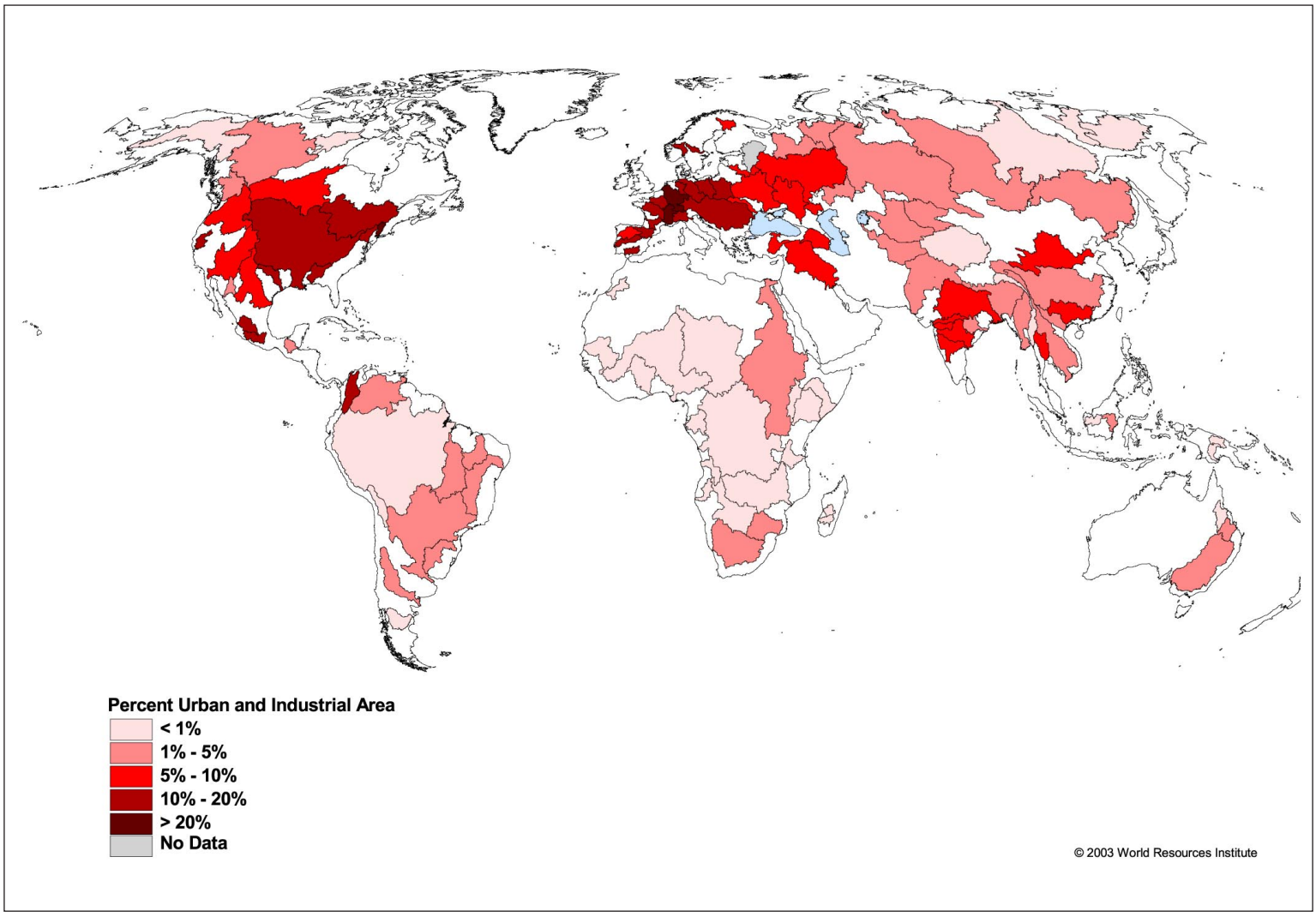
Watersheds of the World : Global Maps

11. Urban and Industrial Area by Basin



Map Description

Freshwater systems are influenced not only by modifying rivers, lakes, and wetlands directly, but also by changing land-use patterns in the whole watershed. The pattern and extent of cities, roads, agricultural land, and natural areas within a watershed influences infiltration properties, transpiration rates, and runoff patterns, which in turn impact water quantity and quality. For example, expanding impervious areas increases the volume and rate of runoff of receiving streams and impacts the water quality and biodiversity of freshwater ecosystems. This map presents the distribution of urban and industrial areas by basin as judged by satellite images of nighttime lights for 1994-95. Because more urbanized watersheds tend to have greater impervious areas as well as higher quantities of urban and industrial pollution, this map also shows those freshwater ecosystems at greater risk of urban and industrial pollution.

This map shows that highly urbanized watersheds are concentrated in basins along the east coast and center of the United States, Western Europe, and Central America with lesser concentrations in China, India, Eastern Europe, Western United States, and the Persian Gulf.

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Mapping Details

The urban and industrial areas were derived from the City Lights dataset, a 1-kilometer by 1 kilometer resolution map derived from nighttime imagery from the Defense Meteorological Satellite Program Operational Linescan System of the United States (NOAA-NGDC 1998). The dataset contains the locations of stable-lights, including frequently observed light sources such as gas flares and oil drilling sites. Time series analysis was used to exclude transient light sources such as fires and lightning. The extent of “lit” area may be slightly overestimated because of the sensor’s resolution and factors such as reflection from water and other surface features. The data better represent urban areas with highly developed economies indicated by extensive electricity networks, street lighting, and industrial activities, such as refineries. The data underestimate urban areas within countries with less developed economies (the mean settlement size required to produce enough light to be detected is much greater in developing countries than in industrialized countries because of differences in energy consumption). The variable is a good indicator of the spatial distribution of settlements and infrastructure, but should not be interpreted as a measure of population density. The percent urban and industrial area is calculated by dividing the area within a watershed indicated as lit, by the total area of the watershed. Percentage of urban area was aggregated by large river basins to produce global maps.

Map Projection

Robinson

Sources

NOAA-NGDC (National Oceanic and Atmospheric Administration-National Geophysical Data Center). 1998.
Stable Lights and Radiance Calibrated Lights of the World CD-ROM. View Nighttime Lights of the World data base available on-line at: http://julius.ngdc.noaa.gov:8080/production/html/BIOMASS/night.html.
Boulder, Colorado, U.S.A.: NOAA-NGDC.

Revenga, C., S. Murray, J. Abramovitz, and A. Hammond, 1998. Watersheds of the World: Ecological Value and Vulnerability.
Washington, DC: World Resources Institute.