very long coastlines. There are countries with large delta regions and heavily populated coastal lowlands, such as Vietnam and Bangladesh. And there are a few countries. like Suriname and Guyana, with sparsely inhabited interiors and populations concentrated in a small coastal strip.

The vulnerabilities faced by these different types of countries are also likely to vary. Many urban and rural inhabitants of the LECZ live in countries with large delta regions. It is too early to say whether settlements in such regions contain most of the population vulnerable to the coastal hazards associated with climate change. These results do, however, illustrate the importance of looking beyond the small island states.

POPULATIO	NS AND L	AND AREAS	S IN LOW I	ELEVATION	COASTAL ZON	NE BY NATION	AL INCOME C	ATEGORY
Po	pulations and	l land areas in t	he LECZ		Shares of population and land in the LECZ			
Income category	Popula- tion (10 ⁶)	Urban pop- ulation (10 ⁶)	Land (10 ³ km ²)	Urban land (10 ³ km ²)	Share of group's population	Share of group's urban popula- tion	Share of group's land	Share group's urban land
Low	246	107	646	36	11.0%	15.6%	2.7%	9.0%
Lower middle	209	128	653	65	9.9%	14.1%	1.6%	7.6%
Upper middle	36	29	375	40	7.8%	8.9%	1.9%	7.6%
High	107	93	890	129	11.7%	12.6%	2.9%	8.3%
World	598	357	2,563	270	10.4%	13.4%	2.2%	8.1%

COUNTRIES WITH LARGEST POPULATIONS AND POPULATION SHARES IN THE LECZ							
Countrie	s ranked by population in the	LECZ – top ten	Countries ranked by share of population in the LECZ – top ten				
Country	Population in LECZ (10 ³⁾	% of population in LECZ	Country	Population in LECZ (10 ³⁾	% of population in LECZ		
1. China	127,038	10%	1. Maldives	291	100%		
2. India	63,341	6%	2. Bahamas	267	88%		
3. Bangladesh	53,111	39%	3. Bahrain	501	78%		
4. Indonesia	41,807	20%	4. Suriname	325	78%		
5. Vietnam	41,439	53%	5. Netherlands	9,590	60%		
6. Japan	30,827	24%	6. Macao	264	59%		
7. Egypt	24,411	36%	7. Guyana	419	55%		
8. United States	23,279	8%	8. Vietnam	41,439	53%		
9. Thailand	15,689	25%	9. Djibouti	250	40%		
10. Philippines	15,122	20%	10. Bangladesh	53,111	39%		

Note: Countries with less than 100,000 people living in the LECZ are excluded. Fifteen small island states that are excluded have population shares greater than 39 per cent in the LECZ, and a combined population in the LECZ of 423,000.

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FURTHER INFORMATION • On the Web: Estimates of year

2000 population, urban area and land area are based on the Global Rural Urban Mapping Project at http://sedac.ciesin.columbia.edu/ gpw. Elevation data is from www2. jpl.nasa.gov/srtm/. World Bank national income classification data is at http://web.worldbank. ora/WBSITE/EXTERNAL/ DATASTATISTICS/ 0..contentMDK:20420458~menuP K:64133156~pagePK:64133150~piP K:64133175~theSitePK:239419,00. html. Least Developed Country information is at www.un.org/special-rep/ohrlls/ldc/list.htm