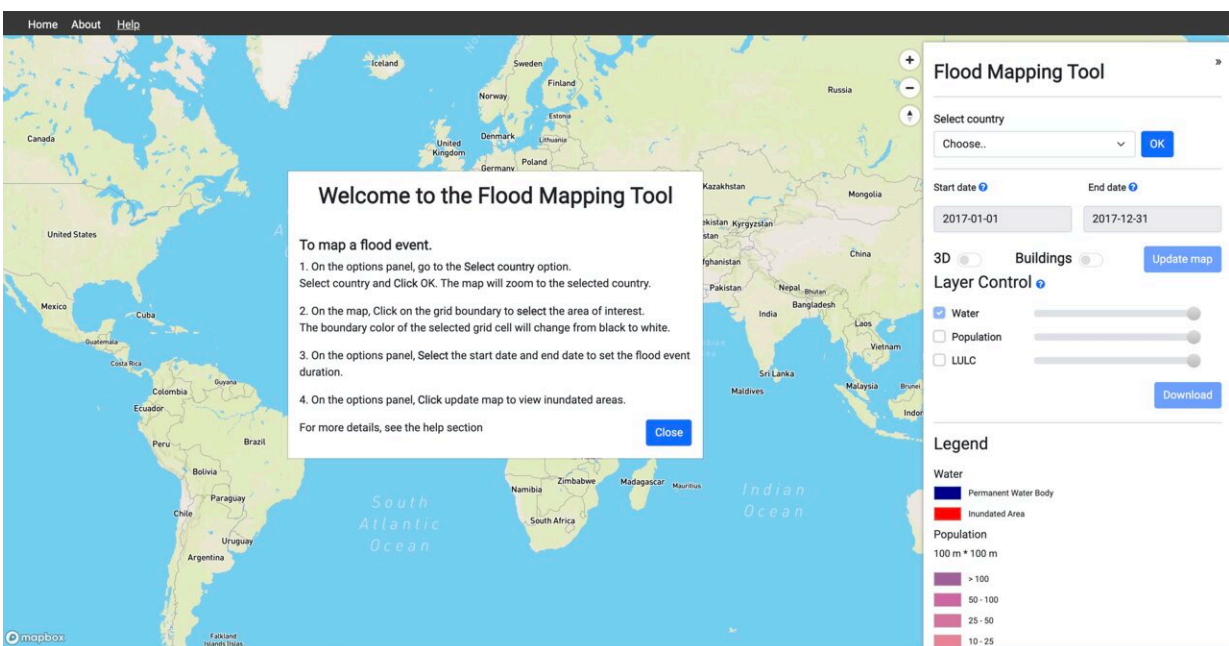# New UN tool maps floods since 1985 to street level, will aid disaster planning, especially in Global South

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Created by the UN University's Institute for Water, Environment and Health in Hamilton, Canada, with support from Google, MapBox and other partners, the new World Flood Mapping Tool lets users adjust variables to help locate gaps in flood defences and responses, and to plan future development of all kinds -- for example, where to build or upgrade infrastructure, or develop agriculture. Credit: UNU-INWEH

UN University-led experts have debuted a new tool that generates

instant, accurate street-level resolution maps of floods worldwide since 1985. The free online World Flood Mapping Tool will help all countries but especially those in the Global South, where flood risk maps are rare and often badly out of date.

Created by the UN University's Institute for Water, Environment and Health in Hamilton, Canada, with support from Google, MapBox and other partners listed below, the tool lets users adjust variables to help locate gaps in flood defenses and responses, and to plan future development of all kinds—for example, where to build or upgrade infrastructure, or develop agriculture.

Simple to use, the tool requires only Internet access to obtain a flood map at 30-meter resolution—street by street level. An upcoming version for more commercial uses, for example by insurance firms, will offer even more precise building-level resolution.

The tool allows users to adjust variables to help locate gaps in flood defenses and responses, and to plan future development of all kinds—for example, where to build or upgrade infrastructure, or develop agriculture.

Says UNU-INWEH Director Vladimir Smakhtin: "Floods in the past decade have impacted the lives of more than half a billion people, mainly in low and middle income countries, and resulted in damages of nearly US $500 billion—roughly equal to the GDP of Singapore. More recent floods worldwide have added to a fast growing toll of upended lives, damage and deaths."

"An estimated 1.5 billion people—greater than the population of Europe—live at risk of exposure to intense flooding," adds Dr. Smakhtin. "We need to prepare now for more intense and more frequent floods due to climate change and hope this tool will help developing

nations in particular to see and mitigate the risks more clearly."

Hamid Mehmood, a GIS and remote sensing specialist at UNU-INWEH who led the tool's development, says that a UNU-INWEH survey showed a majority of flood forecasting centers in flood-prone countries lack the ability to run complex flood forecasting models.

He adds that floods like those this year in Europe that killed more than 200 people and caused billions of dollars in damages are now up to nine times more likely because of climate change.

"As temperatures continue to rise the number of flood events will increase along with their severity," he said. "No place is immune. And yet remarkably few regions, even in wealthy countries, have useful, up-to-date flood maps because of the cost and difficulty of creating them."

The World Flood Mapping Tool uses the Google Earth Engine combined with decades of Landsat data since 1985—a vast catalog of geospatial data enabling planet-scale analysis capabilities.

Layers of Landsat information for a selected region and specified timeframe identifies temporary and permanent water bodies while integrating site-specific elevation and land-use data.

This produces a detailed map of flood inundation in recent decades, with available overlays of population, buildings and land use, which can be used for community planning, building zoning, insurance assessments and more.

To validate the technology, maps generated in less than a minute using the new tool were compared to documented flooding events in Australia, Bangladesh, Canada, Cambodia, India, Mozambique, Sri Lanka and Thailand (detailed below), with 82% accuracy achieved.

Wikipedia's list of history's deadliest floods shows 211 events, 103 of which occurred from 1985, the first year covered by the new tool's data.

The new tool will also reflect new floods soon after they occur to provide the most up-to-date maps to help assess overall flood impacts and plan for the future.

"Painting a detailed picture of the historical and potential flood risk areas will be invaluable for any urban and regional planning department," says project collaborator Dr. Duminda Perera of UNU-INWEH.

The more detailed version of the tool in development for commercial use will provide resolution at a building-by-building level and incorporate building occupancy data.

And a free flood risk prediction tool for release next year will use artificial intelligence to generate current and future flood risk maps for three climate change scenarios at the city, district, and river basin levels.

Maximizing the effectiveness of investments in public infrastructure and reducing costs

Reliable up-to-date information about areas at risk of flooding is especially valuable in Africa and Southeast Asia, where urban areas are expected to grow 80% by 2030. The tool can show the flood-safe locations for housing and industry as well as improving overall urban planning.

The new World Flood Mapping Tool enables governments, funding agencies, and disaster management authorities to hone in on the highest potential risk locations of flooding in the future. Knowing exactly where

flooding will occur can maximize the effectiveness of investments in public infrastructure and reduce costs.

It differs from previously available systems in a number of ways, including:

- Improved resolution of inundation maps to 30 meter resolution, enabling analysis at a citywide level
- Focus on the Global South, where data and information gaps are prominent and annual losses due to floods are high
- Improved accuracy of inundation maps using data from multiple satellite sensors
- Improved accuracy and shorter development time of flood risk maps by using AI models

Dr. Mehmood adds that natural disaster-related insurance rates (where such insurance exists for homes and livelihoods impacted by flooding), flood-related human and economic losses, etc., can be estimated using the new tool.

Potential supply chain vulnerabilities can be revealed. And during disasters, the tool can be used to help determine emergency relief routes.

The World Flood Mapping Tool could also potentially guide development of agriculture insurance support for persons living and farming at the subsistence level. Creating this safety net would have far-reaching implications for global development goals and promoting more secure economies and nations.

The flood inundation maps generated by the tool can be merged with other open datasets—population density or land use / land cover changes, for example—enabling a variety of ways to peer into the future.

Adding other remote-sensing datasets will also improve the tool and offer new ways to employ it, all of which strengthens the ability of countries in the Global South and elsewhere to better plan for and respond to disasters.

More information: The tool: floodmapping.inweh.unu.edu

Provided by United Nations University

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