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TITLE: Subsidence and human influences in mega deltas: The case of the Ganges?Brahmaputra?Meghna

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ABSTRACT:

Relative sea/land level changes are fundamental to people living in deltas. Net subsidence is complex and attributed to tectonics, compaction, sedimentation and anthropogenic causes. It can have severe impacts and needs to be quantified and where possible (for subsidence due to anthropogenic causes) avoided. For the highly populated Ganges-Brahmaputra-Meghna delta, a large range of net subsidence rates are described in the literature, yet the reasons behind this wide range of values are poorly understood. This paper documents and analyses rates of subsidence (for publications until 2014) and relates these findings to human influences (development). 205 point measurements of net subsidence were found, reported in 24 studies. Reported measurements were often repetitive in multiple journals, with some lacking detail as to precise location, cause and method, questioning reliability of the rate of subsidence. Rates differed by locality, methodology and period of measurement. Ten different measurement methods were recorded, with radio-carbon dating being the most common. Temporal and spatially, rates varied between -1.1mm/yr (i.e. uplift) and 43.8mm/yr. The overall mean reported rate was 5.6mm/yr, and the overall median 2.9 mm/yr, with 7.3mm/yr representing one standard deviation. These rates were reduced if inaccurate or vague records were omitted. The highest rates were recorded in the Sylhet Plateau, Dhaka and Kolkata. Highest rates were recorded in the last 1000 years, where the mean increased to 8.8mm/yr and a standard deviation of 7.5mm/yr. This could be partly due to shorter-term measurement records, or anthropogenic influence as multiple high rates are often found in urban settings. Continued development may cause rates to locally increase (e.g. due to groundwater abstraction and/or drainage). Improved monitoring is required over a wider area, to determine long-term trends, particularly as short-term records are highly variable. Focus in regions where wide spread development is occurring or is expected would be advantageous.

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