

# Deltas at risk

Deltas have long shaped humans' lives: our ancestors thrived in river valleys like the Nile, Indus and Yellow. Their rich topsoil, refreshed every year by floods, fed and sustained our early societies.

Today, the story is reversed: humans are shaping deltas. And some deltas are no longer thriving. Modern humans extract oil and water from delta sediments and the rocks below; they build dams upstream that trap sediments that would have replenished the deltas. These and other human activities have led to compacted soils – and slowly sinking deltas.

## Delta risk map

### SUBSTANTIAL RISK

Sediment deposition rates less than sea-level rise

- 1 Paraná, Argentina
- 2 Vistula, Poland
- 3 Indus, Pakistan
- 4 Brahmani, India
- 5 Mahanadi, India
- 6 Godavari, India

### GREATER RISK

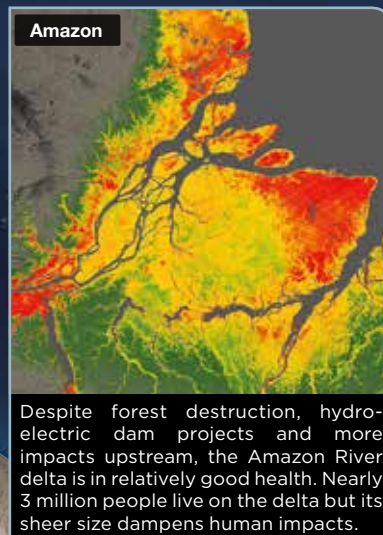
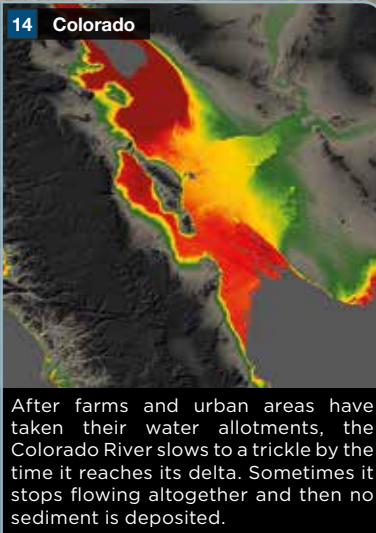
Ground compaction exacerbating low sediment deposition rates

- 7 Mississippi, United States of America
- 8 Magdalena, Colombia
- 9 Niger, Nigeria
- 10 Tigris, Iraq
- 11 Ganges-Brahmaputra, Bangladesh
- 12 Irrawaddy, Myanmar
- 13 Mekong, Vietnam

### SEVERE RISK

Virtually no sediment deposition and accelerating compaction

- 14 Colorado, Mexico
- 15 São Francisco, Brazil
- 16 Rhône, France
- 17 Po, Italy
- 18 Nile, Egypt
- 19 Krishna, India
- 20 Yellow, China
- 21 Yangtze, China
- 22 Pearl, China
- 23 Chao Phraya, Thailand
- 24 Tone, Japan



ELEVATION (metres)



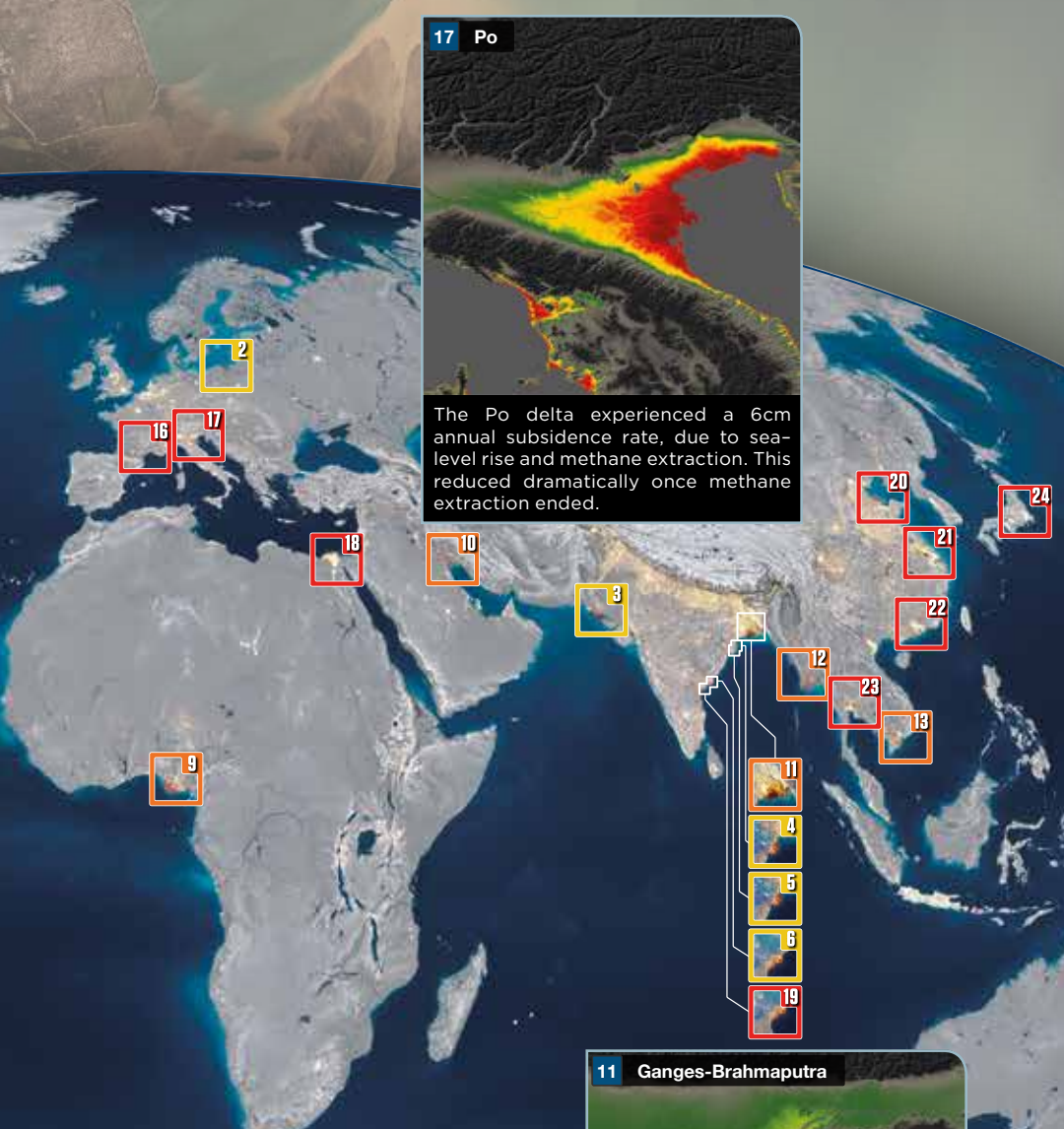
## SOURCES

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 Ericson J P *et al.* (2006) *Global and Planetary Change* 50: 63-82. doi:10.1016/j.gloplacha.2005.07.004  
 IPCC (2013) Summary for Policy Makers. In: Stocker T F *et al.* (eds) *Climate Change 2013: The physical science basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, USA. www.climatechange2013.org/images/report/WG1AR5\_SPM\_FINAL.pdf

Elevation Data: NASA Shuttle Radar Topography Mission Global 3 arc second V003  
 Cartography and design: Globaia

# By numbers

- 1%** The amount of Earth's land area occupied by deltas.
- 24** The number of major deltas that are sinking.
- 4m** Between 1974 and 2010 some parts of Jakarta sank over four metres.
- 45-82cm** The likely range of global average sea-level rise possible by 2100 if emissions continue unabated. Sea level will continue to rise beyond 2100.
- 85%** The percentage of major deltas that experienced severe flooding in the last decade.
- >500 million** The number of people who live on deltas.



**17 Po**

The Po delta experienced a 6cm annual subsidence rate, due to sea-level rise and methane extraction. This reduced dramatically once methane extraction ended.

**20 Yellow**

As deltas sink the risk of flooding rises. In the Yellow River delta typhoons have caused 5m-high storm surges.

**23 Chao Phraya**

In 2011, the Chao Phraya river flooded swamping Bangkok and leaving much of the capital submerged for months. The city has been sinking for decades due to groundwater extraction. Steep taxes on groundwater have slowed subsidence substantially.

**11 Ganges-Brahmaputra**

The delta is home to over 100 million people making it the most populated on Earth. Effective sea-level rise is up to 18 millimetres per year. In 2007-08, substantial flooding affected the Ganges, Mekong, Irrawaddy, Chao Phraya, Brahmani, Mahanadi, Krishna and Godavari. More than 100,000 died and more than a million people were displaced.

**13 Mekong**

Like other deltas, farmers on the Mekong have cut down mangroves to create space for shrimp ponds. Surveys indicate roughly half the mangrove forests have disappeared. Mangroves help prevent erosion and are important flood defences.

**18 Nile**

The Aswan Dam traps nearly 98% of sediment flow downstream. Without those soils, the Nile Delta has compacted and sunk. Relative sea-level rise there is 4.8 millimetres every year.