



Forced coastal migration due to 21st century sea-level rise induced land loss under cost-benefit optimal coastal protection.

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Forced coastal migration due to rising sea-level and induced increased coastal flooding will be a consequence of local lacks of large scale protection. Using a wide range of sea-level rise scenarios projecting 21st century coastal sea-level rise of 29 to 190 cm, socio-economic pathways to project socio-economic change and discount rate assumptions 21st century forced coastal migration as reactive last-resort retreat response to sea-level rise is assessed on global scale assuming local cost-benefit optimal protection decisions. Costs of protection decisions are assessed using the DIVA framework and a global database of 12.148 coastal segments. Costs include expected annual damage to assets by events that overtop existing protection, costs for protection investment and maintenance and migration cost. Robust protection decisions are found for 4.5% of the global coastline, covering 85% of global coastal population and 92% of global coastal floodplain assets. For the remaining 95.5% of global coastline accumulated 21st century land loss ranges from 42,000 km² to 360,000 km² and forced coastal migration ranges from 6.7 to 52 million people. Big countries with long uninhabited coastlines suffering the biggest land losses on country-level. In absolute numbers big countries in South and South-east Asia account for highest forced coastal migration, while in relative numbers island nations have the biggest effects. Global cost of 21st century sea-level rise can be lowered by factor two to five if the cost of forced coastal migration is included in accounting for local sea-level rise response strategies.