
Electronic Mapping

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Taking Population Studies Beyond the Census with LandScan™

Census data for many countries is incomplete or non-existent and, yet, there is still a need for reliable population information from around the world. LandScan™ Global Population Datasets take population data beyond the census by determining how population is likely to be distributed using an award-winning modeling program.

Satellite imagery, land cover data, topographic data, roads, and various other elements are used in conjunction with census data to create an algorithm employed to predict population distribution. Not only does it look at the permanent residences of the population as provided by the census (night-time distribution), it also takes into account mobility during daytime hours resulting in a prediction of ambient population density during an average 24-hour period. The result is a powerful 1-km resolution global population database of value to a wide-range of disciplines.

Developed by Oak Ridge National Laboratory (ORNL) with funding by the U. S. Department of Defense, LandScan™ plays a pivotal role in natural disaster response worldwide. The first dataset was released in 1998/1999 and has since been produced annually. It has allowed emergency responders to pinpoint areas with potential victims after tsunamis, earthquakes, hurricanes, and other natural and man-made disasters. It was soon realized that the data was useful in applications beyond the needs of the federal government and the commercial vendor, East View, was given sole licensing rights for LandScan™ products.

East View quickly began work on a public face for the resource and developed both a Web Map Service (WMS) and Web Coverage Service (WCS). The WMS has improved accessibility of the data for non-GIS users while the WCS allows advanced researchers to extract, edit, and spatial analyze the data. East View also added new services such as file format conversion and institution-level licensing agreements. Licensing fees are determined on a case-by-case basis, with discounts for academic users. The LandScan™ datasets remain free of charge for U.S. federal government agencies.

Studies published in the last three years, which have directly benefited or resulted from the availability of LandScan™ data, include:

- Andresen, Martin A. and Greg W. Jenion. 2010. **“Ambient Populations and the Calculation of Crime Rates and Risk.”** Security Journal 23 (2): 114-133. [doi:10.1057/sj.2008.1](https://doi.org/10.1057/sj.2008.1).
- Berke, Ethan M., Susanne E. Tanski, Eugene Demidenko, Jennifer Alford-Teaster, Xun Shi, and James D. Sargent. 2010. **“Alcohol Retail Density and Demographic Predictors of Health Disparities: A Geographic Analysis.”** American Journal of Public Health 100 (10): 1967-1971. [doi:10.2105/AJPH.2009.170464](https://doi.org/10.2105/AJPH.2009.170464).
- Linard, Catherine, Victor A. Alegana, Abdisalan M. Noor, Robert W. Snow, and Andrew J. Tatem. 2010. **“A High Resolution Spatial Population Database of Somalia for Disease Risk Mapping.”** International Journal of Health Geographics 9 (1): 45-45. [doi:10.1186/1476-072X-9-45](https://doi.org/10.1186/1476-072X-9-45).
- Platts, Philip J., Neil D. Burgess, Roy E. Gereau, Jon C. Lovett, Andrew R. Marshall, Colin J. McClean, Petri K. E. Pellikka, Ruth D. Swetnam, and Rob Marchant. 2011. **“Delimiting Tropical Mountain Ecoregions for Conservation.”** Environmental Conservation 38 (3): 312-324. [doi:10.1017/S0376892911000191](https://doi.org/10.1017/S0376892911000191).
- Shi, X., J. Alford-Teaster, T. Onega, and DM Wang. 2012. **“Spatial Access and Local Demand for Major Cancer Care Facilities in the United States.”** Annals of the Association of American Geographers 102 (5): 1125-1134. [doi:10.1080/00045608.2012.657498](https://doi.org/10.1080/00045608.2012.657498).
- Xue, Jianping, Thomas McCurdy, Janet Burke, Budhendra Bhaduri, Cheng Liu, James Nutaro, and Lauren Patterson. 2010. **“Analyses of School Commuting Data for Exposure Modeling Purposes.”** Journal of Exposure Science and Environmental Epidemiology 20 (1): 69-78. [doi:10.1038/jes.2009.3](https://doi.org/10.1038/jes.2009.3).

A crucial element to consider is the extent to which the predictions prove accurate and reliable. As we all know, the devil is in the details and there are a lot of details that go into the LandScan™ model. Inaccuracies in any of the datasets that are used in the algorithm could result in unreliable population predictions. To help combat this uncertainty, the developers at ORNL routinely conduct verification and validation (V&V) studies. Independent researchers are also looking at the accuracy of the LandScan™ datasets. While some show that the model used holds up in real world situations, others argue that the incompleteness of census data from certain areas of the world, such as Africa, results in datasets whose uncertainty is under-acknowledged. Evaluating these factors and the accuracy and reliability of the LandScan™ data will continue to be a fruitful area of study as long as it is being used as a primary resource in research.

Library collection managers must carefully weigh the benefits vs. the cost of the LandScan™ resource. Access to each new year of LandScan™ data must be purchased separately and only the current year is available through the Web application. Archived datasets for past years could be available in the near future,

