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# Sustainable Deltas in the Anthropocene

**Robert Nicholls**[1], Neil Adger[2], Craig Hutton[3], Susan Hanson[4], Attila Lázár[5], Katharine Vincent[6], Andrew Allan[7], Emma Tompkins[8], Iñaki Arto[9], Munsur Rahman[10], Sugata Hazra[11], Sam Codjoe[12], and Stephen Darby[13]

[1]University of East Anglia, UK (robert.nicholls@uea.ac.uk)
[2]University of Exeter, UK (N.Adger@exeter.ac.uk)
[3]University of Southampton, UK (cwh@geodata.soton.ac.uk)
[4]University of Southampton, UK (S.E.Hanson@soton.ac.uk)
[5]University of Southampton, UK (A.Lazar@soton.ac.uk)
[6]Kulima Integrated Development Solutions (Pty) Ltd, South Africa (katharine@kulima.com)
[7]Dundee University, UK (A.A.Allan@dundee.ac.uk)
[8]University of Southampton, UK (e.l.tompkins@soton.ac.uk)
[9]BC3, Bilbao, Spain (inaki.arto@bc3research.org)
[10]IWFM. BUET, Dhaka, Bangladesh (munsurbuet1989@gmail.com)
[11]Jadavpur University, Kolkata, India (sugata_hazra@yahoo.com)
[12]University of Ghana, Accra, Ghana (SCodjoe@ug.edu.gh)
[13]University of Southampton, UK (s.e.darby@soton.ac.uk)

Populous deltas exemplify many of the diverse social and environmental changes and challenges that are emerging across the planet during the Anthropocene. Loss of relative elevation due to relative sea-level rise (combining climate and subsidence effects) is one major threat, but there are others such as catchment changes (e.g., water extraction and dam construction) which reduce water and sediment inputs. Rapid socio-economic changes within a delta (e.g., migration, urbanisation, economic transition and land use change) are also widespread and frequently add further pressures on the environmental resources contained within delta systems. There are long histories of evolving adaptation practice at household to community level. In the long-term (i.e. 2100 and beyond), given relative sea-level rise, there are three distinct (but not necessarily mutually exclusive) policy choices for deltas: (i) retreat and progressive abandonment of the coastal zone; (ii) protection with ever-higher defences, growing pumping needs, and residual risk issues; or (iii) raise land elevation by controlled sedimentation. Building elevation is an attractive option if sufficient sediment is available, and there are now a few innovative examples that show it can be delivered to the delta surface— for example, through strategic raising of agricultural and natural areas with controlled sedimentation. One challenge is to accomplish this in a way which does not disrupt the livelihoods of the delta residents. Further is sufficient sediment available now or in the future, and what about growing urban areas where flood defence is likely to remain the norm? This raises the question about the trade-off between elevation and wealth. Many deltas cope with 'lost elevation' via defences: the Netherlands is most advanced in this approach, but

such defences are expensive, require access to technology, and require sophisticated governance arrangements to deliver. A range of potential adaptation options at different scales and with different levels of cost will be required to sustain delta futures. This presentation examines potential adaptation options and trade-offs and delta trajectories in a range of examples including the Volta delta, Ghana, the Mahanadi delta, India and the Ganges-Brahmaputra-Meghna delta, India and Bangladesh.