

3.1.8 New Estimates of Global Population and Land in the Low Elevation Coastal Zone Using GHSL-based Datasets¹¹

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Projections for global sea level rise, along with data regarding a region's geographic and demographic characteristics, can be used to assess exposures and to manage risk and vulnerability. In a seminal 2007 study¹², McGranahan, Balk and Anderson estimated the urban and rural population and land exposure in a low elevation coastal zone (LECZ) globally. Subsequent work demonstrated the large influence of data resolution and population modelling assumptions on determining the number of people potentially exposed. New revisions, presented here, use Global Human Settlement Layer (GHSL) datasets to classify settlements along a rural-urban continuum, to quantify population and built-up densities at risk in 1990, 2000 and 2015. New elevation models/datasets are also used to improve the estimation of the exposure zone itself, and to allow for refined exposure estimates below 5 meters and 5-10 meters (contiguous to coastline), and above 10 meters.

Variations in settlement categorizations, and corresponding population models, result in vastly different estimates of the number of exposed people, potentially excluding vulnerable groups from risk and damage assessments associated with climate change scenarios. Thus it is of utmost importance to be transparent about which underlying data sets were used and why. The new estimates for the population living within LECZs correct for many of the issues that arose with prior datasets, which in some instances failed to account for populations living in relatively smaller geographic areas. The 2007 study was based on data from GRUMP (the Global Rural Urban Mapping Project), where total population was allocated at 30 arc seconds (~1km) horizontal resolution, based on circa 1995 DMSP-OLS night-time lights derived urban and rural areas within the census-based spatial units. The work presented here uses GHS-POP (Figure 32), which increases horizontal resolution to 9 arc seconds (~300m) and positional accuracy by utilizing the GHS-BUILT time series.

GHS Settlement Model Grid (GHS-SMOD) constructs a typology of settlement types defined by GHS-BUILT, and population density (derived from GHS-POP) that classifies pixels into 7 categories along a "rural-to-urban continuum". For comparability with other data sets, we simplify GHS-SMOD into three classes: rural, quasi-urban (such as towns, suburbs and semi-dense areas) and urban (Figure 32C). The estimates (presented here) use the Multi-Error-Removed Improved-Terrain Digital Elevation Model (MERIT-DEM) (Figure 32A), which addressed many of the widely studied shortcomings of the Shuttle Radar Topography Mission (SRTM) DEM that was previously used. A sensitivity analysis compares these estimates with those based on other population, urban area proxies, and elevation datasets. The population and settlement layers were then conditioned so that they could be summarized by two LECZ areas (and outside the LECZ), and by country.

Consistent with the 2007 study, the new results place 671M persons or 10.7% of the global population in 2000 living below 10m contiguous to seacoast. This share continued to increase to 11.1 % (815M persons) in 2015 (Figure 32E). Additionally, the new estimates by settlement type place 14.1% of the population of urban centers and 10.7% of those living in quasi-urban areas in the LECZ in 2015 (Figure 32E), with the pie chart showing much higher fractions of urban and quasi-urban residents in the LECZ than beyond it. Similarly, urban land -- while a small fraction of total land -- is disproportionately greater in the LECZ than beyond it. Among urban dwellers living in the LECZ, 31% of those living in urban centers and 43% of those living in quasi-urban centers, live in the higher risk 0-5m zone. Deltaic countries with large cities contribute disproportionately to these estimates. In particular, several countries in Asia have especially large shares of their urban and total population in the LECZ, as shown here for Viet Nam (Figure 32A).

The findings demonstrate the uneven distribution of population living in LECZs, due to the historic and continued development of cities and towns along the coast. With the overwhelming share of population growth to occur in the city and towns of the world, particularly those in Asia, Africa and Latin America, it is crucial that policymakers have spatially accurate population and elevation data such as those presented here in order to project and plan for potential damages from gradual sea level rise and the threat of storm surge flooding, and encourage mitigation.

¹¹ Preliminary Release Data available at <http://www.ciesin.columbia.edu/data/lec2-urban-rural-population-land-area-estimates-v3/>

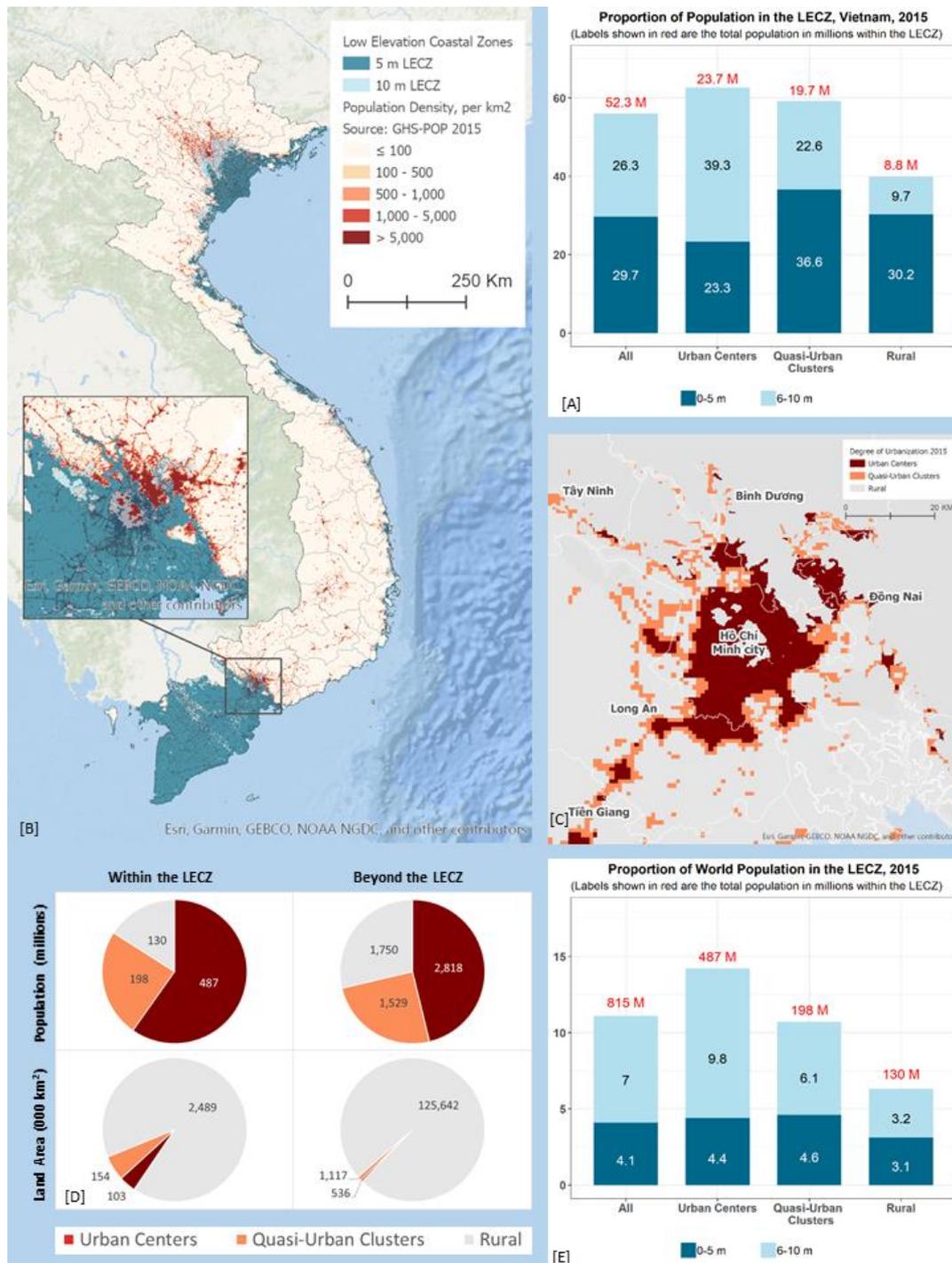


Figure 32 Population in low elevation coastal zones in Vietnam analysed using GHS-POP and settlements classification

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