Deltas in danger: patterns of change across the globe

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Video Abstract

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Abstract

River deltas across the globe are sinking – a problem for the half-billion people currently living on them. These landforms, created as sediment washes downstream towards a river's mouth, are highly susceptible to environmental change. Human activity such as population growth and industrialization are dramatically accelerating this sinking, leading to increased flood risk and the loss of coastal wetlands. To keep deltas intact, a better understanding of the stresses they face is key. Many research groups have studied threats to deltas at the single-delta level; the scope and variety of these threats at the global level, however, isn't clear. But researchers in New York have developed a method to classify the effects of human activity on deltas worldwide. The team used cluster analysis – a way of sorting different variables into groups based on their similarity – to spot patterns in datasets collected at 48 deltas. They examined indicators of stresses experienced in the upstream river basin, the river delta itself, and due to offshore effects. Various threats were investigated, ranging from artificial dam construction to fossil fuel extraction to rising sea levels. Eight patterns of stress related to human activity were defined. Perhaps the most interesting finding was that deltas located in very different parts of the world are facing strikingly similar environmental stresses, whereas those located in close proximity might face different stresses entirely. For example, the Amazon River delta – located near the equator – is under similar environmental pressures as the Lena River delta – located above the Arctic Circle – because both regions have low populations and a lack of development. In contrast, the Orinoco River has more extensive upstream development, and therefore its delta faces different pressures than those at the nearby Amazon River. Defining these patterns allows researchers to apply lessons learned from one delta to deltas across the globe. Synthesizing this information may highlight new ways of protecting the earth, ensuring that communities living on river deltas will have homes for many generations to come.