SUPPORTING INFORMATION

FIGURE 5 METHODS & RESULTS

This supplementary section describes the method and overall result of Figure 5.

METHODS

Base maps and satellite data

GIS layers (digitised from Sri Lanka 1:50,000 scale toposheets) for hydrological and road networks, as well as administrative divisions, were obtained from the International Water Management Institute (IWMI, Colombo) and the Survey Department of Sri Lanka (Colombo). Where needed during the analysis, as for example near river mouths and lagoons, further toposheet information was either digitised or used as geocorrected scanned images below other GIS layers.

As explained below, the 10 m contour line is a reference level used in the present analysis. Unfortunately, contour lines lower than 20 m are not shown on Sri Lanka 1:50,000 scale toposheets, while the most detailed 1:10,000 scale maps, for which the 10 m contour line is present, cover only a limited part of the country. The best alternative, readily available source of data to approach the 10 m contour line was found to be the SRTM – DEM (Shuttle Radar Topographic Mission – Digital Elevation Model) distributed by USGS (United States Geological Survey). The SRTM 3 second arc Digital Elevation Data used in the study was made available by the 'Consultative Group for International Agricultural Research' (CGIAR – Consortium for Spatial Information) after processing to fill the 'no-data' voids present in the USGS dataset. The SRTM elevation data of Sri Lanka was used to generate 10 m interval contour lines of the coastal areas. The generated 20 m and 40 m contour lines were checked

against the contour lines given in 1:50,000 scale toposheets in order to correct for possible horizontal or vertical shifts in the SRTM data, and hence to minimise the effect of the reported relative vertical accuracy of ± 6 m of the data (Rabus *et al.* 2003). Missing data were completed and inaccurate data corrected.

Vulnerable areas along the coast

Vulnerability of the coastal land area to wave-related hazards depends in part on the elevation of the coastal land from the mean sea. Considering that the run up height of the 2004 tsunami event at the shore was reported to be about 10 m (Liu *et al.* 2005), the coastal land area lying under the 10 m contour line was considered as the most vulnerable area for a tsunami and hereafter referred to as '**vulnerable area**'. Vulnerable area of the country was extracted from the GIS layer of contour lines with 10 m intervals, which was generated using SRTM - DEM data. However, before this extraction, evident errors due to the presence of buildings and some 'temporary elevations' along the coastline were corrected manually.

Except at places with coastal cliffs rising more than 10 m directly from the sea level, the polygon of vulnerable area overlaps with the polygon delineating the coastline of the country. The total length of all these overlapping parts of the coastline is hereafter referred as '**vulnerable coastline**' of the country. The rest of the coastline is considered as the '**geographically protected coastline**'.

Mangrove areas along the coastline

In general, intertidal areas of lagoons, river mouths and sheltered bays in coastal areas of tropical countries are ideal habitats for mangroves when the substrate is muddy or sandy. There are historic archives reporting that, such areas in Sri Lanka were covered by extensive mangrove forests in the past (Tennent 1859). However, until today the accurate extent and

composition of mangroves for the entire country is not known. Analysing this would necessitate country-wide very high resolution remote sensing data, which is currently not available and constitutes an unrealistic cost. Instead, the areas considered in this study are based on reliable physical site conditions that form **potential mangrove areas**, many of which are known to have today or to have had mangroves in the past. However, judged from the coast geomorphology and hydrogeography, it should be highlighted that, should mangroves be absent today, restoration of mangroves in these areas is possible and is even advised. Identification of potential mangrove areas was done by overlaying the hydrological network of coastal areas (from 1:50000 toposheets) with a layer of contour lines of the ground in a GIS-environment. Where a water body with an inflow of sea water (overland or through seepage), was located within the first 500 m zone and below the 10 m contour line, its margin or intertidal area was considered as a potential mangrove habitat. A coastline segment having a potential mangrove habitat behind it, is considered part of the 'mangrove coastline' of the country. In figure 5, '**mangrove coastline**' refers to the total length of such segments for the whole country, or in a particular administrative division. Hence, the rest of the coastline is referred to as '**non-mangrove coastline**'. The area within the first 1 km belt of the mangrove coastline is considered the area potentially protected by mangroves. The total of all such areas for the whole country or in an administrative division is referred in this paper as the '**mangrove-protected area**'.

RESULTS

Table S1 shows that approximately 90% of the Sri Lankan coastline is vulnerable, but that less than a third of this vulnerable coastline can be protected by mangrove vegetation. The breakdown of the categories in Table S1 per coastal district is given in Figure 5 of the main article.

Table S1. Total coastline of Sri Lanka and its breakdown into different categories.

	Coastline with potential for mangrove vegetation (km)	**Coastline with potential for non-mangrove vegetation (km)**	**Total (km)**
Vulnerable coastline (km)	523	1057	1580
Geographically protected coastline (km)	15	143	158
Total (km)	538	1200	**1738**

References used in this supporting information section

Liu, PL-F, Lynett P, Fernand H o, Jaffe BE, Fritz H, Higman B, Morton R, Goff J, Synolakis C. 2005. Observations by the international tsunami survey team in Sri Lanka. Science 308: 1595.

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Tennent JE. 1859. Ceylon, an account of the island physical, historical and topographical with notices of its natural history, antiquities and productions. Volume I : Physical geography, Zoology, The Singhalese chronicles, Sciences and social arts, Mediæval history. London, UK: Longman, Green, Longman & Roberts.